UHD World Association
世界超高清视频产业联盟

3D Audio Technology Specification:Part 1: Coding, Transmission and Presentation

（V1.0）

Release Time
2023-12-31

UHD World Association (UWA)
T/UWA 009.1-2023

Contents

Preface

This document was drafted in accordance with the rules given in GB/T 1.1-2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules for Standard Documents".

This document is part 1 of T/UWA 009, "Three-dimensional Acoustic Technical Specifications," which has been released in the following parts:

- Part 1: Encoding distribution and presentation;
- Part 3-1: Technical Requirements and Test Methods for Home Audio-Visual Playback Devices.

This document replaces T/UWA 009.1-2022 "3D audio Technical Specification Part 1: Encoding, Distribution, and Presentation". Compared to T/UWA 009.1-2022, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

The scope of application has been expanded to include radio and television (see Chapter 1);

Delete the definitions of bit rate, sampling frequency, and neural network, modify the encoded audio bitstream to encoded bitstream, add definitions of two-channel stereo, surround sound, three-dimensional sound, metadata, speaker rendering, and binaural rendering (see Chapter 3);

Add low complexity configuration (see 7.3);

Increase the allocation of mute frame bits (see 7.6);

Add non-destructive audio decoding (see Chapter 8);

Add metadata restrictions, speaker rendering, and binaural rendering definitions (see Annex C);

Add universal audio full-rate encoding (see Annex D);

Add the corresponding relationship between the encoding and decoding metadata in this document and the metadata in ITU-R BS.2076-2 (see Annex E).

This document is proposed and centralized by the World Ultra-high-definition Video Industry Alliance.

Introduction

This document is jointly developed by the World HD Video Industry Alliance andZhongguancun Audio-visual Industry Technology Innovation AllianceJointly developed.

The issuing authority of this document draws attention to the following fact: when claiming compliance with this document, it may involve the use of patents related to general full-rate audio codec technology, lossless audio codec technology, and rendering technology.

The issuing agency of this document draws attention to the fact that when claiming compliance with this document, the use of the following 34 patents related to audio codec technology may be involved in 6, 7.3, 7.5, 7.6, 7.7, and 7.13. The names of the patents are as follows:

200710175993.6 Codec integration system and method; 202110559102.7 Encoding and decoding method, device, equipment, storage medium and computer program; 202110596023.3 Audio data encoding and decoding method and related device and computer readable storage medium; 202110865328.X A method and device for encoding and decoding audio signals; 200710135833.9 Stereo audio encoding/decoding method and encoder; 200810106460.7 Stereo signal encoding and decoding method, device and coding system; 200710304486.8 Encoding method and device for audio signals and decoding method and device; 201110289391.X A method and device for generating and restoring downmix signals; 202210699863.7 A codec method, device, and terminal device for multi-channel signals; 202010699711.8 Multi-channel audio signal encoding method, encoder, decoding method, and decoder; 200910235713.5 Multi-channel audio encoding method, encoder, decoding method, and decoder; 202110700570.1 A processing method and device for three-dimensional audio signals; 202110602507.4 A processing method and device for three-dimensional audio signals; 200910169403.8 Frequency band expansion method and device; 201180003043.X Method and decoder for reconstructing source signals; 202110654037.6 Encoding and decoding method, device, equipment, storage medium and computer program; 201610877571.2 A method and device for audio signal reconstruction; 201010187426.4 Signal processing method and system; 202110247466.1 Virtual speaker set determination method and device; 202110246382.6 HOA coefficient acquisition method and device; 202011377433.0: An audio coding method and device; 202011377320.0: An audio coding method and device; PCT/CN2021/100076: An audio rendering system, method, and electronic device; PCT/CN2021/100062: An audio signal encoding method, device, and electronic device for audio rendering; PCT/CN2021/114366: A processing method and device for audio metadata; 202110984837.4: An audio production model and generation method, electronic device, and storage medium; 202111102045.6: Audio program metadata and generation method, electronic device, and storage medium; 202111100818.7: Audio content metadata and generation method, electronic device, and storage medium; 202111102038.6: Audio object metadata and generation method, electronic device, and storage medium; 202111205630.9: Audio track unique identification metadata and generation method, electronic device, and storage medium; 202111204386.4: An audio track metadata and generation method, electronic device, and storage medium; 202111202898.7: An audio stream metadata and generation method, electronic device, and storage medium; 202111308422.1: A metadata and generation method, device, and medium based on the soundbed audio packet format; 202111308430.6: A metadata and generation method, device, and medium based on the object audio packet format; 202111306844.5: A metadata and generation method, device, and storage medium based on the scene audio packet format; 202111308421.7: A metadata and generation method, device, and medium based on the binaural audio packet format; 202111021068.4: A metadata and generation method, device, and storage medium based on the soundbed audio channel format; 202111020417.0: A metadata and generation method, device, and storage medium based on the object audio channel format; 202111021066.5: Scenario-based audio channel metadata and generation method, device, and storage medium; 202111021039.8: Binaural audio channel metadata and generation method, device, and storage medium; 202111425628.2: Serial audio metadata frame generation method, device, device, and storage medium; 202111425590.9: Transmission track format serial metadata generation method, device, device, and storage medium; 202111424251.9: Serial audio block format metadata generation method, device, device, and storage medium; 202111424254.2: Serial audio metadata generation method, device, device, and storage medium; 202111666346.1: Broadcast audio format file generation method, device, device, and storage medium; 202111666362.0: Audio metadata block generation method, device, device, and storage medium; 202210588174.9: Method, device, device, and storage medium for generating internal data structure of the renderer; 202210634563.0: Method and device for rendering audio based on soundbed using metadata; 202210762912.7: Configuration method, device, device, and storage medium for shared renderer components; 202210760302.3: Method, device, device, and storage medium for mapping rendering items of soundbed; 202210603204.9: Method, device, device, and storage medium for determining rendering items of the renderer; 202210600880.0: Method, device, device, and storage medium for determining rendering items of soundbed output; 202210603208.7: Method, device, device, and storage medium for determining rendering items of object output; 202210603212.3: Method, device, device, and storage medium for determining rendering items of scene output; 202210603184.5 audio renderer rendering item processing method, device, equipment and storage medium; 202210608202.9 scene rendering item data mapping method, device, equipment and storage medium; 202210782056.1 audio renderer gain calculation method, device, equipment and storage medium; 202210910129.0 metadata parsing method, device, equipment and medium for object renderer; 202210907370.8 method and device for rendering object-based audio using metadata; 202210912275.7 method and device for rendering scene-based audio using metadata; 202211057713.2 method and device for rendering object-based audio using metadata; 202211063746.8 method and device for rendering scene-based audio using metadata; 201610879165.X method and device for reconstructing audio signals; 201610252268.3 method and device for sampling and reconstructing audio signals; 202110595367.2 encoding method and device for multi-channel audio signals; 200980154599.1 stereo encoding method and device; 202010699775.8 encoding method and device for multi-channel audio signals; 202010699706.7 encoding method and device for multi-channel audio signals; 202110530309.1 audio encoding and decoding method and device; 202110536634.9 three-dimensional audio signal encoding method, device, encoder; 202110680341.8 three-dimensional audio signal encoding method, device, encoder, and system; 202110535832.3 three-dimensional audio signal encoding method, device, and encoder; 202110536623.0 three-dimensional audio signal encoding method, device, and encoder; 202110536631.5 Three-dimensional audio signal encoding method, device and encoder.

The issuing authority of this document does not have any position on the authenticity, validity, and scope of this patent.

The patent holder has assured the issuing authority of this document that he is willing to negotiate with any applicant for patent licensing on reasonable and non-discriminatory terms and conditions. The statement of the patent holder has been filed with the issuing authority of this document. Relevant information can be obtained through the following contact information:

Contact person: Gao Yanxuan

Address: China Electronics Standardization Institute, No. 1, Andingmen East Street, Dongcheng District, Beijing

Zip code: 100007

Tel: 13683269839/01064102619

Fax: 01084029217

Please note that in addition to the above patents, some content of this document may still involve patents. The issuing agency of this document does not assume responsibility for identifying these patents.

3D Audio Technology Specification:Part 1: Coding, Transmission and Presentation

1 Scope

This document specifies the coding, transmission, and presentation methods for 3D audio, and supports mono, dual-channel stereo, multi-channel, 3D audio, HOA, and metadata encoding and decoding.
This document is applicable to the fields of radio and television, broadcast streaming media, network television, digital cinema, real-time communication, virtual reality and augmented reality, video surveillance, digital storage media, and other fields.

2 Normative References

The content of the following documents is normatively referenced in this document, and constitutes indispensable provisions of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced documents (including any amendments) applies.
GB/T 33475.3-2018 Information technology - High efficiency media coding - Part 3: Audio
GY/T 262-2012 Algorithm for measuring the program loudness and true-peak audio level
GY/T 316-2018 Advanced sound system for program production
ISO/IEC 13818-1 Information technology - Generic coding of moving pictures and associated audio information - Part 1: Systems
ISO/IEC 14496-12:2020 Information technology Coding of audio-visual objects Part 12: ISO base media file format
ISO/IEC 23000-19:2022 Information technology - Multimedia application format (MPEG-A) - Part 19: Common media application format (CMAF) for segmented media
ITU-R BS.2076-2 Audio Definition Model
ITU-R BS.2094-1 Common definitions for the Audio Definition Model

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 Reserved

A field that is temporarily not used in a definition of a coded bitstream and may be used in future standard extensions.

3.2 Bitstream

A group of bits in a specific order used as a data encoding representation.

3.3 Coding

Reads an audio sample value and generates a valid bitstream that conforms to this document.

3.4 Coder

The entity of encoding processing.

3.5 Coded bitstream

Ancoded representation of an audio signal.

3.6 side information

Necessary information to control decoding in a bitstream.

3.7 Object

A sound perceived as a whole or as an sound independent of an environment emitted by a sound source .

3.8 Decoding

A type of data processing defined in this document, that is, a process of reading a coded bitstream and outputting an audio sample value.

3.9 Decoder

The entity of decoding processing.

3.10 Spectral coefficient

Used to analyze discrete-spectrum domain data output by a filter group.

3.11 Entropy coding

A type of variable-length lossless coding in a digital representation of a signal, to reduce redundancy in statistical characteristics..

3.12 Channel

A set of ordered audio samples for transmission to a single speaker or another replay device.

3.13 Stereo audio

An audio format in which two channels carry audio signals with a certain phase relationship or amplitude relationship or a mixed phase and amplitude relationship. It is usually reproduced by two symmetrical speakers located in front of the listener, giving the listener a wider sound field experience.

3.14 Surround audio

An audio format in which a plurality of channels carry a plurality of audio signals that form complete audio content, and a sense of a surround sound field is provided for a listener through replay by a plurality of speakers surrounding the listener at an ear height layer of the listener.

3.15 3D Audio

An audio format in which a plurality of channels carry a plurality of audio signals that form complete audio content, and a higher spatial resolution of sound image localization and a sense of an immersive sound field are provided for a listener through direct replay by a plurality of speakers surrounding the listener at different spatial layers, or through replay after rendering or mapping.

3.16 Metadata

Data describing audio content.

3.17 Rendering

A process in which a given audio transmission format is converted into a directly replayable audio format that is applicable to configurations of terminal speakers and headphones.

3.18 Binaural rendering

Creates the effect of spatiall auditory perception for multi-channel audio through two channels.

3.19 Speaker rendering

Creates the presentation effect of spatial auditory perception for audio signals through a set of speakers.

4 Abbreviations

The following abbreviations apply to this document.

AASF	AVS Audio Storage Format
AATF	AVS Audio Transport Format
AVS	Audio Video coding Standard
BWE	Bandwidth Extension
CMAF	Common Media Application Format
CNN	Convolutional Neural Network
CRC	Cylic Redundancy Check
FFT	Fast Fourier Transform
FOA	First Order Ambisonics
HOA	Higher Order Ambisonics
ILD	Inter-channel Level Difference
IMDCT	Inverse Modified Discrete Cosine Transform
ISOBMFF	ISO Base Media File Format
LFE	Low Frequence Effect
LPC	Linear Prediction Coefficients
LSF	Line Spectral Frequencies
LSP	Line Spectral Pairs
MCAC	Multi Channel Adaptive Coupling
MCR	Maximum Correlation Rotation
MDCT	Modified Discrete Cosine Transform
M/S	Middle/Side
PAR	Peak-to-Average Ratio
PCM	Pulse-Code Modulation
SFB	Scale Factor Band
SFM	Spectral Flatness Measure
TNS	Temporal Noise Shaping
VBAP	Vector-based Amplitude Panning
VQ	Vector Quantization

5 Conventions

5.1 Overview

The mathematical operators and precedence used in this document are similar to those used in the C language. However, integer division and arithmetic shift operations are specifically defined. . Unless otherwise specified, numbering and counting convention begins from 0.

5.2 Arithmetic operator

Definitions of arithmetic operators are shown in Table 1.

Table 1 Definition of arithmetic operators

arithmetic operator	Definition
+	addition
-	Subtraction (as a binary operator) or negation (as a unary prefix operator)
×	multiplication
*	multiplication
a^b	Exponentiation, indicating the bth power of a. It may also indicate a superscript.
pow(a, b)	Exponentiation, indicating the bth power of a
/	Division without truncation or rounding
÷	Division without truncation or rounding
$\frac{a}{b}$	Division without truncation or rounding
$\sum_{i=a}^{b} f(i)$	Cumulative sum of the $f(i)$ function when the independent variable i takes all integer values from a to b (including b).
$\lfloor\cdot\rfloor$	round down
$\sqrt{a}$	square root of a
$\|\cdot\|_2$	2-norm

5.3 Logical operator

The definitions of logical operators are shown in Table 2.

Table 2 Definition of logical operators

logical operator	Definition of
||	logical OR
&&	Logic AND
!	logical NOT

5.4 Relational operator

The definitions of relational operators are shown in Table 3.

Table 3 Definition of relational operators

relational operator	Definition
>	greater than
≥	Greater than or equal to
<	less than
≤	Less than or equal to
==	equal to
≠	Not equal to

5.5 Bitwise operator

Definitions of bitwise operators are shown in Table 4.

Table 4 Definition of bit operators

bitwise operator	Definition
&	AND operation
|	OR operation
~	NOToperation
a >> b	Right shift of a two's complement representation of the integer a by b digits. This operation is defined only when b is a positive number. Bits shifted into the most significant bits (MSBs) as a result of the right shift have a value equal to the MSB of a prior to the shift operation..
a << b	Left shift of a two's complement representation of the integer a by b digits. This operation is defined only when b is a positive number. Bits shifted into the least significant bits (LSBs) as a result of the left shift have a value equal to 0.

5.6 Assignment

Definitions of assignment operator are shown in Table 5.

Table 5 Definition of assignment operators

assignment operator	Definition
=	assignment operator
++	Auto-increment. x+1 is equivalent to x = x + 1. When the operator is used in an array subscript, a value of a variable is calculated prior to the auto-increment operation.
+=	Auto-increment by amount specified. For example, x+=3 is equivalent to x=x+3, and x+=(-3) is equivalent to x=x+(-3).
-=	Auto-decrement by amount specified. For example, x -= 3 is equivalent to x = x + (-3), and x -= (-3) is equivalent to x = x – (-3)

5.7 Mnemonic

Definitions of mnemonic are shown in Table 6.

Table 6 Mnemonic definition

mnemonic	Definition
rpchof	Polynomial remainder, high order first
bslbf	A bitstream, left bit first. A bit string is written as a string of 1s and 0s with single quotation marks, for example '1000 0001'. Spaces within a bit string are for ease of reading and have no significance. (Bitstream left bit first)
uimsbf	unsigned integer, the most significant bit first(Unsigned integer, most significant bit first)
bsmbf	A bit string is written as a string of 1s and 0s with single quotation marks, right bit first. For example, if a 5-bit value 6 and then a 3-bit value 2 are coded, the coded bit string is '010 00110'

5.8 Mathematical function

For definitions of mathematical functions, refer to formula (1) and formula (2).

$$|x| = \begin{cases} x & ; \ x > 0 \\ 0 & ; \ x = 0 \\ -x & ; \ x < 0 \end{cases} \quad \text{......(1)}$$

Wherein:

X is an independent variable.

$$ReLu(x) = \begin{cases} x & ; \ x > 0 \\ 0 & ; \ x \le 0 \end{cases} \quad \text{......(2)}$$

Wherein:

X is an independent variable.

5.9 Bitstream Syntax rules

Each data item in the bit stream is in bold font. It is described by its name, bitwise length and type, and mnemonic of transmission order.

The operations caused by a decoded data element in the bitstream depends on a value of the data and a previously decoded data element. Unless otherwise specified, the "bit" in this document indicates a binary bit.

Note 1:Unless otherwise specified, the term "bit" in this document indicates a binary bit.

Note 2:The syntax describeed in this document is specified using "C" code.. A variable or an expression of a non-zero value is equivalent to a true condition. A variable or an expression of a zero value is equivalent to a false condition.

```
while(condition){
data_element
…
}
```

Note 3:

If the condition is true, a data element group is generated immediately after the data flow. This process is repeated until the condition is false.

```
do{
  data_element
  …
```

```
} while(condition)
```

If the condition is true, the data element group is generated immediately after a data stream. This process is repeated until the condition is false.

```
if(condition){
   data_element
   …
} else{
   data_element
   …
}
```

If the condition is true, a first group of data elements is generated in a data stream. If the condition is false, a second group of data elements is in the data stream.

```
for (expr1; expr2; expr3)
   data_element
   …
}
```

The expr1 is an expression that specifies an initial state of a loop, and usually specifies an initial state of the counter. The expr2 specifies a test condition before each loop. If the condition is false, the loop stops. The expr3 is an expression executed at the end of each loop, and usually is a count-up counter.

Note 4: The most common use is as follows:

```
for(i=0;i<n;i++){
data_element
…
}
```

The data element group is generated n times. A conditional structure within the data element group may depend on a value of the loop control variable i. This field is set to '0' when it appears for the first time, increases to '1' when it appears for the second time, and the like..

switch(expr) {	Generate corresponding data elements based on the value of expression expr. The value of expr is
case constcase1:	When constcase1 is used, the data element data_element1 is generated, and the value of expr is
data_element1	constcase2 generates data element data_element2, and so on, the value of expr
break	When constcasen is true, the data element data_elementn is generated. When the value of expr is not equal to
case constcase2:	When any value in constcase1, constcase2, …, constcasen is produced,
data_element2	Data element data_elementdefault
break	
…	
case constcasen:	
data_elementn	
break	
default:	

data_elementdefault
break
}

A variation of this structure is to not use break after case, such as:

switch(expr) {	When the value of expr is constcasex, the number is generated from the corresponding case constcasex
case constcase1:	According to the element, until break appears.
data_element1	When the value of expr is constcase1, the data element data_element1 and
case constcase2:	Data element generated when the value of data_element2, expr is constcasen
data_element2	data_elementn
break	
…	
case constcasen:	
data_elementn	
break	
default:	
data_elementdefault	
break	
}	

Note 5: The data element group may contain nested structures. For simplicity, the "[]" is omitted when there is only one subsequent data element .

data_element[ ]	The data_element is an array of data, and the number of data elements depends on the context;
data_element[n]	data_element[n] is the n+1th element of the array data;
data_element[m][n]	data_element[m][n] is the m+1, n+1 element of the two-dimensional array;
data_element[l][m][n]	data_element[l][m][n] is the l+1, m+1, n+1 element of the three-dimensional array;
data_element[m…n]	data_element[m…n]是位m到位n之间包括的位。

Although the syntax is expressed as a process item, it cannot be considered that the clause implement a reliable decoding process. It simply defines an error-free bitstream input.

The definition of the byte_alignment() function:

If a current position is at a byte boundary, the byte_alignment() function returns '1', that is, a next bit in the bitstream is a start bit of a byte. Otherwise, it returns '0'.

Definition of Nextbits(n) function:

The next bits(n) compares next to- be-decoded bits in the bit string and the bitstream..

6 3D audio codec and rendering framework

3D audio encoding includes general full-rate audio encoding, lossless audio encoding, and metadata encoding. The 3D audio encoding framework is shown in Figure 1. During 3D audio encoding, an input audio signal is divided into a channel signal, an object signal, and an HOA signal. The channel signal is a mono signal, a dual-channel stereo signal, or a multi-channel surround/3D audio signal.The general full-rate audio coding (including a basic configuration and a low-complexity configuration) or the lossless audio coding may be selected for the channel signal, the object signal, and the HOA signal Metadata is encoded using metadata encoding, and the 3D audio coded bitstream is obtained through the 3D audio bitstream multiplexing.

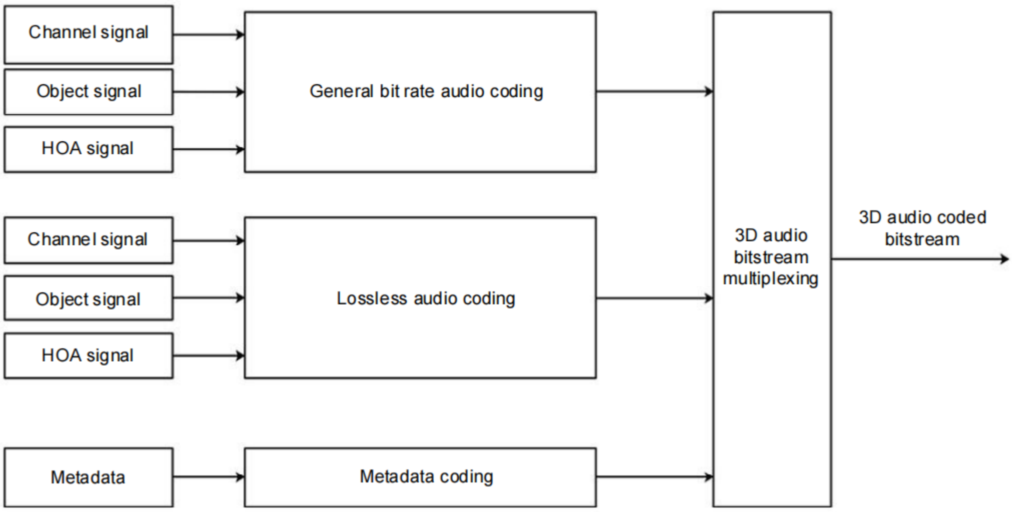


Figure 1: Three-dimensional acoustic coding framework

The general full-rate audio coding supports the following parameter configurations.

—— Support sampling rates are as follows: 32kHz, 44.1kHz, 48kHz, 96kHz, 192kHz.

—— Supported sampling precisions are as follows: 16bit and 24bit.

—— The supported coding bit rates are as follows:

- Mono: 32kb/s, 44kb/s, 56kb/s, 64kb/s, 72kb/s, 80kb/s, 96kb/s, 128kb/s, 144kb/s, 164kb/s, 192kb/s;
- dual-channel stereo: 32kb/s, 48kb/s, 64kb/s, 80kb/s, 96kb/s, 128kb/s, 144kb/s, 192kb/s, 256kb/s, 320kb/s;
- 5.1 multi-channel stereo: 96kb/s, 128kb/s, 144kb/s, 160kb/s, 192kb/s, 256kb/s, 320kb/s, 384kb/s, 448kb/s, 512kb/s, 640kb/s, 720kb/s;
- 7.1 multi-channel: 128kb/s, 160kb/s, 192kb/s, 256kb/s, 384kb/s, 480kb/s, 576kb/s, 640kb/s;
- 5.1.2 multi-channel: 152kb/s, 320kb/s, 480kb/s, 576kb/s;
- 7.1.2 multi-channel: 216kb/s, 384kb/s, 480kb/s, 576kb/s, 768kb/s;
- 5.1.4 multi-channel: 176kb/s, 256kb/s, 384kb/s, 448kb/s, 576kb/s, 704kb/s;
- 7.1.4 multi-channel: 240kb/s, 384kb/s, 512kb/s, 608kb/s, 832kb/s;
- FOA: 96kb/s, 128kb/s, 192kb/s, 256kb/s;
- 2-order HOA: 192kb/s, 256kb/s, 320kb/s, 384kb/s, 480kb/s, 512kb/s, 640kb/s;
- 3-order HOA: 256kb/s, 320kb/s, 384kb/s, 512kb/s, 640kb/s, 896kb/s.

The lossless audio coding supports a maximum of 128 channels.

3D audio decoding is the reverse process of 3D audio coding. The 3D audio coded bitstream is processed through general full-rate audio decoding or lossless audio decoding to obtain a channel signal, an object signal, and an HOA signal. The metadata is obtained through metadata decoding. The decoded channel signal, object signal, and HOA signal nay be rendered through speaker rendering to obtain a signal for multi-speaker playing, or may be binaurally rendered to obtain a signal for headphone playing. The 3D audio decoding and rendering framework is shown in Figure 2.

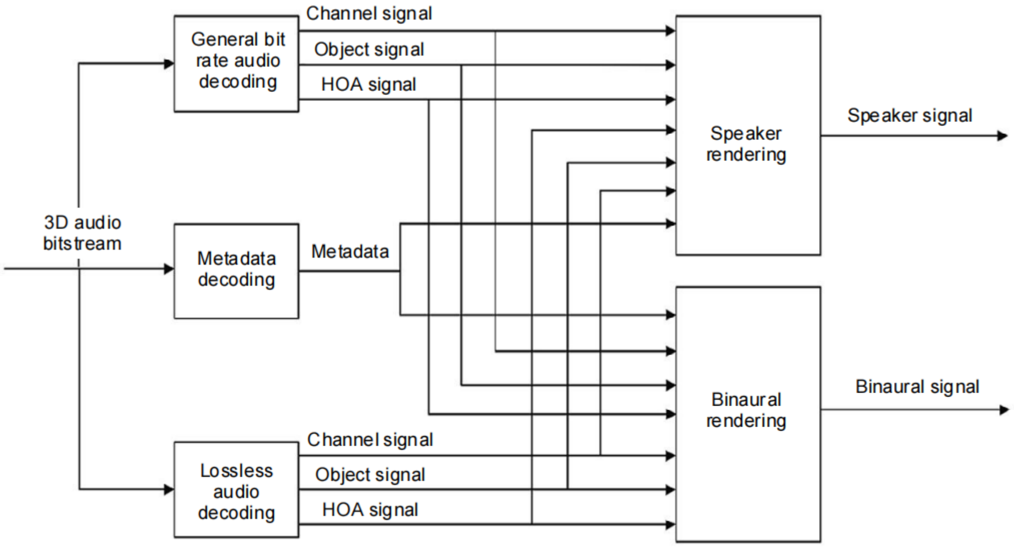


Figure 2 3D audio decoding and rendering framework

For general full-rate audio decoding, refer to Chapter 7. For lossless audio decoding, refer to Chapter 8. For metadata decoding, refer to Chapter 9. The syntax and semantics of the 3D audio coded bitstream should comply with the provisions in Annex A, The audio code table related to the general full-rate audio coding should comply with the provision in Annex B. Metadata restriction, with the reference implementations for a speaker rendering and a binaural rendering, refer to Annex C. For general full-rate audio coding, refer to Annex D. For correspondence between the coding metadata in this document and metadata in ITU-R BS.2076-2 , refer to Annex E.

7 General full-rate audio decoding

7.1 General principles

The General full-rate audio decoding includes core decoding and HOA spatial decoding. The Core decoding decodes a coded bitstream into a channel signal and an object signals. The Core decoding and HOA spatial decoding decodes a coded bitstream into an HOA signals. The general full-rate audio decoding framework is shown in Figure 3. The core decoding includes bitstream demultiplexing, decoding, inverse quantization, and inverse neural network transform, spectral inverse grouping processing, upmixing, and post-decoding processing. The upmixing supports stereo upmixing, multi-channel upmixing, and HOA upmixing. The post-decoding processing includes bandwidth extension decoding, inverse timporal noise shaping, inverse frequency-domain noise shaping, and inverse MDCT.

For the bitstream demultiplexing, refer to section 7.2. For the range decoding, the inverse quantization, and the inverse neural network transform, refer to section 7.3. For the spectrum inverse grouping, refer to section 7.4. For dual-channel stereo bit allocation and upmixing, refer to section 7.5. For multi-channel bit allocation and upmixing, refer to section 7.6. For HOA bit allocation and upmixing, refer to section 7.7. For the post-decoding processing, refer to section 7.8. For the bandwidth extension decoding, refer to section 7.9. For the inverse temporal noise shaping, refer to section 7.10. For the inverse frequency-domain noise shaping, refer to section 7.11. For the inverse MDCT, refer to section 7.12. For the HOA spatial decoding, refer to section 7.13.

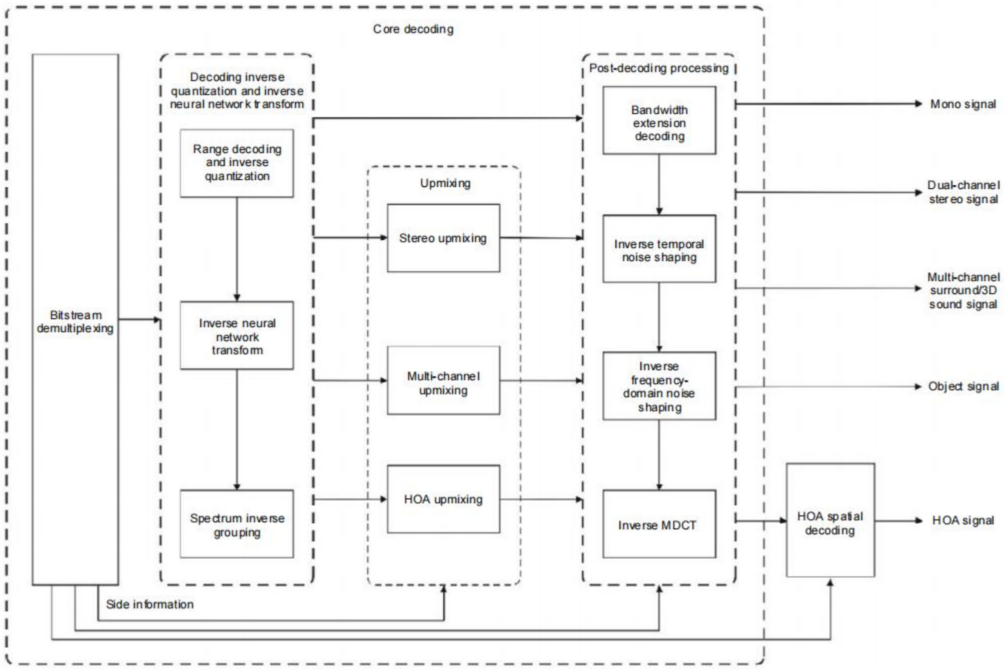


Figure 3: General full-rate audio decoding framework

The mono decoding includes range decoding, inverse quantization, inverse neural network transform, spectrum inverse grouping, and post-decoding processing. For a decoding framework, refer to figure 4. In a range decoding and inverse quantization process, a transform-domain coefficient corresponding to an MDCT coefficient is obtained by parsing a bitstream. A reconstructed MDCT coefficient is obtained by performing inverse neural network transform. Finally, a time-domain mono signal is obtained through post-decoding processing. The post-decoding processing framework is shown in Figure 5.

The obtained process is as follows.

1）Range decoding and inverse quantization

Bitstream information related to coding of an MDCT spectral coefficient is obtained from the bitstream. Range decoding and inverse quantization are performed to obtain a transform-domain coefficient corresponding to the MDCT coefficient, which is used as and inputs for inverse neural network transform. For details, refer to section 7.3.

- Input: the bitstream
- Output: the transform-domain coefficient corresponding to the MDCT coefficient

2）Inverse neural network transform

The inverse neural network transform is performed to the transform-domain coefficient corresponding to the MDCT spectral coefficient to obtain the reconstructed MDCT coefficient. For details, refer to section 7.3.

- Input: the transform-domain coefficient corresponding to the MDCT coefficient
--Output: the reconstructed MDCT coefficient

3）bandwidth extension decoding

A bandwidth extension decoding module performs energy adjustment and spectral detail adjustment on a low-frequency part of the reconstructed MDCT coefficients based on the bandwidth extension parameter obtained by decoding the bitstream, to obtain a high frequency spectrum component. For details, refer to section 7.9.

- Input: the reconstructed MDCT coefficient and a bandwidth extension parameter
- Output: an MDCT coefficient of the mono signal

4）Inverse temporal noise shaping

An inverse temporal noise shaping module is an inverse process at an encoder, and recovers an MDCT coefficient before temporal noise shaping. For details, refer to section 7.10.

5）Inverse frequency-domain noise shaping

An inverse frequency-domain noise shaping module is an inverse process at an encoder and recovers an MDCT coefficient before frequency-domain noise shaping. For details, refer to section 7.11.

Input: the MDCT coefficient of the mono signal after inverse temporal noise shaping and a frequency-domain noise shaping parameter

- Output: an MDCT coefficient of the mono signal after inverse frequency-domain noise shaping

6）Inverse MDCT

An inverse MDCT module transforms the MDCT coefficient into a time-domain signals based on a window control parameter obtained by parsing the bitstream. For details, refer to section 7.12.

- Input: the MDCT coefficient of the mono signal after inverse frequency-domain noise shaping and the windowed control parameter
- Output: a time-domain mono signal

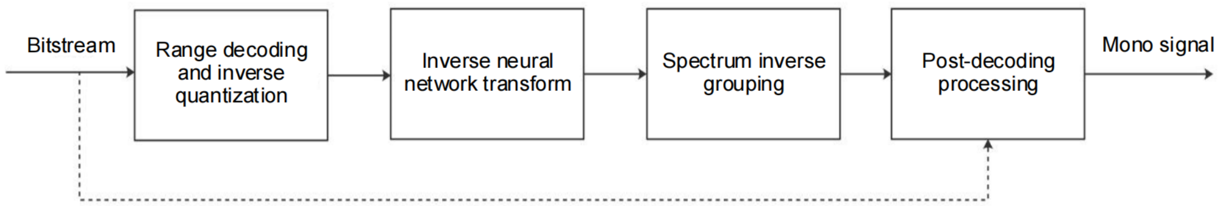


Figure 4 Mono decoding framework

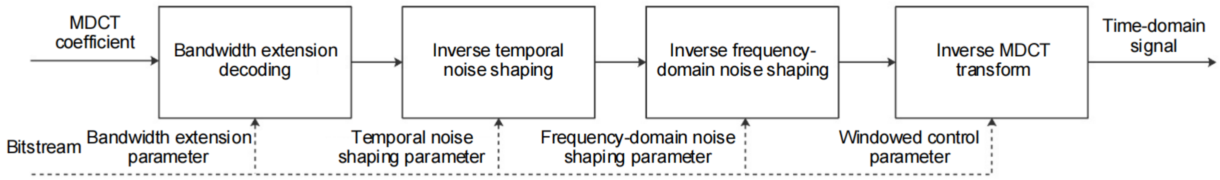


Figure 5 Post-decoding processing framework

The dual-channel stereo decoding includes range decoding, and inverse quantization, neural network inverse transformation, spectral inverse grouping processing, dual-channel stereo upmixing, and post-decoding processing. For a decoding framework, refer to Figure 6. A transform-domain coefficient corresponding to an MDCT coefficient is obtained by parsing a bitstream through range decoding and inverse quantization. A reconstructed downmixed channel MDCT coefficients is obtained through inverse neural network transform. A reconstructed left and right channel MDCT coefficient is obtained through dual-channel stereo upmixing. Finally, a time-domain dual-channel stereo signal is obtained through post-decoding processing. For a post decoding processing framework, refer to figure 4.

The obtained process is as follows:

1）Range decoding and inverse quantization

- Input: the bitstream
- Output: a downmix channel transform-domain coefficients corresponding to the MDCT coefficient

2）Inverse neural network transform

- Input: the downmix channel transform-domain coefficients corresponding to the MDCT coefficient
- -Output: the reconstructed downmix channel MDCT coefficient

3）Dual-channel stereo upmixing

A dual-channel stereo upmixing module performs upmixing on the downmixed channel MDCT coefficient based on a downmixing parameter obtained by parsing the bitstream, to obtai a left and right channel signal. For details, refer to section 7.5.

- Input: the reconstructed downmixed channel MDCT coefficient and the downmixing parameter
- -Output: the reconstructed left and right channel MDCT coefficient

4）dual channel stereo post-decoding processing

The dual-channel stereo post-decoding processing module performs post-decoding processing for each channel.

- Input: the reconstructed left and right channel MDCT coefficient, a bandwidth extension parameter, a temporal noise shaping parameter, a frequency-domain noise shaping parameter, and a window control parameter

-Output: a time-domain dual-channel stereo signal

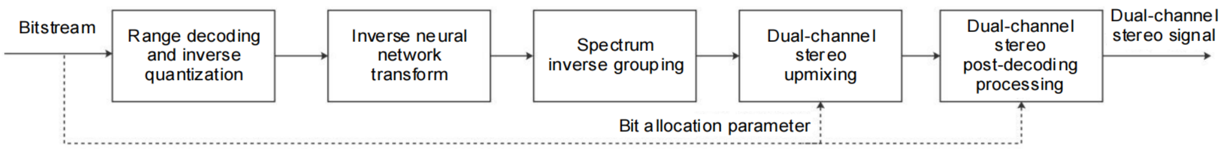


Figure 6: dual-channel stereo decoding framework

The multi-channel decoding includes range decoding, inverse quantization, inverse neural network transform, spectral inverse grouping, multi-channel parameter decoding, multi-channel upmixing, and post-decoding processing. For a decoding framework, refer to figure 7. A transform-domain coefficient corresponding to an MDCT coefficient is obtained by parsing a bitstream through range decoding and inverse quantization. A reconstructed downmixed channel MDCT coefficient is obtained by multi-channel parameter. A reconstructed multi-channel MDCT coefficient is obtained through multi-channel upmixing. Finally, a time-domain multi-channel signal is obtained through post-decoding processing.

The obtaining process is as follows:

1）Range decoding and inverse quantization

- Input: the bitstream
- -Output: the downmix multi-channel transform-domain coefficient corresponding to the MDCT coefficient

2）Inverse neural network transform

- Input: the downmix multi-channel transform-domain coefficient corresponding to the MDCT coefficient
- Output: a reconstructed downmixed multi-channel MDCT coefficient

3）Multi-channel parameter decoding

A multi-channel parameter decoding module parses the bitstream to obtain a multi-channel signal encoding mode parameter. For details, refer to section 7.6.

- Input:the bitstream

-- Output: the multi-channel signal coding mode

4）Multi-channel upmixing

A multi-channel upmixing module performs upmixing on the reconstructed downmixed multi-channel MDCT coefficient based on the multi-channel signal coding mode parameter to obtain the reconstructed multi-channel signal MDCT coefficient. For details, refer to section 7.6.

-- Input: the reconstructed downmixed multi-channel MDCT coefficient, and the multi-channel signal coding mode parameter

-- Output: the reconstructed multi-channel signal MDCT coefficient

5）Multi-channel post-decoding post-processing

The multi-channel post-decoding processing module performs post-decoding processing for each channel.

- Input: the reconstructed multi-channel signal MDCT coefficient, a bandwidth expansion parameter,a temporal noise shaping parameter, a frequency-domain noise shaping parameters, and a windowed control parameter

- Output:the time-domain multichannel signal

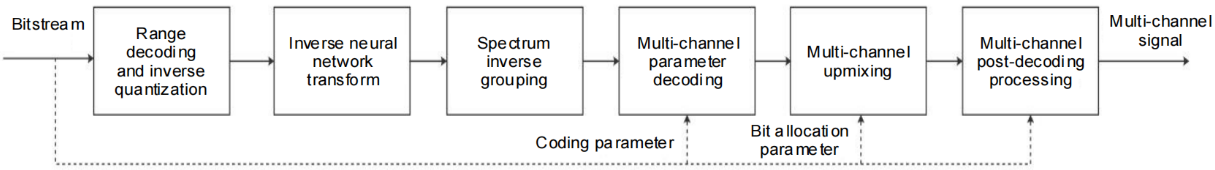


Figure 7 Multi-channel decoding framework

HOA decoding includes range decoding, inverse quantization, inverse neural network transform, spectrum inverse grouping, transmission channel parameter decoding. HOA upmixing, transmission channel post-decoding processing, and HOA spatial decoding. The HOA decoding framework refers to Figure 8. HOA spatial decoding includes sound field component synthesis and HOA signal synthesis. The HOA spatial decoding framework refers to Figure 9. A transform-domain coefficient corresponding to an MDCT coefficient is obtained by parsing a bitstream through range decoding and inverse quantization. A reconstructed downmixed multi-channel MDCT coefficients is obtained through invers neural network transform. An HOA upmixing parameter is obtained through transmission channel parameter decoding. A reconstructed transmission channel signal MDCT coefficient is obtained through HOA upmixing. A time-domain transmission channel signal is obtained through transmission channel post-decoding processing. Finally, a reconstructed HOA signal is obtained through HOA spatial decoding.

The obtained process is as follows.

1）decoding and inverse quantization

- Input: the bitstream

- Output: the downmixed channel transform-domain coefficient corresponding to MDCT coefficient

2）Inverse neural network transform

-- Input: the downmixed channel transform-domain coefficient corresponding to MDCT coefficient

--Output: the reconstructed downmixed channel MDCT coefficient

3）Transmission channel parameter decoding

A transmission channel parameter decoding module parses the bitstream to obtain a transmission channel signal coding mode parameters. For details, refer to section 7.7.

- Input: the bitstream

- Output: the transmission channel signal coding mode parameter

4）HOA upmixing

An HOA upmixing module performs upmixing on the reconstructed downmixed channel MDCT coefficient based on the transmission channel signal coding mode parameter to obtain the reconstructed transmission channel signal MDCT coefficient. For details, refer to section 7.7.

- Input: the reconstructed downmixed channel MDCT coefficient, and the transmission channel signal coding mode parameter

- Output: the reconstructed transmission channel signal MDCT coefficient

5）Transmission channel post-decoding processing

The transmission channel post-decoding processing module performs post-decoding processing for each channel .

- Input: the reconstructed transmission channel signal MDCT coefficient, a bandwidth extension parameters, a time domain noise shaping parameter, a frequency-domain noise shaping parameter, and windowed control parameter

- Output: a time-domain transmission channel signal

6）sound field component synthesis

A sound field component synthesis module configures the decoder based on a configuration parameter, determines a coefficient of a virtual speakers based on a sound field component parameter obtain by parsing the bitstream, and synthesizes a primary sound field signal based on a virtual speaker signal in the transmission channel signal. For details, refer to section 7.13.

- Input: the transmission channel signal, and the sound field component parameter

- Output: the primary sound field signal

7）HOA signal synthesis

An HOA signal synthesis module synthesizes an HOA signal based on a residual signal in the transmission channel signal, a remaining component parameter obtained by parsing the bitstream, and the primary sound field signal. For details, refer to section 7.13.

- Input: the transmission channel signal, the primary sound field signal, and remaining component parameter

- Output: the HOA signal

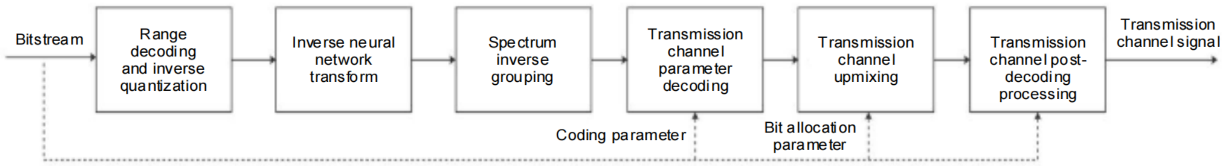


Figure 8 HOA decoding framework

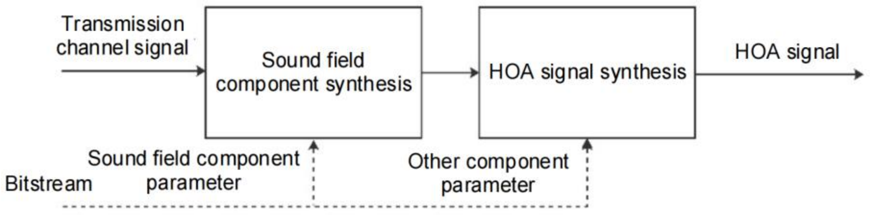


Figure 9 HOA spatial decoding framework

7.2 Syntax, semantics and decoding process process of bitstream demultiplexing

7.2.1 syntax

The syntax of a general full-rate audio bitstream shall comply with the provisions in Table 7.

Table 7 Syntax of general full-rate audio bitstream

syntax of general full-rate audio bitstream	number of bits	mnemonic
ga_co_raw_data_block() {		
Avs3MetadataDec()		
switch(codecFormat) {		
case 0x0: Avs3MonoDec()		
case 0x1: Avs3StereoDec()		
case 0x2: Avs3McDec()		
case 0x3: Avs3HoaDec()		
}		
}		

The syntax of mono decoding shall comply with the provisions of Table 8.

Table 8 Syntax of mono decoding

syntax of mono decoding	number of bits	mnemonic
Avs3MonoDec() {		
DecodeCoreSideBits()		
DecodeGroupBits()		
DecodeQcBits()		
Avs3InverseQC()		
Avs3PostSynthesis()		
}		

The syntax of dual-channel stereo decoding shall comply with the provisions of Table 9.

Table 9 Syntax of dual-channel stereo decoding

syntax binaural stereo decoding	number of bits	mnemonic
Avs3StereoDec() {		
for(ch = 0; ch < 2; ch++) {		

Table 9 (continued)

syntax binaural stereo decoding	Number of bits	mnemonic
DecodeCoreSideBits()		
}		
for(ch = 0; ch < 2; ch++) {		

DecodeGroupBits()		
}		
DecodeStereoSideBits()		
StereoBitsAllocation()		
for(ch = 0; ch < 2; ch++) {		
DecodeQcBits()		
}		
Avs3InverseQC()		
StereoInvMsProcess()		
for(ch = 0; ch < 2; ch++) {		
Avs3PostSynthesis()		
}		
}		

The syntax of multi-channel decoding shall comply with the provisions of Table 10.

Table 10 Syntax of multi-channel decoding

Syntax of multi-channel decoding	number of bits	mnemonic
Avs3McDec() {		
for (ch = 0; ch < numChans; ch++) {		
DecodeCoreSideBits()		
}		
for (ch = 0; ch < numChans; ch++) {		
DecodeGroupBits()		
}		
DecodeMcSideBits()		
McBitsAllocation()		
for (ch = 0; ch < numChans; ch++) {		
DecodeQcBits()		
}		
Avs3InverseQC()		
Avs3McacDec()		
for (ch = 0; ch < numChans; ch++) {		
Avs3PostSynthesis()		
}		
}		

The syntax of HOA decoding shall comply with the provisions of Table 11.

Table 11 Syntax of HOA decoding

Syntax of HOA decoding	number of bits	mnemonic
Avs3HoaDec() {		
for (ch = 0; ch < numChans; ch++) {		

DecodeCoreSideBits()		
}		
for (ch = 0; ch < numChans; ch++) {		
DecodeGroupBits()		
}		
DecodeHoaSideBits()		
HoaSplitBytesGroup()		
for (ch = 0; ch < numChans; ch++) {		
DecodeQcBits()		
}		
Avs3InverseQC()		
Avs3HoaInverseDMX()		
for (ch = 0; ch < numChans; ch++) {		
Avs3PostSynthesis()		
}		
HoaPostSynthesisFilter()		
}		

The syntax of the core decoder side information shall comply with the provisions of Table 12.

Table 12 Syntax of core decoder side information

Syntax of core decoder side information	number of bits	mnemonic
DecodeCoreSideBits() {		
transformType	**2**	**uimsbf**
DecodeFdShapingSideBits()		
DecodeTnsSideBits()		
if (bwePresent == 1) {		
DecodeBweSideBits()		
}		
}		

The configuration of the windowed control parameter shall comply with the provisions of Table 13.

Table 13 Table of configuration of Windowed control parameters

transformType	Windowed control parameters
0x0	long window
0x1	short window
0x2	cut-in window
0x3	cut-out window

7.2.2 Semantics

Avs3MetadataDec() Metadata decoding

Avs3MonoDec()	mono decoding
Avs3StereoDec()	binaural stereo decoding
Avs3McDec()	multichannel decoding
Avs3HoaDec()	HOA decoding
DecodeCoreSideBits()	Parsing core decoder side information
DecodeGroupBits()	spectrum inverse grouping
DecodeStereoSideBits()	Parsing dual-channel stereo side information
DecodeMcSideBits()	Parsing multi-channel side information
DecodeHoaSideBits()	Parsing HOA side information
StereoBitsAllocation()	dual-channel stereo bit allocation
McBitsAllocation()	multi-channel bit allocation
HoaSplitBytesGroup()	HOA bit allocation
StereoInvMsProcess()	dual-channel stereo upmix processing
Avs3McacDec()	Multi-channel decoding processing
Avs3HoaInverseDMX()	HOA decoding processing
DecodeQcBits()	Parsing the quantization coding side information
Avs3InverseQC()	Range decoding and inverse quantization
Avs3PostSynthesis()	post-decoding processing
HoaPostSynthesisFilter()	HOA spatial decoding
codecFormat	Indicating a decoding mode, which is determined according to the channel number index (channel_number_index) in Table A.8 of Annex A. When the channel configuration is mono, codecFormat is 0. When the channel configuration is dual-channel stereo, codecFormat is 1. When the channel configuration is multi-channel configuration, codecFormat is 2. When the channel configuration is HOA configuration, codecFormat is 3.
numChans	The number of channels for the audio signal. When coding_profile is 0, the channel_number corresponding to the channel_number_index in Table A.8 of Annex A is reused.
transformType	2bit, indicating the windowed control parameter. The configuration of the windowed control parameter should comply with the provisions of Table 13. A short window is a sine window with a length of 256 points, and a long window is a sine window with a length of 2048 points. The first 1024 points of a cut-in window are the same as the long window, and the last 1024 points are composed of 448 points of 1,a short windows of 128 points, and 448 points of 0. The first 1024 points of a cut-out window are composed of 448 points of 0, a short window of 128 points and 448 points of 1, and the last 1024 points are the same as the long window.
DecodeFdShapingSideBits()	Parsing frequency-domain noise shaping side information
DecodeTnsSideBits()	Parsing temporal noise shaping side information
DecodeBweSideBits()	Parsing bandwidth extension decoding side information
bwePresent	Indicating whether to enable bandwidth expansion.For conditions of enabling conditions, refer to section 7.9.3.5

7.2.3 decoding process

A general full-rate audio bitstream (ga_co_raw_data_block) is a basic unit included in AASF and AATF coded bitstreams. A sample of on frame is obtained by decoding ga_co_raw_data_block, and a bit rate of one frame can by obtained by decoding a frame header. For details about AASF and AATF formats, refer to Annex A. The bitstream demultiplexing determines a decoding mode (one of mono decoding, dual-channel stereo decoding, multi-channel decoding, HOA decoding, object decoding, and channel and object hybrid decoding) by parsing parameter in AASF and AATF headers, and obtains side information by decoding the bitstream ga_co_raw_data_block for subsequent core decoding and HOA spatial decoding processes. The decoding processes of the ga_co_raw_data_block in different decoding modes, the decoder first parses the metadata Avs3MetadataDec() and then parses audio data. The audio data decoding mode is determined based on coding_profile, channel_number_index, and soundBedType parameters obtained by parsing aasf_frame_header() or aatf_frame_header(). Details are as follows.

When coding_profile is 0 and channel_number_index is 0, the decoder selects mono decoding, and codecFormat is 0. Avs3MonoDec() first parses the core decoder side information DecodeCoreSideBits(), performs spectrum inverse grouping DecodeGroupBits(), then parses the quantization coding side information DecodeQcBits(), performs range decoding and inverse quantization Avs3InverseQC(), and finally performs post-decoding processing Avs3PostSynthesis(), to obtain a decoded mono signal.

When coding_profile is 0 and channel_number_index is 1, the decoder selects dual-channel stereo decoding, and codecFormat is 1. Avs3StereoDec() first parses core decoder side information DecodeCoreSideBits() and performs spectrum inverse grouping DecodeGroupBits() for each channel, then parses dual-channel stereo side information DecodeStereoSideBits(), performs dual-channel stereo bit allocation StereoBitsAllocation(), parses quantization coding side information DecodeQcBits() for each channel, performs range decoding and inverse quantization Avs3InverseQC(), performs dual-channel stereo upmixing processing StereoInvMsProcess(), and finally performs post-decoding processing Avs3PostSynthesis() for each channel, to obtain the decoded dual-channel stereo signal.

When coding_profile is 0 and channel_number_index is greater than 1, the decoder selects multi-channel decoding, and codecFormat is 2. Avs3McDec() first parses the core decoder side information DecodeCoreSideBits() and performs spectrum inverse grouping DecodeGroupBits() for each channel, then parses the multi-channel side information DecodeMcSideBits(), performs multi-channel bit allocation McBitsAllocation(), then parses the quantization coding side information DecodeQcBits() for each channel, performs range decoding and inverse quantization Avs3InverseQC(), performs multi-channel decoding processing Avs3McacDec(), and finally performs post-decoding processing Avs3PostSynthesis() for each channel to obtain a decoded multichannel signal.

When coding_profile is 1 and soundBedType is 0, the decoder selects object decoding. When object_channel_number is 0, codecFormat is 0; when object_channel_number is 1, codecFormat is 1; when object_channel_number is greater than 1, codecFormat is 2. When the object decoding multiplexes channel decoding, that is, the number of channels of an object is 1, it multiplexes mono decoding; when the number ofchannels of an object is 2, it multiplexes dual-channel stereo decoding ; when the number of object channels is greater than 2, it multiplexes multi-channel decoding.

When coding_profile is 1 and soundBedType is 1, the decoder selects channel and object hybrid decoding, codecFormat is 2, the total number of channels for both channels and objects is greater than or equal to 3, and channel and object hybrid decoding multiplexes multiple channel decoding.

When coding_profile is 2, the decoder selects HOA decoding, and codecFormat is 3. The HOA decoding includes core decoding and spatial decoding. The core decoder obtains a virtual speaker signal and residual signal through decoding, and the spatial decoder obtains a HOA signal by decoding the virtual speaker signal and residual signal. Avs3HoaDec() first parses core decoder side information DecodeCoreSideBits() and performs spectrum inverse groupingDecodeGroupBits() for each virtual speaker signal and residual signal, then parses side information DecodeHoaSideBits() for the virtual speaker signal and residual signal, performs bit allocation HoaSplitBytesGroup() for the virtual speaker signal and residual signal, parses quantization coding side information DecodeQcBits() for each channel, performs range decoding and inverse quantization Avs3InverseQC(), performs decoding processing Avs3HoaInverseDMX() for virtual speaker signal and residual signal , performs post-decoding processing Avs3PostSynthesis() for each virtual speaker signal and residual signal, and finally performs HOA spatial decoding HoaPostSynthesisFilter() to obtain the decoded HOA signal.

7.3 Interval , inverse transformation of Syntax, semantics, and decoding process of range decoding, inverse quantization, and inverse neural network transform

7.3.1 syntax

The syntax of quantization and coding side information shall comply with the provisions of Table 14.

Table 14 Syntax of quantization and coding side information

Syntax of quantization, and coding side information	bit number	mnemonic
DecodeQcBits() {		
if (nn_type == 0){	**Note 1**	
isFeatAmplified	**1**	**uimsbf**
scaleQIdx	**7**	**uimsbf**
} else if (nn_type == 1) {		
scaleQIdxLc	**8**	**uimsbf**
}		
if (numGroups == 1) {		
nfParamQIdx[0]	**3**	**uimsbf**
}else if(numGroups == 2) {		
nfParamQIdx[0]	**3**	**uimsbf**
nfParamQIdx[1]	**3**	**uimsbf**
}		
contextNumBytes	**8**	**uimsbf**
contextBitstream	**Note 2**	**uimsbf**
baseBitstream	**Note 3**	**uimsbf**
}		
Note 1: nn_type indicates a neural network configuration, and is obtained from aasf_header() or aatf_header() Note 2: The number of bytes of contextBitstream is contextNumBytes Note 3: The number of bytes of baseBitstream bytes is channelBytes – contextNumBytes		

7.3.2 Semantics

isFeatAmplified 1bit, indicating whether a transform-domain coefficient obtained by neural network transform is scaled up or down before quantization. 0 indicates scaling down, and 1 indicatesscaling up.

scaleQIdx	7 bits, indicating a quantization index of scale adjustment factor of a transform-domain coefficient obtained by neural network transform. A value of an adjustment factor of inverse quantization is obtained from this variable.
scaleQIdxLc	8 bits, indicating a quantization index of a scale adjustment factor of a MDCT spectral coefficient. A value of the adjustment factor of inverse quantization is obtained from this variable.
nfParamQIdx	3 bits, indicating a quantization index of a noise filling parameter corresponding to each of transform-domain coefficients of two groups, the noise filling parameter of inverse quantization is obtained from this variable.
contextNumBytes	8 bits, indicating the number of occupied bytes of a context part in a range coded bitstream.
contextBitstream	In a range coded bitstream, contextBitstream indicating the number of occupied bytes of a contextbitstream.
baseBitstream	In a range-coded bitstream, channelBytes – contextNumBytes indicating the number of occupied bytes of a base bitstream.
numGroups	Indicating the number of groups in an MDCT spectrum. The maximum value is 2. The parsing of mumGroups is shown in 7.4.1.
channelBytes	Indicating the number of bytes allocated for the current channel bitstream.

7.3.3 Decoding process

7.3.3.1 Overview

In the basic configuration, the decoding process includes range decoding, base inverse quantization, noise filling, scale adjustment, inverse transformation using a base decoding neural network. Range decoding includes context range decoding, context inverse quantization, context inverse neural network transformation. base range coding table selection , and base range decoding. The decoding process is shown in Figure 10.

Range decoding relates to both the context part and the basic part. First,range decoding and inverse quantization are performed on the context part, and then after processing of a context decoding neural network ,decoded context information is obtained. A base range coding table is selected based on the context information to perform range decoding and and inverse quantization on the base part of the range coded bitstream,and then obtain the decoded transform-domain coefficient. After the noise filling, scale adjustment, the inverse transformation using the base decoding neural network, the decoded MDCT coefficient is obtained.

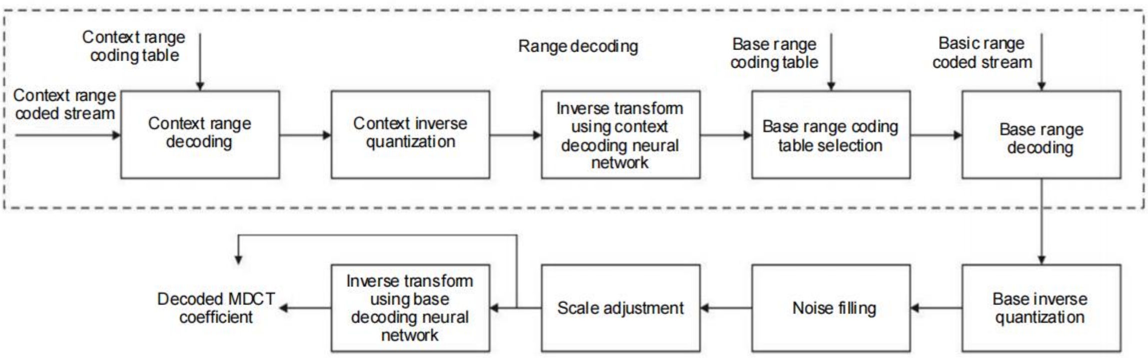


Figure 10 Decoding process of range decoding, inverse quantization and inverse neural network transform

In a low-complexity configuration, the decoding process does not include the base decoding neural network. The decoded MDCT coefficient is obtained after range decoding, base inverse quantization, and scale adjustment.

7.3.3.2 Context range decoding

The context part of the range coded bitstream is decoded based on the context range coding table to obtain a quantization index of a transform-domain coefficient of a context neural network. The context rangel coding table is obtained through pre-training, as shown in Table B.1.

7.3.3.3 Context inverse quantization

Inverse quantization is performed on the quantized index of the transform-domain coefficient of the context neural network to obtain a quantized transform-domain coefficients of the context neural network. Linear quantization is used as the quantization method.

7.3.3.4 Context decoding neural network

An inverse quantized transform-domain coefficient of the context neural network is input into the context decoding neural network for inverse transform to obtain the decoded context information. The context decoding neural network is used to perform the inverse neural network transform on the decoded and dequantized transform-domain coefficient of the context neural network to obtain selected information of the base range coding table. The decoded and dequantized transform-domain coefficient of the context neural network is input into the context decoding neural network. A transposed CNN is a composition unit of the context decoding neural network.
The configuration of the structure of the transposed CNN shall comply with the provisions of Table 15.

Table 15 Configuration of structure of transposed CNN

Item	The value
Number of CNN layers	3
Convolution kernel size	3, 3, 3
Stride	2, 2, 1
Number of CNN channels	16, 16, 16
Activation function	ReLu, ReLu, None
HasBias	1, 1, 1

Stride is a convoluted step parameter of CNN. HasBias indicates whether there is an offset parameterat a current layer . "1" indicates that the current layer has a offset parameter, while "0" indicates that the current layer does not have a offset parameter. A Rectified Linear Unit(ReLU) is used as the activation function. For the definition of the ReLU mathematical function, refer to formula (2). None indicates that there is no activation function at the current layer.
The parameter of the transposed CNN at each layers of the context decoding neural network shall comply with provisions in Tables B.2-B.7. The input to the context decoding neural network is a transform-domain coefficient with 16 CNN channels, each with 16-dimensional. The output is the selected information of the base range coding table with 16 CNN channels, each with 64-dimensional.

7.3.3.5 Selection of base range coding table

A corresponding table is selected from several base range coding tables based on the decoded context

information. Range decoding is performed on the base range coded bitstream, obtaining a quantized transform-domain coefficients on the base neural network.
The base range coding table selection process may be represented as follows: for each dimension of the transform-domain coefficients of the base coding neural network, a minimum standard deviation value greater than or equal to the corresponding decoding context information is searched for in a standard deviation table corresponding to the base range coding. The index corresponding to this standard deviation value is the base range coding table index. The standard deviation table corresponding to the base range coding shall comply with provisions of Table B.8.
The code tables used for the base range coding are several pre-trained fixed code tables, which shall comply with provisions of Table B.9. For example, it is supposed that the value of the nth dimension in the decoding context information is 0.45, a minimum standard deviation value greater than or equal to 0.45 is searched for in a standard deviation table (i.e., Table B.8) corresponding to the base range coding. An index corresponding to this standard deviation value is 13 (it is supposed that the starting sequence number is 1). Then select the 13th base range coding table (i.e., the 13th row in Table B.9), and perform range decoding on the nth dimension of the transform=domain coefficients of the base coding neural network.

7.3.3.6 Base range decoding

The base part of the range coded bitstream is decoded based on the base coding table selected in 7.3.3.5, to obtain the quantization index of the transform domain coefficients of the bas3 neural network . The quantization index of the transform domain coefficients of the base neural network is obtained in a base configuration, and a quantization index of the MDCT spectral coefficient is obtained in a low complexity configuration.

7.3.3.7 Inverse quantization of the transform-domain coefficient in base neural network

Inverse quantization is performed on the quantization index of the transform-domain coefficient of the base neural network, to obtain a quantized transform-domain coefficient of the base neural network. The linear scalar quantization is used as the quantization method. Inverse quantization is performed on the quantization index of the transform-domain coefficient of the base neural network. in the base configuration to obtain the quantized transform-domain coefficient of the base neural network. Inverse quantization is performed on the quantization index of the MDCT spectral coefficient in the low-complexity configuration to obtain the quantized MDCT spectral coefficient .

7.3.3.8 Noise filling

Noise filling adds noise to the quantized transform-domain coefficient of the base neural network obtained at the decoder to compensate for the quantization noise introduced during the quantization process.
For each channel in each frame, the quantization index nfParamQIdx of the noise filling parameter may have one or two values. When the number of groups in the MDCT spectrum is 1, nfParamQIdx has one value, and when the number of groups is 2, nfParamQIdx has two values.
The following noise filling process is performed on the transform-domain coefficient of the base neural network corresponding to each group:
Generating a randomly distributed noise component ‘noise’ in the range of [-1, 1];
Multiplying the noise component noise by the noise filling parameter nfParamQ to obtain the adjusted noise component. The noise filling parameter nfParamQ is obtained by dequantizing the quantization index nfParamQIdx, as shown in formula (3).

$$nfParamQ = \frac{nfParamQIdx}{23.34} \quad (3)$$

In the basic configuration, the transformed-domain coefficient of the base neural network that is quantized to 0, is filled with the adjusted noise component. In the low-complexity configuration, noise is added to the quantized MDCT spectral coefficient obtained at the decoder to compensate for the quantized3e noise introduced during the quantization process.

7.3.3.9 scale adjustment

In the basic configuration, scale adjustment is performed on a ccoefficient obtained through the base neural network transform, and the base process of scaling adjustment is as follows:
Based on a feature amplification flag isFeatAmplified and a scale factor quantization index scaleQIdx, the dequantized scale adjustment factor featureScale is obtained. The pseudo-code for this process is as follows:

```
if (isFeatAmplified == 0){
    featureScale = scaleQIdx / 127.0
}else {
    featureScale = pow(10.0, scaleQIdx / 86.0);
}
```

The transformed domain coefficient of the base neural network is divided by the scale factor featureScale to obtain the transformed-domain coefficient after scale adjustment.
In the low-complexity configuration, scale adjustment is performed on the MDCT spectral coefficient obtained through the noise filling. The base process of scale adjustment is as follows:
Based on the scale factor quantization index scaleQIdxLc, the dequantized scale adjustment factor featureScale is obtained. The calculation of featureScale is shown in formula (4).

$$featureScale = 10^{(scaleQIdxLc - 255.0) / 31.875} \quad (4)$$

The decoded MDCT coefficient obtained through the noise-filled is divided by the scale factor featureScale to obtain the decoded MDCT coefficient.

7.3.3.10 Base decoding neural network

The transformed domain coefficient of the base neural network obtained through the scale adjustment is input into the base decoding neural network to calculate the MDCT spectrum reconstructed at the decoder end. The base structure of the base decoding neural network is a CNN.
The structural parameters of the base decoding neural network shall comply with provisions in Table 16.

Table 16 The structure parameters of Base decoding neural network

Item	Value.
Number of CNN layers	4
Convolution kernel size	5, 5, 5, 5
Stride	2, 2, 2, 2
Number of channels	8, 4, 2, 1
Activation function	IGDN, IGDN, IGDN, None
HasBias	1, 1, 1, 1

Stride specifies a convoluted step parameter for CNN, HasBias indicates whether there is an offset parameter at the current layer, "1" indicates that the current layer has a offset parameter, "0" indicates that the current layer has no offset parameter. The activation function uses IGDN (Inverse Generalized Divisive Normalization) [1]. None indicates that the current layer has no activation function.
The parameter of transposed CNNs in each layer of the bas3 decoding neural network shall comply with provisions in Tables B.10-B.23.

7.4 Syntax, semantics and decoding process of spectrum inverse grouping

7.4.1 Syntax

The syntax of spectrum inverse grouping shall comply with provisions of Table 17.

Table 17 Spectrum inverse grouping processing syntax

Syntax of spectrum inverse grouping	number of bits	mnemonic
DecodeGroupBits() {		
if (transformType == 0x1) {		
numGroups	**1**	**uimsbf**
numGroups += 1		
if (numGroups == 2) {		
for (i = 0; i < 8; i++) {		
groupIndicator[i]	**1**	**uimsbf**
}		
}		
} else {		
numGroups = 1		
for (i = 0; i < 8; i++) {		
groupIndicator[i] = 0		
}		
}		
}		

7.4.2 semantic

numGroups 1bit, used to indicate the number of groups in the MDCT spectrum of the current frame

groupIndicator 1bit, used to indicate to which group the i-th block of the current short frame belongs. 0 indicates the transient group, and 1 indicates the other groups

7.4.3 decoding process

The basic idea of MDCT spectral grouping is as follows: when the windowed control parameter is a short window, the MDCT spectrum corresponding to each short window is called a short block. The MDCT spectra of 8 short blocks are divided into two groups, one group is the transient group including transient short blocks, and the other group is excluding transient short blocks. The MDCT spectra of the two groups are interleaved and concentrated into a 1024-long MDCT spectrum (consistent with the length of long-frame spectrum). Then neural network transform, quantization, and range coding are performed on it.

The process of spectrum inverse grouping at the decoder is as follows: for a short frames, if the number of groups numGroups in the current frame is equal to 2, intra-group de-interleaving is performed on the MDCT spectra of the two groups obtained through decoding (deinterleaving is performed separately on MDCT coefficients of the transient group and MDCT coefficients of the other groups) to obtain the MDCT spectra of the 8 short blocks obtained through intra-group de-interleaving, and inverse grouping arrangement is performed on the MDCT spectra of 8 short blocks obtained through intra-group deinterleaving based on a position indicated by groupIndicator to obtain the MDCT spectra of 8 short blocks of arranged according to a sequence. The MDCT spectra obtained through spectrum inverse grouping are used as the input of the upmixing on each mode.

An example is shown as following :

If the numGroups of the current short frame is equal to 2 and the groupIndicator is [1, 1, 1, 0, 0, 0, 1, 1], then the fourth, the fifth, and the sixth short blocks in eight short blocks of the current frame are transient blocks, while the the first, the second, the third, the seventh, and the eighth short blocks are other blocks.

The grouped MDCT spectra obtained through decoding are arranged according to a sequence of [4, 5, 6, 1, 2, 3, 7, 8], that is, the spectrum of the transient group (including the fourth, the fifth, the sixth short blocks) are placed ahead of he spectra of the other groups (including the first, the second, the third, the seventh, and the eighth short blocks) .

To recover the normal spectrum sequence is to arrange the spectrum of each short block according to time sequence. Specifically, the grouped MDCT spectra obtained through decoding are rearranged according to a sequence from the first to the eighth short blocks.

7.5 syntax ,semantics and decoding process of dual-channel stereo Bit allocation and upmixing

7.5.1 Syntax,

The syntax of the dual-channel stereo side information shall comply with provisions of Table 18.

Table 18 Syntax of the dual-channel stereo side information

Syntax of dual-channel stereo side information	bit number	mnemonic
DecodeStereoSideBits() {		
if (useMcr == 0) {		
Is Ms	**1**	**uimsbf**
if(isMs == 1) {		
IldQIdx	**4**	**uimsbf**
}		
bitsRatio	**3**	**uimsbf**
}		
if (useMcr == 1) {		
for(i = 0; i < vqVecNum[isShortWin]; i++) {		
vqIdx[0][i]	**Note 1**	**uimsbf**
vqIdx[1][i]	**Note 2**	**uimsbf**
}		
}		
}		

Note 1,2: The number of bits of vqIdx[0][i] and vqIdx[1][i] is equal to vqNumBits[isShortWin]

7.5.2 semantic meaning

useMcr	It used to indicate whether MCR dual-channel stereo processing is used. When the dual-channel stereo bit rate is less than or equal to 32kb/s, useMcr is equal to 1. When the dual-channel stereo bit rate is greater than 32kb/s, useMcr is equal to 0.
Is Ms	1bit, used to indicate whether M/S binaural stereo processing is enable for the current frame.
IldQIdx	4bit, used to indicate the amplitude difference between the left and right channels
bitsRatio	3bit, used to indicate the bit allocation ratio of the two downmixed channels.
isShortWin	It used to indicate whether the left channel is a short window. When the left channel is a short window, isShortWin equals 1. When the left channel is not a short window, isShortWin equals 0.
vqVecNum[isShortWin]	It used to indicates the number of sub-vectors in vector quantization of the MCR rotation angle parameters, and is determined based on the flag isShortWin indicating whether the left channel is a short window
vqIdx[0][i]	It used to indicates a vector quantization index of the i-th subvector in the MCR rotation angle parameter vector corresponding to the even-number MDCT spectrum
vqIdx[1][i]	It used to indicates a vector quantization index of the i-th subvector in the MCR rotation angle parameter vector corresponding to the odd-number MDCT spectrum

7.5.3 decoding process

7.5.3.1 Overview

The dual-channel stereo upmixing includes the MCR and M/S upmixing modes. The MCR upmixing mode includes MCR side information decoding and MCR upmixing, while M/S upmix mode includes M/S bit allocation and M/S upmixing. When using the MCR upmixing mode, MDCT spectrum information transmitted in the bitstream is only MDCT spectrum information of one channel obtained throughMCR rotation processing, and it is necessary to recover the MDCT spectra of both channels based on the side information of the MCR dual-channel stereo mode transmitted in the bitstream. When using the M/S upmixing mode, the side information of he dual-channel stereo mode transmitted in the bitstream is used to obtain information such as a flag that indicates whether M/S downmixing is enabled for the current frame, the amplitude difference between the left and right channels, and the bit allocation ratio of the downmixed channel. Based on the total number of bits of the remaining information for quantization and coding, as well as the bit allocation ratio information are used after removing other side information from the current frame, the bit allocation results channelBytes of each channel after downmixing is calculated. Range decoding, inverse quantization, and inverse neural network transform are performed on the bit allocation results to obtain the decoded MDCT coefficients of the downmixed channels. M/S upmixing is performed based on the isMs flag, and energy adjustment is performed based on ILD information, to obtained the decoded MDCT coefficients of the left and right channels.

7.5.3.2 MCR side information decoding

The MCR side information is MCR rotation angle parameters with the odd and even spectra of core band . The core band is defined as the spectrum below the starting frequency of the high-frequency spectrum in 7.9.3.6. In the MCR upmix mode, MCR processing is only performed on the MDCT spectra of the left and right channels . The decoding process shall comply with the requirements of couple_channel_element() decoding in section 7.4 in GB/T 33475.3-2018. The MDCT spectra of the left and right channels are divided into odd frequency spectra and even frequency spectra, each of which is divided into 18 sub-bands. The definition of sub-band boundy and sub-band frequency point number shall comply with Table 19 and Table 20.
For example, the first sub-band starts from sub-band boundary sequence number 0 and ends at sub-band boundary sequence number 1, corresponding to sub-band boundaries from frequency point 0 to frequency point 3, and the number of sub-band frequency points is 4.
The configuration of MCR sub-band boundary shall comply with provisions of Table 19.

Table 19 Configuration of MCR sub-band boundary

Sub-band boundary sequence number	Sub-band boundary
0	0
1	4
2	8
3	12
4	16
5	22
6	28
7	34
8	40
9	48
10	56
11	64
12	76

Table 19 (continued)

Subband boundary number	subband boundary
13	88
14	100
15	116
16	132
17	154
18	176

The configuration of the number of MCR sub-band frequencies shall comply with provisions of Table 20.

Table 20 Configuration of the number of MCR subband frequencies

Subband sequence number	Number of sub-band frequencies

1	4
2	4
3	4
4	4
5	6
6	6
7	6
8	6
9	8
10	8
11	8
12	12
13	12
14	12
15	16
16	16
17	22
18	22

MCR rotation angle parameters are obtained corresponding to odd and even frequency spectra of each sub-band..In the vector quantization of MCR rotation angle parameters, the rotation angle parameters of 18 sub-bands are divided into 6 subvectors (i.e., vqVecNum equals 6), and each sub-vector includes the rotation angle parameters of 3 sub-bands.

The vector quantization of rotation angle parameters is divided into two configurations, corresponding to a short window or a non-short window (including long window, cut-in window, cut-out window) of the left channel in the current frame. That is, isShortWin equals 1 and equals 0. When isShortWin equals 1, the number of vector quantization bits per rotation angle parameter sub-vector is 8 (i.e., the numbers of bits in vqIdx[0][i] and vqIdx[1][i] are 8). That is, the size of the vector quantization code table is 256, and the vector quantization code table shall comply with provisions of B.154 in GB/T 33475.3-2018. When isShortWin equals 0, the number of vector quantization bits per rotation angle parameter subvector is 9 (i.e., the numbers of bits in vqIdx[0][i] and vqIdx[1][i] are 9). That is, the size of the vector quantization code table is 512, and the vector quantization code table shall comply with provisions of B.155 in GB/T 33475.3-2018.

7.5.3.3 MCR mixing

The MCR upmixing uses the parameter stereo method, only the core band MDCT coefficient of one channel obtained through MCR transformation is transmitted. In the decoding process, upmixing needs to be performed based on the core band MDCT coefficient of one channel and the MCR side information that are obtained through coding, to obtain decoded MDCT coefficient of core bands of the left and right channels.

First, the MDCT spectrum of one channel obtained throuth the MCR transform obataind by decoding the bitstream is replicated to obtain thMDCT spectra of the left and right channels obtained through MCR transform. The inverse MCR transform shall comply with the requirements of couple_channel_element() decoding section 7.4 in GB/T 33475.3-2018 to obtain the core band decoded MDCT spectra of the left and right channels.

7.5.3.4 M/S bit allocation

An M/S bit allocation module is mainly used to allocate the remaining available bits after removing other side information to the two downmixed channels based on the bit allocation ratio parameter obtained by decoding the bitstream, thus the subsequent range decoding, inverse quantization, and inverse neural network transform are performed.

First, the number of available bits remaining after removing other side information from the current frame is calculateed an denoted as availableBits. The the following pseudocode shows the general algorithm for calculating availableBits:

```
if (nn_type == 0){
    availableBits = bitsPerFrame - bitsUsed - nChans × (nbits_isFeatAmplified + nbits_featureScale + nbits_contextNumBytes)    } else if (nn_type == 1) {
    availableBits = bitsPerFrame - bitsUsed - nChans × (nbits_featureScaleLc + nbits_contextNumBytes)
}
for (i = 0; i < nChans; i++){
if (numGroups[i] == 1){
availableBits -= nbits_nfParam
  }else if (numGroups[i] == 2){
  availableBits -= 2 × nbits_nfParam
  }
}
```

Where, bitsPerFrame indicates the total number of coding bits of the current frame, bitsUsed indicates the number of side information bits used for the current frame, nChans indicates the number of channels (inr dual-channel stereo mode, the number of channels is 2), nbits_isFeatAmplified indicates the number of bits of the isFeatAmplified parameter (fixed to 1), nbits_featureScale indicates the number of bits of the scaleQIdx parameter (fixed to 7), nbits_featureScaleLc indicates the number of bits of the scaleQIdxLc parameter (fixed to 8), nbits_contextNumBytes indicates the number of bits of the contextNumBytes parameter (fixed to 8), numGroups indicates the number of groups of the MDCT spectra of the current frame, nbits_nfParam indicates the number of bits of the noise filling parameter (fixed to 3).

Then, the bit allocation result of the downmixed channel is obtained based on availableBits and bitsRatio:

Byte is the minimum unitt, so it is necessary to convert availableBits into available bytes availableBytes, as shown in formula (5).

$$availableBytes = floor(availableBits / 8) \quad (5)$$

In the dual-channel stereo mode, the numbers of bytes of the two downmixed channels, channelBytes[0] and channelBytes[1], are calculated according to formula (6) and (7).

$$channelBytes[0] = bitsRatio \times floor(availableBytes / (1 << 3)) \quad (6)$$

$$channelBytes[1] = availableBytes - channelBytes[0] \quad (7)$$

Where, (1<<3) indicates the number of groups of bit allocation in the dual-channel stereo mode, that is, the available number of bits is divided into 8 groups, and some of them are allocated to one of the two downmixed channels, while the remaining bits are allocated to the other downmixed channel.

7.5.3.5 M/S upmixing

If the flag isMs indictes whether M/S binaural stereo processing is enabled for the current frame is 1, then M/S upmixing need to be perfomed on thechannel obtain through decoding, to obtain the decoded MDCT spectra ofleft and right channels.

For M/S upmix processing, refer to formulas (8) and (9) .

$$mdctSpectrum\_L = \frac{\sqrt{2}}{2}(mdctSpectrum\_M + mdctSpectrum\_S) \quad (8)$$

$$mdctSpectrum\_R = \frac{\sqrt{2}}{2}(mdctSpectrum\_M - mdctSpectrum\_S) \quad (9)$$

Where, mdctSpectrum_M and mdctSpectrum_S are the decoded MDCT spectra of the two downmixed channels, mdctSpectrum_L and mdctSpectrum_R are the decoded MDCT spectra of the left and right channels obtained through M/S upmixing.

After M/S upmixing, inverse ILD processing needs to be performed on the MDCT spectra of the left and right channels to recover the amplitude difference between the left and right channels. The inverse ILD processing is performed as follows:

The amplitude ratio levelRatio of the left and right channels is recovered from the ILD parameter obtained by decoding he bitstream, as shown in formula (10).

$$levelRatio = (1 << 4) \,/\, IldQIdx - 1 \quad (10)$$

Where, (1<<4) is the maximum value range of ILD parameter.

The amplitude adjustmentment of the left and right channels is shown in the pseudo-code below:

```
if (levelRatio > 1.0) {
mdctSpectrum_R = levelRatio * mdctSpectrum_R
}else {
mdctSpectrum_L = (1.0 / levelRatio) * mdctSpectrum_L
}
```

7.6 syntax, semantics and decoding process of Multi-channel bit allocation and upmix

7.6.1 syntax

The syntax of multi-channel side information shall comply with provisions of Table 21.

Table 21 Syntax of Multi-channel side information

Syntax of multi-channel side information	number of bits	mnemonic
DecodeMcSideBits() {		
HasSilFlag	**1**	**uimsbf**
if (HasSilFlag == 1) {		
for(i = 0; i < coupleChNum; i++) {		
silFlag[i]	**1**	**uimsbf**
}		
} else {		
for(i = 0; i < coupleChNum; i++) {		
silFlag[i] = 0		
}		

}		

Table 21 (continued)

multi-channel side information syntax	number of bits	mnemonic symbol
pairCnt	**4**	**uimsbf**
for (i = 0; i < pairCnt; i++) {		
channelPairIndex	**Note:**	**uimsbf**
mcIld[ch1]	**5**	**uimsbf**
mcIld[ch2]	**5**	**uimsbf**
}		
for (i = 0; i < coupleChNum; i++) {		
if (silFlag[i] == 0) {		
chBitRatios[i]	**6**	**uimsbf**
}		
}		
}		
Note: The number of bits if channelPairIndex is determined by the number of coupled channels coupleChNum., and is calculated as floor(log2(coupleChNum * (coupleChNum-1) / 2 - 1)) + 1. CoupleChNum is the number of all channels excluding the LFE channel.		

7.6.2 semantic

HasSilFlag 1bit, used to indicate the muted enabling flag. "0" indicates that each channel of the multi-channel signal in the current frame is a non-muted channel, and "1" indicates that there is at least one muted channel in each channel of the multi-channel signal in the current frame'

silFlag[i] 1bit, used to indicate the muted flag. "0" indicates that the i-th channel of the current frame is a non-muted channel, and "1" indicates that the i-th channel of the current frame is a muted channel

pairCnt 4bit, used to indicate the number of channel pairs in the current frame

channelPairIndex The number of the bits of channelPairIndex is related to the total number of channels, as shown in Note 1 in the table above. It is used to indicate the index of the channel pair, and is parsed to obtain the index values of the two channels, ch1 and ch2, in the current channel pair.

mcIld 5bit, used to indicate the parameter quantization index of an inter-channel amplitude difference ILD of the first channel and the second channel in the current channel pair, used for inter-channel energy adjustment

chBitRatios 6bit, used to indicate the bit allocation ratio for each channel

7.6.3 decoding process

7.6.3.1 Overview

The steps of bitstream demultiplexing in the multichannel mode are as follows: firstly perform parsing to obtain a muted HasSilFlag, silFlag, and multichannel side information to guide the multichannel bit allocation, and then perform multi-channel bit allocation. According to the multichannel bit allocation result, the inverse neural network transform, inverse quantization, and range decoding are performed on the coding information of each channel transmitted in the bitstream to obtain the downmixed multi-channel signal. Based on the multichannel side information, multi-channel decoding processing (i.e., multichannel upmixing) is performed on the downmixed multi-channel signal to obtain an upmixed multichannel signal. Post-decoding processing (i.e., bandwidth extension decoding, inverse temporal noise shaping, inverse frequency-domain noise shaping, upmixing, and inverse time-frequency transform) is performed on the upmixed multi-channel signal to obtain a multichannel signal.

The multi-channel side information includes pairCnt, channelPairIndex, mcIld, and the chBitRatios of the downmix channel determined based on the muted channel flag.

The multi-channel mode includes a bit allocation module and a multi-channel upmix module.

The bit allocation module is mainly used to calculate respective number of bit allocation bytes channelBytes for each demultiplexed channel based on the silFlag, chBitRatios, and the total number of remaining bits for quantization and range coding after removing other side information from the current frame. Based on the channelBytes on a coded bitstream of the downmixed channel in multi-channel range decoding, inverse quantization, and invers neural network transform are performed to obtain a decoded MDCT coefficient of the downmixed channel in multi-channel.

The multi-channel upmixing module is mainly used to perform multi-channel decoding processing (M/S upmixing) based on information such as pairCnt and channelPairIndex to obtain the upmixed multi-channel MDCT spectrum. Based on the mcILD information, the energy adjustment is performed on the upmixed multi-channel MDCT spectrum to obtain a decoded MDCT coefficient for each channel.

The multi-channel bit allocation and channel upmixing module mainly includes bit allocation and multi-channel upmixing.

7.6.3.2 bit allocation

The multi-channel bit allocation McBitsAllocation() is mainly used to perform bit allocation on the downmixed multi-channel signal based on the bit allocation parameter of the silFlag, chBitRatios, which are obtained by decoding the bitstream, to obtain the mumber of coded bits of the downmixed multi-channel signal. The remaining available bits after removing other side information are allocated to each downmixed channel in the multi-channel, thus the subsequent range decoding, inverse quantization, and inverseneural network transform are performed.

availableBytes indicates the number of remaining available bytes after removing other side information from the current frame.

In the multi-channel mode a mute channel may exist. Muted channels do not need to participate in the bit allocation process in the multi-channel mode. Instead, a fixed number of bytes is pre-allocated, which is 8. If a muted channel exists, the number of pre-allocated bytes for the muted channel is deducted from the number of available bytes availableBytes. The remaining number of bytes after deduction is allocated to other channels except for the a muted channel.

In the multi-channel mode, an LFE channel may exist. Generally, there is little valid spectrum information of the LFE channel, and it does not need to participate in the bit allocation process in the multi-channel mode. As long as A fixed number of bits are pre-allocated. The nunber of pre-allocated bits of the LFE channel is related to the coding bit rate. *cpeRate* indicates an average bit rate of a channel pair, which is the result of converting the total coding bit rate to a channel pair. If cpeRate is less than 64kb/s, the number of bytes allocated to the LFE

channel is 10; if cpeRate is lesss than 96kb/s, the number of bytes allocated for the LFE channel is 15; if cpeRate is greater than or equal to 96kb/s, the number of bytes allocated for the LFE channel is 20. If the LFE channel exists, the number of pre-allocated bytes of the LFE channel is deducted from the number of available byte *availableBytes*. The remaining number of bytes is allocated to other channels except for the LFE channel.
The process of allocating the number of *availableBytes* to the other channels is as follows:

a)Each channel is pre-allocated with a safe bytes *safeBits* ,which is 8. The number of safes is deducted from the available byte *availableBytes,* and the remaining number of bytes *availableBytes* are allocated in the subsequent steps.

b)Bits are allocated to each channel based on *chBitRatios*. The number of bytes per channel may be represented by formula (11).

$$channelBytes[i] = availableBytes * chBitRatios[i] / (1 << 6) \quad (11)$$

Where, (1<<6) indicates the maximum value range of the channel bit allocation ratio *chBitRatios*.

a)If some bytes have not been allocated in step a), the remaining number of bytes are allocated to the each channel again based on the ratio indicated by *chBitRatios[i]*.

b)If there are still bits remaining after step b), the remaining bits are allocated to the channel with the most bytes allocated in step a).

c)If the number of bytes allocated to some channels exceeds the upper limit for a single channel, the excessive bytes are allocated to the ither channels.

7.6.3.3 upmixing

On the paired two channels ch1 and ch2 indicated by the channel pair index channelPairIndex, M/S upmix is performed to obtain the upmixed MDCT spectra of the paired channels. The upmixing method is the same as the M/S upmixing method in the dual-channel stereo mode.
After the M/S upmixing, inverse ILD processing is performed on the upmixed MDCT spectra of the channel based on mcILD to obtain an upmixed decoded signal that the amplitude difference between channels is restored.
The pseudo-code of inverse ILD processing to restore the amplitude difference between channels is as follows:

```
factor = mcIldCodebook[mcIld[i]]
mdctSpectrum[i] = factor * mdctSpectrum[i]
```

where factor is the amplitude adjustment factor corresponding to the ILD parameter for the i-th channel, mcIldCodebook is the quantization code table of the ILD parameter, which shall comply with provisions in Table B.26, mcIld[i] indicates the quantization index corresponding to the ILD parameter of the i-th channel, and mdctSpectrum[i] indicates an MDCT coefficient vector for the i-th channel.

7.7 HOA bit allocation and upmixing

7.7.1 syntax

The syntax of HOA side information shall comply with provisions in Table 22.

Table 22 Syntax of HOA side Information

Syntax of HOA side information	number of bits	mnemonic
DecodeHoaSideBits() {		
sceneType	**4**	**uimsbf**
spatialAnalysis	**1**	**uimsbf**

if(spatialAnalysis == 1) {		
numVL	**4**	**uimsbf**
for(i = 0; i < numVL; i++) {		
basisIdx[i]	**12**	**uimsbf**
}		
}		
for (groupIdx = 0; groupIdx < nTotalChanGroups; groupIdx++) {		
pairIdx[groupIdx]	**4**	**uimsbf**
if(pairIdx[groupIdx] > 0) {		
for(i = 0; i < pairIdx[groupIdx]; i++) {		
chIdx[groupIdx][i]	**Note:**	**uimsbf**
dmxMode[groupIdx][i]	**1**	**uimsbf**
if(dmxMode[groupIdx][i]== 1) {		
for(sfb = 0; sfb < N_SFB_HOA_LBR - 1; sfb++){		
sfbMask[groupIdx][i][sfb]	**1**	**uimsbf**
}		
}		
}		
for(i = 0; i < groupChans[groupIdx]; i++) {		
groupILD[i]	**5**	**uimsbf**
}		
}		
groupBitsRatio[groupIdx]	**4**	**uimsbf**
for(i = 0; i < groupChans[groupIdx]; i++) {		
bitsRatio[groupIdx][i]	**4**	**uimsbf**
}		
}		
}		
Note: The number of chIdx bits is a round-down value of (log10 (groupChans×(groupChans-1)/2-1)/ $\log_{10}2$)+1.		

7.7.2 semantic

sceneType 4bit, indicating the sound field type

spatialAnalysis 1 bit, indicating the spatial analysis type. "0" indicates thate there is no HOA spatial decoding, and "1" indicates there is HOA spatial decoding.

numVL 4 bit, indicating the number of virtual speaker signals

basisIdx 12 bit, indicating the virtual speaker index

pairIdx 4 bit, indicating the number of paired channels

chIdx indicating the a channel pairi index, the number of bits of chLDx is a round-down value of (log10 (groupChans×(groupChans-1)/2-1)/ $\log_{10}2$)+1

groupILD 5 bits, indicating the quantization index of the ILD parameter within the group

bitsRatio

4 bits. It indicates an intra-group bit allocation ratio parameter

groupBitsRatio 4 bit, indicating the inter-group bit allocation ratio parameter

bitsRatio 4 bit, indicating the an intra-groupallocation ratio parameter

dmxMode 1 bit, indicating the downmixed mode. When dmxMode is 0, it indicates full-band M/S downmixing. When dmxMode is 1, it indicates subb-and M/S downmixing.

sfbMask 1 bit, indicating whether downmixingis performed on the current sub-band. When sfbMask is 0, it indicates that downmixing is not performed on the current sub-band . When sfbMask is 1, it indicates that is downmixing is performed on the current sub-band.

nTotalChanGroups An preset value indicates the number of transmission channel groupss, which shall comply with the provisions in Table 23 to Table 25.

N_SFB_HOA_LBR An preset value indicates the number of sub-bands, which is defined as 22

groupChans An preset value indicates the number of channels in each group, which shall comply with the provisions in Tables 23-25

Definitions of values of the FOA nTotalChanGroups and groupChans shall comply with provisions in Table 23.

Table 23 Definition of values of FOA nTotalChanGroups and groupChans

Bit rate (kb/s)	value of nTotalChanGroups	value of groupChans
96	1	4
128	1	4
192	1	4
256	1	4

Definitions of values of 2 order HOA nTotalChanGroups and groupChans shall comply with provisions in Table 24.

Table 24 Definition of values of 2-order HOA nTotalChanGroups and groupChans

Bit rate (kb/s)	value of nTotalChanGroups	value of groupChans
192	1	9
256	1	9
320	1	9
384	1	9
480	1	9
512	1	9
640	1	9

Definition of values of 3-order HOA nTotalChanGroups and groupChans shall comply with the provisions in Table 25.

Table 25 Definition of values of 3-order HOA nTotalChanGroups and groupChans

Bit rate (kb/s)	value of nTotalChanGroups	value of groupChans

256	2	2, 6
320	2	2, 7
384	2	2, 9
512	2	2, 10
640	2	2,12
896	1	16

7.7.3 decoding process

7.7.3.1 Overview

HOA bit allocation and channel upmixing are performed in the core decoder. During HOA decoding, the core decoder parses the core decoder side information from the bitstream, performs bit allocation HoaSplitBytesGroup() to the virtual speaker signal and the residual signal, and decodes the virtual speaker signal and residual signal on the bitstream. Then, HOA decoding processing Avs3HoaInverseDMX() is performed on the virtual speaker signal and residual signal. Finally, post-decoding processing is performed, including frequency bandwidth extension for the virtual speaker signal and residual signal , temporal noise shaping decoding, frequency-domain noise shaping decoding, and MDCT inverse transform , to obtain the time-domain transmission channel signal. The following describes the bit allocation HoaSplitBytesGroup() for the virtual speaker signal and residual signal, and the decoding process Avs3HoaInverseDMX() for the virtual speaker signal and residual signal in detail..

7.7.3.2 bit allocation

The transport channel obtained through decoding by the core decoder consists of a virtual speaker signal and a residual signal, and is divided into nTotalChanGroups groups. During decoding, the following two parameters are obtained by parsing the bitstream: groupBitsRatio and bitsRatio, where groupBitsRatio[groupIdx] occupies 4 bits, indicating the inter-group bit allocation ratio parameter of the groupIdx-th group. Through bit allocation, the bit allocation ratio of the virtual speaker signal group and the bit allocation ratio of the residual signal group is obtained. bitsRatio[groupIdx][i] occupies 4 bits, indicatting the bit allocation ratio parameter of the i-th channel in the groupIdx-th group. Therefore, the bit allocation ratio of each virtual speaker signal group in all virtual speaker signal groups and the bit allocation ratio of each residual signal group in all residual signal groups is obtained.

Bit allocation is mainly used to allocate the remaining available bits after removing other side information to each transport channel based on the bit allocation ratio parameter obtained by decoding in the bitstream. The coding of other side information also occupies bits.

First, the number of remaining available bits after other side information is removed from the current frame is calculated and denoted as availableBits. The general algorithm for calculating availableBits is availableBits = bitsPerFrame – bitsUsed. Where bitsPerFrame indicates the mumber of initial bits per frame, and bitsUsed is the number of bits already occupied before bit allocation.

HOA bit allocation HoaSplitBytesGroup() is calculated as follows.

First, the number of bits groupBytes[groupIdx] for each group channel, ,is calculated based on the total number of available bits, availableBits, and groupBitsRatio[groupIdx], as shown in formula (12).

$$groupBytes[groupIdx] = availableBits \times \frac{groupBitsRatio[groupIdx]}{\sum_{k=0}^{nTotalChanGroups-1} groupBitsRatio[k]} \quad (12)$$

Where, $\frac{\mathrm{groupBitsRatio[groupIdx]}}{\sum_{k=0}^{\mathrm{nTotalChanGroups}-1}\mathrm{groupBitsRatio[k]}}$ indicates the bit allocation ratio of the virtual speaker signal group in all transport channel signals, or indicates the bit allocation ratio of the residual signal group in all transport channel signals.

Then, the number of bits bytesChannels[groupIdx][i] for each channel is calculated based on bitsRatio[groupIdx][i], as shown in formula (13).

$$bytesChannels[groupIdx][i] = groupBytes[groupIdx] \times \frac{bitsRatio[groupIdx][i]}{\sum_{k=0}^{groupChans[groupIdx]-1} bitsRatio[groupIdx][k]} \quad (13)$$

groupBytes[groupIdx] indicates the total number of allocated bits of the virtual speaker signal group. $\frac{\mathrm{bitsRatio[groupIdx][i]}}{\sum_{k=0}^{\mathrm{groupChans[groupIdx]}-1}\mathrm{bitsRatio[groupIdx][k]}}$ indicates the bit allocation ratio of each virtual speaker signal in the virtual speaker signals group. bytesChannels[groupIdx][i] indicates the number of bits for each virtual speaker signal.

Alternatively, groupBytes[groupIdx] indicates the total number of allocated bits of the residual signal group. $\frac{\mathrm{bitsRatio[groupIdx][i]}}{\sum_{k=0}^{\mathrm{groupChans[groupIdx]}-1}\mathrm{bitsRatio[groupIdx][k]}}$ indicates the bit allocation ratio of each residual signal in the residual signal group. bytesChannels[groupIdx][i] indicatets the number of bits of each residual signal. Through the above process, the number of bits of each group of virtual speaker signals and residual signals is calculated, and the virtual speaker signals and residual signals in the bitstream is decoded.

7.7.3.3 upmixing

HOA decoding process Avs3HoaInverseDMX() is perfomed by decoding the channel group pair information based on chIdx. chIdx is the sequence number of the upper triangular matrix elements (excluding the main diagonal elements) formed by the a channel pair group. Therefore, the channel pair is determined by chIdx. For example, when the number of channels ch is 4, the Matrix matrix is shown in formulas (14) and (15).

$$Matrix = \begin{bmatrix} (ch0ch1) & (ch0ch2) & (ch0ch3) & (ch0ch4) \\ & (ch1ch2) & (ch1ch3) & (ch1ch4) \\ & & (ch2ch3) & (ch2ch4) \\ & & & (ch3ch4) \\ & & & \end{bmatrix} \quad (14)$$

$$chIdx = \begin{bmatrix} 0 & 1 & 2 & 3 \\ & 4 & 5 & 6 \\ & & 7 & 8 \\ & & & 9 \\ & & & \end{bmatrix} \quad (15)$$

When chIdx = 0, the pair of ch0 and ch1 is obtained through parsing.

When dmxMode is full-band M/S downmixing, the value of sub-band sfbMask is set to 1. When dmxMode is sub-band M/S downmixing, the value of sub-band sfbMask of is obtained by parsing the bitstream. When the value of sub-band sfbMask is 1, upmixing is performed to obtain upmixed channels Y1 and Y2. The M/S upmixing is shown infomulas (16) and (17).

$$Y1 = \frac{\sqrt{2}}{2}(ch0 + ch1) \quad (16)$$

$$Y2 = \frac{\sqrt{2}}{2}(ch0 - ch1) \quad (17)$$

Finally, inverse ILD processing is perfomed on the upmixed channels, using the same method as in section 7.6.3.3.

Repeating the above process to obtain the upmixed virtual speaker signal and the upmixed residual signal.obtained through the inverse ILD processing. Then, applying post-decoding processing Avs3PostSynthesis() to obtain the virtual speaker signal and residual signal. The virtual speaker signal and residual signal are used as inputs of the HOA spatial decoder.

7.8 Synax, semantics and decoding process of post-decoding processing

7.8.1 Syntax

The syntax of decoding post-processing shall comply with provisions in Table 26.

Table 26 Syntax of Post-decoding Processing

Syntax of decoding post-processing	number of bits	mnemonic
Avs3PostSynthesis() {		
if (bwePresent == 1) {		
BweApplyDec()		
}		
TnsDec()		
Avs3FdInvSpectrumShaping()		
if (transformType == 0x1) {		
MdctSpectrumDeinterleave()		
}		
Avs3InverseMdctDecoder()		
}		

7.8.2 semantic

BweApplyDec()	bandwidth extension decoding processing
TnsDec()	Temporal noise shaping decoding processing
Avs3FdInvSpectrumShaping()	Frequency-domain noise shaping decoding processing
MdctSpectrumDeinterleave()	Short-frame MDCT spectrum de-interleaving
Avs3InverseMdctDecoder()	Inverse MDCT transform

7.8.3 decoding process

Avs3PostSynthesis() : bandwidth extension decoding processing is performed when the band extension is enabled, followed by temporal noise shaping decoding processing and frequency-domain noise shaping decoding processing. When the windowed control parameter indicates a short window,. MDCT spectrum de-interleaving is performed, and finally inverse MDCT transform is performed to obtain the time-domain reconstruction signal.

7.9 Syntax, semantics and decoding process of bandwidth extension decoding

7.9.1 syntax

The syntax of side information of bandwidth extension decoding shall comply with provisions of Table 27.

Table 27 syntax of side information of bandwidth extension decoding

Syntax of side information of bandwidth extension decoding	number of bits	mnemonic
DecodeBweSideBits() {		
for (i = 0; i < numSfb; i++) {		
sfbEnvQIdx	**7**	**uimsbf**
}		
for (i = 0; i < numTiles; i++) {		
flag_whiten_ONOFF	**1**	**uimsbf**
if(flag_whiten_ONOFF == 0) {		
whiteningLevel[i] = BWE_WHITENING_OFF		

Table 27 (continued)

Syntax of side information of bandwidth extension decoding	bit number	mnemonic
} else {		
flag_whiten_MID_HIGH	**1**	**uimsbf**
if(flag_whiten_MID_HIGH == 0) {		
whiteningLevel[i] = BWE_WHITENING_MID		
} else {		
whiteningLevel[i] = BWE_WHITENING_HIGH		
}		
}		
}		
}		

7.9.2 semantic

sfbEnvQIdx 7bit, used to indicate the quantization index of the envelope parameter of each SFB in a frequncy band of bandwidth extension, from which the envelope parameter of each SFB in the frequency band of band extension is obtained.

flag_whiten_ONOFF 1 bit, used to indicate whether whitening enabled for each frequency area in the frequency band of bandwidth extension. 0 indicates that the whitening is disabled, and 1 indicates that the whitening is enabled.

flag_whiten_MID_HIGH 1 bit, used to indicate whether range of the whitening level of each frequency area in the frequency band of bandwidth extension.is medium (MID) or high (HIGH). 0 indicates MID, and 1 indicates HIGH.

numSfb used to indicates the total number of SFBs in the frequency band of bandwidth extension , see section 7.9.3.6

numTiles	used to indicates the total number of frequency areas in the frequency band of bandwidth extension
whiteningLevel[i]	used to indicates a whitening level parameter of the i-th frequency area in the frequency band of bandwidth extension

7.9.3 decoding process

7.9.3.1 Overview

The band extension at the decoder is mainly to restore the MDCT spectrum of the frequency band of bandwidth extension based on the core band MDCT spectrum and the bandwidth extension parameter obtained through decoding. The bandwidth extension algorithm at the decoder include: spectrum preparation of the bandwidth extension, whitening, and envelope adjustment. The details are as follows.

7.9.3.2 Bandwidth expansion spectrum preparation

The core band MDCT spectrum obtained through decoding is mdctSpectrum, and the MDCT spectrum of the frequency band of bandwidth extension is bweSpectrum. The starting point of the source frequency area corresponding to each target frequency area in the frequency band of bandwidth extension is srcTiles[numTiles], and the boundary of each target frequency area in the spectrum of bandwidth extension is targetTiles[numTiles+1].

The basic process of spectrum preparation is: starting from srcTiles, replicate the core band MDCT spectrum obtained through decoding to the frequency area corresponding to the high-frequency band of bandwidth extension (the boundary of the frequency area is targetTiles).

The process of spectrum replication is shown in the following pseudo-code:

```
for (tileIdx = 0; tileIdx < numTiles; tileIdx++){
    srcLineIdx = srcTiles[tileIdx]
    for (i = targetTiles[tileIdx]; i < targetTiles[tileIdx+1]; i++){
        bweSpectrum[i] = mdctSpectrum[srcLineIdx]
srcLineIdx++
   }
}
```

7.9.3.3 Whitening

When spectrum features of the source frequency area and the target frequency area are different, replicated high-frequency spectrum components needs to whitened to different extend, then the spectrum features of the frequency band of bandwidth extension are more similar to those of the original high-frequency spectrum (such as spectrum components that are closer to harmonic features or closer to noise features).

Spectrum whitening processing is classified into three levels: BWE_WHITENING_OFF, BWE_WHITENING_MID, and BWE_WHITENING_HIGH, corresponding to the spectrum processing methods as follows:

whitenedSpectrum indicates the whitened MDCT spectrum .

BWE_WHITENING_OFF: indicates that no whitening is performed, and the replicated spectrum (i.e., bweSpectrum) is directly used as the whitened spectrum.

BWE_WHITENING_MID: Indicates that the whitening level is medium. The basic method for medium spectrum whitening is to use a moving average algorithm to process bweSpectrum to obtain the whitened MDCT

spectrum.
The moving average algorithm is shown in formula (18).

$$whitenedSpectrum[i] = \left(\frac{1}{2*AvgSize+1}\sum_{i-AvgSize}^{i+AvgSize}(bweSpectrum[i])^2\right)^{1/2} \text{.............................(18)}$$

where AvgSize indicates the size of the moving average processing neighborhood. In the moving average processing on frequency i, the average amplitude is actually calculated for the frequency within the range of [i-AvgSize, i+AvgSize].
BWE_WHITENING_HIGH:indicates that the whitening level is high. Random noise of a certain amplitude is generated to replace bweSpectrum obtained through spectrum replication, in order to obtain a high-frequency spectrum component with a strong noise feature.

7.9.3.4 envelope adjustment

Envelope adjustment adjusts the amplitude of the whitened spectrum based on the envelope information of each SFB in the high-frequency band obtained from decoding in the bitstream, so that the energy of the high-frequency spectrum restored by the bandwidth extension module remains consistent with the energy of the original high-frequency spectrum.
The basic steps of the envelope adjustment algorithm for each SFB of the bandwidth extension spectrum are as follows:
Calculate the frequency bandwidth sfbWidth, as shown in formula (19).

$$sfbWidth = sfbTable[sfbIdx+1] - sfbTable[sfbIdx] \text{..................................(19)}$$

Where, sfbTable indicates the frequency band division table of the bandwidth extension, and sfbIdx indicates the frequency band sequence number.
Calculate the energy currEner of the whitening spectrum of the current SFB, Refer to formula (20).

$$currEner = \frac{1}{sfbWidth}\sum_{i=sfbStart}^{sfbEnd-1}(whitenedSpectrum[i])^2 \text{..................................(20)}$$

Where, sfbStart indicates the starting point of the current SFB, and sfbEnd indicates the end point of the current SFB. The values are shown respectively in formulas (21) and (22).

$$sfbStart = sfbTable[sfbIdx] \text{..(21)}$$

$$sfbEnd = sfbTable[sfbIdx+1] \text{..(22)}$$

Calculate the energy $targetEner$ of the target spectrum of the current SFB based on the SFB envelope parameters transmitted in the bitstream, refer to formula (23).

$$targetEner = 2.0^{\frac{sfbEnvQIdx[sfbIdx]}{4.24966}-4.0} \text{..(23)}$$

Using the energy of the whitened spectra and target spectra to calculate the spectrum gain of the current SFB. The pseudo-code is as follows:

```
if (currEner != 0.0){
    gainSfb = sqrt(targetEner / currEner)
}else{
    gainSfb = 1.0
}
```

Multiply the spectrum gain of the current SFB with the whitened spectrum to obtain the high-frequency spectrum restored by the bandwidth extension algorithm.

7.9.3.5 The conditions for enabling the bandwidth expansion

The conditions for enabling the bandwidth extension vary depending on signal formats such as mono, dual-channel stereo, and multi-channel .
Mono mode: Enabled when the coding rate is less than or equal to 96kb/s.
Dual-channel stereo mode: Enabled when the coding rate is less than or equal to 128kb/s.
Multi-channel mode: Enabled when the equivalent dual-channel stereo coding bit rate is less than or equal to 128kb/s. The calculation method for the equivalent dual-channel stereo coding rate is to multiply the average coding rate by 2, where the average coding rate is the coding bit rate divided by the number of channels (excluding the LFE channel).
FOA/HOA mode: Enabled when the FOA coding rate is less than or equal to 256kb/s, or enabled when the 2-order HOA coding rate is less than or equal to 480kb/s, or enable when the 3-order HOA coding rate is less than or equal to 896kb/s (when the 3rd-order HOA is less than or equal to 640kb/s, disabled for the virtual speaker signal group, and enabled for the residual signal group).

7.9.3.6 Bandwidth extension configuration parameters

Bandwidth extension divides the high-frequency spectrum into several SFBs, with one or more SFBs constituting a frequency area. For each high-frequency area, known as the target frequency area, there is a corresponding low-frequency area, known as the source frequency area, which is used to replicate the spectrum from the low-frequency band to the high-frequency band at the decoder.
According to the above algorithm framework, the configuration parameters of bandwidth extension are as follows:

a)The SFB division method shall comply with provisions in Tables 28-31, where N_SFB indicates the number of SFBs, sfbStart n indicates the starting point of the n-th SFB, and sfbStart 1 indicates the frequency sequence number corresponding to the starting frequency of the high-frequency spectrum;

b)The target frequency area division method shall comply with provisions in Table 32 to \35, where N_tT indicates the number of target frequency areas, and targetTile n indicates the starting point of the nth target frequency area;

c)The source frequency area division method shall comply with provision of Tables 36 to 39, where srcTile n indicates the starting point of the n-th source frequency area;

d)The method in which the high-frequency band constitutes the target frequency area shall comply with provision of Tables 40-43, where tT_SFB n indicates the SFB sequence number corresponding to the starting point of the n-th target frequency area.

The meanings of the above configuration table are explained as follows, taking the configuration of mono channel with a bit rate of 32kb/s and below as an example.
In Table 28, the high-frequency spectrum is divided into six SFBs. The starting point of the frequency range corresponding to the SFB 1 is 352 (i.e., the 352nd MDCT frequency), and the ending point is 415 (i.e., 416 minus 1 in the table). The starting point of the frequency range corresponding to the SFB 2 is 416, and the ending point is 479 (i.e., 480 minus 1 in the table).The remaining parameters are derived accordingly.
In Table 32, the high-frequency spectrum is divided into three target frequency areas. The starting point of the frequency area corresponding to the TFA 1 is 352 (i.e., the 352nd MDCT frequency), and the ending point is 479 (i.e., 480 minus 1 in the table); the starting point of the frequency range corresponding to TFA2 is 480, and the

ending point is 607 (i.e., 608 minus 1 in the table).The remaining parameters are derived accordingly.

In Table 36, the spectrum is divided in to three source frequency areas corresponding to the high-frequency areas is also three. The starting point of the SFA1 is 64 (i.e., the 64th MDCT frequency), and the starting point of SFA2 is 96. The bandwidth of the source frequency area is the same as that of the corresponding target frequency area.

In Table 40, the correspondence between the target frequency area and the high-frequency band is as follows: the TFA 1 includes the SFB 0 and the SFB 1, the TFA2 includes the SFB 2 and SFB 3, and the TFA 3 includes the SFB 4 and the SFB 5..

The configuration of the mono high-frequency SFB shall comply with provisions in Table 28.

Table 28 table of Configuration of mono high-frequency SFB

(kb/s)	N_SFB	sfbStart 1	sfbStart 2	sfbStart 3	sfbStart 4	sfbStart 5	sfbStart 6	sfbStart 7
<=32	6	352	416	480	544	608	672	768
(32,56]	6	448	496	544	608	672	736	832
(56,72]	4	544	608	672	736	832		
(72, 96]	2	672	736	832				

The configuration of the dual-channel stereo high-frequency SFB shall comply with provisions in Table 29.

Table 29 table of Configuration of dual-channel stereo high-frequency SFB

(kb/s)	N_SFB	sfbStart 1	sfbStart 2	sfbStart 3	sfbStart 4	sfbStart 5	sfbStart 6	sfbStart 7
<=48	6	352	416	480	544	608	672	768
(48, 64]	6	352	416	480	544	608	672	768
(64, 96]	4	544	608	672	736	832		
(96, 128]	2	672	736	832				

The configuration of the multi-channel high-frequency SFB shall comply with provisions in Table 30.

Table 30 table of configuration of Multi-channel high-frequency SFB (bit rate converted to channel pairs)

(kb/s)	N_SFB	sfbStart 1	sfbStart 2	sfbStart 3	sfbStart 4	sfbStart 5	sfbStart 6	sfbStart 7
<=56	6	352	400	448	512	576	672	768
(56, 75]	5	400	448	512	576	672	768	
(75, 108]	4	544	608	672	736	832		
(108, 128]	2	672	736	832				

The configuration of the HOA high-frequency SFB shall comply with provisions in Table 31.

Table 31 table of configuration of HOA high-frequency SFB (HOA2/HOA3 is 2-order HOA/3-order HOA)

kb/s	N_SFB	sfbStart 1	sfbStart 2	sfbStart 3	sfbStart 4	sfbStart 5	sfbStart 6	sfbStart 7
192 (HOA2)	4	352	416	480	544	736		
<=128 (FOA) 256 (HOA2) [256, 384]	6	384	448	512	576	672	736	832

(HOA3)								
192 (FOA) 320 (HOA2) 512 (HOA3)	4	544	608	672	736	832		
256 (FOA) [384, 480] (HOA2) [640, 896] (HOA3)	2	672	736	832				

The configuration of the mono target frequency area shall comply with provisions in Table 32.

Table 32 table of Configuration of mono target frequency area

(kb/s)	N_tT	targetTile 1	targetTile 2	targetTile 3	targetTile 4
<=32	3	352	480	608	768
(32,56]	3	448	544	672	832
(56,72]	2	544	672	832	
(72, 96]	1	672	832		

The configuration of the two-channel stereo target frequency area sound shall comply with provisions in Table 33.

Table 33 table of Configuration of dual-channel stereo target frequency area

(kb/s)	N_tT	targetTile 1	targetTile 2	targetTile 3	targetTile 4
<=48	3	352	480	608	768
(48, 64]	3	352	480	608	768
(64, 96]	2	544	672	832	
(96, 128]	1	672	832		

The configuration of the multi-channel target frequency area shall comply with provisions inTable 34.

Table 34 table of configuration of Multi-channel target frequency area (bit rates converted to channel pairs)

(kb/s)	N_tT	targetTile 1	targetTile 2	targetTile 3	targetTile 4
<=56	3	352	448	576	768
(56, 75]	3	400	512	672	768
(75, 108]	2	544	672	832	
(108, 128]	1	672	832		

The configuration of the HOA target frequency area shall comply with provisions inTable 35.

Table 35 table of Configuration of HOA target frequency area (HOA2/HOA3 is 2-order HOA/3r-order HOA)

kb/s	N_tT	targetTile 1	targetTile 2	targetTile 3	targetTile 4
192 (HOA2)	2	352	480	736	

<=128 (FOA) 256 (HOA2) [256, 384] (HOA3)	3	384	512	672	832
192 (FOA) 320 (HOA2) 512 (HOA3)	2	544	672	832	
256 (FOA) [384, 480] (HOA2) [640, 896] (HOA3)	1	672	832		

The configuration of mono sources frequency rarea shall comply with provisions in Table 36.

Table 36 Table of configuration of mono source frequency area

(kb/s)	srcTile 1	srcTile 2	srcTile 3	srcTile 4
<=32	64	96	144	
(32,56]	96	144	192	
(56,72]	144	192		
(72, 96]	192			

The configuration of the dual-channel stereo sources frequency area shall comply with provisions in Table 37.

Table 37 table of Configuration of dual-channel stereo source frequency area

kb/s	srcTile 1	srcTile 2	srcTile 3	srcTile 4
<=48	64	96	144	
(48, 64]	64	96	144	
(64, 96]	144	192		
(96, 128]	192			

The configuration of multi-channel source frequency area shall comply with provisions inTable 38.

Table 38 table of configuration of the Multi-channel source frequency area (bit rates converted to channel pairs)

(kb/s)	srcTile 1	srcTile 2	srcTile 3	srcTile 4
<=56	64	96	144	
(56, 75]	64	96	144	
(75, 108]	144	192		
(108, 128]	192			

The configuration of the HOA source frequency area shall comply with provisions in Table 39.

Table 39 Table of Configuration of HOA source frequency area (HOA2/HOA3 is 2-order HOA/3-order HOA)

(kb/s)	srcTile 1	srcTile 2	srcTile 3	srcTile 4
192 (HOA2)	64	96		
<=128 (FOA)	96	144	192	

256 (HOA2) [256, 384] (HOA3)				
192 (FOA) 320 (HOA2) 512 (HOA3)	144	192		
256 (FOA) [384, 480] (HOA2) [640, 896] (HOA3)	192			

The configuration of SFB sequence number of the mono high-frequency band constituting the target frequency area shall comply with provisions in Table 40.

Table 40 SFB table of configuration of SFB sequence number of mono high-frequency band consisting target frequency .

kb/s	tT_SFB 1	tT_SFB 2	tT_SFB 3	tT_SFB 4
<=32	0	2	4	6
(32,56]	0	2	4	6
(56,72]	0	2	4	
(72, 96]	0	2		

The configuration of the SFB sequence number of the dual-channel stereo high-frequency band consisting the target frequency area shall comply with provisions in Table 41.

Table 41 table of configuration of SFB sequence number of the dual-channel stereo high frequency band constituting target frequency area

(kb/s)	tT_SFB 1	tT_SFB 2	tT_SFB 3	tT_SFB 4
<=48	0	2	4	6
(48, 64]	0	2	4	6
(64, 96]	0	2	4	
(96, 128]	0	2		

The configuration of the SFB sequence configuration requirements of multi-channel high-frequency band constituting the target frequency area shall comply with provisions in Table 42.

Table 42 table of configuration of SFB sequence number of multi-channel high-frequency band constituting target frequency area (bit rates converted to channel pairs)

(kb/s)	tT_SFB 1	tT_SFB 2	tT_SFB 3	tT_SFB 4
<=56	0	2	4	6
(56, 75]	0	2	4	5
(75, 108]	0	2	4	
(108, 128]	0	2		

The configuration of the SFB sequence number the of the HOAhigh-frequency band consitituing the target frequency area shall comply with provisions in Table 43.

Table 43 table of configuration of SFB sequence number of the HOA high-frequency band consitituing the target frequency area (HOA2/HOA3 is 2-order HOA/3-order HOA)

(kb/s)	tT_SFB 1	tT_SFB 2	tT_SFB 3	tT_SFB 4
192 (HOA2)	0	2	4	
<=128 (FOA) 256 (HOA2) [256, 384] (HOA3)	0	2	4	6
192 (FOA) 320 (HOA2) 512 (HOA3)	0	2	4	
256 (FOA) [384, 480] (HOA2) [640, 896] (HOA3)	0	2		

7.10 Syntax, Semantics, and Decoding Process of Inverse Temporal Noise Shaping

7.10.1 Syntax

The syntax of the ttemporal noise shaping side information shall comply with provisions in Table 44.

Table 44 Syntax of temporal noise shaping side information

Syntax of temporal noise shaping side information	bit number	mnemonic
DecodeTnsSideBits() {		
for (i = 0; i < 2; i++) {		
tnsEnable[i]	**1**	**uimsbf**
if(tnsEnable[i] == 1) {		
tnsOrder[i]	**3**	**uimsbf**
tnsOrder[i] += 1		
for (j = 0; j < tnsOrder[i]; j++) {		
tnsHuffCode[i][j]		**uimsbf**
}		
}		
}		
}		

7.10.2 semantic

tnsEnable[i] 1bit, used to indicate whether the i-th TNS filter is enabled, 0 indicates disabled, and 1 indicates enabled.

tnsOrder[i] 3bit, used to represent the order of the ith TNS filter, with a maximum order of 8

tnsHuffCode[i][j] Used to indicates theHuffman coding results of filter coefficient of the j-order of the ith TNS filter. The maximum value of the maximum order(i.e., tnsOrder[i]) of the tns parameter is 8. There is a corresponding Huffman code table for each order of tns parameter. The Huffman code tables (including codewords and the numbers of bits) of the tns parameters from order 0 to 7 shall comply with the number of bits in Tables B.25 to B.32.

7.10.3 decoding process

7.10.3.1 Overview

The basic process of temporal noise shaping is as follows: firstly, range decoding and inverse quantization are performed on the Huffman coding results of the filter coefficient to obtain the filter coefficient; then the frequency bands corresponding to each TNS filter is filtered to obtain the MDCT spectrum after inverse temporal noise-shaping.

7.10.3.2 Decoding and inverse quantization of filter coefficient

The temporal noise shaping filter is indicated by a group of reflection coefficients. The maximum order of the filter is 8, and the actual order of the filter per frame is less than or equal to the maximum order. The Huffman coding is performed on the quantized reflection coefficient at the encoder.. Each dimension of the filter coefficient has a corresponding Huffman code table whish shall comply with provisions in Tables B.25-B.32.
The Huffman decoding process of the filter coefficient quantization index is as follows: For the j-th filter coefficient of the i-th TNS filter in the current frame, selecting the corresponding Huffman code table, and decoding the Huffman codeword tnsHuffCode[i][j] in the bitstream as a quantization index.
The quantized filter coefficient is obtained based on the scalar quantization code table of the filter coefficient and the quantization index obtained through decoding . The scalar quantization code table used here is a non-uniform scalar quantization code table, which shall comply with provisions in Table B.33.

7.10.3.3 Inverse temporal noise shaping filter

The temporal noise shaping uses up to two groups of filters, with the frequency ranges corresponding to the two groups of filters are respectively [660Hz, 5400Hz] and [5400Hz, 20000Hz].
If the enabling flag tnsEnable[i] of the i-th filter group is equal to 1, then inverse temporal noise shaping filtering is performed on the frequency range corresponding to the i-th filter group.
The input of the filtering algorithm is the MDCT spectrum and the corresponding filter coefficient obained through decoding.. Frequency domain filtering is performed on the MDCT spectrum according to a linear prediction filtering algorithm based on reflection coefficient. The filtering process is shown in following pseudo-code:

```
mdct[k] -= parCoeff[tnsOrder - 1] * tnsState[tnsOrder - 1]
for (i = tnsOrder - 2; i >= 0; i--) {
    mdct[k] -= parCoeff[i] * tnsState[i]
    tnsState[i + 1] = parCoeff[i] * mdct[k] + tnsState[i]
}
tnsState[0] = mdct[k]
```

Where, k is the frequency sequence number, mdct[k] indicates the MDCT spectral coefficient of the k-th frequency, parCoeff is the reflection coefficient, tnsOrder is the TNS filter order, and tnsState is theTNS filter history.

7.11 Syntax, semantics and decoding process inverse frequency-domain noise shaping

7.11.1 Syntax

The syntax of frequency-domain noise shaping side information shall comply with provisions in Table 45.

Table 45 Syntax of frequency-domain noise shaping side information

Syntax of Frequency-domain noise shaping side information	number of bits	mnemonic
DecodeFdShapingSideBits() {		
if (lsfLbrFlag == 0) {		
lsfVqIndex[0]	**8**	**uimsbf**
lsfVqIndex[1]	**8**	**uimsbf**
lsfVqIndex[2]	**7**	**uimsbf**
lsfVqIndex[3]	**7**	**uimsbf**
lsfVqIndex[4]	**6**	**uimsbf**
lsfVqIndex[5]	**5**	**uimsbf**
lsfVqIndex[6]	**5**	**uimsbf**
} else {		
lsfVqIndex[0]	**8**	**uimsbf**
lsfVqIndex[1]	**8**	**uimsbf**
lsfVqIndex[2]	**7**	**uimsbf**
lsfVqIndex[3]	**7**	**uimsbf**
lsfVqIndex[4]	**6**	**uimsbf**
}		
}		

7.11.2 semantic

lsfVqIndex[i] Used to indicate the quantization index of the i-th sub-vector in the vector quantization of LSF parameter .

lsfLbrFlag Used to indicate low-precision LSF quantization and coding. When the average bit rate per channel is greater than 32kb/s, lsfLbrFlag is 0, indicating high-precision LSF quantization and coding. When the average bit rate per channel is less than or equal to 32kb/s, lsfLbrFlag is 1, indicating low-precision LSF quantization coding.

7.11.3 decoding process

7.11.3.1 Overview

A spectral quantization noise shaping technique of the LPC-based spectral envelope is used to perform frequency domain noise shaping. The LPC-based spectral envelope is calculated and the MDCT spectrum is shaped to be encoded by encoder. The corresponding spectral envelope information based on the LPC paramete obtained by decoding the bitstream is calculated by decorder, and inverse shaping is performed.

Inverse frequency domain noise shaping mainly includes: LSF parameter inverse quantization, LSF parameter conversion, and inverse frequency-domain noise shaping.

7.11.3.2 LSF parameter inverse quantization

The quantization and coding of an LSF parameter is performed by using the vector quantization technique. The structure of the vector quantization code table is multi-stage split vector quantization. The high-precision and low-precision vector quantization code tables are used for different coding bit rates. When lsfLbrFlag is 0, the high-precision code table is used; when lsfLbrFlag is 1, the low-precision code table is used.
The dimension of the LSF parameter is 16.
The structure of the high-precision code table is as follows: in stage 1, the LSF vector is divided into two sub-vectors with dimensions of 9 and 7, and the numbers of bits in the code table are 8 and 8, which shall comply with provisions in Tables B.34 to B.35; in stage 2, the residual vector quantized in the stage 1 is divided into five sub-vectors with dimensions of 3, 3, 3, 3, and 4, and the numbers of bits in the code table are 7, 7, 6, 5, and 5, which shall comply with provisions in Tables B.36 to B.40.
The structure of the low-precision code table is as follows: in stage 1, the LSF vector is divided into two sub-vectors with dimensions of 9 and 7, and the numbers of bits in the code table are 8 and 8, which shall comply with the provisions in Tables B.41-B.42; the stage 2, the residual vector quantized in stage 1 is divided into three sub-vectors with dimensions of 5, 4, and 7, and the numbers of bits in the code tableare 7, 7, and 6, which shall comply with provisions in Tables B.43-B.45.
According to the LSFVqIndex parameter obtained in the bitstream and the corresponding vector quantization code table, the stage 1 vector and stage 2 vector is obtained through decodeding.The stage 1 vector and stage 2 vector the the LSF parameter mean value vector are added together to obtained the inverse quantized LSF parameter. The LSF parameter mean vector shall comply with provisions in Table B.46.

7.11.3.3 LSF parameter conversion

The LSF parameters is converted to an LSP parameters, and then converted to LPC parameters. The conversion of LSF parameters shall comply with provisions in section 5.1.9 in 3GPP TS 26.445 (Release 17).

7.11.3.4 Inverse frequency-domain noise shaping processing

The inverse frequency-domain noise shaping consists of two steps: LPC spectral envelope calculation and inverse shaping. The basic porcess of LPC spectral envelope calculation is as follows:

Step 1: calculate the LPC spectral envelope of each frequency based on the LPC parameters. The basic principle is shown in formula (24).

$$lpcEnv[k] = \frac{1}{\left|1-\sum_{i=1}^{p} a_i e^{\frac{2\pi jk}{N}i}\right|} \quad \text{......(24)}$$

where lpcEnv[k] is the LPC spectral envelope of the k-th frequency, and a_i is the i-th LPC coefficient.

Firstly, the LPC coefficient is weighted, and the weighting process is as follows:

An LPC weighting coefficient is obtained, the pseudo-code is as follows:

```
GAMMA_LPC = 0.939999998
weightFactor[0] = 1.0
for i = 1 to lpcOrder:
  weightFactor[i] = weightFactor[i-1] * GAMMA_LPC
end
```

where GAMMA_LPC is the initial value of the LPC weighting coefficient, weightFactor is the calculated LPC weighting coefficient, and lpcOrder is the LPC order, which is set to 16.

The LPC weighting coefficient is multiplied by the LPC parameter to obtain a weighted LPC parameter weightedLpc.

Secondly, the low-precision LPC spectral envelope is calculated as follows:

The weighted LPC parameters is pre-rotated, and the complex FFT is performed on the pre-rotated LPC parameters rotateLpc, and the low-precision LPC spectral envelope is calculated.

The pre-rotation of the LPC parameters is as follows:

```
for (i = 0; i < lpcOrder + 1; i++) {
    tmp = i * PI / 512
    realPart[i] = weightedLpc[i] * cos(tmp)
    imagPart[i]= -weightedLpc[i] * sin(tmp)
}
```

Where, realPart and imagPart are the real and imaginary parts of the pre-rotated LPC parameter rotateLpc, respectively.

The number of points of the complex FFT is 512, and the low-precision LPC spectral envelope$rawLpcGain$for the$1/\|FFT(rotateLpc)\|_2$The number of points of low-precision LPC spectral envelope points obtained here is 256.

Thirdly, the interpolated LPC spectral envelope is obtained. 4-fold linearly interpolation is performed on rawLpcGain to obtain an interpolated LPC spectral envelope with 1024 frequency.

Step 2: Calculate the sub-band LPC spectral envelope based on the frequency LPC spectral envelope

The MDCT spectrum is divided into several sub-bands with different length. The average value of the frequency LPC spectral envelopes at each subband is calculated as the sub-band LPC spectral envelope. The current number of sub-bands used is 49, and the sub-band configuration shall comply with provisions in Table B.47.

The method of inverse shaping processing is sd follows: the calculated LPC spectral envelope is to multiplied by the MDCT spectrum to obtain the MDCT spectrum obtained through inverse frequency-domain noise shaping.

7.12 Inverse MDCT decoding process

7.12.1 Overview

The inverse MDCT is performed on the windowed control parameters obtained by parsing the bitstream and the decoded MDCT coefficient of each channel, to obtained a reconstructed time-domain audio signal.

According to different windowed control parameters, the inverse MDCT is divided into the following categories:

If the windowed control parameter is equal to 0x0 or 0x2, indicating that the current frame is a long window or a cut-in window, then 2048-point inverse transform is performed on the MDCT spectrum to obtain a reconstructed time-domain signal of the current frame. The first half frame of the reconstructed time-domain signal is added to the second half-frame of the reconstructed time-domain signal of the previous frame to obtain the output signal of the current frame.

If the windowed control parameter is equal to 0x3, indicating that the current frame is a cut-out window, then the 2048-point inverse transform is performed on the MDCT spectrum to obtain the reconstructed time-domain signal of the current frame. The part of the first half-frame of the reconstructed time-domain signal and that is overlapped with the last short frame of the previous frame, is added to the second half-frame of the last short frame of the previous frame to obtain the output signal of the current frame.

If the windowed control parameter is equal to 0x1, that is, the current frame is a short window, then the 256-point inverse transform is performed respectively on MDCT coefficients of 8 short frames included in the de-interleaved MDCT spectrum, The obtained 8 short-window time-domain signals are overlapped and added to obtain the output signal of the current frame.

7.12.2 Definition of windowed

The forms of window type are as follows:

a)Long window: LONG_SHORT_TRANS_WINDOW, which is a sine window with a length of 2048 points.

b) Cut-in window: LONG_SHORT_TRANS_WINDOW, consisting of a left half sine window with a length of 1024 points, 448 points of 1, a right half sine window with a length of 128 points, and 448 points of 0 .

c) Cutting-out window: SHORT_LONG_TRANS_WINDOW, consisting of 448 points of 0, a left half sine window of 128 point, 448 points of 1, and a right half sine window of 1024 points.

d)Short window: ONLY_SHORT_WINDOW, a sine window with a length of 256 points, with 8 short windows added per frame.

7.13 HOA spatial decoding

7.13.1 Syntax

The Syntax of HOA spatial decoding shall comply with provisions in Table 46.

Table 46 syntax of HOA spatial decoding

Syntax of HOA spatial decoding	bit number	mnemonic
HoaPostSynthesisFilter() {		
if(spatialAnalysis == 1) {		
HoaCoreDec()		
}		
}		

7.13.2 semantic

spatialAnalysis — Used to indicate the spatial analysis type. For the semantic of spatialAnalysis, refer to section7.7.2

HoaCoreDec() — Used to indicate sound field component synthesis and HOA synthesis decoding

7.13.3 decoding process

7.13.3.1 General rules

During HOA spatial decoding the virtual speaker signal and residual signal generated at the encoder, as well as the target virtual speaker attribute information, are reconstructed through post-decoding processing Avs3PostSynthesis() to obtain the decoded HOA signal.

7.13.3.2 Principle of sound field reconstruction by virtual speakers

The HOA coefficient of the virtual speaker is used to reconstruct the sound field .Assuming that the sound field p $p(r,\theta,\varphi,k)$is in spherical coordinate system, refer to formula (25).

$$p(r,\theta,\varphi,k)\ =\sum_{m=0}^{\infty}j^{m}j_{m}^{kr}(kr)\sum_{0\le n\le m,\sigma=\pm1}B_{m,n}^{\sigma}Y_{m,n}^{\sigma}(\theta,\varphi)\qquad(25)$$

where r indicates the radius of the sphere, θ indicates the azimuth angle, φ indicates the pitch angle, k indicates the wave velocity, and m indicates the order number of the HOA.$j^{m}j_{m}^{kr}(kr)$ indicates the spherical Bessel, i.e. radial basis function. j indicates the imaginary unit. $Y_{m,n}^{\sigma}(\theta,\varphi)$ indicates the spherical harmonic function of θ and φ. $B_{m,n}^{\sigma}$ indicates theHOA coefficient. An m-order HOA coefficient is used as an approximate description of a sound field. By overlapping the spherical harmonic according to the coefficients corresponding to a sampling point of the HOA signal, the spatial sound field corresponding to the sampling point is be reconstructed.

7. 13. 3. 3 Virtual speakers

The HOA spatial encoding and decoding adopts a non-uniform virtual speaker distribution. The virtual speaker distribution includes position information of K virtual speakers, which includes the pitch angle index and the horizontal angle index. K is a positive integer greater than 1. K virtual speakers are distributed on a preset spherical surface. The preset spherical surface includes X latitude coils and Y longitude coils, and the virtual speakers are located at the intersection points of the X latitude coils and the Y longitude coils. Area division of the virtual speaker is shown in Figure 11. The preset spherical surface includes L (L>1) latitude areas, and the m-th latitude area includess T_m latitude coils. α_m indicates the horizontal angle difference between adjacent virtual speakers distributed on the m_i-th latitude coil of the K virtual speakers $1 \le m \le L$, T_m is a positive integer, and $1 \le m_i \le T_m$. When $T_m > 1$, α_m indicates the pitch angle difference between any two adjacent latitude coils in the m-th latitude area.

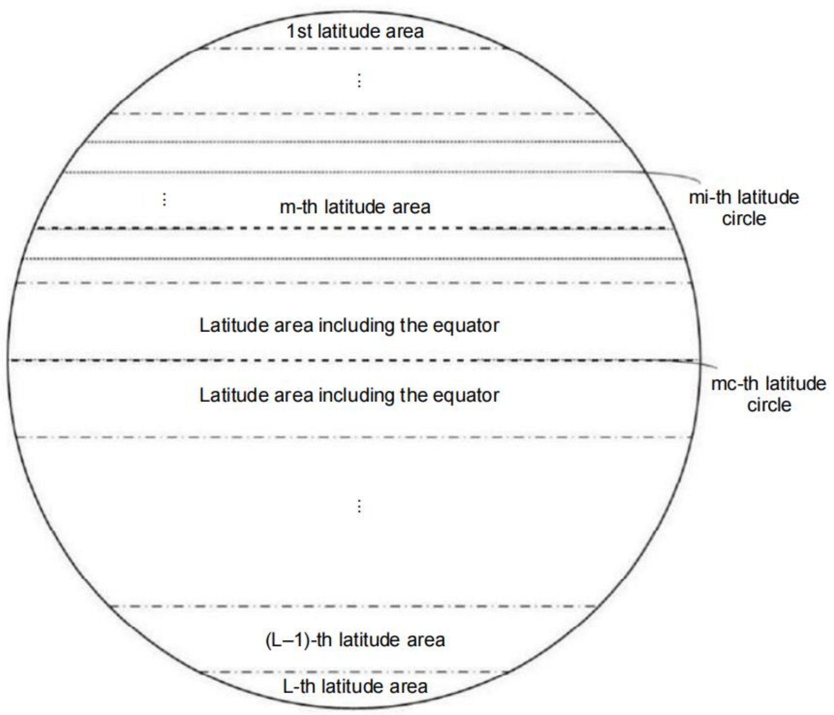


Figure 11 Division of virtual loudspeaker area

K virtual speakers are distributed on one or more latitude coils in each latitude area, and the distance between adjacent virtual speakers on the same latitude coil is indicated by the horizontal angule difference. The horizontal angule differences between all adjacent virtual speakers on the same latitude coil are equal. $\alpha_c < \alpha_m$, where αc is the horizontal angule difference between adjacent virtual speakers distributed on the m_c-th latitude coil among the K virtual speakers, and the m_c-th latitude coil is any one of the latitude coil in the L latitude areas including the equato. Among the L latitude areas, the horizontal angule difference between adjacent virtual speakers in the latitude area including equator is the smallest, and the distribution of virtual speakers in this area is the densest. The distribution of virtual speakers is shown in Figure 12.

An index is used to indicate the positions of the K virtual speakers in the virtual speaker distribution table, the index includes a pitch angle index and a horizontal angle index. On any latitude coil, the horizontal angle of a virtual speakers distributed on is set to 0. Then convert it according to the preset conversion formula between the horizontal angle and the horizontal angle index to obtain the corresponding horizontal angle index. Since the horizontal angle difference between any adjacent virtual speakers on the same latitude coil is equal, the horizontal angles of other virtual speakers on this latitude coil can be obtained, and thus the respective horizontal angle indexes of the other virtual speakes is obtained according to formula (25). Similarly, the respective pitch angle indexes of the virtual speakers is obtained according to formula (24).

The pitch angle φ_k and pitch angle index φ_k' of the k-th virtual speaker among the K virtual speakers meet the following formula (26).

$$\varphi_k' = round\left(\frac{\varphi_k}{2\pi r_{ak} \times 1024}\right) \qquad (26)$$

where r_k indicates the radius of the longitude coil where the k-th virtual speaker is located, and round() indicates rounding.

The conversion formula between the horizontal angle and the horizontal angle index is as follows:

The horizontal angle θ_k and the horizontal angle index θ_k' of the k-th virtual speaker among the K virtual speakers meet the following formula (27).

$$\theta_k' = round\left(\frac{\theta_k}{2\pi r_{bk} \times 1024}\right) \qquad (27)$$

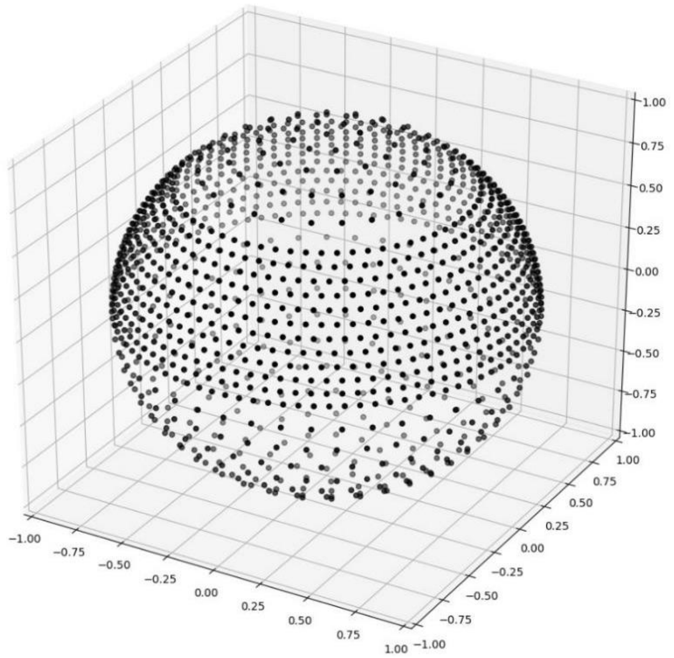


Figure 12 Distribution of virtual peakers

7.13.3.4 HOA coefficient calculation of virtual speakers

Firstly, the virtual speaker attribute information is parsed. The virtual speaker attribute information includes the position information of the virtual speaker, and the position information includes the pitch angle information and the horizontal angle information. The position information of the virtual speaker is indicated by a virtual speaker index, i.e. the pitch angle information is indicated by a pitch angle index, and the horizontal angle information is indicatted by the horizontal angle index. HoaCoreDec() obtains the virtual speaker index basisIdx by parsing the bitstream, and search the preset value of the virtual speaker for the virtual speaker angle index corresponding to the virtual speaker index basisIdx. The virtual speaker angle index includes the azimuth angle indexθ′and the pitch angle indexφ′. The preset values of virtual speakers shall comply with provisions in Table B.48.

Then, the HoaCoreDec() calculates the HOA coefficient of a virtual speaker based on the angle indexs of the virtual speaker . When calculating the HOA coefficient, it is necessary to obtain the trigonometric function values corresponding to the horizontal angle index and the pitch angle index. According to the pitch trigonometric function table, the sine function value and the cosine function value corresponding to the pitch angle index of the virtual speaker are obtained, refer to formulas (28) to (29).

$$sin(\varphi) = \begin{cases} sin\_table\left(\varphi'\right) & \varphi' < \lfloor\frac{N}{4}\rfloor \\ sin\_table\left(\frac{N}{2}-\varphi'\right) & \lfloor\frac{N}{4}\rfloor \le \varphi' < \lfloor\frac{N}{2}\rfloor \\ -sin\_table(\varphi' - \frac{N}{2}) & \lfloor\frac{N}{2}\rfloor \le \varphi' < \lfloor\frac{3N}{4}\rfloor \\ -sin\_table\left(N-\varphi'\right) & \lfloor\frac{3N}{4}\rfloor \le \varphi' < N \end{cases} \quad\text{......(28)}$$

$$cos(\varphi) = \begin{cases} sin\_table(\frac{N}{4}-\varphi') & \varphi' < \lfloor\frac{N}{4}\rfloor \\ -sin\_table(\varphi' - \frac{N}{4}) & \lfloor\frac{N}{4}\rfloor \le \varphi' < \lfloor\frac{N}{2}\rfloor \\ -sin\_table(\frac{3N}{4}-\varphi') & \lfloor\frac{N}{2}\rfloor \le \varphi' < \lfloor\frac{3N}{4}\rfloor \\ sin\_table(\varphi' - \frac{3N}{4}) & \lfloor\frac{3N}{4}\rfloor \le \varphi' < N \end{cases} \quad\text{......(29)}$$

According to the horizontal trigonometric function table, the sine function value and the cosine function value corresponding to the horizontal angle index of the virtual speaker are obtained, refer to formulas (30) to (31).

$$sin(\theta) = \begin{cases} sin\_table\left(\theta'\right) & \theta' < \lfloor\frac{N}{4}\rfloor \\ sin\_table\left(\frac{N}{2}-\theta'\right) & \lfloor\frac{N}{4}\rfloor \le \theta' < \lfloor\frac{N}{2}\rfloor \\ -sin\_table(\theta' - \frac{N}{2}) & \lfloor\frac{N}{2}\rfloor \le \theta' < \lfloor\frac{3N}{4}\rfloor \\ -sin\_table\left(N-\theta'\right) & \lfloor\frac{3N}{4}\rfloor \le \theta' < N \end{cases} \quad (30)$$

$$cos(\theta) = \begin{cases} sin\_table(\frac{N}{4}-\theta') & \theta' < \lfloor\frac{N}{4}\rfloor \\ -sin\_table(\theta' - \frac{N}{4}) & \lfloor\frac{N}{4}\rfloor \le \theta' < \lfloor\frac{N}{2}\rfloor \\ -sin\_table(\frac{3N}{4}-\theta') & \lfloor\frac{N}{2}\rfloor \le \theta' < \lfloor\frac{3N}{4}\rfloor \\ sin\_table(\theta' - \frac{3N}{4}) & \lfloor\frac{3N}{4}\rfloor \le \theta' < N \end{cases} \quad (31)$$

Where, N is 1024, and the pitch trigonometric function table and the horizontal trigonometric function table shall comply with Table B.49. The pitch trigonometric function table and the horizontal trigonometric function table are composed of trigonometric function values corresponding to the position information of the intersection points of N longitude coils and N latitude coils on a preset spherical surface. The pitch trigonometric function table is the trigonometric function value corresponding to the pitch angle index of the intersection points on the longitude coils, and the horizontal trigonometric function table is the trigonometric function value corresponding to the horizontal angle index of the intersection points on the latitude coils.

The method for calculating the HOA coefficient of virtual speakers using the azimuth and pitch angles of virtual speakers shall compliy with Table B.47. In the table, θ indicates the azimuth information of the virtual speaker's position information on the preset spherical surface, φ indicates the pitch angle information of the virtual speaker's position information on the preset spherical surface, m indicates the value of the HOA order, and n indicates the direction parameter in each order.

The HOA coefficient expression shall comply with provisions in Table 47.

Table 47 Order to 3-order HOA coefficient expresions

m	*n*	HOA coefficient expression
0	0	$\frac{1}{2\sqrt{\pi}}$
1	0	$\frac{1}{2}\sqrt{\frac{3}{\pi}}\cos\theta$
	+1	$\frac{1}{2}\sqrt{\frac{3}{\pi}}\sin\theta\cos\varphi$
	-1	$\frac{1}{2}\sqrt{\frac{3}{\pi}}\sin\theta\sin\varphi$

Table 47 (continued)

m	*n*	HOA coefficient expression

	0	$\frac{1}{4}\sqrt{\frac{5}{\pi}}(3cos^2\theta-1)$
	+1	$\frac{1}{2}\sqrt{\frac{15}{\pi}}\sin\theta\cos\theta\cos\varphi$
2	-1	$\frac{1}{2}\sqrt{\frac{15}{\pi}}\sin\theta\cos\theta\sin\varphi$
	+2	$\frac{1}{4}\sqrt{\frac{15}{\pi}}sin^2\theta\cos 2\varphi$
	-2	$\frac{1}{4}\sqrt{\frac{15}{\pi}}sin^2\theta\sin 2\varphi$
	0	$\frac{1}{4}\sqrt{\frac{7}{\pi}}(5cos^3\theta-3\cos\theta)$
	+1	$\frac{1}{4}\sqrt{\frac{21}{2\pi}}(5cos^2\theta-1)\sin\theta\cos\varphi$
	-1	$\frac{1}{4}\sqrt{\frac{21}{2\pi}}(5cos^2\theta-1)\sin\theta\sin\varphi$
3	+2	$\frac{1}{4}\sqrt{\frac{105}{\pi}}\cos\theta\, sin^2\theta\cos 2\varphi$
	-2	$\frac{1}{4}\sqrt{\frac{105}{\pi}}\cos\theta\, sin^2\theta\sin 2\varphi$
	+3	$\frac{1}{4}\sqrt{\frac{35}{2\pi}}sin^3\theta\cos 3\varphi$
	-3	$\frac{1}{4}\sqrt{\frac{35}{2\pi}}sin^3\theta\sin 3\varphi$

7.13.3.5 Sound field component synthesis and HOA signal synthesis

During HOA spatial decoding, the virtual speaker signal and residual signal obtained through post-decodingprocessing, as well as the calculated HOA coefficient of the virtual speaker are reconstructed , to obtain the decoded HOA signal.

HoaCoreDec() synthesizes the virtual speaker signal and the HOA coefficient of the virtual speaker into a sound field component, to obtain in a synthesized HOA signal recoverySignal. The recoverySignal is obtained by multiplying the HOA coefficient of the virtual speaker by the virtual speaker signal, refer to formula (32).

$$recoverySignal = A \times w \qquad (32)$$

Where, A indicates the HOA coefficient matrix of the virtual speaker. The size of matrix A is (M×C), where C indicates the number of virtual speakers, M indicates the number of N-order HOA coefficients, and w indicates the virtual speaker signal vector, with dimension w indicateing the number of virtual speaker signals.
Finally, the residual signal is used to adjust the recoverySignal, and the recoverySignal and the residual signal are added to obtain the decoded HOA signal.

8 Lossless audio decoding

Lossless audio decoding shall comply with provisions in Chapter 8 of GB/T 33475.3-2018.

9 Metadata.decoding

9.1 syntax and semantics of metadata bitstream

9.1.1 syntax

The syntax of the metadata bitstream shall comply with Table 48.

Table 48 syntax of metadata bitstream

Syntax of Metadata bitstream	number of bits	mnemonic
Avs3MetadataDec() {		
smFlag	**1**	**uimsbf**
if (smFlag == 1) {		
Avs3SmDec()		
}		
dmFlag	**1**	**uimsbf**
if (dmFlag == 1) {		
Avs3DmDec()		
}		
}		

9.1.2 semantic

smFlag	1bit, indicating whether there is a static metadata bitstream in the current frame, '0': no, '1': yes
dmFlag	1bit, indicating whether there is a dynamic metadata bitstream in the current frame, '0': no, '1': yes
Avs3SmDec()	Decoding of static metadata
Avs3DmDec()	Decoding of dynamic metadata

9.2 syntax and semantics of Static metadata decoding

9.2.1 syntax

The static metadata decoding syntax shall comply with Table 49.

Table 49 Syntax of Static Metadata Decoding

Syntax of Static metadata decoding	bit number	mnemonic
Avs3SmDec() {		
b_vrExt	**1**	**uimsbf**
basic Level	**3**	**uimsbf**
if((basicLevel == 0) || (basicLevel == 1)) {		
BasicL1()		
}		
if(b_vrExt) {		
vrExtLevel	**3**	**uimsbf**
if (vrExtLevel == 0) {		
VrExtL1()		
}		
}		
}		

9.2.2 semantic

b_vrExt 1bit, indicating status of extended static metadata the current frame, '0': no, '1': yes

basic Level 3bit, indicating the level of basic static metadata, '0': Level0 configuration in Table C.21, '1': Level1 configuration in Table C.21, '2' to '7': reserved

vrExtLevel 3 bits, indicating the level of extended static metadata. '0': the level used by current extended metadata, corresponding to the VrExtL1() function. '1' to '7': reserved

BasicL1() Including basic static metadata decoding at L0 and L1 levels

VrExtL1() Indicating extended static metadata decoding at L1 level

9.3 syntax and semantics of dynamic metadata decoding

9.3.1 syntax

The dynamic metadata decoding syntax requirements shall comply with the provisions of Table 50.

Table 50 Dynamic Metadata Decoding Syntax

Syntax of Dynamic metadata decoding	bit number	mnemonic
Avs3DmDec () {		
dmLevel	**3**	**uimsbf**
for (i = 0; i < numDmChans; i++) {		
muteFlag	**1**	**uimsbf**
transChRef	**5**	**uimsbf**

Table 50 (continued)

Dynamic metadata decoding syntax	number of bits	mnemonic symbol
if (dmLevel == 0) {		
Avs3DmL1Dec()		
}		

if (dmLevel == 1) {		
Avs3DmL1Dec()		
Avs3DmL2Dec()		
}		
}		
}		

9.3.2 semantic

dmLevel — 3bit, indicating the level of dynamic metadata. '0': Avs3DmL1Dec() corresponds to this level, '1': Avs3DmL1Dec() and Avs3DmL2Dec() correspond to this level

muteFlag — 1bit, indicating whether there is dynamic metadata, '0': yes, '1': no

It indicates the number of object channels, and should comply with provisions for the semantics of object_channel_number in Table A.2.

transChRef — 5bit, indicating the physical channel index where the dynamic metadata takes effect

numDmChans — Used to indicating the number of object channels, shall comply with the semantics of object_channel_number specified in Table A.2 .

Avs3DmL1Dec() — indicating dynamic metadata decoding at the L1 level

Avs3DmL2Dec() — Indicating dynamic metadata decoding at the L2 level

9.4 Syntax and semantics of Basic static metadata decoding

9.4.1 Syntax

The syntax of basic static metadata decoding shall comply with provisions in Table 51.

Table 51 syntax of Basic static metadata decoding

Syntax of Basic static metadata decoding	number of bits	mnemonic
BasicL1() {		
audioProgramme()		
numOfContents	**2**	**uimsbf**
numOfContents = numOfContents + 1		
for (i = 0; i < numOfContents; i++) {		
audioContent()		
}		
numOfObjects	**3**	**uimsbf**
numOfObjects = numOfObjects + 1		
for (i = 0; i < numOfObjects; i++) {		
audioObject()		
}		
numOfPacks	**3**	**uimsbf**
numOfPacks = numOfPacks + 1		

Table 51 (continued)

Syntax of Basic static metadata decoding	number of bits	mnemonic
for (i = 0; i < numOfPacks; i++) {		
AudioPackFormat ()		
}		
numOfChannels	**5**	**uimsbf**
numOfChannels = numOfChannels + 1		
for (i = 0; i < numOfChannels; i++) {		
AudioChannelFormat ()		
}		
}		

9.4.2 semantic

AudioProgramme() IndicatingAudioProgramme() decoding, all AudioContent() items are combined together to form a complete "mixing"

AudioContent() Indicating AudioContent() decoding, which giving a description of the audio content, including parameters such as language (if a dialogue exists) and loudness

AudioObject() Indicating AudioObject() decoding, the object is used to associate audio content with format

AudioPackFormat() Indicating AudioPackFormat() decoding, which packing one or more AudioChannelFormat() items belonging to each other (such as a pair of stereos)

AudioChannelFormat() Indicating AudioChannelFormat() decoding, describing a single audio waveform

numOfContents 2bit, indicating the number of audioContent() itemd included in BasicL1()

numOfObjects 3bit, indicating the number of audioObjects() items contained in BasicL1()

numOfPacks 3bit, indicating the number of audioPackFormat() items included in BasicL1()

numOfChannels 5bit, indicating the number of audioChannelFormat() itmes included in BasicL1()

9.5 Syntax and semantics of basic static metadata program layer decoding

9.5.1 syntax

The syntax of basic static metadata program layer decoding shall comply with provisions in Table 52.

Table 52 syntax of basic static metadata program layer decoding

Syntax of Basic static metadata program layer decoding	number of bits	mnemonic
AudioProgramme() {		
b_audioProgrammeLanguage	**1**	**uimsbf**
b_maxDuckingDepth	**1**	**uimsbf**
b_loudnessMetadata	**1**	**uimsbf**
b_audioProgrammeReferenceScreen	**1**	**uimsbf**

if (b_audioProgrammeLanguage) {		
audioProgrammeLanguage	**4**	**uimsbf**
}		

Table 52 (continued)

Syntax of Basic static metadata program layer decoding	number of bits	mnemonic
if (b_maxDuckingDepth) {		
maxDuckingDepth	**5**	**uimsbf**
}		
if (b_loudnessMetadata) {		
LoudnessMetadata()		
}		
if (b_audioProgrammeReferenceScreen) {		
AudioProgrammeReferenceScreen()		
}		
numContents	**2**	**uimsbf**
numContents = numContents + 1		
for (i = 0; i < numContents; i++) {		
refContentIdx	**2**	**uimsbf**
}		
}		

9.5.2 semantic

b_audioProgrammeLanguage: 1bit, indicating whether audioProgrammeLanguage field exists in AudioProgramme(), '0': no, '1': yes

b_maxDuckingDepth: 1bit, indicating whether maxDuckingDepth exists in AudioProgramme(), '0': no, '1': yes

b_loudnessMetadata: 1bit, indicating whether LoudnessMetadata() exists in AudioProgramme(), '0': no, '1': yes

b_audioProgrammeReferenceScreen: 1bit, indicating whether there is an AudioProgrammeReferenceScreen() in AudioProgramme() with '0': no, '1': yes

audioProgrammeLanguage: 4bit, indicating the language of the dialogue in AudioProgramme(), '0': Chinese, '1': English, '2': French, '3': Spanish, '4': Portuguese, '5': German, '6' - '15': reserved

maxDuckingDepth: 5bit, indicating the maximum allowable automatic ducking depth for each AudioObject() in the program, with a value range of [-62,0]

numContents: 2bit, indicating the number of refContentIdx items referenced in AudioProgramme()

refContentIdx: 2bit, indicating the index of the content contained in AudioProgramme()

LoudnessMetadata()	Indicating a loudness decoding interface, which corrects audio based on the loudness algorithm in ITU-R BS.1770
AudioProgrammeReferenceScreen()	Indicating a screen size decoding interface, which standardizes the reference/production/monitoring screen sizes of AudioProgramme()

9.6 Syntax and semanticsof Basic static metadata content layer decoding

9.6.1 syntax

The syntax of basic static metadata content layer decoding shall comply with provisions in Table 53.

Table 53 syntax of basic static metadata content layer decoding

Syntax of basic static metadata content layer decoding	number of bits	mnemonic
AudioContent () {		
contentIdx	**2**	**uimsbf**
b_audioContentLanguage	**1**	**uimsbf**
b_loudnessMetadata	**1**	**uimsbf**
b_dialogue	**1**	**uimsbf**
b_numComplementaryObjectGroup	**1**	**uimsbf**
if (b_audioContentLanguage) {		
audioContentLanguage	**4**	**uimsbf**
}		
if (b_loudnessMetadata) {		
loudnessMetadata()		
}		
if (b_dialogue) {		
Dialogue()		
}		
if (b_numComplementaryObjectGroup) {		
numComplementaryObjectGroup	**2**	**uimsbf**
numComplementaryObjectGroup=numComplementaryObjectGroup + 1		
for (i=0; i < numComplementaryObjectGroup; i++) {		
numComplementaryObject	**3**	**uimsbf**
numComplementaryObject= numComplementaryObject + 1		
for (j=0; j < numComplementaryObject; j++) {		
ComplementaryObjectIdx	**3**	**uimsbf**
}		
}		
}		
numObjects	**3**	**uimsbf**
numObjects = numObjects + 1		
for (i = 0; i < numObjects; i++) {		
refObjectIdx	**3**	**uimsbf**
}		

}		

9.6.2 semantic

contentIdx	2bit, indicating the unique index value of AudioContent()
b_audioContentLanguage	1bit, indicating whether an audioContentLanguage field exists in AudioContent(), '0': no, '1': yes
b_loudnessMetadata	1bit, indicating whether LoudnessMetadata() exists in AudioContent(), '0': no, '1':yes
b_dialogue	1bit, indicating whether a dialogue field exists in AudioContent() '0': no, '1': yes
b_numComplementaryObjectGroup	1bit, indicating whether the numComplementaryObjectGroup field exists in AudioContent(), '0': no, '1': yes
audioContentLanguage	4bit, indicating the language of the dialogue in AudioContent(), '0': Chinese, '1': English, '2': French, '3': Spanish, '4': Portuguese, '5': German, '6' - '15': reserved
numComplementaryObjectGroup	2bit, indicating the number of complementary object groups in AudioContent()
numComplementaryObject	2bit, indicating the number of complementary object indexes, ComplementaryObjectIdx, included in the ComplementaryObjectGroup
ComplementaryObjectIdx	3bit, indicating an index value of complementary object in the specified ComplementaryObjectGroup
numObjects	3bit, indicating the number of refObjectIdx items references in AudioContent()
refObjectIdx	3bit, indicating the index of the object included in AudioContent()
Dialogue()	indicating a dialogue decoding interface, which detailed describing the content type
LoudnessMetadata()	Indicating a loudness decoding interface, which corrects audio according to the loudness algorithm in ITU-R BS.1770

9.7 syntax and semantics of basic static metadata object layer decoding

9.7.1 syntax

The syntax of basic static metadata object layer decoding shall comply with provisions in Table 54.

Table 54 syntax of basic static metadata object layer decoding

Syntax of basic static metadata object layer decoding	number of bits	mnemonic
AudioObject () {		
objectIdx	**3**	**uimsbf**
b_audioObjectLanguage	**1**	**uimsbf**
b_dialogue	**1**	**uimsbf**
b_audioObjectImportance	**1**	**uimsbf**
b_disableDucking	**1**	**uimsbf**

b_interact	**1**	**uimsbf**
b_gain	**1**	**uimsbf**
b_headLocked	**1**	**uimsbf**
b_mute	**1**	**uimsbf**
if (b_audioObjectLanguage) {		
audioObjectLanguage	**4**	**uimsbf**
}		

Table 54 (continued)

Syntax of basic static metadata object layer decoding	bit number	mnemonic
if (b_dialogue) {		
Dialogue()		
}		
if (b_audioObjectImportance) {		
audioObjectImportance	**4**	**uimsbf**
}		
if (b_interact) {		
for (i = 0; i < 24; i++) {		
Object Name [i]	**8**	**uimsbf**
}		
audioObjectInteraction()		
}		
if (b_gain) {		
objectGainUnit	**1**	**uimsbf**
objectGainQFlag	**1**	**uimsbf**
objectGain	**6**	**uimsbf**
}		
numPacks	**3**	**uimsbf**
numPacks = numPacks + 1		
for (i = 0; i < numPacks; i++) {		
refPackFormatIdx	**3**	**uimsbf**
}		
}		

9.7.2 semantic

objectIdx 3bit, indicating the unique index value of AudioObject()

b_AudioObjectLanguage 1bit, indicating whether an AudioObjectLanguage field exists in AudioObject(), '0': no, '1': yes

b_dialogue 1bit, indicating whether a dialogue field exists in AudioObject(), '0': no, '1': yes

b_audioObjectImportance 1bit, indicating whether an audioObjectImportance field exists in AudioObject(), '0': no, '1': yes

b_disableDucking 1bit, indicating whether AudioObject() allows automatic automatic

	ducking '1': no, '0': yes
b_interact	1bit, indicating whether an interac field exists in AudioObject(), '0': no, '1': yes
b_gain	1bit, indicating whether there a gain field exists in AudioObject(), '0': no, '1': yes
b_headLocked	1bit, indicating whether the perceptual position of the AudioObject() audio element is locked relative to the head. '1': yes, '0': no
b_mute	1bit, indicating whether AudioObject() is in a playback state, '0': the object is being played back. '1': the object is muted
audioObjectLanguage	4bit, indicating the language of the dialogue in AudioObject(), '0': Chinese, '1': English, '2': French, '3': Spanish, '4': Portuguese, '5': German, '6' - '15': reserved
audioObjectImportance	4bit, indicating the importance level of AudioObject() '10': the highest importance, '0': the lowest importance, '11' - '15': reserved
Object Name	8bit, indicating the name of AudioObject()
objectGainUnit	1bit, indicating the unit of objectGain, '0': linear, '1': dB
objectGainQFlag	1bit, indicating the gain quantization interval. When gainUnit=0 and gainQFlag=0, the quantization interval is [0, 1]. When gainUnit=0 and gainQFlag=1, the quantization interval is (1, 16). When gainUnit=1 and gainQFlag=0, the quantization interval is [-80, 0]. When gainUnit=1 and gainQFlag=1, the quantization interval is (0, 24].
objectGain	6bit, indicating the gain value applied to all audio samples referenced by AudioObject(), with a value range of linear [0,16]/dB [-80,24]
numPacks	3bit, indicating the number of refPackFormatIdx itmes referenced in AudioObject()
refPackFormatIdx	3bit, indicating the index of the audioPackFormat included in AudioObject()
Dialogue()	indicating the dialogue decoding interface, which detailed describing the content type

9.8 syntax and semantics of dialogue field decoding in basic static metadata

9.8.1 syntax

The syntax of dialogue field decoding in the basic static metadata shall comply with provisions in Table 55.

Table 55 syntax of dialogue field decoding in the basic static metadata

dialogue field decodingin the basic static metadata	number of bits	mnemonic
Dialogue() {		
dialogueAttribute	**2**	**uimsbf**
dialogueType	**3**	**uimsbf**
}		

9.8.2 semantic

dialogueAttribute 2bit, indicating the type of dialogue content, which shall comply with provisions inTable 33 in ITU-R BS.2076-2

dialogueType 3bit, indicating the content type contained in dialogueAttribute, which shall comply with provisions in Table 34 in ITU-R BS.2076-2

9.9 syntax and semantics of packaging layer decoding in basic static metadata

9.9.1 syntax

The syntax of packaging layer decoding in basic static metadata shall comply with provisions in Table 56.

Table 56 syntax of packaging layer decoding in basic static metadata

syntax of packaging layer decoding in basic static metadata	bit number	mnemonic
AudioPackFormat () {		
packFormatIdx	**3**	**uimsbf**
b_audioPackFormatImportance	**1**	**uimsbf**
b_transChannelReuse	**1**	**uimsbf**
if (b_audioPackFormatImportance) {		
audioPackFormatImportance	**4**	**uimsbf**
}		
typeLabel	**3**	**uimsbf**
absoluteDistance	**5**	**uimsbf**
if (typeLabel == 1 || typeLabel == 2) {		
packFormatID	**6**	**uimsbf**
if (typeLabel == 2) {		
numMatrixOutputChannel	**5**	**uimsbf**
numMatrixOutputChannel = numMatrixOutputChannel + 1		
for (i = 0; i< numMatrixOutputChannel; i++) {		
DirectSpeakersPosition()		
}		
}		
}		
else if (typeLabel == 4) {		
normalization	**2**	**uimsbf**
nfcRefDist	**4**	**uimsbf**
screenRef	**1**	**uimsbf**
hoaOrder	**3**	**uimsbf**
}		
if (b_transChannelReuse == 0) {		
packFormatStartIdx	**5**	**uimsbf**
}		
numChannels	**5**	**uimsbf**
numChannels = numChannels + 1		
for (i = 0; i < numChannels; i++) {		

refChannelIdx	**5**	**uimsbf**
channelTypeLabel [refChannelIdx] = typeLabel		
if (typeLabel == 1 || typeLabel == 2) {		
channelPackFormatID[refChannelIdx] = packFormatID		
}		
if (typeLabel == 2) {		
channelNumMatrixOutputChannel[refChannelIdx] = numMatrixOutputChannel		

Table 56 (continued)

syntax of packaging layer decoding in basic static metadata	number of bits	mnemonic
}		
if (b_transChannelReuse) {		
transChRef	**5**	**uimsbf**
}		
}		
}		

9.9.2 semantic

packFormatIdx	3bit, indicating the unique index value of AudioPackFormat()
b_audioPackFormatImportance	1 bit, indicating whether an audioPackFormatImportance field exists in AudioPackFormat(), '0': no, '1': yes
b_transChannelReuse	1 bit, indicating whether the physical channels corresponding to all AudioChannelFormat() in AudioPackFormat() are arranged continuously. 0 indicates yes, and 1 indicates no. When b_transChannelReuse value is 0, the physical channel index corresponding to the first AudioChannelFormat() item in AudioPackFormat() is indicated by the packFormatStartIdx field. When b_transChannelReuse value is 1, the physical channel index corresponding to each AudioChannelFormat() itme in the AudioPackFormat() is indicated by transChRef.
audioPackFormatImportance	4 bit, indicating the importance level of the audioObject, '10': highest importance, '0': lowest importance, '11' - '15': reserved
typeLabel	4 bit, indicating the description of the channel type, which shall comply with provisions in Table 57
absoluteDistance	5 bit, indicating the absolute distance, with a value range of [0,16]
packFormatID	6 bit, 0-31 shall comply with the 5 least significant bits of the AudioPackFormatID specified in Table 2 in ITU-R BS.2094-1, and 32-63 are user-defined
numMatrixOutputChannel	5 bit, indicating the number of matrix output channels based on the matrix
normalization	2 bit, indicating the scene-based normalization method, '0': SN3D, '1' - '3': reserved
nfcRefDist	4 bit, indicating the reference distance (in meters) normalized by

	absoluteDistance and used in the scene-based audio production process, which can be used for near-field compensation(NFC) audio rendering, with a value range of [0,1].
screenRef	1 bit, indicating whether the scene-based program is related to the screen
hoaOrder	3 bit, indicating the scence-based maximum order
packFormatStartIdx	5 bits, indicating the physical channel index corresponding to the AudioChannelFormat() included in AudioPackFormat() or the starting value of plurality of consecutive physical channel indexes corresponding to plurality of AudioChannelFormat() items.
numChannels	5 bit, indicating the number of refChannelIdx items referenced in AudioPackFormat()
refChannelIdx	5 bit, indicating the index of the AudioChannelFormat included in AudioPackFormat()
channelTypeLabel	indicating a local variable, mapping 32 TypeLabel values. It is obtained by parsing the AudioPackFormat() function and used in the AudioChannelFormat function
channelPackFormatID	indicating a local variable, mapping 32 PackFormatID values, It is obtained by parsing the AudioPackFormat() function, and used in the AudioChannelFormat function
channelNumMatrixOutputChannel	indicating a local variable, mapping to 32 channelNumMatrixOutputChannel, It is obtained by parsing the AudioPackFormat() function and used in the AudioChannelFormat function.
transChRef	5 bit, indicating the physical channel index corresponding to the AudioChannelFormat() included in AudioPackFormat()

The definition of typeLabel shall comply with provisions in Table 57.

Table 57 definition of typeLabel

Channel type	typeLabel	Description
DirectSpeakers	1	For channel-based audio, each channel is directly input to a speaker
Matrix	2	For all other typeLabel items, the signals are matrixed together, such as the middle, left and right signals
Objects	3	For object-based audio, the channels represent the audio object (or part of the object), including position information
HOA	4	For scene-based audio, high-fidelity surround stero systems and HOA are used
Binaural	5	For dual-channel audio, playback is performed on headphones
User Custom	Other values	User-defined types

9.10 syntax and semantics of channel layer decoding in basic static metadata

9.10.1 syntax

The syntax of channel layer decoding in basic static metadata shall comply with provisions in Table 58.

Table 58 syntax of channel layer decoding in basic static metadata

Syntax of channel layer decoding in basic static metadata	bit number	mnemonic
AudioChannelFormat () {		
channelFormatIdx	**5**	**uimsbf**
b_channelGain	**1**	**uimsbf**
if (b_channelGain) {		
channelGainUnit	**1**	**uimsbf**
channelGain_QFlag	**1**	**uimsbf**
channelGain	**6**	**uimsbf**
}		
if (channelTypeLabel [channelFormatIdx] == 1) {		
if (channelPackFormatID[channelFormatIdx] == 0x3f) {		
DirectSpeakersPosition()		
}		
} else if(channelTypeLabel [channelFormatIdx] == 2) {		
for (i = 0; i< channelNumMatrixOutputChannel[channelFormatIdx]; i++) {		
matrixCoef[i]	**8**	**uimsbf**
}		
}		
}		

9.10.2 semantic

channelFormatIdx	5bit, indicating the unique index value of AudioChannelFormat()
b_channelGain	1bit, indicating whether a channelGain field exists in AudioChannelFormat(), '0': no, '1': yes
channelGainUnit	1bit, indicating the unit of channelGain, '0': linear, '1': dB
channelGain_QFlag	1bit, indicating the channelGain quantization interval. When gainUnit=0 and channelGainQFlag=0, the quantization interval is [0, 1]. When gainUnit=0 and channelGainQFlag=1, the quantization interval is (1, 16]. When gainUnit=1 and channelGainQFlag=0, the quantization interval is [-80, 0]. When gainUnit=1 and channelGainQFlag=1, the quantization interval is (0, 24].
channelGain	6bit, indicating the gain value applied to all audio samples referenced by AudioChannelFormat()
matrixCoef	8bit, indicating matrix coefficients based on the matrix type, with a value range of [0.1,10]

9.11 syntax and semantic of the object interaction field decoding in basic static metadata

9.11.1 Syntax

The syntax of the object interaction field decoding in basic static metadata shall comply with provisions inTable 59.

Table 59 syntax of the object interaction field idecoding n basic static metadata

syntax of the object interaction field decoding in basic static metadata objects	number of bits	mnemonic
AudioObjectInteraction() {		
onOffInteract	**1**	**uimsbf**
gainInteract	**1**	**uimsbf**
positionInteract	**1**	**uimsbf**
if (gainInteract) {		
gainInteractionUnit	**1**	**uimsbf**
gainInteractionRange_min	**7**	**uimsbf**
gainInteractionRange_max	**7**	**uimsbf**
}		
if (positionInteract) {		
cartesianInteraction	**1**	**uimsbf**
if (cartesianInteraction == 1) {		
positionInteractionRange_Xmin	**8**	**uimsbf**
positionInteractionRange_Xmax	**8**	**uimsbf**
positionInteractionRange_Ymin	**6**	**uimsbf**
positionInteractionRange_Ymax	**6**	**uimsbf**
positionInteractionRange_Zmin	**4**	**uimsbf**
positionInteractionRange_Zmax	**4**	**uimsbf**
} else {		
positionInteractionRange_azimuthMin	**8**	**uimsbf**
positionInteractionRange_azimuthMax	**8**	**uimsbf**
positionInteractionRange_elevationMin	**6**	**uimsbf**

Table 59 (continued)

syntax of the decoding object interaction field in basic static metadata	number of bits	mnemonic
positionInteractionRange_elevationMax	**6**	**uimsbf**
positionInteractionRange_distanceMin	**4**	**uimsbf**
positionInteractionRange_distanceMax	**4**	**uimsbf**
}		
}		
}		

9.11.2 semantic meaning

onOffInteract 1bit, if user can switch the object on or off, this item is set to 1, otherwise this item is set to 0

gainInteract 1bit, if user can change the gain of the object, this item is set to 1, otherwise this item is set to 0

positionInteract 1bit, if user can change the position of the object, this item is set to 1, otherwise this item is set to 0

gainInteractionUnit 1bit, indicating the unit of gainInteractionRange, '0': linear '1': dB

gainInteractionRange_min 7bit, indicating the minimum linear gain factor or logarithmic

	gain offset of a possible user gain interaction, with a value range of [0,1]
gainInteractionRange_max	7bit, indicating the maximum linear gain factor or logarithmic gain offset for possible user gain interaction, with a value range of [1,16]
cartesianInteraction	1 bit, indicating whether a Cartesian coordinate system is used
positionInteractionRange_Xmin	8 bit, indicating the minimum X-axis normalized offset value of a possible user position interaction, with a value range of [-1,1]
positionInteractionRange_Xmax	8 bit, indicating the maximum X-axis normalized offset value of a possible user position interaction, with a value range of [-1,1]
positionInteractionRange_Ymin	6 bit, indicating the minimum Y-axis normalized offset value of a possible user position interaction, with a value range of [-1,1]
positionInteractionRange_Ymax	6 bit, indicating the maximum Y-axis normalized offset value of a possible user position interaction, with a value range of [-1,1]
positionInteractionRange_Zmin	4 bit, indicating the minimum Z-axis normalized offset value of a possible user position interaction, with a value range of [-1,1]
positionInteractionRange_Zmax	4 bit, indicating the maximum Z-axis normalized offset value of a possible user position interaction, with a value range of [-1,1]
positionInteractionRange_azimuthMin	8 bit, indicating the minimum azimuth offset value of a possible user position interaction, with a value range of [-180,0]
positionInteractionRange_azimuthMax	8 bit, indicating the maximum azimuth offset value of a possible user location interaction, with a value range of [0,180]
positionInteractionRange_elevationMin	6 bit, indicating the minimum height offset value of a possible user position interaction, with a value range of [-90,0]
positionInteractionRange_elevationMax	6 bit, indicating the maximum height offset value of a possible user position interaction, with a value range of [0,90]
positionInteractionRange_distanceMin	4 bit, indicating the minimum normalized distance of a possible user location interaction, with a value range of [0,1]
positionInteractionRange_distanceMax	4 bit, indicating the maximum normalized distance of a possible user location interaction, with a value range of [0,1]

9.12 syntax and semantics of speaker position decoding in basic static metadata

9.12.1 syntax

The syntax of speaker position decoding in basic static metadata shall comply with provisions in Table 60.

Table 60 syntax of decoding speaker position in the basic static metadata

speaker position decoding in the basic static metadata	bit number	mnemonic
DirectSpeakersPosition() {		
azimuth	**8**	**uimsbf**
elevation	**6**	**uimsbf**
distance	**4**	**uimsbf**
DirectSpeakerScreenEdgeLock	**2**	**uimsbf**
}		

9.12.2 semantic

azimuth	8 bit, indicating the exact azimuth position of a speaker, with a value range of [-180,180]
elevation	6 bit, indicating the exact height position of a speaker, with a value range of [-90,90]
distance	4 bit, indicating the exact normalized distance of a speaker from the starting point, with a value range of [0,1]
DirectSpeakerscreenEdgeLock	2 bit, indicating the definition of a speaker position at the edge of the screen, including four values: left, right, up, and down. '0': left, '1': right, '2': up, '3': down

9.13 syntax and semantic of loudness field decoding in basic static metadata

9.13.1 syntax

The syntax of the loudness field decoding in basic static metadata shall comply with provisions in Table 61.

Table 61 syntax of loudness field idecoding n basic static metadata

syntax ofloudness field decoding in basic static metadata	bit number	mnemonic
LoudnessMetadata() {		
b_integratedLoudness	**1**	**uimsbf**
b_loudnessRange	**1**	**uimsbf**
b_maxTruePeak	**1**	**uimsbf**
b_maxMomentary	**1**	**uimsbf**
b_maxShortTerm	**1**	**uimsbf**
b_dialogueLoudness	**1**	**uimsbf**
if (b_integratedLoudness) {		
integratedLoudness	**5**	**uimsbf**
}		

Table 61 (continued)

syntax of decoding loudness field in basic static metadata	number of bits	mnemonic
if (b_loudnessRange) {		
loudnessRange	**5**	**uimsbf**
}		
if (b_maxTruePeak) {		
maxTruePeak	**5**	**uimsbf**
}		
if (b_maxMomentary) {		
maxMomentary	**5**	**uimsbf**
}		
if (b_maxShortTerm) {		
maxShortTerm	**5**	**uimsbf**

}		
if (b_dialogueLoudness) {		
dialogueLoudness	**5**	**uimsbf**
}		
}		

9.13.2 semantic meaning

b_integratedLoudness 1 bit, indicating whether an integratedLoudness field exists in loudness, '0': no, '1': yes

b_loudnessRange 1 bit, indicating whether a loudnessRange field exists in loudness, '0': no, '1': yes

b_maxTruePeak 1 bit, indicating whether the maxTruePeak field exists in the loudness. '0': no '1': yes

b_maxMomentary 1 bit, indicating whether the maxMomentary field exists in loudness, '0': no '1': yes

b_maxShortTerm 1 bit, indicating whether a maxShortTerm field exists in loudness, '0': no, '1': yes

b_dialogueLoudness 1 bit, indicating whether a dialogueLoudness field exists in loudness, '0': no, '1': yes

integratedLoudness 5 bit, indicating the intergrated loudness value, with a value range of [-70,0]

loudnessRange 5 bit, indicating the loudness range, with a value range of [10,70]

maxTruePeak 5 bit, indicating the maximum true peak, with a value range of [-70,0]

maxMomentary 5 bit, indicating the maximum momentary loudness, with a value range of [-70,0]

maxShortTerm 5 bit, indicating the maximum short-term loudness, with a value range of [-70,0]

dialogueLoudness 5 bit, indicating the loudness of the average dialogue, with a value range of [-70,0]

9.14 syntax and semantic of program reference screen field decoding in basic static metadata

9.14.1 syntax

The syntax of program reference screen field decoding in basic static metadata shall comply with provisions in Table 62.

Table 62 syntax of program reference screen field decoding in basic static metadata

syntax of program reference screen field decoding basic static metadata	number of bits	mnemonic
AudioProgrammeReferenceScreen() {		
cartesianReferenceScreen	**1**	**uimsbf**
aspect ratio	**3**	**uimsbf**
if (cartesianReferenceScreen == 0) {		
screenCentrePosition_azimuth	**8**	**uimsbf**
screenCentrePosition_elevation	**6**	**uimsbf**
screenCentrePosition_distance	**4**	**uimsbf**
screenWidth_polar	**7**	**uimsbf**
} else {		

screenCentrePosition_X	**8**	**uimsbf**
screenCentrePosition_Y	**6**	**uimsbf**
screenCentrePosition_Z	**4**	**uimsbf**
screenWidth_cartesian	**7**	**uimsbf**
}		
}		

9.14.2 semantic meaning

cartesianReferenceScreen 1 bit, indicating whether the Cartesian coordinate system is used

aspect ratio 3 bit, indicating the mapping table of the aspect ratio of the screen, '0': 16:9, '1': 21:9, '2' - '7': reserved

screenCentrePosition_azimuth 8 bit, indicating the azimuth of the center of the screen, with a value range of [-180,180]

screenCentrePosition_elevation 6 bit, indicating the height of the screen center, with a value range of [0,90]

screenCentrePosition_distance 4 bit, indicating the normalized distance to the center of the screen, with a value range of [0,1]

screenWidth_polar 7 bit, indicating the screen width in polar coordinates, with a value range of [0,180]

screenCentrePosition_X 8 bit, indicating the normalized X coordinate of the center of the screen, with a value range of [-1,1]

screenCentrePosition_Y 6 bit, indicating the normalized Y coordinate of the center of the screen, with a value range of [-1,1]

screenCentrePosition_Z 4 bit, indicating the normalized Z coordinate at the center of the screen, with a value range of [-1,1]

screenWidth_cartesian 7 bit, indicating the normalized screen width in Cartesian coordinates. The maximum value of screenWidth_cartesian shall conply with the maximum value of screenWidth in the Cartesian coordinates system in ITU-R BS.2076-2, with a value range of [0,1].

9.15 syntax and semantics of dynamic metadata Level1 decoding

9.15.1 Syntax

The syntax of dynamic metadata Level1 decoding shall comply with provisions inTable 63.

Table 63 syntax of dynamic metadata Level1 decoding

syntax of dynamic metadata Level1 decoding	bit number	mnemonic
Avs3DmL1Dec() {		
if (muteFlag == 0) {		
cartesianDm	**1**	**uimsbf**
b_obj_extent	**1**	**uimsbf**
b_obj_gain	**1**	**uimsbf**
b_obj_diffuse	**1**	**uimsbf**

b_obj_importance	**1**	**uimsbf**
if (cartesianDm == 0) {		
obj_position_azimuth	**8**	**uimsbf**
obj_position_elevation	**6**	**uimsbf**
obj_position_distance	**4**	**uimsbf**
if(b_obj_extent) {		
obj_width_horizontal	**7**	**uimsbf**
obj_hight_vertical	**5**	**uimsbf**
obj_depth_distance	**4**	**uimsbf**
}		
} else {		
obj_position_x	**8**	**uimsbf**
obj_position_y	**6**	**uimsbf**
obj_position_z	**4**	**uimsbf**
if(b_obj_extent) {		
obj_width_x	**7**	**uimsbf**
obj_hight_y	**5**	**uimsbf**
obj_depth_z	**4**	**uimsbf**
}		
}		
if(b_obj_gain) {		
gain	**7**	**uimsbf**
}		
if(b_obj_diffuse) {		
diffuse	**7**	**uimsbf**
}		
jumpPosition	**1**	**uimsbf**
if(b_obj_importance) {		
importance	**4**	**uimsbf**
}		
}		
}		

9.15.2 semantic

cartesianDm　1 bit, indicating the type of coordinate system used, '0': polar coordinate system, '1': Cartesian coordinate system

b_obj_extent　1 bit, indicating whether the obj_width, obj_hight, and obj_depth fields exist in Avs3DmL1Dec (). '0': no, '1': yes

b_obj_gain　1 bit, indicating whether a gain field exists in Avs3DmL1Dec (), '0': no, '1': yes

b_obj_diffuse　1 bit, indicating whether diffuse field exists in Avs3DmL1Dec() '0': no, '1': yes

b_obj_importance	1 bit, indicating whether an importance field exists in Avs3DmL1Dec() '0': no, '1': yes
obj_position_azimuth	8 bit, indicating the horizontal angle at the position of the object when using the polar coordinate system, with a value range of [-180,180]
obj_position_elevation	6 bit, indicating the pitch angle at the position of the object when using the polar coordinate system, with a value range of [-90,90]
obj_position_distance	4 bit,indicating the normalized distance at the position of the object when using the polar coordinate system, with a value range of [0,1]
obj_position_x	8 bit, indicating the normalized X coordinate of the left/right dimension of the object when using Cartesian coordinates, with a value range of [-1,1]
obj_position_y	6 bit, indicating the normalized Y coordinate of the front/back dimension of the object when using Cartesian coordinates, with a value range of [-1,1]
obj_position_z	4 bit, indicating the normalized Z coordinate of the up/down dimension of the object when using Cartesian coordinates, with a value range of [-1,1]
obj_width_horizontal	7 bit, indicating the width of the object sound source when using the polar coordinate system, with a value range of [0,360]
obj_height_vertical	5 bit, indicating the height of the object sound source when using the polar coordinate system, with a value range of [0,360]
obj_depth_distance	4 bit, indicating the normalized depth of the object sound source when using the polar coordinate system, with a value range of [0,1]
obj_width_x	7 bit, indicating the normalized width of the object sound source when using the Cartesian coordinate system, with a value range of [0,1]
obj_height_y	5 bit, indicating the normalized height of the object sound source when using the Cartesian coordinate system, with a value range of [0,1]
obj_depth_z	4 bit, indicating the normalized depth of the object sound source when using the Cartesian coordinate system, with a value range of [0,1]
gain	7 bit, indicating the object rendering gain information, which is linear, with a value range of [0,6]
diffuse	7 bit, indicating the diffuse reflection of the object, with a value range of [0,1]
jumpPosition	1 bit, indicating whether the position of the object in the current frame has changed. '0': interpolation will be performed throughout the current frame. '1': the position will change
importance	4 bits, indicating the importance level of the object, '10': highest importance, '0': lowest importance, '11' - '15': reserved

9.16 Syntax and semantics of dynamic metadata Level2 decoding

9.16.1 syntax

The syntax of dynamic metadata Level2 decoding shall comply with provisions in Table 64.

Table 64 syntax of dynamic metadata Level2 decoding

syntax of dynamic metadata Level2 decoding	number of bits	mnemonic
Avs3DmL2Dec() {		
if (muteFlag == 0) {		

hasChannelLock	**1**	**uimsbf**
if (hasChannelLock == 1) {		

Table 64 (continued)

Syntax od dynamic metadata Level2 decoding	number of bits	mnemonic
channelLock	**1**	**uimsbf**
if(channelLock == 1) {		
channelLock_maxDistance	**4**	**uimsbf**
}		
}		
hasObjectDivergence	**1**	**uimsbf**
if (hasObjectDivergence == 1) {		
objectDivergence	**4**	**uimsbf**
if(objectDivergence != 0)		
objectDivergence_azimuthRange	**6**	**uimsbf**
}		
}		
hasObjectScreenRef	**1**	**uimsbf**
if (hasObjectScreenRef == 1) {		
obj_screenRef	**1**	**uimsbf**
}		
hasScreenEdgeLock	**1**	**uimsbf**
if (hasScreenEdgeLock == 1) {		
screenEdgeLock	**2**	**uimsbf**
}		
}		
}		

9.16.2 semantic

hasChannelLock — 1 bit, indicating whether channelLock metadata exists, '0': no '1': yes

channelLock — 1 bit, indicating whether the channel is locked, '0': no, '1': yes

channelLock_maxDistance — 4 bit, indicating the maximum distance in channel locking, with a value range of [0,2]

hasObjectDivergence — 1 bit, indicating whether objectDivergence metadata exists, '0': no, '1': yes

objectDivergence — 4 bit, indicating the object divergence, with a value range of [0,1]

objectDivergence_azimuthRange — It indicating adjusting the balance between the specified position of the object and the other two positions specified by the objectDivergence_azimuthRange value (symmetrical on both sides of the object, with the object position being +/- objectDivergence_azimuthRange). The value range is [0,180].

hasObjectScreenRef — 1 bit, indicating whether screen-related metadata exists, '0': no, '1': yes

obj_screenRef — 1 bit, indicating whether the object is related to the screen, '0': no, '1':

	yes
hasScreenEdgeLock	1 bit, indicating whether screenEdgeLock metadata exists, '0': no, '1': yes
screenEdgeLock	2 bit, indicating screen edge locking, '0': left, '1': right, '2': up, '3': down

9.17 Exended static metadata Level1 decoding

9.17.1 syntax

The syntax of extended static metadata Level1 decoding shall comply with provisions in Table 65.

Table 65 syntax of extended static metadata Level1 decoding

syntax of extended static metadata Level1 decoding	number of bits	mnemonic
VrExtL1() {		
b_acousticEnv	**1**	**uimsbf**
b_renderInfo	**1**	**uimsbf**
ambisonicOrder	**3**	**uimsbf**
if (b_acousticEnv) {		
acousticEnv()		
}		
if (b_renderInfo) {		
renderInfo()		
}		
}		

9.17.2 semantic

b_acousticEnv	1 bit, indicating whether the acousticEnv field exists in vrExtL1() '0': no, '1': yes
b_renderInfo	1 bit, indicating whether a renderInfo field exists in vrExtL1(), '0': no, '1': yes
ambisonicOrder	3 bits, indicating the spherical harmonic coding order, used by the renderer
AcousticEnv()	Indicating an interface for decoding acoustic environment metadata
RenderInfo()	Indicating an interface for decoding post effect processing metadata

9.18 acoustic environment metadata decoding in Extended static metadata

9.18.1 syntax

The syntax of acoustic environment metadata decoding in extended static metadata shall comply with provisions inTable 66.

Table 66 syntax of acoustic environment metadata decoding in extended static metadata

syntax of acoustic environment metadata decoding in extended the static metadata	bit number	mnemonic
AcousticEnv() {		
b_earlyReflectionGain	**1**	**uimsbf**
b_lateReverbGain	**1**	**uimsbf**

Table 66 (continued)

syntax of acoustic environment metadata decoding in extended the static metadata	number of bits	mnemonic
reverbType	**2**	**uimsbf**
if (b_earlyReflectionGain == 1) {		
earlyReflectionGain	**7**	**uimsbf**
}		
if (b_lateReverbGain == 1) {		
lateReverbGain	**7**	**uimsbf**
}		
lowFreqProFlag	**1**	**uimsbf**
if (reverbType == 2) {		
convolutionReverbType	**5**	**uimsbf**
}		
numSurface	**3**	**uimsbf**
numSurface = numSurface + 1		
for (i = 0; i < numSurface; i++) {		
Surface()		
}		
}		

9.18.2 semantic

b_earlyReflectionGain	1 bit, indicating whether an earlyReflectionGain field exists in AcousticEnv(), '0': no, '1': yes
b_lateReverbGain	1 bit, indicating whether a lateReverbGain field exists in AcousticEnv() '0': no, '1': yes
reverbType	2 bits, indicating the type of acoustic environment model, '0': 'Physical (physical reverberation)', '1': 'Artificial (artificial reverberation)', '2': 'Sample (sample reverberation)', '3': 'Extended type'
earlyReflectionGain	7 bits, indicating the early reflection gain, with a value range of [0,1]
lateReverbGain	7 bits, indicating the late reflection gain, with a value range of [0,1]
lowFreqProFlag	1 bit, indicating low-frequency separation processing. '0': reverberation is not performed on low-frequency to maintain the definition
convolutionReverbType	5 bits, indicating the sampling reverberation type, {0,1,2...N}, for example: '0': sampling reverberation in a concert hall, '1': sampling reverberation in a recording studio , ...
numSurface	3 bits, indicating the number of surfaces () items in acousticEnv (), with values of {0, 1, 2, 3, 4, 5}
Surface()	indicating an interface for decoding wall metadata of the same material

9.19 Decoding of wall surface metadata of the same material in extended static metadata

9.19.1 syntax

The syntax of decoding of wall surface metadata of the same material in extended static metadata shall comply with provisions in Table 67.

Table 67 Decoding of wall surface metadata of the same material in extended static metadata

Decoding of wall surface metadata of the same material in extended the static metadata	number of bits	mnemonic
Surface() {		
material	**5**	**uimsbf**
if(material == 0x1f) {		
for (i = 0； i < 8; i++) {		
absorption[i]	**7**	**uimsbf**
scattering[i]	**7**	**uimsbf**
}		
}		
numVertices	**5**	**uimsbf**
numVertices = numVertices + 1		
for (i = 0; i < numVerticesLimit; i++) {		
Vertex()		
}		
}		

9.19.2 semantic

material — 5 bits, a sub-element of vertex,indicating the material typle in the acoustic environment, with the range of {0,1,…,31}, supporting 32 types of materials, such as brick and water. scattering and absorption rates vary depending on materials. It indicates the coordinate of the triangle vertex composed of unified geometric material surfaces.

absorption — 7 bits, indicating the absorption rate of a certain bandwidth

scattering — 7 bits, indicating the scattering rate

numVertices — 4 bits, indicating the number of Vertex() itmes included in Surface()

Vertex() — indicating the coordinate of the triangle vertexes composed of unified geometric material surface

numVerticesLimit — When numSurface is 0, when the value of numVertices is within the range [7, 31], numVerticesLimit=numVertices+1; when the value of numVertices is less than 7, the value of numVerticesLimit is 8

When numSurface is 1, when the value of numVertices is within the range [3, 17], numVerticesLimit = numVertices + 1; when the value of numVertices is less than 3, the value of numVerticesLimit is 4; when the value of numVertices is greater than 17, the value of numVerticesLimit is 18

When numSurface is 2, when the value of numVertices is within the range [2, 11], numVerticesLimit = numVertices + 1; when the value of numVertices is less than 2, the value of numVerticesLimit is 3; when the value of numVertices is greater

than 11, the value of numVerticesLimit is 12
When numSurface is 3, when the value of numVertices is within the range [1, 8], numVerticesLimit=numVertices+1; when the value of numVertices is less than 1, the value of numVerticesLimit is 2; when the value of numVertices is greater than 8, the value of numVerticesLimit is 9
When numSurface is 4, when the value of numVertices is wuthin the range [1,6], numVerticesLimit=numVertices+1; when the value of numVertices is less than 1, the value of numVerticesLimit is 2; when the value of numVertices is greater than 6, the value of numVerticesLimit is 7
When numSurface is 5, when the value of numVertices is within the range[1,5], numVerticesLimit=numVertices+1; when the value of numVertices is less than 1, the value of numVerticesLimit is 2; when the value of numVertices is greater than 5, the value of numVerticesLimit is 6

9.20 Decoding of the triangles vertices composed of unified geometric material surface in the extended static metadata

9.20.1 Grammar

The syntax of decoding of the triangles vertices composed of unified geometric material surface in extended the static metadata shall comply with provisions in Table 68.

Table 68 Decoding of the triangles vertices composed of unified geometric material surface in extended the static metadata in the extended static metadata

syntax of decoding of the triangles vertices composed of unified geometric material surface in extended the static metadata	number of bits	mnemonic
Vertex() {		
x	**7**	**uimsbf**
y	**7**	**uimsbf**
z	**7**	**uimsbf**
}		

9.20.2 semantic meaning

x 7 bits, indicating x coordinate of triangle vertex, with a value range [-100,100]

y 7 bits, indicating the y coordinate of triangle vertex y coordinate, with a value range: [-100,100]

z 7 bits, indicating the z coordinate of triangle vertex, with a value range [-100,100]

9.21 rendering information decoding in extended static metadata

9.21.1 syntax

The syntax of rendering information decoding in static metadata shall comply with provisions in Table 69.

Table 69 Syntax of rendering information decoding in Static Metadata

Syntax of rendering information decoding in extended static metadata	number of bits	mnemonic
RenderInfo() {		
targetDevice	**1**	**uimsbf**
hrtfType	**4**	**uimsbf**
for (i = 0； i < 16; i++) {		
headphoneType[i]	**7**	**uimsbf**
}		
AudioEffect()		
}		

9.21.2 semantic

targetDevice — 1 bit, indicating the production intention and the type of playback device. '0': headphones, '1': speakers

hrtfType — 4 bits, indicating the header-related transfer function(HRTF) data shall complying with the SOFA (Spatially Oriented Format for Acoustics) standard. The {0,1,…,5} whose indexes respectively correspond to [THK, MIT, SADIE, CIPIC, HUTUBS, custom]

headphoneType — 7 bits, indicating the type of monitoring headphones, "ABCD..." indicating the character string of the monitoring headphone types

AudioEffect() — Indicating the interface for decoding post-processing metadata such as EQ (Equalizer), DRC (Dynamic Range Control)

9.22 post effect processing decoding in extended static metadata

9.22.1 grammar; syntax

The syntax of post-effect processing decoding in extended static metadata shall comply with the provisions of Table 70.

Table 70 syntax of post-processing decoding in extended static metadata

Syntax of post-processing decoding in extended in static metadata	number of bits	mnemonic
AudioEffect () {		
b_EQ_exist	**1**	**uimsbf**
b_DRC_exist	**1**	**uimsbf**
b_Gain_exist	**1**	**uimsbf**
if (b_EQ_exist || b_DRC_exist || b_Gain_exist) {		
effectChain	**3**	**uimsbf**
}		
if (b_EQ_exist) {		
numEqband	**4**	**uimsbf**
numEqband = numEqband + 1		
for (i= 0;i < numEqband; i++) {		

eqEffect ()		
}		
}		
if (b_DRC_exist) {		
attackTime	**4**	**uimsbf**
releaseTime	**4**	**uimsbf**
threshold	**7**	**uimsbf**
preGain	**7**	**uimsbf**
postGain	**7**	**uimsbf**
ratio	**7**	**uimsbf**
}		
if (b_Gain_exist) {		
effectGain	**7**	**uimsbf**
}		
}		

9.22.2 semantic

b_EQ_exist 1 bit, indicating whether an EQ field exists in AudioEffect(), '0': no, '1': yes

b_DRC_exist 1 bit, indicating whethera DRC field exists in AudioEffect(), '0': no, '1': yes

b_Gain_exist 1 bit, indicating whether a Gain field exists in AudioEffect(), '0': no, '1': yes

effectChain 3 bits, indicating the execution order of EQ, DRC, and Gain,

‘0’： Gain—> EQ—> DRC

‘1’： Gain—> DRC—> EQ

‘2’： EQ—>DRC—>Gain

‘3’： EQ—> Gain—> DRC

‘4’： DRC—> EQ—>Gain

‘5’： DRC—> Gain—> EQ

numEqband 4 bits, indicating the number of eqEffects items included in AudioEffect(), '0' - '11': indicating the number of eqEffects items included in AudioEffect(), '12' - '15': reserved

attackTime 4 bits, indicating the trigger time, with a value range of [1,100]

release time 4 bits, indicating the release time, with a value range of [50,300]

threshold 7 bits, indicating the trigger threshold, with a value range of [-80,10]

preGain 7 bits, indicating the pre-gain, with a value range of [-10,10]

postGain 7 bits, indicating the post-gain, with a value range of [0,20]

ratio 7 bits, indicating the compression ratio, with a value range of [1,100]

effectGain 7 bits, indicating the effect gain, with a value range of [-20,20]

EqEffect() indicating the interface for EQ attribute effect parameter decoding

9.23 equalization effect decoding in extended static metadata

9.23.1 syntax

The syntax of equalization effect decoding in extended static metadata shall comply with provisions inTable 71.

Table 71 syntax of equalization effect decoding in extended static metadata

syntax of equalization effect decoding in extended the static metadata	bit number	mnemonic
EqEffect() {		
eqType	**3**	**uimsbf**
eqFc	**7**	**uimsbf**
eqQQFlag	**1**	**uimsbf**
from EQQ	**6**	**uimsbf**
eqGain	**7**	**uimsbf**
}		

9.23.2 semantic meaning

eqType 3 bits, indicating the type of EQ

eqFc 7 bits, indicating the cut-off frequency of the filter, with a value range of [20,16000]

eqQQFlag 1 bit, indicating the eqQ quantization interval. When eqQQFlag=0, the quantization interval is [0.1, 1]; when eqQQFlag=1, the quantization interval is (1, 12].

by EQQ 6 bits, indicating the quality factor, with a value range of [0.1,12]

eqGain 7 bits, indicating the gain of EQ, with a value range of [-20,20]

b_EQ_exist 1 bit, indicating whether there an EQ field exists in AudioEffect(), '0': no, '1': present

b_DRC_exist 1 bit, indicating whether a DRC field exists in AudioEffect(), '0': no, '1': yes

b_Gain_exist 1 bit, indicating whether a Gain field exists in AudioEffect() '0': no, '1': yes

9.24 decoding process

During metadata decoding a quantization step size and quantization offset of the metadata a re set based on the value range of the metadata, thereby determining the quantization accuracy. The decoder parses a bitstream to obtain the quantization index of the metadata, and the dequantized the value$Qvalue$ of metadata is calculated based on the quantized index$QIdx$, quantized step sizeQStepand quantitative offset Qsethe metadata is dequantized i, refer to formula (33).

$$Qvalue = QIdx \times \mathrm{QStep} + \mathrm{Qset} \quad (33)$$

The metadata quantification parameter shall comply with provisions in Table 72.

Table 72 Metadata Quantization Parameters

Metadata element	Metadata name	quantization step	quantization offset
AudioProgramme()	maxDuckingDepth	2.000000	0
AudioPackFormat ()	nfcRefDist	0.066666	0
LoudnessMetadata()	integratedLoudness	2.258065	0
	loudnessRange	1.935483	10.0
	maxTruePeak	2.258065	0

	maxMomentary	2.258065	0
	maxShortTerm	2.258065	0
	dialogueLoudness	2.258065	0
AudioProgrammeReferenceScreen()	screenCentrePosition_azimuth	1.411764	-180.0
	screenCentrePosition_elevation	1.428571	0
	screenCentrePosition_distance	0.066666	0
	screenWidth_polar	1.417322	0
	screenCentrePosition_X	0.007843	-1.0
	screenCentrePosition_Y	0.031746	-1.0
	screenCentrePosition_Z	0.133333	-1.0
	screenWidth_cartesian	0.007874	0

Table 72 (continued)

Metadata element	Metadata name	quantization step	quantization offset
AudioObjectInteraction()	gainInteractionRange_min (gainInteractionUnit is 0)	0.007874	0
	gainInteractionRange_min (gainInteractionUnit is 1)	0.629921	0
	gainInteractionRange_max (gainInteractionUnit is 0)	0.118110	1.0
	gainInteractionRange_max (gainInteractionUnit is 1)	0.188976	0
	positionInteractionRange_Xmin	0.007843	-1.0
	positionInteractionRange_Xmax	0.007843	-1.0
	positionInteractionRange_Ymin	0.031746	-1.0
	positionInteractionRange_Ymax	0.031746	-1.0
	positionInteractionRange_Zmin	0.133333	-1.0
	positionInteractionRange_Zmax	0.133333	-1.0
	positionInteractionRange_azimuthMin	0.705882	0
	positionInteractionRange_azimuthMax	0.705882	0
	positionInteractionRange_elevationMin	1.428571	0
	positionInteractionRange_elevationMax	1.428571	0
	positionInteractionRange_distanceMin	0.066667	0
	positionInteractionRange_distanceMax	0.066667	0
DirectSpeakersPosition()	azimuth	1.411764	0
	elevation	2.857140	0
	distance	0.066667	0
AudioObject()	objectGain (objectGainUnit is 0, objectGainQFlag is 0)	0.015873	0
	objectGain (objectGainUnit is 0, objectGainQFlag is 1)	0.238095	1.0

	objectGain (objectGainUnit is 1, objectGainQFlag is 0)	1.269841	0
	objectGain (objectGainUnit is 1, objectGainQFlag is 1)	0.380952	0
AudioChannelFormat()	channelGain (channelGainUnit is 0, channelGain_QFlag is 0)	0.015873	0
	channelGain (channelGainUnit is 0, channelGain_QFlag is 1)	0.238095	1.0
	channelGain (channelGainUnit is 1, channelGain_QFlag is 0)	1.269841	0

Table 72 (continued)

Metadata element	Metadata name	quantization step	quantization offset
AudioChannelFormat()	channelGain (channelGainUnit is 1, channelGain_QFlag is 1)	0.380952	0
	Matrix Coef	0.038823	0.1
AcousticEnv()	earlyReflectionGain	0.007874	0
	lateReverbGain	0.007874	0
Surface()	absorption	0.007874	0
	scattering	0.007874	0
Vertex()	x	1.574803	-100.0
	y	1.574803	-100.0
	z	1.574803	-100.0
AudioEffect()	attackTime	6.600000	1.0
	release time	16.666660	50.0
	threshold	0.708661	-80.0
	preGain	0.157480	-10.0
	postGain	0.157480	0
	ratio	0.779527	1.0
	effectGain	0.314960	-20.0
eqEffect()	eqQ (eqQQFlag is 0)	0.014285	0.1
	eqQ (eqQQFlag is 1)	0.174603	1.0
	eqGain	0.314960	-20.0
Avs3DmL1Dec()	obj_position_azimuth	1.411764	-180
	obj_position_elevation	2.857142	-90
	obj_position_distance	0.066666	0
	obj_width_horizontal	2.834645	0
	obj_hight_vertical	11.612903	0
	obj_depth_distance	0.066666	0
	obj_position_x	0.007843	-1.0
	obj_position_y	0.031746	-1.0
	obj_position_z	0.133333	-1.0
	obj_width_x	0.007874	0

Avs3DmL1Dec()	obj_hight_y	0.032258	0
	obj_depth_z	0.066666	0
	gain	0.047244	0
	diffuse	0.007874	0
Avs3DmL2Dec()	channelLock_maxDistance	0.133333	0
	objectDivergence	0.066666	0
	objectDivergence_azimuthRange	2.857142	0

The absoluteDistance metadata is dequantized according to formula (34).

$absoluteDistance = 10^{(QIdx \times 0.0396919)} - 1.0$

(34)

The eqFc metadata is dequantized according to formula (35).

$eqFc = 10^{((QIdx \times 0.457179 + 20 \times log10(20))/20)}$

The absoluteDistance metadata is dequantized according to formula (34).

$$absoluteDistance = 10^{(QIdx \times 0.0396919)} - 1.0 \quad (34)$$

The eqFc metadata is dequantized according to formula (35).

$$eqFc = 10^{((QIdx \times 0.457179 + 20 \times log10(20))/20)} \quad (35)$$

Annex A (Normative)Syntax and semantics of 3D audio coded bitstream

A.1 syntax

A.1.1 Overview

The 3D audio bitstream format is based on the AASF and AATF specifications in GB/T 33475.3-2018, providing the syntax and semantic of AASF and AATF descriptions. The 3D audio bitstream file extension is av3a.

AASF includes the header information of the audio sequence and subsequent raw data block. AASF is only applicale to systems that define a starting point without the need to start decoding from the midd of the audio datastream. AASF includes all the necessary information for decoding and playing audio data,which is an exchange storage format.

The AATF includes the synchronization words and information necessary for decoding.The synchronization word allows the decoder to decode without a determined starting point.

A.1.2 syntax of AASF

AASF includes the header information of the audio sequence and subsequent raw data blocks, and its syntax shall comply with provisions in Table A.1.

Table A.1 Syntax of aasf_sequence()

Syntax	bit number	mnemonic
aasf_sequence()		
{		
aasf_header()		
if (audio_codec_id < 2) {		
if (coding_profile == 0) {		
if (audio_codec_id == 1)		
ll_raw_data_stream()		
}		
if (coding_profile == 2)		
hoa_raw_data_stream()		
}		
else if (audio_codec_id == 2)		
ga_co_raw_data_stream()		
}		

The AASF header describes the header information of the audio storage format, including identification, size of a data storage format of the AASF header The syntax of aasf_header() shall comply with provisions in Table A.2.

Table A.2 Syntax of aasf_header()

syntax	number of bits	mnemonic
aasf_header()		
{		

Table A.2 (continued)

syntax	bit number	mnemonic
aasf_id	**32**	**BSLBF**
header_size	**24**	**BSLBF**
raw_stream_length	**32**	**bslbf**
audio_codec_id	**4**	**bslbf**
resolution	**2**	**BSLBF**
if(audio_codec_id==2) {		
nn_type	**3**	**uimsbf**
}		
coding_profile	**3**	**BSLBF**
anc_data_index	**1**	**BSLBF**
if(audio_codec_id==1)		
channel_number	**{4;8}**	**BSLBF**
if(audio_codec_id==2){		
if(coding_profile ==0){		
channel_number_index	**7**	**bslbf**
}		
if(coding_profile ==1){		
soundBedType	**2**	**uimsbf**
if (soundBedType == 0){		
object_channel_number	**7**	**uimsbf**
bitrate_index_per_channel	**4**	**uimsbf**
} else if (soundBedType == 1){		
channel_number_index	**7**	**uimsbf**
bitrate_index	**4**	**uimsbf**
object_channel_number	**7**	**uimsbf**
bitrate_index_per_channel	**4**	**uimsbf**
}		
}		
if(coding_profile ==2){		
order	**4**	**uimsbf**
}		
}		
sampling_frequency_index	**4**	**bslbf**
if(audio_codec_id==1){		
if(sampling_frequency_index==0xf) {		
sampling_frequency	**24**	**uimsbf**
}		

}		
if(audio_codec_id==2 && coding_profile != 1) {		

Table A.2 (continued)

syntax	number of bits	mnemonic
bitrate_index	**4**	**BSLBF**
}		
byte_alignment()		
}		

A.1.3 Syntax of AATF

The AATF includes synchronization words and information necessary for decoding, and its syntax shall comply with provisions inTable A.3.

Table A.3 Syntax of aatf_sequence()

syntax	bit number	mnemonic
aatf_sequence()		
{		
while (nextbits(n) == syncword) {		
aatf_frame()		
}		
}		

The AATF frame describes the bitstream sequence of the audio transmission frame, which consists of the corresponding decoded header information, information header, error check, and raw data block. The syntax of aatf_frame() shall comply with provisions in Table A.4.

Table A.4 Syntax of aatf_frame()

syntax	number of bits	mnemonic
aatf_frame()		
{		
syncword	**12**	**bslbf**
audio_codec_id	**4**	**bslbf**
anc_data_index	**1**	**bslbf**
if(audio_codec_id < 3){		
aatf_frame_header()		
if (audio_codec_id == 2){		
frame_error_check()		
}		
byte_alignment()		
if (audio_codec_id < 2) {		
if (coding_profile == 0) {		

if (audio_codec_id == 1)		
ll_raw_data_block()		
}		
if (coding_profile == 2)		

Table A.4 (continued)

syntax	bit number	mnemonic
hoa_raw_data_block()		
}		
}		
else if (audio_codec_id == 2)		
ga_co_raw_data_block()		
}		
if (audio_codec_id == 1){		
frame_error_check()		
}		
}		

frame_error_check() is located at the end of the attf frame and is used to check the integrity of bitstream of each frame. All bits of the current frame are entered into the CRC algorithm according to their sequence of its occurrence. The syntax of frame_error_check() shall comply with Table A.5.

Table A.5 Syntax of frame_error_check()

syntax	bit number	mnemonic
frame_error_check()		
{		
crc_check	**8**	**rpchof**
}		

The AATF decoded header describes decoded header information, which consists of synchronization words, sampling rate indexes, and so on. The syntax of aatf_frame_header() shall comply with provisions in Table A.6.

Table A.6 Syntax of aatf_frame_header()

syntax	number of bits	mnemonic
aatf_frame_header()		
{		
if(audio_codec_id==2) {		
nn_type	**3**	**uimsbf**
}		
coding_profile	**3**	**uimsbf**
sampling_frequency_index	**4**	**uimsbf**
if(audio_codec_id==1) {		
if (sampling_frequency_index==0xf) {		

sampling_frequency	**24**	**uimsbf**
}		
}		
if(audio_codec_id != 2){		

Table A.6 (continued)

syntax	number of bits	mnemonic
raw_frame_length	**16**	**bslbf**
}		
aatf_error_check()		
if(audio_codec_id==1)		
channel_number	**{4; 8}**	**bslbf**
if(audio_codec_id==2){		
if(coding_profile ==0){		
channel_number_index	**7**	**bslbf**
}		
if(coding_profile ==1){		
soundBedType	**2**	**uimsbf**
if (soundBedType == 0){		
object_channel_number	**7**	**uimsbf**
bitrate_index_per_channel	**4**	**uimsbf**
} else if (soundBedType == 1){		
channel_number_index	**7**	**uimsbf**
bitrate_index	**4**	**uimsbf**
object_channel_number	**7**	**uimsbf**
bitrate_index_per_channel	**4**	**uimsbf**
}		
}		
if(coding_profile ==2){		
order	**4**	**uimsbf**
}		
}		
resolution	**2**	**uimsbf**
if(audio_codec_id==2 && coding_profile != 1) {		
bitrate_index	**4**	**uimsbf**
}		
}		

The syntax of aatf_error_check() shall comply with provisions in Table A.7.

Table A.7 Syntax of aatf_error_check()

syntax	number of bits	mnemonic

aatf_error_check()		
{		
crc_check	**8**	**rpchof**
}		

A.2 semantic meaning

ll_raw_data_stream() — Indicating the sequence of ll_raw_data_block() generated by a lossless audio coding tool

ga_co_raw_data_stream() — Indicating the sequence of ga_co_raw_data_block() generated by a general full-rate audio coding tool

raw_stream_length — 16bit, indicating the length of the raw audio data stream, in bytes

audio_codec_id — 4bit，
'1': lossless audio coding data
'2': General full-rate audio coding data
'0', '3' - '15': reserved

anc_data_index — 1bit, indicating whether an auxiliary data block exists.

resolution — 2 bit, indicating the index of the number of quantization bits of the input signal,
'1': a 16 bits/sample point
'2':a 24 bits/sample point
'0', '3': reserved

nn_type — 3 bit，
'0': a basic configuration of neural network
'1': a low complexity configuration of neural network
'2' - '7': Reserved

coding_profile — 3 bit，
'0': a Basic framework
'1': an object metadata encoding framework
'2': an HOA data coding framework
'3' - '7': Reserved

channel_number_index — 7 bit, indicating an index of the number of channels, which shall comply with provisions in Table A.8, and the spatial position of the speakers shall comply with provisions in GY/T 316-2018

channel_number — When audio_codec_id is 1 and the number of channels is less than 16, this field is 4 bits, '0' to '14': indicates the number of channels, '15' indicating extension; when audio_codec_id is 1 and the number of channels is greater than or equal to 16, this field is 8 bits, indicating the number of channel

order — 4 bit, (order + 1) indicating the order of the HOA signal

sampling_frequency_index — 4 bit, indicating an index of sampling frequency of the input signal, which shall comply with provisions in Table A.9

sampling_frequency — 24bit, unsigned integer, indicating the sampling frequency valuein Hertz

	(Hz) for extension, 0x000000：0 Hz 0x000001：1 Hz … 0xFFFFFE: 16777214 Hz 0FFFFFF: reserved
bitrate_index	4 bit, indicating the index of bit rate, which shall comply with provisions in Table A.10 to Table A.20
ll_raw_data_block()	indicating lossless audio coded raw bitstream data, generated by a lossless audio encoding tool
ga_co_raw_data_block()	indicating the raw bitstream data of general full-rate audio coding, and is generated by the general full-rate audio coding tool.
aasf_sequence()	indicating the sequence in AVS_Audio_Storage_Format format shall comply with provisions in Table A.1
aasf_header()	indicating the AASF header, located at the beginning of aasf_sequence, shall comply with provisions in Table A.2
aatf_sequence()	indicating the sequence in the AVS_Audio_Transport_Format format is required to comply with provisions in Table A.3
aatf_frame()	indicating the AATF frame shall comply with trovisions in Table A.4
aatf_frame_header()	indicating the decoding frame header of AATF, which shall comply with provisions in Table A.6
raw_frame_length	16 bit, indicating the total length of the current frame of the bitstream. the flag of the total length of the current frame of the bitstream is added to obtain the basic information of the bitstream
frame_error_check()	Indicating the data generated by CRC check. All bits in the AATF frame are checked according to the their occurrence sequence in the CRC algorithm, which shall comply with Table A.5.
aatf_error_check()	indicating the data generated by CRC check shall comply with provisions of Table A..7
syncword	12 bit, indicating the synchronization word,the bit string is '1111 1111 1111'
soundBedType	2 bit, indicating the type of sound bed '0': No sound bed, only object audio is available '1': The sound bed is one of mono audio, dual-channel stereo audio, or multi-channel audio '2' - '3': Reserved
object_channel_number	7 bit，(object_channel_number + 1)indicates the number of channels for all the object audio.
bitrate_index_per_channel	4 bits, indicating the index of the average bit rate per channel for all object audio, multiplexed with channel_number_index
crc_check	CRC check

Table A.8 table of channel_number configuration

channel_number_index	channel configuration	channel_number

0x0	monophonic sound	1
0x1	two-channel stereo	2
0x2	5.1	6
0x3	7.1	8
0x6	FOA	4
0x7	5.1.2	8
0x8	5.1.4	10
0x9	7.1.2	10
0xa	7.1.4	12
0xb	3rd order HOA	16
0xc	2nd order HOA	9
0x4, 0x5, 0xd-0x7f	reserved.	

Table A.9 Table of Sampling Rate Mapping

sampling_frequency_index	Sampling frequency (Hz)
0x0	192000
0x1	96000
0x2	48000
0x3	44100
0x4	32000
0x5-0xf	reserved.

Table A.10 Index Table of Monophonic Coding Bit Rate

bitrate_index	Bit rate (kb/s)
0x1	32
0x2	44
0x3	56
0x4	64
0x5	72
0x6	80
0x7	96
0x8	128
0x9	144
0xa	164
0xb	192
0x0, 0xc~0xf	Reserve

Table A.11 Index Table of Dual-channel Stereo Encoding Bit Rate

bitrate_index	Bit rate (kb/s)
0x1	32
0x2	48
0x3	64

0x4	80
0x5	96
0x6	128
0x7	144
0x8	192
0x9	256
0xa	320
0x0, 0xb~0xf	Preserve

Table A.12 index tabl of 5.1 Multi-channel encoding bit ratee

bitrate_index	Bit rate (kb/s)
0x0	192
0x1	256
0x2	320
0x3	384
0x4	448
0x5	512
0x6	640
0x7	720
0x8	144
0x9	96
0xa	128
0xb	160
0xc~0xf	Retain

Table A.13 7.1 index table of Multi-channel coding bit rate

bitrate_index	Bit rate (kb/s)
0x0	192
0x1	480
0x2	256
0x3	384
0x4	576
0x5	640
0x6	128
0x7	160
0x8~0xf	Keep it

Table A.14 Index Table of FOA Coding Bit Rate

bitrate_index	Bit rate (kb/s)
0x1	96
0x2	128
0x3	192

0x4	256
0x0, 0x5~0xf	Keep it

Table A.15 index table of 5.1.2 Multi-channel coding bit rate

bitrate_index	Bit rate (kb/s)
0x0	152
0x1	320
0x2	480
0x3	576
0x4~0xf	Keep it

Table A.16 index table of 5.1.4 Multi-channel coding bit rate

bitrate_index	Bit rate (kb/s)
0x0	176
0x1	384
0x2	576
0x3	704
0x4	256
0x5	448
0x6~0xf	Keep it

Table A.17 index table of 7.1.2 Multi-channel coding bit rate

bitrate_index	Bit rate (kb/s)
0x0	216
0x1	480
0x2	576
0x3	384
0x4	768
0x5~0xf	Reserve

Table A.18 index table of 7.1.4 Multi-channel coding bit rate

bitrate_index	Bit rate (kb/s)
0x0	240
0x1	608
0x2	384
0x3	512
0x4	832
0x5~0xf	Reserved.

Table A.19 index table of 2-order HOA coding bit rate

bitrate_index	Bit rate (kb/s)
0x0	192
0x1	256
0x2	320
0x3	384
0x4	480
0x5	512
0x6	640
0x7~0xf	Reserve

Table A.20 Index Table of 3-Order HOA Encoding Bit Rate

bitrate_index	Bit rate (kb/s)
0x0	256
0x1	320
0x2	384
0x3	512
0x4	640
0x5	896
0x6~0xf	keep it

Annex B (Normative) Audio Code Table

The 3D audio code table shall comply with provisions in Table B.1 to Table B.49.

Table B.1 Context range Code Table

Indexing	probability
1	0 1 65534 65535 65536
2	0 1 65534 65535 65536
3	0 1 65534 65535 65536
4	0 1 65534 65535 65536
5	0 1 2 3 4 5 6 7 8 9 11 16 30 69 169 405 909 1885 3581 6203 9806 14349 20045 27710 39581 63884 65352 65478 65513 65523 65526 65527 65528 65529 65530 65531 65532 65533 65534 65535 65536
6	0 1 65534 65535 65536
7	0 1 65534 65535 65536
8	0 1 65534 65535 65536
9	0 1 65534 65535 65536
10	0 1 65534 65535 65536
11	0 1 65534 65535 65536
12	0 1 65534 65535 65536
13	0 1 2 3 4 16 227 4637 62245 65417 65525 65531 65532 65533 65534 65535 65536
14	0 1 65534 65535 65536
15	0 1 65534 65535 65536
16	0 1 65534 65535 65536

Table B.2 Parameters of context decoding neural network: CNN layer 1(convolutional kernel parameter: kernel)

Parameter value
-0x1.0292f20000000p-9, -0x1.366fe00000000p-11, -0x1.87d1260000000p-10, -0x1.cc52800000000p-9, -0x1.6487740000000p-1, 0x1.828c6c0000000p-11, 0x1.0e08e00000000p-11, 0x1.b500fa0000000p-10, -0x1.2c5b220000000p-11, 0x1.1109140000000p-10, -0x1.899ed60000000p-9, -0x1.14eea20000000p-9, -0x1.3e52fe0000000p-4, -0x1.70af560000000p-10, -0x1.2668220000000p-12, 0x1.c0e2fe0000000p-10,
0x1.ff18000000000p-9, 0x1.9878960000000p-10, 0x1.a7f9ec0000000p-8, 0x1.2fba2c0000000p-8, -0x1.40fa4e0000000p-2, -0x1.705e160000000p-9, -0x1.09d3900000000p-8, 0x1.c2f6460000000p-10, -0x1.5402600000000p-9, 0x1.da25b00000000p-10, -0x1.2bfaf60000000p-9, 0x1.46ced60000000p-10, -0x1.3890400000000p-1, -0x1.0021f00000000p-8, -0x1.57a5ba0000000p-10, -0x1.3e41140000000p-10,
-0x1.6a29260000000p-7, -0x1.45bb160000000p-8, -0x1.3078d00000000p-7, -0x1.53d64e0000000p-7, -0x1.d2fd4a0000000p-2, 0x1.5911c00000000p-8, 0x1.6539ca0000000p-7, -0x1.36a2e60000000p-9, 0x1.dbac1c0000000p-9, 0x1.4fc8b40000000p-9, 0x1.2cdc1e0000000p-8, -0x1.80a7f80000000p-11,

-0x1.d4c0160000000p-1, 0x1.04827c0000000p-11, -0x1.12470a0000000p-10, -0x1.24878e0000000p-9,
-0x1.eb9d460000000p-7, -0x1.d1f8600000000p-9, -0x1.7db0400000000p-7, -0x1.a270a20000000p-7, -0x1.53a65a0000000p-1, 0x1.7cc2a40000000p-8, 0x1.4d8f800000000p-7, 0x1.fabc2c0000000p-15, 0x1.b9bba80000000p-8, -0x1.0820600000000p-9, 0x1.48a9ec0000000p-8, -0x1.6501ec0000000p-10, -0x1.547f9a0000000p-1, 0x1.aed1c40000000p-9, 0x1.3f92960000000p-9, -0x1.589be20000000p-10,
0x1.55c9fc0000000p-8, 0x1.5fef600000000p-8, 0x1.5abd8a0000000p-8, 0x1.43a8580000000p-8, -0x1.a74e920000000p-2, -0x1.121cd40000000p-8, -0x1.7a86360000000p-8, -0x1.80dea20000000p-10, -0x1.631c460000000p-8, 0x1.eb8acc0000000p-10, 0x1.76a6680000000p-13, 0x1.616ffe0000000p-11, -0x1.00a68c0000000p-2, 0x1.b95ba60000000p-11, -0x1.455f8e0000000p-9, -0x1.b823ac0000000p-13,
-0x1.338c020000000p-5, -0x1.d717660000000p-7, -0x1.f4a05e0000000p-6, -0x1.06740e0000000p-5, -0x1.c5f5940000000p-1, 0x1.c7f1700000000p-7, 0x1.d753300000000p-6, -0x1.f8530e0000000p-9, 0x1.fe39c40000000p-7, -0x1.842c660000000p-10, 0x1.22700e0000000p-7, -0x1.e0d3140000000p-8, -0x1.c33e720000000p-5, 0x1.1cb7320000000p-7, 0x1.a451b80000000p-8, 0x1.226df40000000p-9,
0x1.f359840000000p-11, -0x1.104b300000000p-10, 0x1.1676a80000000p-10, 0x1.6adc2c0000000p-12, -0x1.1f921c0000000p-1, 0x1.580dc00000000p-9, 0x1.cb52920000000p-13, -0x1.6313d80000000p-12, 0x1.77a0120000000p-12, 0x1.b043e60000000p-12, 0x1.5bc0320000000p-10, -0x1.3a8bee0000000p-11, -0x1.5249920000000p-5, 0x1.6a6f160000000p-10, -0x1.f626940000000p-13, -0x1.c109a80000000p-13,
0x1.4352880000000p-6, 0x1.42f98c0000000p-7, 0x1.0ff08a0000000p-6, 0x1.2a00d60000000p-6, -0x1.9dc7040000000p-1, -0x1.1645220000000p-7, -0x1.0b2c200000000p-6, 0x1.22cafc0000000p-9, -0x1.4f324e0000000p-7, -0x1.57332e0000000p-11, -0x1.c87e280000000p-8, 0x1.e999160000000p-9, 0x1.a929ce0000000p-6, -0x1.93fc580000000p-8, -0x1.31cc680000000p-8, 0x1.88ebca0000000p-10,
0x1.661a680000000p-6, 0x1.5a72120000000p-7, 0x1.51c0d40000000p-6, 0x1.4e4fba0000000p-6, -0x1.5ea56c0000000p-3, -0x1.29e23e0000000p-7, -0x1.4844440000000p-6, 0x1.c5cd260000000p-8, -0x1.1e96180000000p-7, 0x1.aa21580000000p-10, -0x1.712eba0000000p-9, 0x1.7cf6a60000000p-9, 0x1.ec5d460000000p-1, -0x1.1d7b320000000p-7, -0x1.5d53640000000p-8, -0x1.274ee20000000p-10,
-0x1.8c5efa0000000p-7, -0x1.02360a0000000p-7, -0x1.c269b80000000p-7, -0x1.0d53ce0000000p-6, 0x1.41bf9e0000000p-2, 0x1.03e8880000000p-7, 0x1.9c7f0e0000000p-7, -0x1.2fc2980000000p-8, 0x1.df16840000000p-9, 0x1.6d733a0000000p-9, 0x1.5d40fa0000000p-8, -0x1.1da57a0000000p-8, -0x1.6854200000000p-2, 0x1.35eb9e0000000p-7, 0x1.32ec120000000p-8,

-0x1.ab3cf60000000p-9,
-0x1.55a11c0000000p-4, -0x1.03bede0000000p-5, -0x1.16411e0000000p-4, -0x1.23561c0000000p-4, 0x1.c07daa0000000p-8, 0x1.a8beec0000000p-6, 0x1.0314840000000p-4, -0x1.6e54b60000000p-7, 0x1.046d800000000p-5, 0x1.8d052a0000000p-10, 0x1.59b9ae0000000p-6, -0x1.9c1e260000000p-7, 0x1.13f1800000000p-3, 0x1.0cd2600000000p-6, 0x1.05ca240000000p-6, -0x1.0264e60000000p-9,
0x1.00c44c0000000p-6, 0x1.7f93a20000000p-8, 0x1.cb3f380000000p-7, 0x1.81a6ac0000000p-7, -0x1.c6a8f00000000p-4, -0x1.c6f7c00000000p-8, -0x1.a3d0840000000p-7, 0x1.0e63900000000p-8, -0x1.46a5ca0000000p-8, -0x1.2bdabe0000000p-10, -0x1.42b33e0000000p-8, 0x1.3462000000000p-10, -0x1.f8b61e0000000p-4, -0x1.0775400000000p-11, -0x1.5552b80000000p-9, 0x1.06f3f00000000p-15,
0x1.2692aa0000000p-8, 0x1.614c400000000p-10, 0x1.4396440000000p-8, 0x1.a255740000000p-8, -0x1.0ca9720000000p-3, -0x1.6093680000000p-9, -0x1.1892180000000p-8, 0x1.b350a60000000p-12, -0x1.5841fc0000000p-8, -0x1.d51fe80000000p-10, -0x1.18bb860000000p-10, -0x1.545d7a0000000p-10, -0x1.2c272a0000000p+0, -0x1.77dffa0000000p-9, 0x1.7a89d60000000p-13, 0x1.7c57220000000p-11,
-0x1.8c939a0000000p-8, 0x1.0f32440000000p-10, -0x1.dfffd20000000p-8, -0x1.7aec5a0000000p-8, 0x1.eebdaa0000000p-4, 0x1.2a379c0000000p-8, 0x1.7dc1ce0000000p-8, 0x1.e6996e0000000p-13, 0x1.8a7fde0000000p-8, -0x1.a675fc0000000p-12, 0x1.1ec7420000000p-8, -0x1.e3ed200000000p-10, -0x1.1e9b840000000p+0, 0x1.e3ee460000000p-9, 0x1.15f5ba0000000p-8, -0x1.0aa18a0000000p-11,
-0x1.edc16a0000000p-9, -0x1.6912aa0000000p-8, -0x1.ab72ee0000000p-11, -0x1.c3f94a0000000p-10, -0x1.2b77740000000p-1, 0x1.bab7f00000000p-9, 0x1.3d11d20000000p-10, -0x1.724ce80000000p-9, -0x1.3723860000000p-10, -0x1.3033f20000000p-11, 0x1.fc38020000000p-11, -0x1.93710e0000000p-10, -0x1.70a8300000000p-3, -0x1.548f100000000p-10, -0x1.970bec0000000p-10, -0x1.68d1120000000p-9,
-0x1.8e7a740000000p-8, -0x1.6c89b60000000p-9, -0x1.33e5ea0000000p-8, -0x1.01ce900000000p-9, 0x1.b8829c0000000p-3, 0x1.090e860000000p-9, 0x1.a6940e0000000p-9, -0x1.e1aaec0000000p-9, 0x1.58d3ac0000000p-11, -0x1.1bc8aa0000000p-13, 0x1.7a75ba0000000p-11, -0x1.0b5f260000000p-11, 0x1.f27c580000000p-1, 0x1.390c0c0000000p-9, 0x1.bfb8f60000000p-12, -0x1.3e35480000000p-11,
0x1.d15b6c0000000p+1, 0x1.15310a0000000p-2, 0x1.1c4af60000000p+0, 0x1.5667520000000p+0, 0x1.1318400000000p-4, -0x1.bd89b80000000p-3, -0x1.9110580000000p-1, 0x1.66adda0000000p-4, -0x1.08f7260000000p-2, -0x1.cd21920000000p-7, -0x1.2d1f4a0000000p-3, 0x1.eef6c00000000p-4, -0x1.3abeae0000000p-5, -0x1.14d6a80000000p-3, -0x1.afdb260000000p-4, -0x1.be7ee40000000p-9,

-0x1.ce70d40000000p-8, -0x1.0b4de20000000p-8, -0x1.a4a3860000000p-8, -0x1.347d5e0000000p-8, -0x1.c099ec0000000p-2, 0x1.253d7e0000000p-9, 0x1.6fd1320000000p-8, 0x1.47f58e0000000p-11, 0x1.186d2e0000000p-8, 0x1.4ae9cc0000000p-10, 0x1.061da00000000p-9, -0x1.476cc60000000p-11, 0x1.07bab00000000p-1, 0x1.ae89e80000000p-11, 0x1.125cf00000000p-8, 0x1.99ed8c0000000p-11,
-0x1.2db3540000000p-6, -0x1.e01b1a0000000p-8, -0x1.a878460000000p-7, -0x1.38785e0000000p-6, -0x1.37a3480000000p-5, 0x1.a3ba6c0000000p-8, 0x1.dcd3740000000p-7, -0x1.7185620000000p-10, 0x1.9173980000000p-8, 0x1.86255c0000000p-10, 0x1.96f1ae0000000p-8, -0x1.3114340000000p-9, -0x1.6786360000000p-2, 0x1.0288e20000000p-9, 0x1.ec3e5e0000000p-15, -0x1.2a9bf40000000p-11,
0x1.469e9a0000000p-6, 0x1.7108280000000p-8, 0x1.380c340000000p-6, 0x1.1d3d340000000p-6, -0x1.0fbb9e0000000p-1, -0x1.1c55c20000000p-7, -0x1.f1f0a40000000p-7, 0x1.07f3300000000p-8, -0x1.b7fafe0000000p-8, 0x1.6255320000000p-9, -0x1.346ef00000000p-8, 0x1.a948420000000p-9, 0x1.2fb6b80000000p-2, -0x1.383ce60000000p-8, -0x1.fe50aa0000000p-9, 0x1.13ed9e0000000p-10,
0x1.edf5680000000p-11, -0x1.703e680000000p-9, 0x1.e579680000000p-16, 0x1.cdc1d00000000p-12, -0x1.2e31940000000p-2, -0x1.1b89680000000p-9, 0x1.f088ca0000000p-10, 0x1.29d3280000000p-8, -0x1.6408800000000p-8, -0x1.557a820000000p-8, -0x1.343b1a0000000p-8, 0x1.541a160000000p-10, 0x1.1db0be0000000p-1, -0x1.af98ea0000000p-10, 0x1.d4002e0000000p-12, -0x1.28a1aa0000000p-9,
-0x1.28d2080000000p-9, -0x1.8c43040000000p-10, -0x1.d78a180000000p-10, -0x1.2a1e780000000p-9, -0x1.ad8b780000000p-1, 0x1.23d41a0000000p-10, 0x1.3f14fe0000000p-9, -0x1.43261c0000000p-16, 0x1.8d18de0000000p-11, -0x1.a77a9e0000000p-14, 0x1.2dc0ba0000000p-9, -0x1.496fea0000000p-11, 0x1.ba47b40000000p-4, 0x1.0405380000000p-9, 0x1.75308e0000000p-10, -0x1.b371460000000p-12,
-0x1.dc7cc20000000p-8, -0x1.6aa8a40000000p-8, -0x1.1b499a0000000p-7, -0x1.2769c00000000p-7, 0x1.13f3440000000p-6, 0x1.9922a40000000p-8, 0x1.bff37e0000000p-8, -0x1.3d44920000000p-10, 0x1.738e6a0000000p-9, 0x1.bc8d6a0000000p-10, 0x1.24ab360000000p-8, -0x1.1316340000000p-9, -0x1.9b07ca0000000p-2, 0x1.5ab1f80000000p-9, 0x1.c169b80000000p-9, 0x1.aa58a00000000p-11,
0x1.62cb4a0000000p-10, 0x1.26baea0000000p-8, 0x1.f935be0000000p-11, 0x1.e0f51e0000000p-10, -0x1.68083e0000000p-3, -0x1.61f0ac0000000p-10, -0x1.36c6900000000p-9, 0x1.a34f580000000p-9, -0x1.2a732e0000000p-9, 0x1.d658ce0000000p-18, -0x1.3494280000000p-10, 0x1.8a5e980000000p-10, 0x1.6f1b5c0000000p-4, -0x1.6326040000000p-9, -0x1.d2e4e20000000p-12, -0x1.376f9c0000000p-11,
-0x1.d129820000000p-7, -0x1.fb78900000000p-8, -0x1.3d01c20000000p-7,

-0x1.ef6d680000000p-8, -0x1.dd48b60000000p-7, 0x1.5c15a20000000p-8, 0x1.168cf00000000p-7, -0x1.a8885c0000000p-9, 0x1.20aeda0000000p-8, 0x1.de284c0000000p-10, 0x1.2302a40000000p-8, -0x1.d9ddd20000000p-13, -0x1.42b7f00000000p-1, 0x1.db8a1c0000000p-11, 0x1.fd34240000000p-15, -0x1.b7712c0000000p-17,
0x1.6c16140000000p-6, 0x1.0a3dfa0000000p-7, 0x1.589ed20000000p-6, 0x1.539eb40000000p-6, -0x1.f728be0000000p-4, -0x1.1d15ae0000000p-6, -0x1.ee18d20000000p-7, 0x1.eecb620000000p-8, -0x1.845ecc0000000p-7, -0x1.5eec220000000p-9, -0x1.29163a0000000p-10, 0x1.b234f60000000p-8, 0x1.a24c6e0000000p-4, -0x1.9954ee0000000p-8, -0x1.b3c5f00000000p-9, -0x1.2b6d2e0000000p-9,
0x1.a56bf40000000p-6, 0x1.9fbfa40000000p-7, 0x1.5d2a140000000p-6, 0x1.5c38200000000p-6, 0x1.0ce4a40000000p-6, -0x1.3e65ec0000000p-7, -0x1.615b9c0000000p-6, 0x1.45b1680000000p-8, -0x1.9e2b3c0000000p-7, -0x1.bc51180000000p-10, -0x1.fd96da0000000p-8, 0x1.941d3c0000000p-8, -0x1.361bdc0000000p-2, -0x1.0d2d040000000p-7, -0x1.8e00440000000p-8, 0x1.946bea0000000p-11,
0x1.23504c0000000p-11, -0x1.d3783c0000000p-10, -0x1.37ffec0000000p-11, 0x1.6cade20000000p-13, -0x1.37f2540000000p-2, -0x1.dddff00000000p-11, 0x1.14dca40000000p-10, 0x1.42b2420000000p-10, 0x1.6f5aec0000000p-12, 0x1.97d85e0000000p-11, 0x1.84b9280000000p-11, -0x1.64918c0000000p-10, 0x1.18c7e00000000p-2, 0x1.491b0e0000000p-17, -0x1.f7f1300000000p-15, -0x1.21f60a0000000p-10,
-0x1.5044260000000p-7, -0x1.41fff80000000p-8, -0x1.447aa40000000p-7, -0x1.3c44560000000p-7, -0x1.ea45980000000p-3, 0x1.0fc69c0000000p-8, 0x1.27b4540000000p-7, 0x1.5c886a0000000p-11, 0x1.df79440000000p-9, -0x1.03639a0000000p-10, 0x1.966ed60000000p-10, 0x1.6ed2980000000p-10, 0x1.9d97de0000000p-1, 0x1.093cce0000000p-12, 0x1.c0992a0000000p-11, 0x1.75319c0000000p-9,
-0x1.4b50fc0000000p-8, -0x1.568b140000000p-10, -0x1.355d120000000p-9, -0x1.2109ee0000000p-8, -0x1.f4ddb40000000p-2, 0x1.3cebfe0000000p-8, 0x1.38d9a40000000p-8, -0x1.8642aa0000000p-10, 0x1.74fe040000000p-8, 0x1.c86f540000000p-10, -0x1.e6e05c0000000p-12, 0x1.2964780000000p-11, -0x1.4e58020000000p-6, 0x1.750fa40000000p-10, -0x1.733b860000000p-9, 0x1.5d6fbe0000000p-9,
0x1.9891be0000000p-4, 0x1.9082100000000p-4, -0x1.084cb40000000p-4, -0x1.a86ba60000000p-3, 0x1.42737a0000000p-3, 0x1.2a2e200000000p-3, -0x1.960aec0000000p-3, 0x1.ac39b80000000p-7, -0x1.7291fe0000000p-3, -0x1.5365d80000000p-4, -0x1.17fdea0000000p-5, 0x1.a6a4d60000000p-3, 0x1.fd811a0000000p-4, -0x1.293aa60000000p-5, -0x1.2a90740000000p-4, 0x1.52e80a0000000p-9,
0x1.ea70180000000p-10, -0x1.edc9fa0000000p-13, 0x1.be09b00000000p-9, 0x1.6fdbac0000000p-10, 0x1.2b09460000000p-1, -0x1.dfad280000000p-10,

-0x1.9809e60000000p-10, -0x1.7310ba0000000p-10, -0x1.d8ecdc0000000p-9, -0x1.31f2d00000000p-9, -0x1.b5bfff0000000p-9, -0x1.2677300000000p-9, 0x1.c30c6e0000000p-2, -0x1.333edc0000000p-11, 0x1.8a138a0000000p-11, -0x1.7311d40000000p-10,
0x1.5f9de80000000p+2, 0x1.872ab80000000p-1, 0x1.6f57f00000000p+1, 0x1.a7c9d20000000p+1, 0x1.96798a0000000p-1, -0x1.4346520000000p-1, -0x1.1bf3820000000p+1, 0x1.c87f220000000p-3, -0x1.8641320000000p-1, -0x1.f366780000000p-6, -0x1.94dfe00000000p-2, 0x1.36e74a0000000p-2, -0x1.faf0c00000000p-4, -0x1.9a0c560000000p-2, -0x1.32b1e20000000p-2, 0x1.451ef20000000p-8,
-0x1.d1346c0000000p-7, -0x1.1887c40000000p-8, -0x1.7cca660000000p-7, -0x1.c0a9c20000000p-7, -0x1.e207b80000000p-4, 0x1.ac2da20000000p-8, 0x1.2abd920000000p-7, -0x1.9cc5580000000p-10, 0x1.b7435e0000000p-9, -0x1.3cd3760000000p-8, 0x1.b721ce0000000p-13, -0x1.a595280000000p-11, 0x1.284f380000000p-4, 0x1.3d72340000000p-12, -0x1.fd135c0000000p-10, 0x1.7637720000000p-9,
0x1.5b416e0000000p-9, 0x1.609f700000000p-10, 0x1.bb98760000000p-9, 0x1.6ffa360000000p-9, 0x1.722f200000000p-7, -0x1.2f83aa0000000p-9, -0x1.1b94d60000000p-9, 0x1.20d0840000000p-11, -0x1.4496c80000000p-8, -0x1.aa35b40000000p-13, -0x1.9ce2c00000000p-10, 0x1.9aef080000000p-10, -0x1.3c07b60000000p-10, -0x1.f8ef860000000p-9, -0x1.118a7a0000000p-10, 0x1.9d75080000000p-11,
-0x1.1ecb040000000p-5, -0x1.f10fb80000000p-7, -0x1.fd35ea0000000p-6, -0x1.e8976a0000000p-6, -0x1.02c5f40000000p-4, 0x1.abe8100000000p-7, 0x1.c9c0d40000000p-6, -0x1.bba9da0000000p-9, 0x1.e1c6100000000p-7, 0x1.fe275a0000000p-10, 0x1.bf63920000000p-8, -0x1.412e2e0000000p-8, 0x1.b4e6300000000p-5, 0x1.8ee4220000000p-7, 0x1.cf3fd60000000p-9, -0x1.0619240000000p-10,
0x1.65a3b20000000p-5, 0x1.076bd40000000p-6, 0x1.2b28f80000000p-5, 0x1.32b92a0000000p-5, -0x1.1e3ede0000000p-3, -0x1.3d14e00000000p-7, -0x1.01cd9a0000000p-5, 0x1.9187ac0000000p-8, -0x1.0654000000000p-6, 0x1.eb10400000000p-10, -0x1.85d4f60000000p-8, 0x1.0ef6620000000p-7, 0x1.0ac6e60000000p-6, -0x1.2494ac0000000p-7, -0x1.4200620000000p-8, -0x1.8b31420000000p-12,
-0x1.3d84140000000p-5, -0x1.fab80a0000000p-7, -0x1.03eb5a0000000p-5, -0x1.0996600000000p-5, -0x1.01dde60000000p-1, 0x1.aed93c0000000p-7, 0x1.eaba620000000p-6, -0x1.378fbe0000000p-8, 0x1.f49dd60000000p-7, -0x1.eda8c60000000p-13, 0x1.0a266a0000000p-7, -0x1.e599ea0000000p-8, -0x1.f9a9e60000000p-4, 0x1.1620020000000p-7, 0x1.a953620000000p-8, 0x1.4437fa0000000p-13,
0x1.5067920000000p-7, 0x1.f5e5760000000p-9, 0x1.3b30560000000p-7, 0x1.1978ea0000000p-7, -0x1.f5830e0000000p-2, -0x1.83560a0000000p-9, -0x1.1d93000000000p-7, 0x1.ddc9fe0000000p-13, -0x1.147f400000000p-9,

0x1.98d2ec0000000p-11, -0x1.0cc0bc0000000p-9, 0x1.3fe3240000000p-9, 0x1.038dea0000000p-6, -0x1.24b3220000000p-9, -0x1.fee3e40000000p-10, 0x1.2d1d780000000p-10,
0x1.cffa960000000p-6, 0x1.9df73a0000000p-7, 0x1.98d8c80000000p-6, 0x1.a6f13a0000000p-6, 0x1.3f5b880000000p-1, -0x1.ba056a0000000p-7, -0x1.8a052a0000000p-6, 0x1.b420fa0000000p-9, -0x1.80636c0000000p-7, -0x1.e4249c0000000p-11, -0x1.c61e300000000p-8, 0x1.cbc3c00000000p-8, 0x1.a000b40000000p-5, -0x1.eb431a0000000p-8, -0x1.94f6c80000000p-8, 0x1.302db00000000p-10,
0x1.7a26620000000p-5, 0x1.d10b640000000p-7, 0x1.3d7bd60000000p-5, 0x1.51ef300000000p-5, 0x1.50961c0000000p-2, -0x1.01cd780000000p-6, -0x1.10dc640000000p-5, 0x1.2e269e0000000p-7, -0x1.0eef620000000p-6, -0x1.03ea9a0000000p-8, -0x1.59ec400000000p-7, 0x1.3e0f720000000p-7, 0x1.ccdfba0000000p-7, -0x1.5846420000000p-7, -0x1.82822c0000000p-8, 0x1.1e4cb80000000p-9,
-0x1.360ee40000000p-6, -0x1.e31c000000000p-8, -0x1.bafb980000000p-7, -0x1.e5db8c0000000p-7, -0x1.3e66c20000000p-2, 0x1.a744e60000000p-9, 0x1.662c9e0000000p-7, 0x1.99cb0c0000000p-10, 0x1.865b080000000p-7, 0x1.eb5efa0000000p-10, 0x1.0576780000000p-7, -0x1.1dffe60000000p-11, 0x1.d011860000000p-4, 0x1.4ae8240000000p-9, 0x1.9e5a7a0000000p-8, -0x1.5069ec0000000p-9,
-0x1.a09d660000000p-4, -0x1.530d420000000p-5, -0x1.63017c0000000p-4, -0x1.7213e40000000p-4, -0x1.debafe0000000p-2, 0x1.1ecff80000000p-5, 0x1.4390d40000000p-4, -0x1.cd4d280000000p-7, 0x1.4def1a0000000p-5, -0x1.a9574e0000000p-12, 0x1.54792e0000000p-6, -0x1.22805a0000000p-6, -0x1.1d847c0000000p-2, 0x1.71cd640000000p-6, 0x1.13ccec0000000p-6, -0x1.0bf1bc0000000p-10,
0x1.222f680000000p-6, 0x1.3d90e00000000p-7, 0x1.1e3e2e0000000p-6, 0x1.00114c0000000p-6, -0x1.031bd40000000p-3, -0x1.9cab920000000p-8, -0x1.d5c02a0000000p-7, 0x1.36afae0000000p-9, -0x1.5113e00000000p-7, 0x1.7490ba0000000p-11, -0x1.79b4380000000p-8, 0x1.91ebe20000000p-9, -0x1.0fd2460000000p-5, -0x1.24c3880000000p-9, -0x1.e6d70e0000000p-9, -0x1.16d6740000000p-11,
0x1.8c2a820000000p-7, 0x1.cb8fcc0000000p-8, 0x1.376a600000000p-7, 0x1.5501ae0000000p-7, 0x1.d782640000000p-4, -0x1.5df7820000000p-8, -0x1.5f99f20000000p-7, 0x1.898a6e0000000p-9, -0x1.1fece00000000p-7, 0x1.0b0c0e0000000p-11, -0x1.9aad440000000p-11, 0x1.9b21560000000p-8, -0x1.3339cc0000000p-3, -0x1.325f160000000p-10, -0x1.24882c0000000p-9, -0x1.d7b5b60000000p-10,
0x1.6472ba0000000p-6, 0x1.65a1d20000000p-7, 0x1.2909320000000p-6, 0x1.7bb62e0000000p-6, -0x1.e5bbcc0000000p-4, -0x1.aedd740000000p-8, -0x1.37f01a0000000p-6, 0x1.5040660000000p-9, -0x1.0bb0aa0000000p-7, 0x1.4a7af00000000p-9, -0x1.d5243e0000000p-8, 0x1.c00c460000000p-9,

0x1.8f6c500000000p-2, -0x1.1527f80000000p-7, -0x1.656eaa0000000p-8, 0x1.2c8bc00000000p-10,
0x1.dce1f20000000p-5, 0x1.1e74d40000000p-5, 0x1.d4a4f60000000p-5, 0x1.aed3d20000000p-5, 0x1.ff698e0000000p-2, -0x1.3491480000000p-6, -0x1.988d380000000p-5, 0x1.52f33c0000000p-7, -0x1.87be160000000p-6, -0x1.0a44ae0000000p-12, -0x1.8123ce0000000p-8, 0x1.1df4ac0000000p-7, 0x1.e86eb60000000p-2, -0x1.1bf5a40000000p-8, -0x1.841a220000000p-7, 0x1.a8e5200000000p-11,
-0x1.3f89c20000000p-8, -0x1.9e28d80000000p-10, -0x1.7eb31e0000000p-9, -0x1.089d0c0000000p-8, -0x1.975ac60000000p-3, 0x1.fe0e6e0000000p-13, 0x1.61e1580000000p-9, -0x1.7fed040000000p-12, 0x1.0b0cec0000000p-10, 0x1.3551980000000p-16, -0x1.9df84e0000000p-11, -0x1.817b9c0000000p-10, 0x1.3e828a0000000p-7, -0x1.3533d80000000p-12, 0x1.9fd8f60000000p-16, -0x1.ebf3800000000p-9,

Table B.3 Parameters of context decoding neural network Layer 1 CNN (bias parameter:bias)

Parameter value
0x1.b737080000000p-3, -0x1.635d260000000p+1, -0x1.993fd20000000p-2, -0x1.c72c020000000p+0, -0x1.63e0fa0000000p+1, 0x1.41686e0000000p-2, -0x1.f642a00000000p-3, 0x1.4067f20000000p-1, -0x1.0798e40000000p-2, -0x1.eb1dd60000000p-1, 0x1.04c7d80000000p-5, -0x1.76560e0000000p-1, -0x1.b0c64a0000000p-2, -0x1.2410f60000000p-1, -0x1.0f3c6c0000000p+0, -0x1.d71c320000000p-2,

Table B.4 Parameters of context decoding neural network, layer 2 CNN (convolutional kernel parameter:kernel)

Parameter value
0x1.2a9e6a0000000p-1, 0x1.acf3840000000p+1, 0x1.8011da0000000p-2, 0x1.a34f7a0000000p-1, 0x1.57683a0000000p+1, -0x1.40068e0000000p-2, 0x1.a4af4a0000000p-6, -0x1.c33c040000000p-6, -0x1.a70f300000000p-3, -0x1.9a64a80000000p-2, -0x1.50111e0000000p-1, 0x1.da8a060000000p-3, 0x1.a3f6d40000000p-4, 0x1.3059a40000000p-3, 0x1.beaa700000000p-2, -0x1.5a652a0000000p+0,
-0x1.3cb0220000000p-7, 0x1.94a3600000000p+0, 0x1.6fa2b40000000p-3, 0x1.41c3340000000p-3, 0x1.7b7b320000000p-5, 0x1.e327ea0000000p-3, -0x1.cc8d1a0000000p-3, -0x1.110b140000000p-3, 0x1.4a56680000000p-5, 0x1.d96b240000000p-4, -0x1.434bbe0000000p-3, 0x1.bb9c240000000p-4, 0x1.d2adb00000000p-2, -0x1.8218540000000p-6, -0x1.326f560000000p-11, -0x1.d9cfb00000000p-4,
0x1.77449c0000000p-2, 0x1.d30b460000000p-1, -0x1.83be980000000p-3, 0x1.89c0e00000000p-3, 0x1.d443b20000000p-2, 0x1.fc7a820000000p-13, -0x1.d5c4100000000p-2, -0x1.2be84a0000000p-4, -0x1.2f67540000000p-3,

0x1.f10a5e0000000p-3, -0x1.7777040000000p-2, -0x1.718d460000000p-8, 0x1.457ad20000000p-3, -0x1.38cd280000000p-5, 0x1.3530880000000p-2, -0x1.dc22f20000000p-1,
0x1.2583740000000p-1, 0x1.2a62620000000p+2, 0x1.4452900000000p-3, 0x1.92e2bc0000000p+0, 0x1.c14b3e0000000p+0, -0x1.7ce9480000000p-2, -0x1.02a5fe0000000p-1, -0x1.d6e4e60000000p-2, -0x1.3687700000000p-6, -0x1.e55ad40000000p-3, -0x1.dd72760000000p-2, 0x1.cd121e0000000p-1, 0x1.7ac87c0000000p-2, -0x1.4ca4f60000000p-2, 0x1.6763c00000000p-1, -0x1.3eb2900000000p+1,
0x1.bb17b60000000p-1, 0x1.73fba80000000p+0, 0x1.3c39a60000000p-5, 0x1.f4fd9e0000000p-3, 0x1.39a19e0000000p-1, -0x1.f54e040000000p-3, -0x1.5cb8760000000p-3, -0x1.da4c0c0000000p-4, -0x1.b9bda20000000p-2, -0x1.bf87ba0000000p-2, -0x1.bbb1200000000p-4, 0x1.81fb200000000p-2, -0x1.1bbf9c0000000p-3, 0x1.099bd20000000p-5, 0x1.b7b3960000000p-3, -0x1.b7951e0000000p-1,
-0x1.d6b2280000000p-8, 0x1.1f7f660000000p-2, 0x1.4550500000000p-4, 0x1.48d4d60000000p-3, -0x1.07163e0000000p-2, -0x1.2e35000000000p-3, 0x1.ff12200000000p-4, -0x1.f67c120000000p-10, -0x1.913bec0000000p-3, 0x1.9e0c420000000p-6, 0x1.075c0a0000000p-5, 0x1.eb70ec0000000p-1, 0x1.0f39060000000p-4, 0x1.af02500000000p-3, 0x1.aaa3940000000p-3, -0x1.1491200000000p-2,
0x1.53bcb40000000p-6, 0x1.efbd120000000p-1, 0x1.42dd3a0000000p-3, 0x1.7dd7be0000000p-3, 0x1.bc7f2e0000000p-2, 0x1.6d57a20000000p-3, -0x1.55391c0000000p-3, -0x1.0ff51a0000000p-3, -0x1.4aa7740000000p-2, 0x1.0bc9300000000p-2, -0x1.9300620000000p-4, 0x1.b8bfa60000000p-4, 0x1.4e46120000000p-6, 0x1.6d65fa0000000p-2, 0x1.905ee20000000p-2, -0x1.81c9f40000000p-3,
-0x1.1b3f120000000p-11, -0x1.4fbe880000000p-2, 0x1.d5deb80000000p-4, -0x1.d0931a0000000p-5, 0x1.3efb540000000p-3, 0x1.4acc940000000p-4, -0x1.1c4dee0000000p-1, -0x1.2062660000000p-4, -0x1.d5e9600000000p-3, -0x1.fdc1580000000p-2, -0x1.c340940000000p-5, -0x1.39c68a0000000p-3, 0x1.6e35f00000000p-6, 0x1.e144700000000p-6, 0x1.3c55560000000p-1, -0x1.2bf3420000000p-1,
0x1.1000100000000p-2, -0x1.b60bfa0000000p-4, -0x1.19c0f80000000p-3, 0x1.b386740000000p-5, -0x1.3e315c0000000p-2, 0x1.091b780000000p-1, -0x1.7b52a20000000p-2, 0x1.68c9f60000000p-3, -0x1.2d392a0000000p-3, 0x1.f9b3540000000p-4, -0x1.dc8a1c0000000p-3, 0x1.ed66720000000p-2, -0x1.7c633a0000000p-2, 0x1.84b7700000000p-3, 0x1.cf38fc0000000p-2, -0x1.303da40000000p-3,
0x1.8230180000000p-3, 0x1.60d3980000000p+0, -0x1.4f231e0000000p-3, 0x1.1e03b20000000p-1, 0x1.a2d0240000000p+0, -0x1.9302480000000p-4, -0x1.1a1f120000000p-2, -0x1.8a676e0000000p-4, -0x1.78ca920000000p-1, 0x1.ba15060000000p+0, -0x1.8074740000000p-3, -0x1.14e95c0000000p-3,

0x1.460d080000000p-3, 0x1.1a6d560000000p-2, 0x1.abeaae0000000p-2, -0x1.1f10ac0000000p+1,
0x1.27f8fa0000000p-2, 0x1.b7753a0000000p-3, -0x1.61e35c0000000p-3, 0x1.5469780000000p-2, 0x1.dcc1d20000000p-1, -0x1.51dcd60000000p-3, 0x1.9e2fb80000000p-4, -0x1.e4e8160000000p-3, -0x1.a158700000000p-1, -0x1.3066340000000p-1, 0x1.05926a0000000p-5, -0x1.31349c0000000p-2, 0x1.62087c0000000p-6, 0x1.02b5c40000000p-2, 0x1.bebb1c0000000p-2, -0x1.9e570a0000000p-2,
-0x1.8c405c0000000p-2, 0x1.120a5a0000000p+0, 0x1.db47620000000p-5, 0x1.2fd7c80000000p-1, 0x1.38474c0000000p-1, -0x1.31069c0000000p-6, -0x1.54876e0000000p-5, 0x1.0b473c0000000p-3, -0x1.62150a0000000p-1, -0x1.5801080000000p-1, 0x1.8e8fda0000000p-4, 0x1.8db6640000000p-3, 0x1.8acaea0000000p-3, 0x1.2979f60000000p-2, 0x1.18c40a0000000p-3, -0x1.455a1c0000000p-1,
0x1.8ea3300000000p-2, 0x1.0f30940000000p-1, 0x1.0eb5540000000p-2, 0x1.4e016c0000000p-2, -0x1.4bb0080000000p-1, -0x1.138fbe0000000p-4, -0x1.81690c0000000p-2, -0x1.b7ba600000000p-4, -0x1.d450160000000p-4, 0x1.e6eaac0000000p-3, -0x1.319b6a0000000p-3, -0x1.09c4720000000p-4, -0x1.4275720000000p-3, 0x1.88c1560000000p-4, -0x1.0f4f560000000p-1, -0x1.ee3f540000000p-3,
-0x1.0f28240000000p-3, 0x1.4869b00000000p-1, 0x1.58f72a0000000p-3, 0x1.1059460000000p-2, 0x1.d12d2e0000000p-2, 0x1.352c680000000p-3, -0x1.30f94c0000000p-4, 0x1.02b0180000000p-4, 0x1.dc1d780000000p-6, 0x1.5a10780000000p-1, 0x1.2dedfc0000000p-3, 0x1.d7e6bc0000000p-2, 0x1.85996a0000000p-3, 0x1.dcb52c0000000p-5, 0x1.5cf15a0000000p-2, -0x1.9e21580000000p-1,
0x1.db76ce0000000p-2, 0x1.0a93420000000p-1, 0x1.54dad80000000p-2, 0x1.0d613a0000000p-2, -0x1.d70bc00000000p-1, -0x1.5637700000000p-3, -0x1.065ed60000000p-2, -0x1.6a8dac0000000p-11, -0x1.df807c0000000p-4, 0x1.3fa36a0000000p-7, 0x1.dcfb120000000p-3, 0x1.0d22f40000000p-5, 0x1.7f04300000000p-3, 0x1.679f120000000p-1, -0x1.dfba660000000p-4, -0x1.09932a0000000p+0,
-0x1.67a2fc0000000p-1, -0x1.2511400000000p-4, -0x1.7b7c040000000p-2, 0x1.7519c40000000p-5, 0x1.a6e82e0000000p-2, 0x1.1c3b8e0000000p-5, -0x1.1961280000000p-3, 0x1.f94ce00000000p-3, -0x1.06b0840000000p-1, -0x1.0ccce80000000p+0, 0x1.5e820a0000000p-2, 0x1.099b300000000p-2, -0x1.a33c5c0000000p-3, -0x1.9eb9820000000p-3, -0x1.7523d80000000p-2, -0x1.0a4a160000000p+0,
0x1.cf0f780000000p-2, 0x1.2dfe800000000p-2, -0x1.1691820000000p-1, 0x1.97642c0000000p-1, 0x1.fb20900000000p-1, -0x1.03564a0000000p-3, -0x1.dbbae60000000p-4, -0x1.9717c20000000p-6, -0x1.b79acc0000000p-2, -0x1.1815c40000000p-1, 0x1.f484c80000000p-3, 0x1.b15d580000000p-4, -0x1.3f217a0000000p-3, 0x1.f24d220000000p-7, 0x1.d44eca0000000p-2,

-0x1.da581e0000000p-2,
0x1.6930940000000p-3, 0x1.e5cc000000000p-3, 0x1.0a8d9e0000000p-4, 0x1.44c8120000000p-4, 0x1.afc5680000000p-3, 0x1.c969dc0000000p-4, -0x1.bf5eb00000000p-4, -0x1.7489da0000000p-4, -0x1.387fd20000000p-3, -0x1.096c660000000p-1, -0x1.e962280000000p-5, 0x1.0270020000000p-5, 0x1.afdb460000000p-3, 0x1.9272dc0000000p-4, 0x1.4ae3120000000p-3, -0x1.683b820000000p-5,
-0x1.496dfa0000000p-2, -0x1.3d3b9a0000000p-3, 0x1.8db2f00000000p-8, -0x1.9cab300000000p-6, 0x1.202afa0000000p-5, 0x1.e32d720000000p-6, -0x1.e8c76c0000000p-9, -0x1.9ccfa80000000p-3, -0x1.93ddd60000000p-7, 0x1.7336780000000p-4, -0x1.088a500000000p-5, 0x1.4aaf7e0000000p-3, -0x1.22685a0000000p-2, -0x1.93e2620000000p-4, 0x1.fdf6b80000000p-4, 0x1.87d7ee0000000p-8,
-0x1.4abd900000000p-5, 0x1.3cbb060000000p-2, 0x1.39855e0000000p-5, 0x1.56a0820000000p-1, 0x1.3589520000000p+0, -0x1.0bfe980000000p-3, -0x1.8f2b360000000p-3, -0x1.48fb160000000p-3, 0x1.465d1c0000000p-4, -0x1.848c780000000p-1, -0x1.664cd20000000p-3, 0x1.e9455e0000000p-3, 0x1.5865700000000p-3, 0x1.07b5f20000000p-3, 0x1.9b14100000000p-2, -0x1.34f4460000000p-2,
0x1.87bbba0000000p-4, 0x1.3c66d40000000p-1, -0x1.6b88620000000p-3, -0x1.5480aa0000000p-3, 0x1.26af540000000p-1, 0x1.c908e80000000p-5, -0x1.4b55820000000p-3, 0x1.5522c40000000p-5, 0x1.4787aa0000000p-4, -0x1.165e0e0000000p-3, 0x1.e8e0fa0000000p-5, -0x1.77acb80000000p-2, -0x1.25b4200000000p-1, -0x1.34e84c0000000p+0, 0x1.cb5b520000000p-5, -0x1.5da8d60000000p-3,
0x1.658d5e0000000p-1, 0x1.a245cc0000000p-3, 0x1.e4dd3e0000000p-6, -0x1.075f880000000p-6, 0x1.4604dc0000000p-2, -0x1.f3e5640000000p-6, 0x1.e5d6200000000p-6, -0x1.6f73a60000000p-1, -0x1.56278e0000000p+0, -0x1.44411c0000000p-3, 0x1.4631060000000p-4, 0x1.146eac0000000p-1, 0x1.3844200000000p-5, -0x1.2112d40000000p-4, 0x1.93d6240000000p-2, -0x1.093f660000000p-4,
0x1.3c669c0000000p-13, -0x1.6c2ea40000000p-8, 0x1.90a1c00000000p-4, 0x1.4e92cc0000000p-3, 0x1.3373a40000000p-1, 0x1.8762160000000p-3, -0x1.01714e0000000p-3, -0x1.3214d40000000p-3, -0x1.ca05b40000000p-5, -0x1.fa776a0000000p-3, -0x1.5d58f40000000p-4, -0x1.53f3ae0000000p-5, 0x1.251b820000000p-2, -0x1.e8d3dc0000000p-7, -0x1.62a20c0000000p-2, -0x1.0cef0a0000000p-6,
0x1.04e31c0000000p-2, -0x1.6d429a0000000p-3, -0x1.468df60000000p-7, -0x1.8506120000000p-5, -0x1.92ade00000000p-1, 0x1.a516180000000p-5, -0x1.95fcca0000000p-5, -0x1.03e9400000000p-4, -0x1.0212180000000p-3, 0x1.2e9a300000000p-6, -0x1.3c7c860000000p-5, 0x1.4da71e0000000p-3, 0x1.5529160000000p-6, -0x1.3fc3880000000p-3, 0x1.bef81a0000000p-4, 0x1.43753c0000000p-4,

0x1.eefb640000000p-2, 0x1.1fd5d40000000p-2, 0x1.128af40000000p-3, 0x1.4ed46a0000000p-5, 0x1.1d5a220000000p-4, 0x1.4e00c60000000p-4, 0x1.6356760000000p-5, 0x1.6cf0740000000p-5, -0x1.9dcca00000000p-3, -0x1.e369800000000p-4, -0x1.78bc500000000p-6, 0x1.7650c80000000p-2, -0x1.9ab98e0000000p-4, -0x1.6d33c00000000p-3, 0x1.d3bffe0000000p-2, -0x1.91dc960000000p-4,
0x1.27079a0000000p-2, 0x1.833f940000000p-2, -0x1.8b0ba60000000p-7, 0x1.08bcc80000000p-2, 0x1.2b9f560000000p-2, 0x1.65bf040000000p-5, -0x1.00c2b00000000p-3, 0x1.8051ae0000000p-9, -0x1.2138ec0000000p-3, 0x1.84b4da0000000p-3, -0x1.943db20000000p-5, 0x1.3b5aba0000000p-5, 0x1.2234840000000p-4, -0x1.0df4180000000p-3, 0x1.39fb440000000p-3, 0x1.166f3c0000000p-1,
-0x1.3a93d60000000p-6, 0x1.d181920000000p-4, -0x1.b995140000000p-8, -0x1.3d5fae0000000p-4, -0x1.bcca740000000p-4, 0x1.0cb5340000000p-5, -0x1.96a9160000000p-3, -0x1.0dc2120000000p-2, 0x1.bc2e700000000p-3, -0x1.4804b80000000p-5, -0x1.628d960000000p-5, 0x1.4c6fc60000000p-7, - 0x1.babbb60000000p-4, 0x1.76a43a0000000p-4, 0x1.2ab79e0000000p-3, 0x1.866b8e0000000p-7,
0x1.4a08d80000000p-2, 0x1.37c1920000000p-2, -0x1.0ffbf40000000p-1, 0x1.be2d780000000p-1, 0x1.7e1a3a0000000p+0, -0x1.81d22e0000000p-4, -0x1.195f820000000p-2, 0x1.d980740000000p-3, -0x1.c4c8160000000p-3, -0x1.12db9a0000000p-2, -0x1.91f4a20000000p-2, -0x1.67554c0000000p-4, -0x1.6188860000000p-5, -0x1.3d8ca80000000p-3, 0x1.ec7ba00000000p-2, 0x1.1c48720000000p-3,
0x1.1fdffc0000000p-3, 0x1.a1f22a0000000p-2, 0x1.2170cc0000000p-2, 0x1.8056000000000p-4, -0x1.7226440000000p-3, -0x1.8bc9040000000p-4, -0x1.89a9ac0000000p-8, -0x1.fe74120000000p-4, -0x1.53ea700000000p-4, 0x1.0866e20000000p-2, -0x1.8247180000000p-5, 0x1.328ab40000000p-2, 0x1.e6be520000000p-2, -0x1.233e3c0000000p-2, 0x1.72d6860000000p-2, -0x1.5f63aa0000000p+0,
0x1.622e380000000p-2, 0x1.6592960000000p-3, -0x1.146bc00000000p-2, 0x1.aab2a20000000p-9, 0x1.2180580000000p+0, -0x1.9ce9360000000p-3, -0x1.dd44e40000000p-3, 0x1.26b3660000000p-5, 0x1.8e204e0000000p-3, -0x1.5060de0000000p-1, 0x1.c6b1e80000000p-4, 0x1.1c8e780000000p-1, -0x1.03575c0000000p-1, 0x1.812aec0000000p-5, 0x1.ed5e5a0000000p-3, 0x1.0589b80000000p-3,
0x1.81e0a80000000p-1, 0x1.4eb3e00000000p+0, -0x1.6de4000000000p-3, 0x1.950bf20000000p-2, 0x1.1d844e0000000p+1, -0x1.a3b9c80000000p-2, -0x1.c9fb6a0000000p-4, -0x1.0c72360000000p-3, -0x1.643a060000000p-3, -0x1.5f3d340000000p+0, -0x1.ec04380000000p-3, -0x1.fb3e480000000p-1, 0x1.0951820000000p-3, -0x1.efdbdc0000000p-3, 0x1.ec84020000000p-2, -0x1.e2024c0000000p+0,
0x1.cd519e0000000p-4, 0x1.9a9ff00000000p-3, -0x1.14ba7c0000000p-2,

0x1.5bb8be0000000p-2, 0x1.f044ea0000000p-4, -0x1.34a4380000000p-6, -0x1.34cae00000000p-3, 0x1.072a100000000p-3, -0x1.d6ea840000000p-2, 0x1.be8c620000000p-2, 0x1.d09caa0000000p-10, 0x1.c6cce00000000p-3, -0x1.46a4040000000p-2, -0x1.1dcc120000000p-3, 0x1.fbab6a0000000p-3, 0x1.d03fd40000000p-3,
0x1.40ea4e0000000p-2, -0x1.84b21a0000000p-4, -0x1.7f39b00000000p+0, -0x1.5a00d60000000p-3, -0x1.7794600000000p+1, -0x1.356e280000000p-1, -0x1.e8a7780000000p-5, -0x1.01c86c0000000p-1, -0x1.9753680000000p-3, -0x1.00776a0000000p-1, -0x1.1905a40000000p-2, -0x1.1d1c720000000p-2, -0x1.9d2c800000000p-6, -0x1.1edf1a0000000p-1, -0x1.c4bc220000000p-4, 0x1.2fe0a00000000p-3,
-0x1.8b52f00000000p-4, -0x1.25f2200000000p-2, -0x1.114e6c0000000p-4, 0x1.55bfea0000000p-6, -0x1.b32e8e0000000p-3, 0x1.52456e0000000p-4, -0x1.f3cf3a0000000p-4, -0x1.2305860000000p-5, 0x1.1ae6a60000000p-6, -0x1.bdd6aa0000000p-5, -0x1.60b7500000000p-4, -0x1.64ab1e0000000p-4, -0x1.bad3020000000p-8, 0x1.ea03bc0000000p-8, -0x1.ad39900000000p-2, 0x1.cb51960000000p-3,
0x1.0bbe400000000p-1, -0x1.e077440000000p-2, -0x1.1051e60000000p-5, -0x1.62b0120000000p-7, 0x1.5d2f6e0000000p+0, -0x1.6692da0000000p-5, -0x1.7510640000000p-2, -0x1.ad2dde0000000p-9, 0x1.eb94900000000p-4, -0x1.3c7c6a0000000p-1, 0x1.f301820000000p-5, -0x1.1334c60000000p+1, 0x1.a2d5480000000p-6, 0x1.720abc0000000p-3, 0x1.3951be0000000p-3, -0x1.78ead00000000p-3,
-0x1.b27f7c0000000p-2, -0x1.40928c0000000p+0, -0x1.0a6eca0000000p+0, -0x1.a0e5080000000p-1, -0x1.de76860000000p-1, -0x1.5394760000000p+0, -0x1.011a600000000p+0, -0x1.fdbad20000000p-1, -0x1.f09e1c0000000p-1, 0x1.01c5e00000000p-9, -0x1.44a76c0000000p-1, -0x1.1e4eb00000000p+0, -0x1.23a9940000000p+0, -0x1.f643780000000p-1, -0x1.565a0a0000000p-2, -0x1.4a7abe0000000p-3,
-0x1.91f2dc0000000p-1, 0x1.54de640000000p-3, -0x1.07805e0000000p-2, 0x1.24f8820000000p-2, 0x1.e7dcac0000000p-2, 0x1.adc7d20000000p-6, -0x1.b1da960000000p-2, -0x1.d30af40000000p-3, -0x1.e61a5c0000000p-2, -0x1.4b8ed00000000p-2, 0x1.4f860e0000000p-7, 0x1.353c860000000p-2, 0x1.5c25440000000p-3, 0x1.a8cd0a0000000p-7, 0x1.9cb8f00000000p-2, -0x1.fe02240000000p-2,
-0x1.a214a60000000p-3, -0x1.ee45da0000000p-4, -0x1.a10fb00000000p-3, -0x1.cc80f40000000p-3, 0x1.7ccba00000000p-3, -0x1.6a49e20000000p-2, -0x1.8777f80000000p-3, -0x1.0af2aa0000000p-1, -0x1.1722ae0000000p-3, -0x1.da2d080000000p-4, -0x1.3ba1c40000000p-3, -0x1.17cc4e0000000p-3, -0x1.2573cc0000000p-6, 0x1.f01a200000000p-5, 0x1.6a8e360000000p-3, -0x1.65d0a60000000p-3,
0x1.a910d60000000p-3, 0x1.f18f1c0000000p-3, -0x1.ebe1fa0000000p-5, -0x1.79800e0000000p-4, -0x1.edf78c0000000p-4, 0x1.a289dc0000000p-5,

-0x1.a6a7040000000p-3, -0x1.fbba620000000p-6, 0x1.22ccfa0000000p-4, -0x1.e14f4a0000000p-1, -0x1.dff9300000000p-6, -0x1.0c412a0000000p-3, 0x1.3e0c3e0000000p-4, 0x1.475afc0000000p-5, 0x1.f84be40000000p-3, -0x1.69b4cc0000000p-2,
-0x1.8659d40000000p-5, -0x1.2341860000000p-5, 0x1.2ca4800000000p-5, -0x1.b615a00000000p-5, 0x1.00bdd20000000p-3, 0x1.402ade0000000p-4, -0x1.fac57e0000000p-4, -0x1.827e9a0000000p-3, 0x1.08bc140000000p-2, -0x1.ee6fce0000000p-5, -0x1.a9fb780000000p-6, 0x1.86f0300000000p-3, 0x1.0c32b80000000p-3, 0x1.d1e0ca0000000p-4, 0x1.0e15320000000p-2, 0x1.0319060000000p-8,
0x1.20b3940000000p-2, -0x1.27e11a0000000p-3, -0x1.20d9e60000000p-3, -0x1.472f700000000p-6, 0x1.0ba4d20000000p-2, 0x1.8b75520000000p-3, -0x1.36cc700000000p-2, -0x1.f9acc20000000p-2, 0x1.53369c0000000p-2, 0x1.31814e0000000p-2, -0x1.4e83c00000000p-3, -0x1.19d2220000000p-4, 0x1.2dbd260000000p-5, -0x1.04273a0000000p-8, 0x1.b3e6480000000p-2, 0x1.3a78780000000p-2,
0x1.8381ac0000000p-2, 0x1.7d6a240000000p-1, -0x1.cd874e0000000p-2, 0x1.9c6c3c0000000p-2, 0x1.76afec0000000p-2, -0x1.1d61ac0000000p-3, -0x1.1a0c0a0000000p-3, -0x1.a028e20000000p-2, 0x1.5d2ec60000000p-1, 0x1.55cfb80000000p+0, -0x1.58ca8a0000000p-4, 0x1.3e00d80000000p-1, -0x1.025e9c0000000p-3, -0x1.86862a0000000p-2, 0x1.9147140000000p-2, -0x1.553d960000000p-1,
0x1.6407f40000000p-1, 0x1.8349140000000p-3, -0x1.db39140000000p-3, -0x1.a666820000000p-4, 0x1.f6183c0000000p-4, 0x1.2120f40000000p-7, 0x1.00a5940000000p-2, -0x1.3f14360000000p-1, -0x1.2487f00000000p-4, -0x1.15d42c0000000p-1, 0x1.644b4c0000000p-4, 0x1.d9e87a0000000p-4, -0x1.c87fe20000000p-5, 0x1.27ac580000000p-2, 0x1.3392d40000000p-1, -0x1.1cf2b60000000p-4,
-0x1.716c940000000p-4, -0x1.1e872c0000000p-5, -0x1.43157c0000000p-2, 0x1.03161c0000000p-3, 0x1.2ee1520000000p-1, 0x1.0bae500000000p-3, -0x1.646ace0000000p-4, 0x1.af71ee0000000p-6, 0x1.a577940000000p-3, 0x1.29e12a0000000p-2, -0x1.5763400000000p-9, -0x1.d380800000000p-4, -0x1.17238e0000000p-5, -0x1.c56a060000000p-4, 0x1.4364460000000p-2, 0x1.3f1c640000000p-2,
0x1.d2b5360000000p-3, -0x1.74bb600000000p-1, 0x1.9970140000000p-6, 0x1.149fec0000000p-2, 0x1.77f11e0000000p-4, 0x1.2fc1200000000p-6, -0x1.b6d6860000000p-3, 0x1.2a68120000000p-4, 0x1.7e7dde0000000p-7, -0x1.c97b560000000p-3, -0x1.f45bc20000000p-7, 0x1.68ca3c0000000p-2, - 0x1.43c6480000000p-5, 0x1.0d25040000000p-4, 0x1.0f05f60000000p-6, -0x1.ce4a380000000p-3,
0x1.89fa660000000p-4, 0x1.2e1d920000000p-1, -0x1.1028fc0000000p-2, 0x1.2810360000000p-6, -0x1.29f7ca0000000p-6, -0x1.43b4ac0000000p-2, 0x1.696b680000000p-3, -0x1.668cbc0000000p-3, 0x1.8cf46c0000000p-2,

-0x1.df75ae0000000p-3, 0x1.24318c0000000p-4, -0x1.4124b80000000p-2, -0x1.8091a00000000p+0, -0x1.ae4cea0000000p-6, -0x1.4b183e0000000p-2, 0x1.10c0cc0000000p-1,
-0x1.81c6c40000000p-4, 0x1.9ca85c0000000p-5, -0x1.d1bf6a0000000p-2, -0x1.f5b52e0000000p-4, -0x1.01d3ea0000000p-3, -0x1.9e98a00000000p+0, -0x1.7e3b8a0000000p+0, -0x1.5604780000000p+1, -0x1.b641ec0000000p-1, 0x1.3ededa0000000p-3, -0x1.39d6720000000p-1, -0x1.a3f40a0000000p-4, -0x1.a58ed80000000p-2, -0x1.fc9d420000000p-2, 0x1.712f6e0000000p-5, -0x1.2460b00000000p-1,
-0x1.2222be0000000p-3, 0x1.b16d520000000p-2, -0x1.ef074e0000000p-5, 0x1.68b4160000000p-3, 0x1.d32ba80000000p-1, 0x1.d988ae0000000p-5, 0x1.f532220000000p-6, -0x1.bc20c80000000p-2, -0x1.568c240000000p-2, -0x1.7b5fd40000000p-1, 0x1.cbe5560000000p-4, 0x1.afdb880000000p-1, -0x1.3c2d6a0000000p-2, -0x1.876a120000000p-5, -0x1.091e780000000p-4, 0x1.15b0d40000000p-3,

Table B.5 Parameters of context decoding neural network, layer 2 CNN (bias parameter:bias)

Parameter value
-0x1.8651700000000p+0, 0x1.3d20080000000p-7, -0x1.2adf2a0000000p-6, -0x1.bd9b740000000p+0, -0x1.38cc000000000p-3, -0x1.1858e00000000p-4, 0x1.4141d00000000p-6, 0x1.0ea0580000000p-10, -0x1.0c9ba60000000p-4, -0x1.acd53e0000000p-1, -0x1.8695fc0000000p-2, -0x1.63eb6e0000000p+0, -0x1.6c770e0000000p-5, -0x1.b741960000000p-4, -0x1.b0056c0000000p-1, -0x1.5847640000000p-2,

Table B.6 Parameters of the context decoding neural network: Layer 3 CNN (convolutional kernel parameter: kernel)

Parameter value
0x1.c85c500000000p-3, 0x1.a9ff920000000p-3, -0x1.216db20000000p-1, 0x1.0a1a2e0000000p-1, -0x1.9a86340000000p-1, 0x1.c22e7a0000000p-3, 0x1.ab533c0000000p-2, -0x1.fcfa9e0000000p-3, 0x1.2e4f300000000p-2, 0x1.dc9c1e0000000p-1, 0x1.9dafe80000000p-5, 0x1.354ae20000000p-2, -0x1.4881b80000000p-6, -0x1.54d7680000000p-2, 0x1.0dee8a0000000p-2, 0x1.ee0d4e0000000p-4,
0x1.79b3720000000p-2, -0x1.a945240000000p-10, -0x1.bb59e20000000p-2, 0x1.8f1b1c0000000p-1, -0x1.6894b40000000p+0, -0x1.97e0f40000000p-2, 0x1.7b5d2e0000000p-3, -0x1.c32bce0000000p-3, 0x1.039b1a0000000p-3, 0x1.78a7d00000000p-3, 0x1.0bc78c0000000p-4, 0x1.b196580000000p-5, 0x1.5cfa620000000p-2, -0x1.978bec0000000p-5, -0x1.474f400000000p-2, 0x1.9751880000000p-5,
0x1.0079e60000000p-2, -0x1.c738de0000000p-7, -0x1.e3e9780000000p-2,

0x1.b864800000000p-1, -0x1.71b1720000000p+0, -0x1.7773b60000000p-1, 0x1.16a8ec0000000p-3, -0x1.979a5c0000000p-3, 0x1.f2f1080000000p-4, 0x1.1b80c60000000p-3, 0x1.23e3de0000000p-4, 0x1.8f42fc0000000p-5, 0x1.bf29e40000000p-3, -0x1.906a9a0000000p-6, -0x1.7cffa60000000p-3, 0x1.4ce4800000000p-6,
0x1.8c49640000000p-2, -0x1.46ca0c0000000p-8, -0x1.294bd40000000p-1, 0x1.cab6860000000p-2, -0x1.5e67b80000000p+0, 0x1.6e8cae0000000p-1, 0x1.fdb9180000000p-3, -0x1.06736e0000000p-3, 0x1.1e4a1c0000000p-3, 0x1.1668480000000p-2, 0x1.0631500000000p-8, 0x1.239dc80000000p-5, 0x1.ebe5be0000000p-2, -0x1.3a8afe0000000p-4, -0x1.0eec320000000p-1, 0x1.022a800000000p-4,
0x1.43ac7e0000000p-1, -0x1.087bc20000000p-8, -0x1.99d48c0000000p-2, -0x1.3dc5e60000000p-1, -0x1.5bd7020000000p+0, -0x1.40ee280000000p-1, 0x1.10507e0000000p-4, -0x1.58656c0000000p-2, 0x1.ab96b00000000p-4, 0x1.b82f4a0000000p-5, -0x1.c844fa0000000p-3, 0x1.07f8880000000p-5, 0x1.a3265c0000000p-2, 0x1.fda6680000000p-7, 0x1.aecec80000000p+0, 0x1.2b29dc0000000p-4,
0x1.38274c0000000p-2, 0x1.990c100000000p-3, -0x1.01aca00000000p-1, 0x1.2c413e0000000p-1, -0x1.08fcee0000000p+0, 0x1.83d56c0000000p-3, 0x1.8f74d00000000p-2, -0x1.4a96f80000000p-2, 0x1.21b1d80000000p-2, 0x1.97360a0000000p-1, 0x1.5314c40000000p-1, 0x1.a056500000000p-3, 0x1.9a7dde0000000p-4, -0x1.5c84b80000000p-2, 0x1.bd72420000000p-3, 0x1.c1a8b40000000p-3,
0x1.c15eda0000000p-2, 0x1.cc72f20000000p-6, -0x1.4a0d460000000p-1, 0x1.1f65660000000p-1, -0x1.73f7a60000000p+0, 0x1.3f20f00000000p-1, 0x1.23fa800000000p-2, -0x1.0c8a3a0000000p-3, 0x1.61e0b80000000p-3, 0x1.ecf7420000000p-2, 0x1.4ce1ea0000000p-5, 0x1.8269060000000p-5, 0x1.d804c60000000p-2, -0x1.14ce240000000p-3, -0x1.2ccd840000000p-1, 0x1.cf523e0000000p-4,
0x1.dc1eda0000000p-2, -0x1.241edc0000000p-6, -0x1.83de640000000p-3, -0x1.0ba9060000000p-1, -0x1.2ddebe0000000p+0, 0x1.44defe0000000p-3, 0x1.1948740000000p-4, -0x1.7869360000000p-2, 0x1.85928e0000000p-4, 0x1.08bf500000000p-5, -0x1.05b6e00000000p-3, 0x1.f2c1f80000000p-7, 0x1.f3d3060000000p-5, 0x1.8fdb520000000p-6, -0x1.48723a0000000p-3, 0x1.fd51f40000000p-5,
0x1.1c16a20000000p-2, 0x1.17ac1e0000000p-3, 0x1.13018e0000000p-3, 0x1.ca7ee60000000p-1, -0x1.226e680000000p+0, -0x1.22d4ae0000000p-1, 0x1.8325bc0000000p-2, -0x1.b0f62e0000000p-3, 0x1.0a47120000000p-2, 0x1.2c199a0000000p-1, 0x1.462ca00000000p-1, 0x1.9adb1a0000000p-4, 0x1.208b020000000p-2, -0x1.3e7c960000000p-2, 0x1.52ede20000000p-4, 0x1.f0d93a0000000p-3,
0x1.3977960000000p-1, 0x1.a649ba0000000p-2, -0x1.29258a0000000p-2, 0x1.10770e0000000p-1, -0x1.5ff2f80000000p-1, -0x1.f4b3580000000p-7,

0x1.9e3eea0000000p-2, -0x1.50dfe00000000p-1, 0x1.75135e0000000p-2, 0x1.8691d60000000p-1, 0x1.a8f73a0000000p-2, 0x1.965eae0000000p-2, -0x1.86e9520000000p-3, -0x1.ebc0980000000p-3, 0x1.a3426c0000000p-2, 0x1.84c5740000000p-6,
0x1.8d17e20000000p-2, 0x1.19ada00000000p-4, -0x1.777ddc0000000p-2, 0x1.afd8d40000000p-1, -0x1.55c33e0000000p+0, -0x1.e625d20000000p-2, 0x1.49b9e40000000p-2, -0x1.bf08a40000000p-4, 0x1.b796ce0000000p-3, 0x1.2a62b20000000p-1, 0x1.9178cc0000000p-3, 0x1.126dd80000000p-4, 0x1.d336340000000p-2, -0x1.c5a2e80000000p-3, -0x1.ee30d20000000p-3, 0x1.85cbd80000000p-3,
0x1.00e2a00000000p-1, -0x1.95745e0000000p-9, -0x1.4e2eec0000000p-1, -0x1.d76ef00000000p-4, -0x1.71dd900000000p+0, -0x1.44d2960000000p-2, 0x1.67309c0000000p-4, -0x1.b39e3c0000000p-3, 0x1.9d56400000000p-4, 0x1.08e6620000000p-3, -0x1.7c99360000000p-4, 0x1.6821cc0000000p-7, 0x1.fe93380000000p-2, 0x1.17e13e0000000p-7, 0x1.fca2a20000000p+0, 0x1.98d80e0000000p-7,
0x1.31e2540000000p-2, -0x1.1f23980000000p-5, -0x1.71bb140000000p-3, -0x1.4af0fa0000000p-2, -0x1.f5be620000000p-2, -0x1.f66a1e0000000p-3, 0x1.6aa53c0000000p-4, -0x1.6c4f700000000p-3, 0x1.e997c40000000p-5, 0x1.2f5dac0000000p-3, -0x1.3bb98e0000000p-6, -0x1.3fe01c0000000p-7, -0x1.8f07900000000p-4, 0x1.be47da0000000p-6, -0x1.cac9840000000p-2, -0x1.2a5d580000000p-6,
0x1.0fad9c0000000p-1, 0x1.619b0e0000000p-2, -0x1.5c4ff20000000p-3, 0x1.5b1f380000000p-1, -0x1.b226180000000p-2, -0x1.731eca0000000p-1, 0x1.c4cdd20000000p-2, -0x1.33e28c0000000p-1, 0x1.5cb7420000000p-2, 0x1.;}, 0x1.25b3be0000000p-4, 0x1.8333060000000p-2, -0x1.9fc0080000000p-3, -0x1.131c580000000p-2, 0x1.7bdd3e0000000p-1, 0x1.30ee200000000p-4,
0x1.8f97700000000p-2, -0x1.1b22e60000000p-8, -0x1.6ba58a0000000p-1, 0x1.5151a20000000p-2, -0x1.4f4ebc0000000p+0, 0x1.3e472e0000000p-4, 0x1.f7fe980000000p-4, -0x1.1eeeba0000000p-2, 0x1.c154380000000p-4, 0x1.8249740000000p-4, 0x1.3733400000000p-4, 0x1.6547340000000p-6, 0x1.5364600000000p-2, -0x1.7192160000000p-7, 0x1.9874f60000000p-1, -0x1.6857a00000000p-7,
0x1.ae8d4e0000000p-2, -0x1.88e5360000000p-7, -0x1.ea85440000000p-2, -0x1.9928840000000p-3, -0x1.44527e0000000p+0, 0x1.1efc280000000p-1, 0x1.2cbe680000000p-3, -0x1.e731ec0000000p-3, 0x1.a4cce00000000p-4, 0x1.c6a9480000000p-6, -0x1.e3495e0000000p-6, 0x1.61dd7c0000000p-10, 0x1.edb8c40000000p-2, -0x1.174c7c0000000p-7, 0x1.872ed00000000p+0, -0x1.451bb60000000p-8,
0x1.508a480000000p-2, 0x1.b1236e0000000p-3, 0x1.a700e60000000p-3, 0x1.165c620000000p-4, 0x1.5ba9f00000000p-2, -0x1.5a6dc20000000p-2, 0x1.4ba5a00000000p-7, -0x1.f2aa4c0000000p-1, 0x1.3b88f00000000p-2,

0x1.35b4980000000p-4, 0x1.29e4d80000000p-1, 0x1.4a2e080000000p-2, -0x1.53f25c0000000p-2, 0x1.e6a24c0000000p-3, -0x1.988f480000000p-2, 0x1.685e8e0000000p-3,
0x1.7029860000000p-1, 0x1.e0eb060000000p-2, -0x1.f3374a0000000p-3, 0x1.21ee340000000p+0, 0x1.e2755c0000000p-5, -0x1.7d52f80000000p-3, 0x1.4fe81a0000000p-3, -0x1.6dfb980000000p-1, 0x1.72f0c60000000p-2, 0x1.02bc800000000p-2, 0x1.77b5880000000p-2, 0x1.9ac3e40000000p-2, -0x1.6f09b20000000p-1, 0x1.1ba3540000000p-2, 0x1.8a387c0000000p-3, 0x1.ae923a0000000p-4,
0x1.7ac2d20000000p-1, 0x1.f9f19e0000000p-2, -0x1.0f844c0000000p-3, 0x1.2e1d4c0000000p+0, -0x1.d1390a0000000p-4, 0x1.7cc4040000000p-4, 0x1.6d96a60000000p-3, -0x1.64aa2c0000000p-1, 0x1.5c9ddc0000000p-2, 0x1.89801a0000000p-2, 0x1.43e9400000000p-2, 0x1.8c422e0000000p-2, -0x1.3d182e0000000p-1, 0x1.00a42e0000000p-2, 0x1.fa50940000000p-3, 0x1.5957280000000p-4,
0x1.3c8b340000000p-1, 0x1.9950620000000p-2, 0x1.acd3620000000p-2, 0x1.2480d80000000p+0, 0x1.80d8220000000p-4, -0x1.7a4c8c0000000p-1, 0x1.66a5b00000000p-3, -0x1.41f20a0000000p-1, 0x1.6b24d80000000p-2, 0x1.33d28c0000000p-2, 0x1.2cuoj800000000p-4, 0x1.96e4d00000000p-2, -0x1.66cbd40000000p-1, 0x1.488fca0000000p-3, 0x1.81b3440000000p-3, 0x1.c080ce0000000p-5,
0x1.aa29020000000p-2, 0x1.0f06f60000000p-1, 0x1.074a720000000p-3, 0x1.ec52660000000p+0, -0x1.5c2c680000000p-2, 0x1.67e1ee0000000p-1, 0x1.ff135e0000000p-3, -0x1.e0b4040000000p-2, 0x1.6699ca0000000p-2, 0x1.5ee4260000000p-1, 0x1.50a9de0000000p-3, 0x1.a9e7e80000000p-2, -0x1.5dce7e0000000p-2, 0x1.1916bc0000000p-3, 0x1.ad58520000000p-1, 0x1.16b7400000000p-4,
0x1.b4c07e0000000p-3, 0x1.bc16dc0000000p-3, -0x1.4f790a0000000p-2, 0x1.3f6dc40000000p-2, 0x1.84ced80000000p-2, 0x1.d0b8980000000p-9, 0x1.286e720000000p-5, -0x1.d7dc0e0000000p-1, 0x1.34d92e0000000p-2, 0x1.731e780000000p-4, 0x1.9f49140000000p-2, 0x1.51fdbc0000000p-2, -0x1.93a95e0000000p-2, 0x1.5f13fc0000000p-3, -0x1.36c36a0000000p-2, 0x1.0c242c0000000p-3,
0x1.05cb4e0000000p-1, 0x1.4bf3180000000p-2, 0x1.b554100000000p-2, 0x1.15544a0000000p+0, 0x1.5fa0d00000000p-3, -0x1.872fc80000000p-1, 0x1.8557e80000000p-3, -0x1.d2c9560000000p-1, 0x1.65a0d20000000p-2, 0x1.9246740000000p-3, -0x1.a43c820000000p-3, 0x1.972ea60000000p-2, -0x1.9ed2b80000000p-1, 0x1.a6977c0000000p-3, -0x1.e2c05c0000000p-6, 0x1.f5a8fe0000000p-6,
0x1.be94fe0000000p-3, 0x1.09e0300000000p-1, -0x1.67b1ce0000000p-2, 0x1.780e680000000p+0, -0x1.8e78700000000p-1, 0x1.fff9180000000p-1, 0x1.1380980000000p-2, -0x1.209aec0000000p-1, 0x1.6107280000000p-2, 0x1.6325600000000p-1, 0x1.c239000000000p-2, 0x1.aa76dc0000000p-2,

-0x1.17921a0000000p-2, -0x1.83956c0000000p-4, 0x1.5514720000000p-1, 0x1.2d8fa00000000p-4,
0x1.6007520000000p-2, 0x1.c11bee0000000p-3, -0x1.7d04880000000p-3, 0x1.6614dc0000000p-2, 0x1.7c07820000000p-2, 0x1.fb585e0000000p-4, 0x1.4c16c60000000p-4, -0x1.9597f40000000p-1, 0x1.430b0c0000000p-2, 0x1.622a300000000p-3, 0x1.81ed560000000p-2, 0x1.806aa80000000p-2, -0x1.bd05560000000p-2, 0x1.371e440000000p-3, -0x1.c715f00000000p-3, 0x1.ec84580000000p-5,
0x1.18b8aa0000000p-6, 0x1.b72e460000000p-4, 0x1.a888fc0000000p-4, 0x1.7a0fd20000000p-6, 0x1.38f6900000000p-4, 0x1.aaa0ec0000000p-4, -0x1.d8da000000000p-8, -0x1.a8bbc00000000p-1, 0x1.216c660000000p-2, 0x1.8855aa0000000p-3, -0x1.0436d80000000p-5, 0x1.7f1fb20000000p-2, -0x1.f674800000000p-4, 0x1.5408320000000p-3, -0x1.411e260000000p-2, 0x1.e118ca0000000p-5,
0x1.a0fd580000000p-2, 0x1.1782fe0000000p-2, -0x1.4305260000000p-2, 0x1.800b240000000p-1, 0x1.70a2c00000000p-2, -0x1.558cb20000000p-2, 0x1.3392a60000000p-3, -0x1.da101e0000000p-1, 0x1.5a586e0000000p-2, 0x1.ad16760000000p-3, 0x1.80e4c00000000p-6, 0x1.92223c0000000p-2, -0x1.45ebd80000000p-1, 0x1.7035c40000000p-3, -0x1.2ea34c0000000p-3, 0x1.dac89a0000000p-6,
0x1.12cb440000000p-1, 0x1.130e4e0000000p-1, -0x1.40d6140000000p-7, 0x1.cb5bfe0000000p+0, 0x1.da584c0000000p-4, -0x1.9a421a0000000p-2, 0x1.d21efa0000000p-3, -0x1.5b7efa0000000p-1, 0x1.715e340000000p-2, 0x1.1a93600000000p-1, -0x1.2aa1ec0000000p-2, 0x1.a580de0000000p-2, -0x1.0061960000000p-1, 0x1.d67d6a0000000p-3, 0x1.2837d60000000p-1, 0x1.1490700000000p-4,
0x1.db9dc60000000p-4, 0x1.67d8fc0000000p-2, 0x1.78dc400000000p-2, 0x1.bfb1620000000p-3, -0x1.4df09e0000000p-1, -0x1.1891280000000p-1, 0x1.8668100000000p-2, -0x1.06cb8e0000000p-1, 0x1.3cbba80000000p-2, 0x1.cd35fa0000000p-1, -0x1.1cf8b00000000p-2, 0x1.a3ace60000000p-2, -0x1.f600f60000000p-3, -0x1.b85af00000000p-2, 0x1.a65e980000000p-2, 0x1.406dce0000000p-4,
0x1.4999320000000p-4, 0x1.7361a20000000p-3, -0x1.87c3c60000000p-3, -0x1.d707e80000000p-5, 0x1.0326e20000000p-1, 0x1.4243a60000000p-6, -0x1.065a420000000p-4, -0x1.04f4b00000000p+0, 0x1.3e2d040000000p-2, 0x1.0ec9c60000000p-4, -0x1.3c99920000000p-3, 0x1.8c2c240000000p-2, -0x1.6be5ec0000000p-3, 0x1.03f34c0000000p-2, -0x1.82110e0000000p-2, 0x1.3c8efc0000000p-4,
0x1.37a7ac0000000p-1, 0x1.05d0260000000p-1, -0x1.359be60000000p-3, 0x1.558e020000000p+0, 0x1.bf147c0000000p-5, -0x1.73deee0000000p-3, 0x1.35ae700000000p-3, -0x1.5614260000000p-1, 0x1.60a1520000000p-2, 0x1.9745b60000000p-2, -0x1.0d18e60000000p-5, 0x1.8ae6e00000000p-2, -0x1.1181680000000p-1, 0x1.02ac9c0000000p-2, 0x1.4020880000000p-2,

0x1.09df7e0000000p-4,
0x1.2a70d80000000p-1, 0x1.fd3da80000000p-2, 0x1.c3c37e0000000p-2, 0x1.6d9adc0000000p+0, 0x1.44c6160000000p-3, -0x1.2628500000000p-1, 0x1.89a6680000000p-3, -0x1.fe37ac0000000p-2, 0x1.7288400000000p-2, 0x1.0f6abc0000000p-1, -0x1.cf19300000000p-4, 0x1.923f4c0000000p-2, -0x1.e5725e0000000p-2, 0x1.88fbde0000000p-3, 0x1.98d5020000000p-2, 0x1.15db700000000p-4,
0x1.c414260000000p-8, 0x1.3df1b60000000p-6, 0x1.990bb20000000p-2, -0x1.ef4a3a0000000p-4, -0x1.be932e0000000p-2, 0x1.7331f20000000p-3, 0x1.37e11c0000000p-10, -0x1.7850660000000p-2, 0x1.bac3540000000p-4, 0x1.0b423c0000000p-3, -0x1.cf6eb40000000p-6, 0x1.5451fa0000000p-5, -0x1.340b340000000p-5, 0x1.c101980000000p-7, -0x1.29d21e0000000p-3, 0x1.6641a80000000p-4,
0x1.8aa5c20000000p-6, 0x1.271a140000000p-3, 0x1.468c440000000p-7, -0x1.29fab60000000p-2, -0x1.393fee0000000p-3, 0x1.c0ba920000000p-4, -0x1.8a51160000000p-4, -0x1.5d15260000000p-1, 0x1.08a79a0000000p-2, 0x1.71e9bc0000000p-3, -0x1.1e03960000000p-2, 0x1.5da1520000000p-2, -0x1.e3e1ba0000000p-4, 0x1.c3630a0000000p-3, -0x1.a8fdc20000000p-2, 0x1.6ad2b60000000p-4,
0x1.cfbb480000000p-5, 0x1.0047aa0000000p-3, 0x1.3f45c20000000p-2, -0x1.5191d80000000p-2, -0x1.2012500000000p-2, 0x1.1b42d00000000p-4, -0x1.0cb8980000000p-4, -0x1.86ebfa0000000p-1, 0x1.0ea05e0000000p-2, 0x1.8d7de00000000p-3, -0x1.07cc0a0000000p-2, 0x1.72c8f20000000p-2, -0x1.8d15420000000p-4, 0x1.a4325e0000000p-3, -0x1.c2dbb40000000p-2, 0x1.0fa3ce0000000p-4,
0x1.ef6c080000000p-4, 0x1.f8411c0000000p-4, -0x1.ae1c6a0000000p-2, -0x1.0f15600000000p-2, -0x1.e54e100000000p-3, -0x1.8aa93a0000000p-5, -0x1.12b1520000000p-4, -0x1.64693c0000000p-1, 0x1.e0831e0000000p-3, 0x1.9461c40000000p-3, -0x1.ecc9f00000000p-5, 0x1.3ad9ea0000000p-2, -0x1.4e7e6e0000000p-4, 0x1.b8721c0000000p-3, -0x1.4fd60c0000000p-2, 0x1.9a7bae0000000p-4,
-0x1.1e621e0000000p-4, 0x1.1cc2200000000p-4, -0x1.0823920000000p-1, -0x1.af31c80000000p-3, -0x1.31de300000000p-2, 0x1.c66ff00000000p-6, 0x1.26837a0000000p-7, -0x1.aeb1ec0000000p-1, 0x1.019a7e0000000p-2, 0x1.58eaaa0000000p-6, 0x1.131b940000000p-2, 0x1.50118a0000000p-2, -0x1.3b0ea20000000p-3, 0x1.c8b7880000000p-3, -0x1.46e72e0000000p-2, 0x1.344e580000000p-4,
0x1.c6484e0000000p-7, 0x1.b0d7380000000p-9, -0x1.5ea8ce0000000p-5, -0x1.6d1c620000000p-3, -0x1.8a60ec0000000p-2, 0x1.1b96ca0000000p-3, 0x1.a1c1ba0000000p-8, -0x1.5da19e0000000p-2, 0x1.0c88540000000p-3, 0x1.7b1a2a0000000p-4, 0x1.c662d60000000p-3, 0x1.0a8f140000000p-5, -0x1.cd8c0a0000000p-6, 0x1.dd00fa0000000p-6, -0x1.952ebe0000000p-4, 0x1.13a1e20000000p-3,

0x1.04daf20000000p-3, 0x1.0787a00000000p-4, -0x1.a827920000000p-3, -0x1.4b85cc0000000p-2, -0x1.4e0cde0000000p-2, -0x1.6332220000000p-4, -0x1.0762140000000p-5, -0x1.3528d40000000p-1, 0x1.9c05680000000p-3, 0x1.210e280000000p-3, 0x1.86aca20000000p-2, 0x1.ee49120000000p-3, -0x1.0875ce0000000p-5, 0x1.b851480000000p-3, -0x1.aa11bc0000000p-3, 0x1.ddd3500000000p-4,
-0x1.c667540000000p-5, 0x1.c5a8700000000p-5, -0x1.eeb8bc0000000p-3, -0x1.1fc4e20000000p-4, -0x1.4918560000000p-3, 0x1.fd83860000000p-3, 0x1.acd87e0000000p-5, -0x1.8b25b00000000p-1, 0x1.002e620000000p-2, 0x1.a15e640000000p-4, 0x1.9c2ffe0000000p-6, 0x1.74ab5a0000000p-2, -0x1.a084180000000p-3, 0x1.7ca24e0000000p-3, -0x1.cfd3160000000p-2, 0x1.786b1a0000000p-5,
0x1.e7ea560000000p-5, -0x1.83f7240000000p-7, -0x1.b042ba0000000p-2, -0x1.1331e20000000p-2, -0x1.c671440000000p-2, -0x1.1cbc6a0000000p-5, 0x1.99ed020000000p-9, -0x1.1b183a0000000p-2, 0x1.4865960000000p-3, 0x1.9be30a0000000p-4, 0x1.d94b700000000p-2, 0x1.0a45040000000p-4, -0x1.2862200000000p-4, 0x1.3f0b8e0000000p-4, -0x1.ef22320000000p-6, 0x1.8e9c8e0000000p-3,
0x1.3871780000000p-5, -0x1.c192480000000p-8, -0x1.8f6fa20000000p-4, -0x1.abd61a0000000p-4, -0x1.f10d300000000p-3, -0x1.e6887a0000000p-4, 0x1.6c66f80000000p-6, -0x1.02b93e0000000p-2, 0x1.2f1e1a0000000p-4, 0x1.2189a40000000p-4, 0x1.a13b9e0000000p-3, 0x1.1213240000000p-7, 0x1.58261c0000000p-7, -0x1.3b53d20000000p-6, -0x1.713f1e0000000p-5, 0x1.0ab6bc0000000p-6,
0x1.410b900000000p-4, -0x1.0170660000000p-8, -0x1.35d91a0000000p-2, -0x1.6cd5800000000p-2, -0x1.d474b80000000p-2, -0x1.8c2b140000000p-5, -0x1.3b2f020000000p-6, -0x1.e898d20000000p-2, 0x1.878b080000000p-3, 0x1.d472c20000000p-5, 0x1.681cca0000000p-1, 0x1.dddbbc0000000p-4, -0x1.67be7e0000000p-5, 0x1.324aca0000000p-3, -0x1.17c5120000000p-4, 0x1.9b021c0000000p-3,
0x1.15ebd00000000p-4, 0x1.7655400000000p-4, -0x1.ad45da0000000p-3, -0x1.196c620000000p-2, -0x1.bfeaa20000000p-2, -0x1.9f7c440000000p-4, -0x1.83b1180000000p-6, -0x1.baf1800000000p-1, 0x1.08b7cc0000000p-2, 0x1.dcfb040000000p-6, 0x1.acac080000000p-2, 0x1.5c43420000000p-2, -0x1.efc7e60000000p-4, 0x1.11859c0000000p-2, -0x1.813ebc0000000p-2, 0x1.d385d60000000p-4,
0x1.f1375e0000000p-3, 0x1.54fa780000000p-3, 0x1.32194c0000000p-3, -0x1.af0da80000000p-7, 0x1.c4b5860000000p-3, -0x1.56d6b80000000p-4, 0x1.2892b60000000p-5, -0x1.f685160000000p-1, 0x1.2441820000000p-2, 0x1.c4f3b80000000p-4, 0x1.63c2900000000p-2, 0x1.6dc7d80000000p-2, -0x1.2f4cac0000000p-2, 0x1.1dfa940000000p-2, -0x1.3f4a860000000p-1, 0x1.14d0300000000p-3,
-0x1.c625660000000p-6, 0x1.7f73120000000p-7, -0x1.8594c40000000p-3,

-0x1.8f6a280000000p-5, -0x1.7be0b00000000p-3, 0x1.cc34380000000p-9, 0x1.e9d1ac0000000p-7, -0x1.2d674c0000000p-3, 0x1.757c4e0000000p-5, 0x1.f5b5280000000p-6, 0x1.8de20a0000000p-4, -0x1.b369a20000000p-8, -0x1.79cf9c0000000p-6, 0x1.3603be0000000p-6, 0x1.9ab88e0000000p-7, 0x1.a898900000000p-5,
0x1.8e0c700000000p-4, 0x1.3ce9980000000p-3, -0x1.335c940000000p-2, -0x1.5840900000000p-3, -0x1.f401200000000p-3, 0x1.5416120000000p-5, -0x1.8bc9460000000p-5, -0x1.8fdee80000000p-1, 0x1.0e92500000000p-2, 0x1.114b360000000p-3, -0x1.b339780000000p-4, 0x1.6e64b80000000p-2, -0x1.09320e0000000p-3, 0x1.123e160000000p-2, -0x1.d53e240000000p-2, 0x1.08569c0000000p-4,
0x1.46007a0000000p-3, 0x1.e455460000000p-4, -0x1.bfde1c0000000p-2, -0x1.a388000000000p-3, -0x1.0ef9c60000000p-2, -0x1.3f9b920000000p-3, -0x1.a9e4d80000000p-6, -0x1.99d9ce0000000p-1, 0x1.0d9c780000000p-2, 0x1.c9be5e0000000p-4, 0x1.4c55340000000p-3, 0x1.638db00000000p-2, -0x1.0dd39a0000000p-3, 0x1.09975a0000000p-2, -0x1.ceb3e00000000p-2, 0x1.d2f1ec0000000p-4,

Table B.7 Parameters of context decoding neural network, layer 3 CNN (bias parameter:bias)

Parameter value
0x1.c296300000000p-4, 0x1.c2940c0000000p-4, 0x1.c2930c0000000p-4, 0x1.c28c660000000p-4, 0x1.c28fb60000000p-4, 0x1.c287860000000p-4, 0x1.c27ef40000000p-4, 0x1.c2965a0000000p-4, 0x1.c285ec0000000p-4, 0x1.c286260000000p-4, 0x1.c297720000000p-4, 0x1.c292580000000p-4, 0x1.c27c780000000p-4, 0x1.c298400000000p-4, 0x1.c28c100000000p-4, 0x1.c2999a0000000p-4,

Table B.8 Standard deviation table corresponding to basic range coding

Parameter value
0x1.c28f5c0000000p-4, 0x1.fd8f280000000p-4, 0x1.20245e0000000p-3, 0x1.45df8c0000000p-3, 0x1.708b900000000p-3, 0x1.a0ce0a0000000p-3, 0x1.d762480000000p-3, 0x1.a8e120000000p-2, 0x1.2d759a0000000p-2, 0x1.54ef340000000p-2, 0x1.81941a000000p-2, 0x1.b41194000000p-2, 0x1.ed2b96000000p-2, 0x1.16dfe4p-1, 0x1.3b6466p-1, 0x1.64b11p-1, 0x1.93662e p-1, 0x1.c839ap-1, 0x1.fb56pp+ 1, 0x1.23c378pp+ 1, 0x1.49f8ap+ 1, 0x1.752d5cp+ 1, 0x1.a60b1c0000000p+0, 0x1.dd4ef60000000p+0, 0x1.0de7b60000000p+1, 0x1.313f8c0000000p+1, 0x1.59382a0000000p+1, 0x1.866cb40000000p+1, 0x1.b98ca00000000p+1, 0x1.f35e5e0000000p+1, 0x1.1a612c0000000p+2, 0x1.3f5b2c0000000p+2, 0x1.692cb80000000p+2, 0x1.98781e0000000p+2, 0x1.cdf4f00000000p+2, 0x1.e34eb400000p+3, 0x1.ab5988p+3, 0x1.e34eb4p+3, ... 0x1.8b54e60000000p+4, 0x1.bf19500000000p+4, 0x1.f9a5160000000p+4, 0x1.1dedba0000000p+5, 0x1.435eb40000000p+5, 0x1.6db6ce0000000p+5, 0x1.9d9a5e0000000p+5, 0x1.d3c3480000000p+5, 0x1.0881e20000000p+6, 0x1.2b24c40000000p+6, 0x1.5250be0000000p+6, 0x1.7e9dd80000000p+6, 0x1.b0b8060000000p+6, 0x1.e961c0000000p+6, 0x1.14bb78000000p+7, 0x1.38f82a000000p+7, 0x1.61f39e00000p+7, 2x1.9477e2p+7, 2x1.c83b34p+7, 2x1.f88a28p+7, 2x1.3b29f4p+7, 2x1.e969f8p+7, 2x1.b4b7dcp+7, 2x1.e4a3e8p+7, 2x1.a8d8c8p+7, 2x1.d4a3e8p+7, 2x1.f4a3e8p+7, 2x1.3d4a3e8p+7, 2x1.7d4a3e8p+7,

2x1.b4a3e8p+7, 2x1.e4a3e8p+7, 2x1.a8d8c8p+7, 2x1.d4a3e8p+7, 2x1.f4a3e8p+7,

Table B.9 Code table for base range coding

The index	**probability table**
1	0 1 65534 65535 65536
2	0 2 65533 65535 65536
3	0 12 65523 65535 65536
4	0, 55, 65480, 65535, 65536
5	0 179 65356 65535 65536
6	0 459 65076 65535 65536
7	0 977 64558 65535 65536
8	0 1794 63741 65535 65536
9	0, 2930, 62605, 65535, 65536
10	0 4363 61172 65535 65536
11	0 2 6036 59499 65533 65535 65536
12	0 14 7875 57659 65521 65535 65536
13	0 60 9803 55732 65475 65535 65536
14	0 193 11751 53783 65342 65535 65536
15	0, 486, 13662, 51872, 65047, 65533, 65536
16	0 11 1026 15497 50038 64509 65524 65535 65536
17	0 49 1865 17225 48310 63670 65486 65535 65536
18	0 162 3022 18829 46701 62508 65368 65530 65536
19	0 413 4460 20292 45210 61042 65089 65502 65536
20	0 67 923 6162 21653 43879 59370 64608 65464 65531 65536
21	0 201 1702 7997 22859 42645 57507 63802 65303 65504 65536
22	0 61 530 2824 9939 23967 41557 55585 62700 64994 65464 65525 65536
23	0 180 1078 4213 11864 24931 40550 53617 61268 64402 65300 65480 65536
24	0 88 502 1967 5882 13783 25824 39680 51721 59622 63537 65002 65416 65504 65536
25	0 55 286 1064 3165 7714 15614 26614 38897 49897 57797 62346 64447 65225 65456 65511 65536
26	0 156 637 1884 4605 9595 17291 27272 38156 48136 55832 60822 63543 64790 65271 65427 65536
27	0 124 469 1304 3067 6316 11545 18890 27895 37534 46540 53885 59114 62363 64126 64961 65306 65430 65536
28	0 114 396 1024 2278 4531 8170 13454 20350 28441 36974 45065 51961 57245 60884 63137 64391 65019 65301 65415 65536
29	0 116 373 896 1874 3556 6217 10091 15279 21671 28915 36468 43712 50104 55292 59166 61827 63509 64487 65010 65267 65383 65536
30	0 60 188 443 917 1743 3091 5153 8106 12068 17049 22914 29382 36065 42533 48398 53379 57341 60294 62356 63704 64530 65004 65259 65387 65447 65536
31	0 78 227 495 953 1698 2849 4538 6893 10013 13940 18637 23975 29739 35652 41416 46754

The index	probability table
	51451 55378 58498 60853 62542 63693 64438 64896 65164 65313 65391 65536
32	0 58 162 340 633 1097 1804 2838 4291 6253 8798 11970 15767 20136 24964 30091 35322 40449 45277 49646 53443 56614 59159 61121 62574 63608 64315 64779 65072 65250 65354 65412 65536
33	0 50 134 271 486 814 1299 1995 2962 4263 5961 8109 10742 13870 17471 21490 25836 30391 35018 39573 43919 47938 51539 54667 57300 59448 61146 62448 63415 64111 64596 64924 65139 65276 65360 65410 65536
34	0 49 126 245 423 683 1054 1570 2271 3201 4403 5920 7789 10034 12667 15680 19044 22709 26606 30648 34740 38783 42680 46345 49709 52722 55355 57600 59469 60986 62188 63118 63819 64335 64706 64966 65144 65263 65340 65389 65536
35	0 53 131 245 407 634 945 1364 1917 2634 3545 4680 6068 7734 9694 11957 14521 17370 20475 23795 27278 30863 34483 38068 41551 44871 47976 50825 53389 55652 57612 59278 60666 61801 62712 63429 63982 64401 64712 64939 65101 65215 65293 65346 65536
36	0 43 104 189 306 466 680 962 1329 1799 2392 3129 4031 5119 6412 7925 9669 11650 13867 16311 18965 21804 24796 27902 31079 34280 37457 40563 43555 46394 49048 51492 53709 55690 57434 58947 60240 61328 62230 62967 63560 64030 64397 64679 64893 65053 65171 65256 65317 65360 65536
37	0 39 93 166 263 390 556 770 1042 1383 1807 2327 2958 3715 4613 5664 6881 8274 9849 11610 13555 15679 17971 20416 22993 25678 28443 31257 34088 36902 39667 42352 44929 47374 49666 51790 53735 55496 57071 58464 59681 60732 61630 62387 63018 63538 63962 64303 64575 64789 64955 65083 65180 65253 65307 65346 65536
38	0 31 71 124 193 282 395 538 717 939 1211 1543 1943 2422 2989 3655 4429 5322 6341 7495 8789 10227 11810 13537 15404 17403 19525 21757 24083 26485 28942 31433 33936 36427 38884 41286 43612 45844 47966 49965 51832 53559 55142 56580 57874 59028 60047 60940 61714 62380 62947 63426 63826 64158 64430 64652 64831 64974 65087 65176 65245 65298 65338 65369 65536
39	0 27 62 107 163 234 322 431 564 726 922 1158 1439 1771 2162 2618 3146 3753 4446 5232 6116 7104 8201 9409 10730 12165 13712 15368 17128 18985 20931 22955 25045 27188 29370 31575 33788 35993 38175 40318 42408 44432 46378 48235 49995 51651 53198 54633 55954 57162 58259 59247 60131 60917 61610 62217 62745 63201 63592 63924 64205 64441 64637 64799 64932 65041 65129 65200 65256 65301 65336
40	0 28 62 104 156 219 296 389 500 632 789 974 1192 1446 1740 2080 2470 2914 3418 3987 4625 5337 6127 6998 7953 8995 10125 11344 12651 14045 15524 17084 18720 20426 22195 24020 25891 27800 29736 31688 33645 35597 37533 39442 41313 43138 44907 46613 48249 49809 51288 52682 53989 55208 56338 57380 58335 59206 59996 60708 61346 61915 62419 62863 63253 63593 63887 64141 64359 64544 64701 64833 64944 65037 65114 65177 65229 65271 65305
41	0 25 55 91 135 187 249 322 408 509 627 764 923 1107 1318 1559 1833 2144 2494 2888 3328 3818 4361 4960 5619 6339 7124 7975 8894 9882 10939 12065 13260 14522 15850 17240 18689 20193 21748 23347 24986 26657 28354 30070 31797 33528 35255 36971 38668 40339 41978 43577 45132 46636 48085 49475 50803 52065 53260 54386 55443 56431 57350 58201

The index	probability table
	58986 59706 60365 60964 61507 61997 62437 62831 63181 63492 63766 64007 64218 64402 64561 64698 64816 64917
42	0 21 46 76 111 152 200 256 320 395 481 580 693 822 969 1135 1323 1534 1771 2036 2331 2658 3020 3419 3858 4339 4864 5434 6052 6720 7439 8210 9034 9912 10845 11832 12873 13967 15113 16309 17553 18842 20174 21545 22952 24391 25857 27346 28853 30373 31901 33431 34959 36479 37986 39475 40941 42380 43787 45158 46490 47779 49023 50219 51365 52459 53500 54487 55420 56298 57122 57893 58612 59280 59898 60468 60993 61474 13 62312 62674 63001 63296 63561 63798 64009 64197 64363 64510 64639 64752 64851 64937 65012 65076 65132 65180 65221 65256 65286 65311 65332 65536
43	0 20 44 71 102 138 180 228 282 344 414 494 584 685 799 926 1068 1227 1403 1599 1815 2053 2315 2603 2918 3261 3635 4040 4479 4952 5462 6009 6595 7221 7887 8595 9345 10137 10971 11848 12767 13727 14728 15769 16848 17964 19115 20299 21513 22755 24022 25311 26620 27945 29282 30628 31979 33332 34683 36029 37366 38691 40000 41289 42556 43798 45012 46196 47347 48463 49542 50583 51584 52544 53463 54340 55174 55966 57424 58090 58716 59302 59849 60359 60832 61271 61676 62050 62393 62708 62996 63258 63496 63712 63908 64084 64243 64385 64512 64626 64727 64817 64896 64966 65028 65082 65130 65172 65208 65239 65266 65290 65310 65536
44	0 16 35 56 80 108 139 174 214 259 309 365 428 498 577 664 761 868 986 1116 1260 1418 1591 1780 1986 2210 2453 2717 3002 3310 3642 3999 4381 4790 5227 5693 6189 6715 7273 7862 8484 9139 9827 10548 11302 12089 12909 13761 14645 15560 16505 17480 18483 19512 20566 21644 22743 23862 24999 26151 27317 28494 29679 30871 32066 33263 34458 35650 36835 38012 39178 40330 41467 42586 43685 44763 45817 46846 47849 48824 69 50684 51568 52420 53240 54027 54781 55502 56190 56845 57467 58056 58614 59140 59636 60102 60539 60948 61330 61687 62019 62327 62612 62876 63119 63343 63549 63738 63911 64069 64213 64343 64461 64568 64665 64752 64831 64901 64964 65020 65070 65115 65155 65190 65221 65249 65273 65294 65313 65329 65536
45	0 15 32 51 72 96 123 153 186 223 264 309 359 414 475 542 616 697 786 883 989 1105 1231 1368 1516 1676 1849 2036 2238 2455 2688 2938 3205 3490 3795 4119 4464 4830 5218 5629 6063 6521 7003 7509 8040 8597 9180 9788 10422 11082 11768 12480 13217 13980 14767 15579 16414 17272 18152 19053 19974 20915 21873 22848 23838 24842 25859 26886 27923 28967 30017 31072 32129 33187 34244 35299 36349 37393 38430 39458 40475 9 42469 43444 44402 45343 46264 47165 48045 48903 49738 50550 51337 52100 52837 53549 54235 54895 55529 56137 56720 57277 57808 58314 58796 59254 59688 60099 60487 60853 61198 61522 61827 62112 62379 62629 62862 63079 63281 63468 63641 63801 63949 64086 64212 64328 64434 64531 64620 64701 64775 64842 64903 64958 65008 65053 65094 65131 65164 65194 65221 65245 65266 65285 65302 65317 65536
46	0 14 30 47 66 87 110 136 164 195 229 266 307 351 399 452 510 573 641 715 795 881 974 1075 1184 1301 1427 1562 1707 1862 2028 2205 2394 2595 2809 3036 3277 3533 3804 4090 4392 4711 5047 5400 5771 6160 6568 6995 7441 7907 8393 8899 9425 9971 10537 11124 11731 12358 13005 13672 14358 15063 15787 16529 17289 18066 18860 19670 20495 21335 22188 23054 23932 24820 25718 26625 27539 28460 29386 30316 31249 34055 34988 35918 36844 37765 38679 39586 40484 41372 42250 43116 43969 44809 45634 46444 47238 48015

The index	probability table
	48775 49517 50241 50946 51632 52299 52946 53573 54180 54767 55333 55879 56405 56911 57397 57863 58309 58736 59144 59533 59904 60257 60593 60912 61214 61500 61771 62027 62268 62495 62709 62910 63099 63276 63442 63597 63742 63877 64003 64120 64229 64330 64423 64509 64589 64663 64731 64794 64852 64905 64953 64997 65038 65075 65109 65140 65168 65194 65217
47	0 12 25 39 55 72 91 111 133 157 183 212 243 277 313 352 395 441 491 544 601 663 729 800 876 958 1045 1138 1238 1344 1457 1578 1706 1842 1987 2141 2304 2476 2658 2850 3053 3267 3492 3729 3978 4239 4513 4800 5100 5414 5742 6084 6441 6812 7198 7600 8017 8449 8897 9361 9841 10337 10848 11375 11918 12477 13051 13641 14246 14866 15501 16150 16813 17490 18181 18884 19600 20328 21067 21817 22577 23347 24126 707 26508 27315 28128 28945 29766 30590 31416 32243 33070 33897 34723 35547 36368 37185 37998 38805 39606 40400 41187 41966 42736 43496 44246 44985 45713 46429 47132 47823 48500 49163 49812 50447 51067 51672 52262 52836 53395 53938 54465 54976 55471 55951 56415 56863 57295 57712 58114 58500 58871 59228 59570 59898 60212 60512 60799 61073 61334 61583 61820 62045 62259 62462 62654 62836 63008 63171 63325 63855 63968 64074 64174 64267 64354 64436 64512 64583 64649 64711 64768 64821 64871 64917 64960 64999 65035 65069 65100 65129 65155 65179 65201 65221 65240 65257 65273 65287 65300 65312 65536
48	0 11 23 35 49 64 80 97 115 135 156 179 204 231 260 291 324 359 397 437 480 526 575 628 684 744 808 876 948 1024 1105 1191 1282 1378 1480 1587 1700 1820 1946 2079 2219 2366 2521 2683 2854 3033 3220 3416 3621 3835 4059 4293 4537 4791 5055 5330 5616 5913 6221 6541 6872 7215 7570 7937 8316 8707 9110 9526 9954 10394 10847 11312 11790 12280 12782 13296 13822 14360 14910 15471 16044 16628 17223 17828 18444 19069 19704 20348 21001 21663 22333 23010 23695 24386 25084 25787 26496 27209 27927 28648 29372 30099 30828 31558 32289 33020 33751 34481 35210 35937 36661 37382 38100 38813 39522 40225 40923 41614 42299 42976 43646 44308 44961 45605 46240 46865 47481 48086 48681 49265 49838 50399 50949 51487 52013 52527 53029 53519 53997 54462 54915 55355 55783 56199 56602 56993 57372 57739 58094 58437 58768 59088 59396 59693 60772 61016 61250 61474 61688 61893 62089 62276 62455 62626 62788 62943 63090 63230 63363 63489 63609 63722 63829 63931 64027 64118 64204 64285 64361 64433 64501 64565 64625 64681 64734 64783 64829 64872 64912 64950 64985 65018 65049 65078 65105 65130 65153 65174 65194 65212 65229 65245 65260 65274 65286 65298 65309
49	0 10 21 32 44 57 71 86 102 119 137 156 177 199 223 248 275 304 334 366 400 436 475 516 559 605 654 705 759 816 876 940 1007 1078 1153 1232 1315 1402 1493 1589 1690 1795 1905 2021 2142 2269 2401 2539 2683 2834 2991 3155 3326 3504 3689 3881 4080 4287 4502 4725 4956 5195 5443 5699 5964 6238 6521 6813 7114 7424 7744 8073 8412 8760 9118 9485 9862 10249 10645 11051 11467 11892 12327 12772 13226 13689 14162 1464 4 15135 15635 16144 16661 17187 17721 18263 18813 19371 19936 20508 21087 21673 22265 22863 23467 24076 24690 25309 25932 26559 27190 27824 28461 29101 29743 30387 31032 31678 32325 32972 33619 34265 34910 35554 36196 36836 37473 38107 38738 39365 39988 40607 41221 41830 42434 43032 43624 44210 44789 45361 45926 46484 47034 47576 48110 48636 49153 49662 50162 50653 51135 51608 52071 52525 52970 53405 53830 048 55435 55812 56179 56537 56885 57224 57553 57873 58183 58484 58776 59059 59333 59598 59854 60102 60341

The index	probability table
	60572 60795 61010 61217 61416 61608 61793 61971 62142 62306 62463 62614 62758 62896 63028 63155 63276 63392 63502 63607 63708 63804 63895 63982 64065 64144 64219 64290 64357 64421 64481 64538 64592 64643 64692 64738 64781 64822 64861 64897 64931 64963 64993 65022 65049 65074 65098 65120 65141 65160 65178 65195 65211 65226 65240 65253 65265 65276 65287
50	0 9 18 28 39 50 62 75 89 103 118 134 151 169 188 208 230 253 277 303 330 358 388 420 453 488 525 564 605 648 693 740 790 842 897 954 1014 1077 1143 1212 1284 1359 1438 1520 1606 1696 1790 1887 1989 2095 2205 2319 2438 2562 2691 2824 2962 3106 3255 3409 3569 3734 3905 4082 4265 4454 4649 4851 5059 5274 5495 5723 5958 6200 6449 6705 6968 7238 7515 7800 8092 8392 8699 9013 9335 9665 10002 10347 10699 11059 11426 11801 12184 12574 12971 13376 13788 14207 14634 15068 15509 15957 16411 16872 17340 17814 18294 18781 19274 19772 20276 20785 21300 21820 22345 22874 23408 23946 24488 25034 25583 26136 26692 27250 27811 28374 28939 29506 30075 30645 31216 31787 32359 32931 33503 34074 34645 35215 35784 36351 36916 37479 38040 38598 39154 39707 40256 40802 41344 41882 42416 42945 43470 43990 44505 45014 45518 46016 46509 76 47950 48418 48879 49333 49781 50222 50656 51083 51502 51914 52319 52716 53106 53489 53864 54231 54591 54943 55288 55625 55955 56277 56591 56898 57198 57490 57775 58052 58322 58585 58841 59090 59332 59567 59795 60016 60231 60439 60641 60836 61025 61208 61385 61556 61721 61881 62035 62184 62328 62466 62599 62728 62852 62971 63085 63195 63301 63403 63500 63594 63684 63770 63852 63931 64006 64078 64147 64213 4393 64448 64500 64550 64597 64642 64685 64726 64765 64802 64837 64870 64902 64932 64960 64987 65013 65037 65060 65082 65102 65121 65139 65156 65172 65187 65201 65215 65228 65240 65251 65262 65272 65281 65290 65536
51	0 8 16 24 33 42 52 62 73 85 97 110 124 138 153 169 186 204 222 241 261 282 304 328 353 379 406 435 465 496 529 563 599 636 675 716 759 803 849 897 947 1000 1055 1112 1171 1233 1297 1364 1434 1506 1581 1659 1740 1824 1911 2001 2094 2191 2291 2395 2502 2613 2728 2847 2970 3097 3228 3363 3502 3646 3794 3947 4104 4266 4433 4605 4782 4964 5151 5343 5540 5742 5950 6163 6381 6605 6834 7069 6 8330 8600 8875 9156 9443 9736 10035 10340 10651 10968 11291 11620 11955 12295 12641 12993 13351 13715 14084 14459 14839 15225 15616 16013 16415 16822 17235 17653 18076 18503 18935 19372 19813 20259 20709 21163 21621 22083 22549 23018 23491 23967 24446 24928 25413 25901 26391 26883 27377 27873 28371 28871 29372 29874 30377 30881 31386 31891 32397 32903 33409 33914 34419 34923 35426 35928 36429 36929 37427 37923 38417 8909 39399 39887 40372 40854 41333 41809 42282 42751 43217 43679 44137 44591 45041 45487 45928 46365 46797 47224 47647 48065 48478 48885 49287 49684 50075 50461 50841 51216 51585 51949 52307 52659 53005 53345 53680 54009 54332 54649 54960 55265 55564 55857 56144 56425 56700 56970 57234 57492 57744 57990 58231 58466 58695 58919 59137 59350 59558 59760 59957 60149 60336 60518 60695 60867 61034 61196 61353 61506 61654 61937 62072 62203 62330 62453 62572 62687 62798 62905 63009 63109 63206 63299 63389 63476 63560 63641 63719 63794 63866 63936 64003 64067 64129 64188 64245 64300 64353 64403 64451 64497 64541 64584 64625 64664 64701 64737 64771 64804 64835 64865 64894 64921 64947 64972 64996 65018 65039 65059 65078 65096 65114 65131 65147 65162 65176 65190 65203 65215 65227 65238 65248 65258 65267 65276 65284 65292

The index	probability table
52	0 7 14 22 30 38 47 56 66 76 87 98 110 122 135 148 162 177 192 208 225 242 260 279 299 320 342 364 387 411 436 463 491 520 550 581 613 647 682 718 756 795 836 878 922 968 1015 1064 1115 1168 1222 1278 1336 1396 1458 1523 1590 1659 1730 1804 1880 1959 2040 2124 2210 2299 2391 2486 2584 2685 2789 2896 3006 3119 3235 3354 3477 3603 3733 3866 4003 4143 4287 4435 4587 4742 4901 5064 5231 5402 5577 5756 594 0 6128 6320 6516 6717 6922 7131 7345 7563 7786 8013 8245 8481 8722 8968 9218 9473 9732 9996 10265 10538 10816 11099 11386 11678 11975 12276 12582 12892 13207 13526 13850 14178 14511 14848 15189 15534 15884 16238 16596 16958 17324 17694 18068 18446 18827 19212 19601 19993 20388 20787 21189 21594 22002 22413 22827 23244 23663 24085 24509 24935 25364 25795 26228 26662 27098 27536 27975 28416 28858 29301 29745 30190 30635 31081 31528 31975 32422 32869 33316 33763 34210 34656 35101 35546 35990 36433 36875 37316 37755 38193 38629 39063 39496 39927 40356 40782 41206 41628 42047 42464 42878 43289 43697 44102 44504 44903 45298 45690 46079 46464 46845 47223 47597 47967 48333 48695 49053 49407 49757 50102 50443 50780 51113 51441 51765 52084 52399 52709 53015 53316 53613 53905 54192 54475 54753 55026 55295 55559 55818 56073 56323 56569 56810 6 57278 57505 57728 57946 58160 58369 58574 58775 58971 59163 59351 59535 59714 59889 60060 60227 60390 60549 60704 60856 61004 61148 61288 61425 61558 61688 61814 61937 62056 62172 62285 62395 62502 62606 62707 62805 62900 62992 63081 63167 63251 63332 63411 63487 63561 63632 63701 63768 63833 63895 63955 64013 64069 64123 64176 64227 64276 64323 64369 64413 64455 64496 64535 64573 64609 64644 64678 64710 64741 64771 800 64828 64855 64880 64904 64927 64949 64971 64992 65012 65031 65049 65066 65083 65099 65114 65129 65143 65156 65169 65181 65193 65204 65215 65225 65235 65244 65253 65261 65269 65277 65284 65291 65536
53	0 6 12 19 26 33 41 49 57 66 75 84 94 104 115 126 137 149 161 174 187 201 216 231 247 263 280 298 316 335 355 375 396 418 441 465 489 514 540 567 595 624 654 685 717 750 785 821 858 896 935 976 1018 1061 1106 1152 1200 1249 1300 1352 1406 1462 1519 1578 1639 1702 1766 1832 1900 1970 2042 2116 2192 2270 2350 2433 2518 2605 2694 2786 2880 2977 3076 3178 3282 4473 4608 4746 4887 5031 5178 5328 5481 5638 5798 5961 6127 6297 6470 6646 6826 7009 7196 7386 7580 7777 7978 8182 8390 8601 8816 9035 9257 9483 9712 9945 10182 10422 10666 10914 11165 11420 11678 11940 12206 12475 12748 13024 13304 13587 13874 14164 14458 14755 15056 15360 15667 15977 16291 16608 16928 17251 17577 17906 18238 18573 18911 19252 19596 19943 20292 20644 20998 21355 21714 22076 22440 22806 23174 23544 23916 24290 24666 25044 25423 25804 26187 26571 26956 27343 27731 28120 28510 28901 29293 29686 30079 30473 30867 31262 31657 32052 32447 32842 33237 33632 34027 34422 34816 35210 35603 35996 36388 36779 37169 37558 37946 38333 38718 39102 39485 39866 40245 40623 40999 41373 41745 42115 42483 42849 43213 43575 43934 44291 44645 44997 45346 45692 46036 46377 46715 47050 47382 47711 48037 48360 48680 48997 49311 49621 8 50232 50533 50830 51124 51414 51701 51984 52264 52540 52813 53082 53348 53610 53868 54123 54374 54622 54866 55106 55343 55576 55805 56031 56253 56472 56687 56898 57106 57310 57511 57708 57902 58092 58279 58462 58642 58818 58991 59161 59327 59490 59650 59807 59960 60110 60257 60401 60542 60680 60815 60947 61076 61202 61325 61445 61563 61678 61790 61899 62006 62110 62212 62311 62408 62502 62594 62683 62770

The index	probability table
	62855 62938 018 63096 63172 63246 63318 63388 63456 63522 63586 63649 63710 63769 63826 63882 63936 63988 64039 64088 64136 64182 64227 64270 64312 64353 64392 64430 64467 64503 64538 64571 64603 64634 64664 64693 64721 64748 64774 64799 64823 64847 64870 64892 64913 64933 64953 64972 64990 65008 65025 65041 65057 65072 65087 65101 65114 65127 65139 65151 65162 65173 65184 65194 65204 65213 65222 65231 65239 65247 65255 65262 65269 65276 65282
54	0 5 11 17 23 29 36 43 50 57 65 73 81 89 98 107 116 126 136 147 158 169 181 193 206 219 232 246 260 275 290 306 322 339 357 375 394 413 433 454 475 497 520 543 567 592 618 644 671 699 728 758 789 821 854 887 921 956 992 1030 1069 1109 1150 1192 1235 1279 1325 1372 1420 1469 1520 1572 1625 1680 1736 1794 1853 1914 1976 2040 2105 2172 2241 2311 2383 2457 2532 2609 2688 2769 2852 2937 3023 3111 3201 3 293 3387 3483 3582 3683 3786 3891 3998 4107 4219 4333 4449 4568 4689 4812 4938 5066 5196 5329 5464 5602 5742 5885 6031 6179 6330 6483 6639 6798 6959 7123 7290 7459 7631 7806 7984 8164 8347 8533 8722 8914 9108 9305 9505 9708 9914 10123 10334 10548 10765 10985 11208 11434 11662 11893 12127 12364 12604 12846 13091 13339 13590 13843 14099 14358 14619 14883 15150 15419 15691 15966 16243 16523 16805 17090 17377 58 18252 18548 18847 19148 19451 19756 20063 20372 20683 20996 21311 21628 21947 22268 22591 22915 23241 23569 23898 24229 24561 24894 25229 25565 25902 26240 26580 26921 27263 27606 27950 28294 28639 28985 29331 29678 30026 30374 30722 31071 31420 31769 32118 32468 32818 33168 33517 33866 34215 34564 34912 35260 35608 35955 36301 36647 36992 37336 37680 38023 38365 38706 39046 39385 39722 1718 42046 42372 42696 43019 43340 43659 43976 44291 44604 44915 45224 45531 45836 46139 46440 46739 47035 47329 47621 47910 48197 48482 48764 49044 49321 49596 49868 50137 50404 50668 50929 51188 51444 51697 51948 52196 52441 52683 52923 53160 53394 53625 53853 54079 54302 54522 54739 54953 55164 55373 55579 55782 55982 56179 56373 56565 56754 56940 57123 57303 57481 57656 57828 57997 58164 58328 58489 58648 58804 58957 59108 59256 59402 59545 59685 59823 59958 60091 60221 60349 60475 60598 60719 60838 60954 61068 61180 61289 61396 61501 61604 61705 61804 61900 61994 62086 62176 62264 62350 62435 62518 62599 62678 62755 62830 62904 62976 63046 63115 63182 63247 63311 63373 63434 63493 63551 63607 63662 63715 63767 63818 63867 63915 63962 64008 64052 64095 64137 64178 64218 64257 64295 64331 64366 64400 64433 64466 64498 64529 8 64616 64643 64669 64695 64720 64744 64767 64790 64812 64833 64854 64874 64893 64912 64930 64948 64965 64981 64997 65012 65027 65041 65055 65068 65081 65094 65106 65118 65129 65140 65151 65161 65171 65180 65189 65198 65206 65214 65222 65230 65237 65244 65251 65258 65264 65270 65276 65282 65287
55	0 5 10 15 20 25 31 37 43 49 55 62 69 76 83 90 98 106 114 122 131 140 149 159 169 179 189 200 211 223 235 247 260 273 286 300 314 329 344 359 375 391 408 425 443 461 480 499 519 540 561 583 605 628 652 676 701 726 752 779 807 835 864 894 925 956 988 1021 1055 1090 1125 1161 1198 1236 1275 1315 1356 1398 1441 1485 1530 1576 1623 1671 1720 1771 1823 1876 1930 1985 2041 2099 2158 2218 2279 2342 2406 2471 2538 2606 2676 2747 2820 2894 2970 3047 3126 3206 3288 3371 3456 3542 3630 3720 3811 3904 3999 4096 4194 4294 4396 4500 4606 4713 4822 4933 5046 5161 5278 5397 5518 5641 5766 5893 6022 6153 6286 6421 6558 6697 6838 6981 7126 7273 7422 7574 7728 7884 8042 8202 8364 8528 8695 8864 9035

The index	probability table
	9208 9383 9561 9741 9923 10107 10294 10483 10674 10867 11062 11260 11460 11662 11866 12072 12281 12492 12705 12920 13137 6 13578 13802 14028 14256 14486 14718 14952 15188 15426 15666 15908 16152 16398 16646 16896 17148 17402 17658 17916 18176 18437 18700 18965 19232 19500 19770 20042 20315 20590 20866 21144 21423 21704 21986 22270 22555 22841 23129 23418 23708 23999 24292 24586 24881 25177 25474 25772 26071 26371 26672 26973 27275 27578 27882 28186 28491 28796 29102 29409 29716 30023 30331 30639 30947 31256 31565 31874 32183 32492 32801 33 110 33419 33728 34037 34346 34654 34962 35270 35577 35884 36191 36497 36802 37107 37411 37715 38018 38320 38621 38922 39222 39521 39819 40116 40412 40707 41001 41294 41585 41875 42164 42452 42738 43023 43307 43589 43870 44149 44427 44703 44978 45251 45523 45793 46061 46328 46593 46856 47117 47377 47635 47891 48145 48397 48647 48895 49141 49385 49627 49867 50105 50341 50575 50807 51037 51265 51491 51715 51937 52588 52801 53012 53221 53427 53631 53833 54033 54231 54426 54619 54810 54999 55186 55370 55552 55732 55910 56085 56258 56429 56598 56765 56929 57091 57251 57409 57565 57719 57871 58020 58167 58312 58455 58596 58735 58872 59007 59140 59271 59400 59527 59652 59775 59896 60015 60132 60247 60360 60471 60580 60687 60793 60897 60999 61099 61197 61294 61389 61482 61573 61663 61751 61837 61922 62005 62087 62167 62246 62323 62473 62546 62617 62687 62755 62822 62887 62951 63014 63075 63135 63194 63252 63308 63363 63417 63470 63522 63573 63622 63670 63717 63763 63808 63852 63895 63937 63978 64018 64057 64095 64132 64168 64203 64238 64272 64305 64337 64368 64399 64429 64458 64486 64514 64541 64567 64592 64617 64641 64665 64688 64710 64732 64753 64774 64794 64813 64832 64850 64868 64885 64902 64918 64934 64949 64964 64979 64993 33,65046, 65058, 65070, 65082, 65093, 65104, 65114, 65124, 65134, 65144, 65153, 65162, 65171, 65179, 65187, 65195, 65203, 65210, 65217, 65224, 65231, 65238, 65244, 65250, 65256, 65262, 65268, 65273, 65278, 65283, 65288, 65293, and 65536
56	0 4 8 12 17 22 27 32 37 42 47 53 59 65 71 77 83 90 97 104 111 118 126 134 142 150 159 168 177 186 195 205 215 225 236 247 258 269 281 293 305 318 331 344 358 372 386 401 416 432 448 464 481 498 516 534 553 572 591 611 631 652 673 695 717 740 763 787 812 837 863 889 916 944 972 1001 1030 1060 1091 1122 1154 1187 1221 1255 1290 1326 1362 1399 1437 1476 1516 1556 1597 1639 1682 1726 1771 1817 1864 1911 1959 2008 2058 2109 2161 2214 2268 2323 2379 2436 2494 2554 2615 2677 2740 2804 2869 2935 3002 3071 3141 3212 3284 3358 3433 3509 3586 3665 3745 3826 3909 3993 4078 4165 4253 4342 4433 4525 4619 4714 4811 4909 5008 5109 5211 5315 5420 5527 5636 5746 5858 5971 6086 6202 6320 6440 6561 6684 6808 6934 7062 7191 7322 7455 7589 7725 7863 8002 8143 8286 8431 8577 8725 8875 0134 10299 10466 10635 10805 10977 11151 11327 11504 11683 11864 12046 12230 12416 12604 12793 12984 13177 13371 13567 13765 13964 14165 14368 14572 14778 14986 15195 15406 15618 15832 16047 16264 16483 16703 16925 17148 17373 17599 17826 18055 18285 18517 18750 18984 19220 19457 19695 19935 20176 20418 20662 20907 21153 21400 21648 21897 22147 22399 22652 22906 23161 23417 23674 23932 24190 24449 24709 24970 25232 25758 26022 26287 26553 26819 27086 27353 27621 27890 28159 28429 28699 28969 29240 29511 29783 30055 30327 30599 30872 31145 31418 31691 31964 32237 32510 32783 33056 33329 33602 33875 34148 34421 34694 34966 35238 35510 35782 36053 36324 36594 36864 37134 37403 37672 37940 38207 38474 38740 39006 39271 39535

The index	probability table
	39798 40061 40323 40584 40844 41103 41361 41619 41876 42132 42387 42641 42894 43146 43396 43645 43893 44140 6 44631 44875 45117 45358 45598 45836 46073 46309 46543 46776 47008 47238 47467 47694 47920 48145 48368 48590 48810 49029 49246 49461 49675 49887 50098 50307 50515 50721 50925 51128 51329 51528 51726 51922 52116 52309 52500 52689 52877 53063 53247 53429 53610 53789 53966 54142 54316 54488 54658 54827 54994 55159 55322 55484 55644 55802 55959 56114 56267 56418 56568 56716 56862 57007 57150 57291 971 58102 58231 58359 58485 58609 58732 58853 58973 59091 59207 59322 59435 59547 59657 59766 59873 59978 60082 60184 60285 60384 60482 60579 60674 60768 60860 60951 61040 61128 61215 61300 61384 61467 61548 61628 61707 61784 61860 61935 62009 62081 62152 62222 62291 62358 62424 62489 62553 62616 62678 62739 62799 62857 62914 62970 63025 63079 63132 63184 63235 63285 63334 63382 63429 63476 63522 63567 63611 63654 63737 63777 63817 63856 63894 63931 63967 64003 64038 64072 64105 64138 64170 64201 64232 64262 64291 64320 64348 64376 64403 64429 64455 64480 64505 64529 64552 64575 64597 64619 64640 64661 64681 64701 64720 64739 64758 64776 64794 64811 64828 64844 64860 64876 64891 64906 64920 64934 64948 64961 64974 64987 64999 65011 65023 65034 65045 65056 65067 65077 65087 65097 65106 65115 65124 65133 65142 65150 65158 65166 65174 65181 65188 65195 65202 65209 65215 65221 65227 65233 65239 65245 65250 65255 65260 65265 65270 65275 65280 65284 65288 65292 65536
57	0 4 8 12 16 20 24 28 32 37 42 47 52 57 62 67 72 78 84 90 96 102 108 115 122 129 136 143 150 158 166 174 182 190 198 207 216 225 234 244 254 264 274 284 295 306 317 329 341 353 365 378 391 404 417 431 445 459 474 489 504 520 536 552 569 586 603 621 639 658 677 696 716 736 757 778 799 1499 1534 1570 1607 1644 1682 1721 1760 1800 1841 1883 1925 1968 2012 2057 2102 2148 2195 2243 2291 2340 2390 2441 2493 2546 2599 2653 2708 2764 2821 2879 2938 2998 3059 3120 3182 3245 3309 3374 3440 3507 3575 3644 3714 3785 3857 3930 4004 4080 4157 4235 4314 4394 4475 4557 4640 4724 4809 4896 4984 5073 5163 5254 5346 5440 5535 5631 5728 5826 5926 6027 6129 6232 6337 6443 6550 6658 6768 6879 6991 7105 7220 336 7453 7572 7692 7813 7936 8060 8185 8312 8440 8569 8700 8832 8965 9100 9236 9373 9512 9652 9793 9936 10080 10226 10373 10521 10671 10822 10974 11128 11283 11439 11597 11756 11916 12078 12241 12405 12571 12738 12906 13076 13247 13419 13593 13768 13944 14122 14301 14481 14662 14845 15029 15214 15400 15588 15777 15967 16158 16351 16545 16740 16936 17133 17331 17531 17732 17934 18137 18341 18546 18752 18959 19167 19586 19797 20009 20222 20436 20651 20867 21084 21302 21521 21741 21962 22184 22407 22630 22854 23079 23305 23532 23759 23987 24216 24445 24675 24906 25137 25369 25602 25835 26069 26303 26538 26773 27009 27245 27482 27719 27957 28195 28433 28672 28911 29150 29390 29630 29870 30110 30351 30592 30833 31074 31315 31556 31798 32040 32282 32524 32766 33008 33250 33492 33734 33975 34216 34457 34698 34939 35180 35420 35660 0 36140 36379 36618 36857 37095 37333 37571 37808 38045 38281 38517 38752 38987 39221 39455 39688 39921 40153 40384 40615 40845 41074 41303 41531 41758 41985 42211 42436 42660 42883 43106 43328 43549 43769 43988 44206 44423 44639 44854 45068 45281 45493 45704 45914 46123 46331 46538 46744 46949 47153 47356 47558 47759 47959 48157 48354 48550 48745 48939 49132 49323 49513 49702 49890 50076 50261 50445 50628 50809 50989 168 51346 51522 51697 51871 52043 52214 52384 52552 52719 52885 53049 53212

The index	probability table
	53374 53534 53693 53851 54007 54162 54316 54468 54619 54769 54917 55064 55210 55354 55497 55638 55778 55917 56054 56190 56325 56458 56590 56721 56850 56978 57105 57230 57354 57477 57598 57718 57837 57954 58070 58185 58299 58411 58522 58632 58740 58847 58953 59058 59161 59263 59364 59464 59562 59659 59755 59850 59944 60481 60566 60650 60733 60815 60896 60976 61055 61133 61210 61286 61360 61433 61505 61576 61646 61715 61783 61850 61916 61981 62045 62108 62170 62231 62292 62352 62411 62469 62526 62582 62637 62691 62744 62797 62849 62900 62950 62999 63047 63095 63142 63188 63233 63278 63322 63365 63407 63449 63490 63530 63569 63608 63646 63683 63720 63756 63791 63826 63860 63894 63927 63959 63991 64022 64053 64083 64112 64141 64169 64197 64224 64251 64277 64303 64328 64353 64377 64401 64424 64447 64469 64491 64512 64533 64554 64574 64594 64613 64632 64651 64669 64687 64704 64721 64738 64754 64770 64786 64801 64816 64831 64845 64859 64873 64886 64899 64912 64925 64937 64949 64961 64973 64984 64995 65006 65016 65026 65036 65046 65056 65065 65074 65083 65092 65100 65108 65116 65124 65132 65140 65147 65154 65161 65168 65175 65182 65188 12 65218 65223 65228 65233 65238 65243 65248 65253 65258 65262 65266 65270 65274 65278 65282 65286 65290 65536
58	0 3 6 9 12 16 20 24 28 32 36 40 44 48 52 56 61 66 71 76 81 86 91 96 102 108 114 120 126 132 138 144 151 158 165 172 179 186 193 201 209 217 225 233 241 250 259 268 277 286 296 306 316 326 336 347 358 369 380 391 403 415 427 439 452 465 478 491 505 519 533 547 562 577 592 608 624 640 656 673 690 707 725 743 761 180 1206 1232 1259 1286 1314 1342 1371 1400 1430 1460 1491 1522 1554 1586 1619 1652 1686 1720 1755 1790 1826 1863 1900 1938 1976 2015 2054 2094 2135 2176 2218 2260 2303 2347 2391 2436 2482 2528 2575 2623 2671 2720 2770 2820 2871 2923 2975 3028 3082 3137 3192 3248 3305 3363 3421 3480 3540 3601 3663 3725 3788 3852 3917 3983 4049 4116 4184 4253 4323 4394 4466 4538 4611 4685 4760 4836 4913 5393 5476 5560 5645 5731 5818 5906 5995 6085 6176 6268 6361 6455 6550 6646 6743 6841 6940 7040 7141 7243 7346 7450 7555 7661 7768 7876 7985 8095 8206 8318 8431 8545 8660 8776 8893 9011 9130 9250 9372 9495 9619 9744 9870 9997 10125 10254 10384 10515 10647 10780 10914 11049 11185 11322 11460 11599 11740 11882 12025 12169 12314 12460 12607 12755 12904 13054 13205 13357 13510 13664 13819 13975 14132 14290 14449 14770 14932 15095 15259 15424 15590 15757 15925 16094 16264 16435 16607 16780 16953 17127 17302 17478 17655 17833 18012 18192 18373 18554 18736 18919 19103 19288 19474 19660 19847 20035 20224 20413 20603 20794 20986 21178 21371 21565 21760 21955 22151 22348 22545 22743 22941 23140 23340 23540 23741 23942 24144 24347 24550 24754 24958 25163 25368 25574 25780 25986 26193 26400 26608 26816 27025 27234 27443 27653 27863 3 28284 28495 28706 28917 29129 29341 29553 29765 29977 30190 30403 30616 30829 31042 31255 31468 31682 31896 32110 32324 32538 32752 32966 33180 33394 33608 33822 34035 34248 34461 34674 34887 35100 35313 35525 35737 35949 36161 36373 36584 36795 37006 37217 37427 37637 37847 38056 38265 38474 38682 38890 39097 39304 39510 39716 39922 40127 40332 40536 40740 40943 41146 41348 41549 41750 41950 42150 42349 42547 942 43139 43335 43530 43725 43919 44112 44304 44496 44687 44877 45066 45255 45443 45630 45816 46002 46187 46371 46554 46736 46917 47098 47278 47457 47635 47812 47988 48163 48337 48510 48683 48855 49026 49196 49365 49533 49700 49866 50031 50195 50358 50520 50681 50841 51000 51158 51315 51471 51626 51780 51933 52085 52236 52386

The index	probability table
	52535 52683 52830 52976 53121 53265 53408 53550 53691 53830 53968 54105 54241 54376 54775 54906 55036 55165 55293 55420 55546 55671 55795 55918 56040 56160 56279 56397 56514 56630 56745 56859 56972 57084 57195 57305 57414 57522 57629 57735 57840 57944 58047 58149 58250 58350 58449 58547 58644 58740 58835 58929 59022 59114 59205 59295 59384 59472 59559 59645 59730 59814 59897 59979 60060 60140 60220 60299 60377 60454 60530 60605 60679 60752 60824 60896 60967 61037 61106 61174 61241 61307 61565 61627 61689 61750 61810 61869 61927 61985 62042 62098 62153 62208 62262 62315 62367 62419 62470 62520 62570 62619 62667 62715 62762 62808 62854 62899 62943 62987 63030 63072 63114 63155 63196 63236 63275 63314 63352 63390 63427 63464 63500 63535 63570 63604 63638 63671 63704 63736 63768 63799 63830 63860 63890 63919 63948 63976 64004 64031 64058 64084 64110 64136 64161 64186 64210 64234 64258 64281 48 64370 64391 64412 64432 64452 64472 64491 64510 64529 64547 64565 64583 64600 64617 64634 64650 64666 64682 64698 64713 64728 64743 64757 64771 64785 64799 64812 64825 64838 64851 64863 64875 64887 64899 64910 64921 64932 64943 64954 64964 64974 64984 64994 65004 65013 65022 65031 65040 65049 65057 65065 65073 65081 65089 65097 65104 65111 65118 65125 65132 65139 65146 65152 65158 65164 65170 65176 65182 65188 5199 65204 65209 65214 65219 65224 65229 65234 65238 65242 65246 65250 65254 65258 65262 65266 65270 65274 65278 65281 65284 65287 65290 65536
59	0 3 6 9 12 15 18 21 24 27 30 34 38 42 46 50 54 58 62 66 70 74 78 83 88 93 98 103 108 113 118 123 128 134 140 146 152 158 164 170 176 182 189 196 203 210 217 224 231 238 246 254 262 270 278 286 294 303 312 321 330 339 348 358 368 378 388 398 408 419 430 441 452 463 475 487 499 47 966 986 1006 1026 1047 1068 1089 1111 1133 1155 1178 1201 1224 1248 1272 1296 1321 1346 1371 1397 1423 1450 1477 1504 1532 1560 1589 1618 1647 1677 1707 1738 1769 1800 1832 1864 1897 1930 1964 1998 2033 2068 2104 2140 2176 2213 2250 2288 2326 2365 2404 2444 2484 2525 2566 2608 2651 2694 2738 2782 2827 2872 2918 2964 3011 3058 3106 3155 3204 3254 3304 3355 3407 3459 3512 3565 3619 957 4015 4074 4134 4194 4255 4317 4379 4442 4506 4570 4635 4701 4767 4834 4902 4971 5040 5110 5181 5252 5324 5397 5471 5545 5620 5696 5773 5850 5928 6007 6087 6167 6248 6330 6413 6496 6580 6665 6751 6837 6924 7012 7101 7191 7281 7372 7464 7557 7651 7745 7840 7936 8033 8131 8229 8328 8428 8529 8631 8734 8837 8941 9046 9152 9259 9366 9474 9583 9693 9804 9916 10028 10141 10255 10370 10486 10603 10720 10838 10957 1077 11198 11320 11442 11565 11689 11814 11940 12066 12193 12321 12450 12580 12711 12842 12974 13107 13241 13376 13511 13647 13784 13922 14061 14200 14340 14481 14623 14765 14908 15052 15197 15343 15489 15636 15784 15933 16082 16232 16383 16534 16686 16839 16993 17147 17302 17458 17614 17771 17929 18088 18247 18407 18568 18729 18891 19053 19216 19380 19544 19709 19875 20041 20208 20375 20543 20712 20881 21051 21221 21563 21735 21908 22081 22255 22429 22604 22779 22955 23131 23308 23485 23662 23840 24018 24197 24376 24556 24736 24916 25097 25278 25460 25642 25824 26007 26190 26373 26557 26741 26925 27110 27295 27480 27665 27851 28037 28223 28409 28596 28783 28970 29157 29344 29532 29720 29908 30096 30284 30472 30660 30848 31037 31226 31415 31604 31793 31982 32171 32360 32549 32738 32927 33116 33305 33494 33683 33872 34061 34250 9 34627 34815 35003 35191 35379 35567 35755 35943 36130 36317 36504 36691 36878 37064 37250 37436

The index	probability table
	37622 37807 37992 38177 38362 38546 38730 38914 39097 39280 39463 39645 39827 40009 40190 40371 40551 40731 40911 41090 41269 41447 41625 41802 41979 42156 42332 42508 42683 42858 43032 43206 43379 43552 43724 43895 44066 44236 44406 44575 44744 44912 45079 45246 45412 45578 45743 45907 46071 46234 46396 46558 46719 040 47199 47358 47516 47673 47829 47985 48140 48294 48448 48601 48753 48904 49055 49205 49354 49503 49651 49798 49944 50090 50235 50379 50522 50664 50806 50947 51087 51226 51365 51503 51640 51776 51911 52046 52180 52313 52445 52576 52707 52837 52966 53094 53221 53347 53473 53598 53722 53845 53967 54089 54210 54330 54449 54567 54684 54801 54917 55032 55146 55259 55371 55483 55594 55704 55813 55921 56450 56553 56656 56758 56859 56959 57058 57156 57254 57351 57447 57542 57636 57730 57823 57915 58006 58096 58186 58275 58363 58450 58536 58622 58707 58791 58874 58957 59039 59120 59200 59280 59359 59437 59514 59591 59667 59742 59816 59890 59963 60035 60106 60177 60247 60316 60385 60453 60520 60586 60652 60717 60781 60845 60908 60970 61032 61093 61153 61213 61272 61330 61388 61445 61502 61558 61613 61668 61722 61775 61880 61932 61983 62033 62083 62132 62181 62229 62276 62323 62369 62415 62460 62505 62549 62593 62636 62679 62721 62762 62803 62843 62883 62922 62961 62999 63037 63074 63111 63147 63183 63219 63254 63289 63323 63357 63390 63423 63455 63487 63518 63549 63580 63610 63640 63669 63698 63727 63755 63783 63810 63837 63864 63890 63916 63941 63966 63991 64015 64039 64063 64086 64109 64132 64154 64176 64198 64219 81 64301 64321 64340 64359 64378 64397 64415 64433 64451 64468 64485 64502 64519 64535 64551 64567 64583 64598 64613 64628 64643 64657 64671 64685 64699 64712 64725 64738 64751 64764 64776 64788 64800 64812 64824 64835 64846 64857 64868 64879 64889 64899 64909 64919 64929 64939 64948 64957 64966 64975 64984 64993 65001 65009 65017 65025 65033 65041 65049 65056 65063 65070 65077 65084 65091 65098 65105 65111 65117 65123 5129 65135 65141 65147 65153 65159 65164 65169 65174 65179 65184 65189 65194 65199 65204 65209 65213 65217 65221 65225 65229 65233 65237 65241 65245 65249 65253 65257 65260 65263 65266 65269 65272 65275 65278 65281 65284 65287
60	0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 55 59 63 67 71 75 79 83 87 91 95 99 103 107 111 116 121 126 131 136 141 146 151 156 161 166 171 177 183 189 195 201 207 213 219 225 231 238 245 252 259 266 273 280 287 294 302 310 318 326 334 342 350 358 367 376 385 394 403 412 421 431 441 451 461 471 754 768 783 798 813 828 844 860 876 892 908 925 942 959 976 994 1012 1030 1048 1067 1086 1105 1124 1144 1164 1184 1204 1225 1246 1267 1288 1310 1332 1354 1377 1400 1423 1446 1470 1494 1518 1543 1568 1593 1619 1645 1671 1698 1725 1752 1780 1808 1836 1865 1894 1923 1953 1983 2013 2044 2075 2106 2138 2170 2203 2236 2269 2303 2337 2371 2406 2441 2477 2513 2549 2586 2623 2661 2699 2738 2777 2816 2856 2896 2937 2978 3020 3062 3104 3147 3190 3234 3278 3323 3368 3414 3460 3507 3554 3602 3650 3699 3748 3798 3848 3899 3950 4002 4054 4107 4160 4214 4268 4323 4378 4434 4490 4547 4604 4662 4720 4779 4838 4898 4959 5020 5082 5144 5207 5270 5334 5398 5463 5529 5595 5662 5729 5797 5865 5934 6004 6074 6145 6216 6288 6361 6434 6508 6582 6657 6733 6809 6886 6963 7041 7120 7199 7279 7360 7441 7523 7605 7688 7772 7856 7941 3 8200 8287 8375 8464 8553 8643 8734 8825 8917 9010 9103 9197 9292 9387 9483 9579 9676 9774 9872 9971 10071 10171 10272 10374 10476 10579 10683 10787 10892 10998 11104 11211 11318 11426 11535 11644 11754 11865 11976 12088 12201 12314

The index	probability table
	12428 12543 12658 12774 12890 13007 13125 13243 13362 13482 13602 13723 13844 13966 14089 14212 14336 14460 14585 14711 14837 14964 15092 15220 15349 15478 15608 15738 15869 6266 16399 16533 16668 16803 16939 17075 17212 17349 17487 17625 17764 17903 18043 18184 18325 18467 18609 18752 18895 19039 19183 19328 19473 19619 19765 19912 20059 20207 20355 20503 20652 20801 20951 21101 21252 21403 21555 21707 21859 22012 22165 22319 22473 22627 22782 22937 23093 23249 23405 23562 23719 23876 24034 24192 24350 24509 24668 24827 24987 25147 25307 25468 25629 25790 25951 26113 26275 26437 26599 26925 27088 27251 27415 27579 27743 27907 28071 28236 28401 28566 28731 28896 29061 29227 29393 29559 29725 29891 30057 30223 30389 30555 30722 30889 31056 31223 31390 31557 31724 31891 32058 32225 32392 32559 32726 32893 33060 33227 33394 33561 33728 33895 34062 34229 34396 34563 34730 34896 35062 35228 35394 35560 35726 35892 36058 36224 36389 36554 36719 36884 37049 37214 37378 37542 37706 37870 38034 38197 3 38686 38848 39010 39172 39334 39495 39656 39817 39978 40138 40298 40458 40617 40776 40935 41093 41251 41409 41566 41723 41880 42036 42192 42348 42503 42658 42812 42966 43120 43273 43426 43578 43730 43882 44033 44184 44334 44484 44633 44782 44930 45078 45226 45373 45520 45666 45812 45957 46102 46246 46390 46533 46676 46818 46960 47101 47242 47382 47521 47660 47798 47936 48073 48210 48346 48482 48617 48752 48886 152 49284 49416 49547 49677 49807 49936 50065 50193 50321 50448 50574 50700 50825 50949 51073 51196 51319 51441 51562 51683 51803 51923 52042 52160 52278 52395 52511 52627 52742 52857 52971 53084 53197 53309 53420 53531 53641 53750 53859 53967 54074 54181 54287 54393 54498 54602 54706 54809 54911 55013 55114 55214 55314 55413 55511 55609 55706 55802 55898 55993 56088 56182 56275 56368 56460 56551 56642 56732 56998 57085 57172 57258 57344 57429 57513 57597 57680 57762 57844 57925 58006 58086 58165 58244 58322 58399 58476 58552 58628 58703 58777 58851 58924 58997 59069 59140 59211 59281 59351 59420 59488 59556 59623 59690 59756 59822 59887 59951 60015 60078 60141 60203 60265 60326 60387 60447 60506 60565 60623 60681 60738 60795 60851 60907 60962 61017 61071 61125 61178 61231 61283 61335 61386 61437 61487 61537 61586 61635 61683 61731 61778 61825 61871 61917 61962 62007 62051 62095 62138 62181 62223 62265 62307 62348 62389 62429 62469 62508 62547 62586 62624 62662 62699 62736 62772 62808 62844 62879 62914 62948 62982 63016 63049 63082 63115 63147 63179 63210 63241 63272 63302 63332 63362 63391 63420 63449 63477 63505 63533 63560 63587 63614 63640 63666 63692 63717 63742 63767 63791 63815 63839 63862 63885 63908 63931 63953 63975 39 64060 64081 64101 64121 64141 64161 64180 64199 64218 64237 64255 64273 64291 64309 64326 64343 64360 64377 64393 64409 64425 64441 64457 64472 64487 64502 64517 64531 64545 64559 64573 64587 64601 64614 64627 64640 64653 64666 64678 64690 64702 64714 64726 64738 64749 64760 64771 64782 64793 64804 64814 64824 64834 64844 64854 64864 64873 64882 64891 64900 64909 64918 64927 64935 64943 64951 64959 64967 64975 64983 4991 64998 65005 65012 65019 65026 65033 65040 65047 65054 65060 65066 65072 65078 65084 65090 65096 65102 65108 65114 65119 65124 65129 65134 65139 65144 65149 65154 65159 65164 65169 65174 65178 65182 65186 65190 65194 65198 65202 65206 65210 65214 65218 65222 65226 65230 65234 65237 65240 65243 65246 65249 65252 65255 65258 65261 65264 65267 65270 65273 65276 65279 65282

The index	probability table
61	0 2 4 6 8 10 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66 69 72 75 79 83 87 91 95 99 103 107 111 115 119 123 127 131 135 139 143 148 153 158 163 168 173 178 183 188 193 198 203 208 214 220 226 232 238 244 250 256 262 268 274 280 287 294 301 308 315 322 329 336 343 350 358 366 374 382 390 398 406 414 422 430 439 448 457 466 475 484 493 502 512 522 532 542 552 562 572 582 593 604 615 626 637 648 659 671 683 695 707 719 731 744 757 770 783 796 809 823 837 851 865 879 893 908 923 938 953 968 983 999 1015 1031 1047 1063 1080 1097 1114 1131 1148 1166 1184 1202 1220 1238 1257 1276 1295 1314 1334 1354 1374 1394 1414 1435 1456 1477 1498 1520 1542 1564 1586 1609 1632 1655 1678 1702 1726 1750 1774 1799 1824 1849 1874 1900 1926 1952 1979 0 2290 2320 2350 2381 2412 2443 2475 2507 2539 2571 2604 2637 2670 2704 2738 2772 2807 2842 2877 2913 2949 2985 3022 3059 3097 3135 3173 3212 3251 3290 3330 3370 3410 3451 3492 3533 3575 3617 3660 3703 3746 3790 3834 3879 3924 3969 4015 4061 4108 4155 4202 4250 4298 4347 4396 4445 4495 4545 4596 4647 4698 4750 4802 4855 4908 4962 5016 5070 5125 5180 5236 5292 5349 5406 5464 5522 5580 5639 5698 5940 6002 6064 6127 6190 6253 6317 6381 6446 6511 6577 6643 6710 6777 6845 6913 6982 7051 7121 7191 7262 7333 7405 7477 7550 7623 7697 7771 7846 7921 7997 8073 8150 8227 8304 8382 8460 8539 8618 8698 8778 8859 8940 9022 9104 9187 9271 9355 9440 9525 9611 9697 9784 9871 9959 10047 10136 10225 10315 10405 10496 10587 10679 10771 10864 10957 11051 11145 11240 11335 11431 11527 11624 11721 11819 11917 5 12315 12416 12517 12619 12721 12824 12927 13031 13135 13240 13345 13451 13557 13664 13771 13879 13987 14095 14204 14313 14423 14533 14644 14755 14867 14979 15092 15205 15319 15433 15548 15663 15779 15895 16011 16128 16245 16363 16481 16600 16719 16839 16959 17079 17200 17321 17443 17565 17688 17811 17934 18058 18182 18307 18432 18558 18684 18810 18937 19064 19191 19319 19447 19576 19705 19834 19964 487 20619 20751 20883 21016 21149 21282 21416 21550 21684 21819 21954 22089 22225 22361 22497 22634 22771 22908 23045 23183 23321 23459 23598 23737 23876 24015 24155 24295 24435 24575 24716 24857 24998 25139 25281 25423 25565 25707 25850 25993 26136 26279 26422 26566 26710 26854 26998 27142 27287 27432 27577 27722 27867 28012 28157 28303 28449 28595 28741 28887 29033 29179 29325 29472 29619 29766 29913 30501 30648 30795 30942 31089 31236 31384 31532 31680 31828 31976 32124 32272 32420 32568 32716 32864 33012 33160 33308 33456 33604 33752 33900 34048 34195 34342 34489 34636 34783 34930 35077 35224 35371 35518 35665 35812 35959 36105 36251 36397 36543 36689 36835 36981 37127 37272 37417 37562 37707 37852 37997 38142 38286 38430 38574 38718 38862 39005 39148 39291 39434 39577 39719 39861 40003 40145 40286 40427 40568 40709 40849 40989 41129 41269 41408 41547 41686 41825 41963 42101 42239 42376 42513 42650 42787 42923 43059 43195 43330 43465 43600 43734 43868 44002 44135 44268 44401 44533 44665 44797 44928 45059 45190 45320 45450 45579 45708 45837 45965 46093 46220 46347 46474 46600 46726 46852 46977 47102 47226 47350 47473 47596 47719 47841 47963 48084 48205 48325 48445 48565 48684 48803 48921 49039 49156 49273 49389 49505 49621 49736 51 49965 50079 50192 50305 50417 50529 50640 50751 50861 50971 51080 51189 51297 51405 51513 51620 51727 51833 51939 52044 52149 52253 52357 52460 52563 52665 52767 52868 52969 53069 53169 53268 53367 53465 53563 53660 53757 53853 53949 54044 54139 54233 54327 54420 54513 54605 54697 54788 54879 54969 55059 55148 55237 55325 55413 55500 55587 55673 55759 55844

The index	probability table
	55929 56013 56097 56180 56262 56344 56425 6745 56824 56902 56980 57057 57134 57211 57287 57363 57438 57513 57587 57661 57734 57807 57879 57951 58022 58093 58163 58233 58302 58371 58439 58507 58574 58641 58707 58773 58838 58903 58967 59031 59094 59157 59220 59282 59344 59405 59466 59526 59586 59645 59704 59762 59820 59878 59935 59992 60048 60104 60159 60214 60268 60322 60376 60429 60482 60534 60586 60637 60688 60739 60789 60839 60888 60937 60986 61034 61082 61176 61223 61269 61315 61360 61405 61450 61494 61538 61581 61624 61667 61709 61751 61792 61833 61874 61914 61954 61994 62033 62072 62111 62149 62187 62225 62262 62299 62335 62371 62407 62442 62477 62512 62546 62580 62614 62647 62680 62713 62745 62777 62809 62841 62872 62903 62934 62964 62994 63024 63053 63082 63111 63140 63168 63196 63224 63251 63278 63305 63332 63358 63384 63410 63435 63460 63485 63510 2 63606 63629 63652 63675 63698 63720 63742 63764 63786 63807 63828 63849 63870 63890 63910 63930 63950 63970 63989 64008 64027 64046 64064 64082 64100 64118 64136 64153 64170 64187 64204 64221 64237 64253 64269 64285 64301 64316 64331 64346 64361 64376 64391 64405 64419 64433 64447 64461 64475 64488 64501 64514 64527 64540 64553 64565 64577 64589 64601 64613 64625 64636 64647 64658 64669 64680 64691 64702 732 64742 64752 64762 64772 64782 64791 64800 64809 64818 64827 64836 64845 64854 64862 64870 64878 64886 64894 64902 64910 64918 64926 64934 64941 64948 64955 64962 64969 64976 64983 64990 64997 65004 65010 65016 65022 65028 65034 65040 65046 65052 65058 65064 65070 65076 65081 65086 65091 65096 65101 65106 65111 65116 65121 65126 65131 65136 65141 65145 65149 65153 65157 65161 65165 65169 65173 65177 65181 65185 65193 65197 65201 65205 65209 65212 65215 65218 65221 65224 65227 65230 65233 65236 65239 65242 65245 65248 65251 65254 65257 65260 65263 65266 65269 65272 65274 65276 65278 65280 65282 65284
62	0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 35 38 41 44 47 50 53 56 59 62 65 68 71 74 77 80 83 86 89 92 95 98 101 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 266 272 278 284 290 296 486, 494, 502, 510, 519, 528, 537, 546, 555, 564, 573, 582, 591, 601, 611, 621, 631, 641, 651, 661, 671, 681, 692, 703, 714, 725, 736, 747, 758, 769, 781, 793, 805, 817, 829, 841, 853, 865, 878, 891, 904, 917, 930, 943, 956, 970, 984, 998, 1012, 1026, 1040, 1054, 1069, 1084, 1099, 1114, 1129, 1144, 1160, 1176, 1192, 1208, 1224, 1240, 1257, 1274, 1291, 1308, 1325, 1342, 1360, 1378, 1396, 1414, 1432, 1450, 1469, 1488, 1507, 1526, 1545, 1565, 1585, 1605, 1625, 50 1772 1794 1816 1838 1860 1883 1906 1929 1952 1975 1999 2023 2047 2071 2096 2121 2146 2171 2196 2222 2248 2274 2300 2327 2354 2381 2408 2436 2464 2492 2520 2549 2578 2607 2636 2666 2696 2726 2756 2787 2818 2849 2880 2912 2944 2976 3008 3041 3074 3107 3141 3175 3209 3243 3278 3313 3348 3384 3420 3456 3492 3529 3566 3603 3641 3679 3717 3755 3794 3833 3872 3912 3952 3992 4033 4074 4115 4157 4199 4241 4283 4326 4369 4412 4456 4500 4544 4589 4634 4679 4725 4771 4817 4864 4911 4958 5006 5054 5102 5151 5200 5249 5299 5349 5399 5450 5501 5553 5605 5657 5710 5763 5816 5870 5924 5978 6033 6088 6143 6199 6255 6312 6369 6426 6484 6542 6600 6659 6718 6778 6838 6898 6959 7020 7081 7143 7205 7268 7331 7394 7458 7522 7586 7651 7716 7782 7848 7914 7981 8048 8115 8183 8251 8320 8389 8458 8528 8598 8669 8740 8811 01 9174 9248 9322 9397 9472 9547 9623 9699 9776 9853 9930 10008 10086 10164 10243 10322 10402 10482 10562 10643 10724 10806 10888 10970 11053 11136 11220 11304 11388 11473 11558

The index	probability table
	11644 11730 11816 11903 11990 12078 12166 12254 12343 12432 12522 12612 12702 12793 12884 12975 13067 13159 13252 13345 13438 13532 13626 13721 13816 13911 14007 14103 14199 14296 14393 14491 14589 14687 14786 14885 14984 15486 15588 15690 15792 15895 15998 16101 16205 16309 16413 16518 16623 16728 16834 16940 17046 17153 17260 17367 17475 17583 17691 17800 17909 18018 18128 18238 18348 18459 18570 18681 18793 18905 19017 19130 19243 19356 19470 19584 19698 19812 19927 20042 20157 20273 20389 20505 20621 20738 20855 20972 21090 21208 21326 21444 21563 21682 21801 21920 22040 22160 22280 22400 22521 22642 22763 22884 23006 23128 72 23494 23617 23740 23863 23986 24110 24234 24358 24482 24606 24731 24856 24981 25106 25231 25356 25482 25608 25734 25860 25986 26112 26239 26366 26493 26620 26747 26874 27002 27130 27258 27386 27514 27642 27770 27898 28027 28156 28285 28414 28543 28672 28801 28930 29059 29188 29318 29448 29578 29708 29838 29968 30098 30228 30358 30488 30618 30748 30878 31008 31138 31268 31398 31528 31659 31790 31921 32052 32183 2445 32576 32707 32838 32969 33100 33231 33362 33493 33624 33755 33885 34015 34145 34275 34405 34535 34665 34795 34925 35055 35185 35315 35445 35575 35705 35835 35965 36095 36224 36353 36482 36611 36740 36869 36998 37127 37256 37385 37513 37641 37769 37897 38025 38153 38281 38409 38536 38663 38790 38917 39044 39171 39297 39423 39549 39675 39801 39927 40052 40177 40302 40427 40552 40677 40801 40925 41049 41173 41297 41543 41666 41789 41911 42033 42155 42277 42399 42520 42641 42762 42883 43003 43123 43243 43363 43482 43601 43720 43839 43957 44075 44193 44311 44428 44545 44662 44778 44894 45010 45126 45241 45356 45471 45585 45699 45813 45927 46040 46153 46266 46378 46490 46602 46713 46824 46935 47045 47155 47265 47374 47483 47592 47700 47808 47916 48023 48130 48237 48343 48449 48555 48660 48765 48870 48974 49078 49182 49285 49388 1 49593 49695 49797 49898 49999 50099 50199 50299 50398 50497 50596 50694 50792 50890 50987 51084 51180 51276 51372 51467 51562 51657 51751 51845 51938 52031 52124 52216 52308 52399 52490 52581 52671 52761 52851 52940 53029 53117 53205 53293 53380 53467 53553 53639 53725 53810 53895 53979 54063 54147 54230 54313 54395 54477 54559 54640 54721 54801 54881 54961 55040 55119 55197 55275 55353 55430 55 811 55886 55961 56035 56109 56182 56255 56328 56400 56472 56543 56614 56685 56755 56825 56894 56963 57032 57100 57168 57235 57302 57369 57435 57501 57567 57632 57697 57761 57825 57889 57952 58015 58078 58140 58202 58263 58324 58385 58445 58505 58565 58624 58683 58741 58799 58857 58914 58971 59028 59084 59140 59195 59250 59305 59359 59413 59467 59520 59573 59626 59678 59730 59782 59833 59884 59934 59984 60181 60229 60277 60325 60372 60419 60466 60512 60558 60604 60649 60694 60739 60783 60827 60871 60914 60957 61000 61042 61084 61126 61168 61209 61250 61291 61331 61371 61411 61450 61489 61528 61566 61604 61642 61680 61717 61754 61791 61827 61863 61899 61935 61970 62005 62040 62074 62108 62142 62176 62209 62242 62275 62307 62339 62371 62403 62434 62465 62496 62527 62557 62587 62617 62647 62676 62705 62734 62763 62847 62875 62902 62929 62956 62983 63009 63035 63061 63087 63112 63137 63162 63187 63212 63236 63260 63284 63308 63331 63354 63377 63400 63423 63445 63467 63489 63511 63533 63554 63575 63596 63617 63638 63658 63678 63698 63718 63738 63757 63776 63795 63814 63833 63851 63869 63887 63905 63923 63941 63958 63975 63992 64009 64026 64043 64059 64075 64091 64107 64123 64139 64154 64169 64184 64199 64214 64229 71 64285 64299 64313 64327

The index	probability table
	64340 64353 64366 64379 64392 64405 64418 64430 64442 64454 64466 64478 64490 64502 64514 64525 64536 64547 64558 64569 64580 64591 64602 64612 64622 64632 64642 64652 64662 64672 64682 64692 64701 64710 64719 64728 64737 64746 64755 64764 64773 64781 64789 64797 64805 64813 64821 64829 64837 64845 64853 64861 64868 64875 64882 64889 64896 64903 64910 64917 64924 64931 4963 64969 64975 64981 64987 64993 64999 65005 65011 65017 65023 65028 65033 65038 65043 65048 65053 65058 65063 65068 65073 65078 65083 65088 65093 65098 65103 65107 65111 65115 65119 65123 65127 65131 65135 65139 65143 65147 65151 65155 65159 65163 65167 65171 65175 65179 65182 65185 65188 65191 65194 65197 65200 65203 65206 65209 65212 65215 65218 65221 65224 65227 65230 65233 65236 65239 65242 65245 65248 65251 65256 65258 65260 65262 65264 65266 65268 65270 65272 65274 65276 65278 65280 65282 65284 65536
63	0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 57 60 63 66 69 72 75 78 81 84 87 90 93 96 99 102 105 108 111 114 117 120 123 126 129 132 135 138 142 146 150 154 158 162 166 170 174 178 182 186 190 194 198 202 206 210 214 218 222 226 231 236 241 246 251 256 261 266 271 276 399 405 411 418 425 432 439 446 453 460 467 474 481 488 495 502 509 517 525 533 541 549 557 565 573 581 589 597 605 614 623 632 641 650 659 668 677 686 695 704 714 724 734 744 754 764 774 784 794 804 814 825 836 847 858 869 880 891 902 913 925 937 949 961 973 985 997 73 1389 1405 1421 1437 1453 1469 1486 1503 1520 1537 1554 1571 1588 1606 1624 1642 1660 1678 1696 1715 1734 1753 1772 1791 1810 1829 1849 1869 1889 1909 1929 1949 1970 1991 2012 2033 2054 2076 2098 2120 2142 2164 2186 2209 2232 2255 2278 2301 2324 2348 2372 2396 2420 2444 2469 2494 2519 2544 2569 2595 2621 2647 2673 2699 2726 2753 2780 2807 2834 2862 2890 2918 2946 2974 3003 3032 3061 3090 3120 3150 3180 3210 3240 3271 3302 3333 3364 3395 3427 3459 3491 3523 3556 3589 3622 3655 3689 3723 3757 3791 3825 3860 3895 3930 3965 4001 4037 4073 4109 4146 4183 4220 4257 4295 4333 4371 4409 4448 4487 4526 4565 4605 4645 4685 4725 4766 4807 4848 4889 4931 4973 5015 5058 5101 5144 5187 5231 5275 5319 5363 5408 5453 5498 5543 5589 5635 5681 5728 5775 5822 5869 5917 5965 6013 6062 6111 6160 6209 6259 63 6615 6667 6719 6772 6825 6878 6931 6985 7039 7093 7148 7203 7258 7314 7370 7426 7482 7539 7596 7653 7711 7769 7827 7886 7945 8004 8063 8123 8183 8243 8304 8365 8426 8488 8550 8612 8674 8737 8800 8863 8927 8991 9055 9120 9185 9250 9316 9382 9448 9514 9581 9648 9715 9783 9851 9919 9988 10057 10126 10196 10266 10336 10406 10477 10548 10619 10691 10763 10835 10908 10981 575 11651 11727 11803 11880 11957 12034 12112 12190 12268 12346 12425 12504 12583 12663 12743 12823 12904 12985 13066 13148 13230 13312 13394 13477 13560 13643 13727 13811 13895 13979 14064 14149 14234 14320 14406 14492 14579 14666 14753 14840 14928 15016 15104 15193 15282 15371 15460 15550 15640 15730 15821 15912 16003 16094 16186 16278 16370 16462 16555 16648 16741 16835 16929 17023 17117 17212 17307 17402 17689 17785 17881 17978 18075 18172 18269 18367 18465 18563 18661 18760 18859 18958 19057 19157 19257 19357 19457 19558 19659 19760 19861 19963 20065 20167 20269 20371 20474 20577 20680 20783 20887 20991 21095 21199 21303 21408 21513 21618 21723 21828 21934 22040 22146 22252 22358 22465 22572 22679 22786 22893 23000 23108 23216 23324 23432 23540 23649 23758 23867 23976 24085 24194 24303 24413 24523 24633 24743 24853 25074 25185 25296 25407 25518 25629

The index	probability table
	25740 25852 25964 26076 26188 26300 26412 26524 26636 26749 26862 26975 27088 27201 27314 27427 27540 27653 27766 27880 27994 28108 28222 28336 28450 28564 28678 28792 28906 29020 29134 29248 29363 29478 29593 29708 29823 29938 30053 30168 30283 30398 30513 30628 30743 30858 30973 31088 31203 31318 31433 31548 31663 31778 31893 32008 32123 32238 32353 32469 32585 32701 32817 32933 48 33163 33278 33393 33508 33623 33738 33853 33968 34083 34198 34313 34428 34543 34658 34773 34888 35003 35118 35233 35348 35463 35578 35693 35808 35923 36038 36152 36266 36380 36494 36608 36722 36836 36950 37064 37178 37292 37406 37520 37633 37746 37859 37972 38085 38198 38311 38424 38537 38649 38761 38873 38985 39097 39209 39321 39433 39545 39656 39767 39878 39989 40100 40211 40322 40432 40542 40652 40762 1091 41200 41309 41418 41527 41636 41745 41853 41961 42069 42177 42285 42392 42499 42606 42713 42820 42927 43033 43139 43245 43351 43457 43562 43667 43772 43877 43982 44086 44190 44294 44398 44502 44605 44708 44811 44914 45016 45118 45220 45322 45424 45525 45626 45727 45828 45928 46028 46128 46228 46327 46426 46525 46624 46722 46820 46918 47016 47113 47210 47307 47404 47500 47596 47692 47788 47883 47978 48356 48450 48544 48637 48730 48823 48915 49007 49099 49191 49282 49373 49464 49555 49645 49735 49825 49914 50003 50092 50181 50269 50357 50445 50532 50619 50706 50793 50879 50965 51051 51136 51221 51306 51390 51474 51558 51642 51725 51808 51891 51973 52055 52137 52219 52300 52381 52462 52542 52622 52702 52781 52860 52939 53017 53095 53173 53251 53328 53405 53482 53558 53634 53710 53785 53860 53935 1 54304 54377 54450 54522 54594 54666 54737 54808 54879 54949 55019 55089 55159 55228 55297 55366 55434 55502 55570 55637 55704 55771 55837 55903 55969 56035 56100 56165 56230 56294 56358 56422 56485 56548 56611 56673 56735 56797 56859 56920 56981 57042 57102 57162 57222 57281 57340 57399 57458 57516 57574 57632 57689 57746 57803 57859 57915 57971 58027 58082 58137 58192 58246 58300 670 58722 58773 58824 58875 58926 58976 59026 59076 59125 59174 59223 59272 59320 59368 59416 59463 59510 59557 59604 59650 59696 59742 59787 59832 59877 59922 59966 60010 60054 60098 60141 60184 60227 60270 60312 60354 60396 60437 60478 60519 60560 60600 60640 60680 60720 60759 60798 60837 60876 60914 60952 60990 61028 61065 61102 61139 61176 61212 61248 61284 61320 61355 61390 61425 61460 61494 61528 61562 61596 61663 61696 61729 61762 61794 61826 61858 61890 61921 61952 61983 62014 62045 62075 62105 62135 62165 62195 62224 62253 62282 62311 62339 62367 62395 62423 62451 62478 62505 62532 62559 62586 62612 62638 62664 62690 62716 62741 62766 62791 62816 62841 62865 62889 62913 62937 62961 62984 63007 63030 63053 63076 63099 63121 63143 63165 63187 63209 63231 63252 63273 63294 63315 63336 63356 63376 63396 63416 63494 63513 63532 63551 63570 63589 63607 63625 63643 63661 63679 63697 63714 63731 63748 63765 63782 63799 63816 63832 63848 63864 63880 63896 63912 63928 63943 63958 63973 63988 64003 64018 64033 64048 64062 64076 64090 64104 64118 64132 64146 64160 64173 64186 64199 64212 64225 64238 64251 64264 64276 64288 64300 64312 64324 64336 64348 64360 64372 64383 64394 64405 64416 64427 64438 64449 64460 64471 64481 01 64511 64521 64531 64541 64551 64561 64571 64581 64590 64599 64608 64617 64626 64635 64644 64653 64662 64671 64680 64688 64696 64704 64712 64720 64728 64736 64744 64752 64760 64768 64776 64783 64790 64797 64804 64811 64818 64825 64832 64839 64846 64853 64860 64867 64874 64880 64886 64892 64898 64904 64910 64916

The index	probability table
	64922 64928 64934 64940 64946 64952 64958 64964 64969 64974 64979 64984 64989 64994 64999 5019 65024 65029 65034 65039 65044 65049 65054 65059 65063 65067 65071 65075 65079 65083 65087 65091 65095 65099 65103 65107 65111 65115 65119 65123 65127 65131 65135 65139 65143 65147 65150 65153 65156 65159 65162 65165 65168 65171 65174 65177 65180 65183 65186 65189 65192 65195 65198 65201 65204 65207 65210 65213 65216 65219 65222 65225 65228 65231 65233 65235 65237 65239 65241 65243 65245 65247 65249 65257 65259 65261 65263 65265 65267 65269 65271 65273 65275 65277 65279 65281 65283 65285 65536
64	0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 85 88 91 94 97 100 103 106 109 112 115 118 121 124 127 130 133 136 139 142 145 148 151 154 157 160 163 166 169 9 334 339 344 349 354 359 364 369 374 379 384 389 395 401 407 413 419 425 431 437 443 449 455 461 467 473 479 485 491 497 504 511 518 525 532 539 546 553 560 567 574 581 588 595 602 610 618 626 634 642 650 658 666 674 682 690 698 706 714 722 731 740 749 758 767 776 785 794 1106 1118 1130 1142 1154 1166 1178 1190 1202 1215 1228 1241 1254 1267 1280 1293 1306 1319 1333 1347 1361 1375 1389 1403 1417 1431 1445 1459 1474 1489 1504 1519 1534 1549 1564 1579 1595 1611 1627 1643 1659 1675 1691 1707 1723 1740 1757 1774 1791 1808 1825 1842 1859 1877 1895 1913 1931 1949 1967 1985 2004 2023 2042 2061 2080 2099 2118 2137 2157 2177 2197 2217 2237 2257 446 2468 2490 2512 2534 2556 2579 2602 2625 2648 2671 2694 2717 2741 2765 2789 2813 2837 2861 2886 2911 2936 2961 2986 3011 3037 3063 3089 3115 3141 3167 3194 3221 3248 3275 3302 3329 3357 3385 3413 3441 3469 3498 3527 3556 3585 3614 3643 3673 3703 3733 3763 3793 3823 3854 3885 3916 3947 3978 4010 4042 4074 4106 4138 4171 4204 4237 4270 4303 4337 4371 4405 4439 4473 4508 4543 4578 4613 4648 4684 4720 4756 4792 4828 4865 4902 4939 4976 5013 5051 5089 5127 5165 5203 5242 5281 5320 5359 5398 5438 5478 5518 5558 5599 5640 5681 5722 5763 5805 5847 5889 5931 5973 6016 6059 6102 6145 6189 6233 6277 6321 6365 6410 6455 6500 6545 6591 6637 6683 6729 6776 6823 6870 6917 6964 7012 7060 7108 7156 7205 7254 7303 7352 7402 7452 7502 7552 7602 7653 7704 7755 7806 7858 551 8606 8661 8716 8772 8828 8884 8940 8997 9054 9111 9168 9226 9284 9342 9400 9459 9518 9577 9636 9696 9756 9816 9876 9936 9997 10058 10119 10180 10242 10304 10366 10428 10491 10554 10617 10680 10744 10808 10872 10936 11001 11066 11131 11196 11262 11328 11394 11460 11527 11594 11661 11728 11795 11863 11931 11999 12067 12136 12205 12274 12343 12413 12483 12553 12623 12694 12765 12836 12907 12979 7 13340 13413 13486 13559 13633 13707 13781 13855 13930 14005 14080 14155 14230 14306 14382 14458 14534 14611 14688 14765 14842 14920 14998 15076 15154 15232 15311 15390 15469 15548 15628 15708 15788 15868 15948 16029 16110 16191 16272 16353 16435 16517 16599 16681 16764 16847 16930 17013 17096 17180 17264 17348 17432 17516 17601 17686 17771 17856 17941 18027 18113 18199 18285 18371 18458 18545 18632 18719 982 19070 19158 19246 19335 19424 19513 19602 19691 19780 19870 19960 20050 20140 20230 20320 20411 20502 20593 20684 20775 20867 20959 21051 21143 21235 21327 21419 21512 21605 21698 21791 21884 21977 22071 22165 22259 22353 22447 22541 22635 22730 22825 22920 23015 23110 23205 23300 23396 23492 23588 23684 23780 23876 23972 24069 24166 24263 24360 24457 24554 24651 24748 24845 24943 25041 25139 25237 25629 25727 25826 25925 26024 26123 26222 26321 26420 26519 26618 26717 26817 26917 27017 27117

The index	probability table
	27217 27317 27417 27517 27617 27717 27817 27917 28017 28118 28219 28320 28421 28522 28623 28724 28825 28926 29027 29128 29229 29330 29431 29532 29633 29734 29836 29938 30040 30142 30244 30346 30448 30550 30652 30754 30856 30958 31060 31162 31264 31366 31468 31570 31672 31774 31876 31978 32080 32182 32284 32386 32488 32590 32794 32896 32998 33100 33202 33304 33406 33508 33610 33712 33814 33916 34018 34120 34222 34324 34426 34528 34630 34732 34834 34936 35038 35140 35242 35344 35446 35548 35649 35750 35851 35952 36053 36154 36255 36356 36457 36558 36659 36760 36861 36962 37063 37164 37265 37365 37465 37565 37665 37765 37865 37965 38065 38165 38265 38365 38465 38565 38664 38763 38862 38961 49 39947 40045 40143 40241 40339 40437 40534 40631 40728 40825 40922 41019 41116 41213 41310 41406 41502 41598 41694 41790 41886 41982 42077 42172 42267 42362 42457 42552 42647 42741 42835 42929 43023 43117 43211 43305 43398 43491 43584 43677 43770 43863 43955 44047 44139 44231 44323 44415 44507 44598 44689 44780 44871 44962 45052 45142 45232 45322 45412 45502 45591 45680 45769 45858 45947 46036 46124 46212 6476 46563 46650 46737 46824 46911 46997 47083 47169 47255 47341 47426 47511 47596 47681 47766 47850 47934 48018 48102 48186 48269 48352 48435 48518 48601 48683 48765 48847 48929 49010 49091 49172 49253 49334 49414 49494 49574 49654 49734 49813 49892 49971 50050 50128 50206 50284 50362 50440 50517 50594 50671 50748 50824 50900 50976 51052 51127 51202 51277 51352 51427 51501 51575 51649 51723 51796 51869 51942 52015 52159 52231 52303 52375 52446 52517 52588 52659 52729 52799 52869 52939 53008 53077 53146 53215 53283 53351 53419 53487 53554 53621 53688 53755 53822 53888 53954 54020 54086 54151 54216 54281 54346 54410 54474 54538 54602 54665 54728 54791 54854 54916 54978 55040 55102 55163 55224 55285 55346 55406 55466 55526 55586 55646 55705 55764 55823 55882 55940 55998 56056 56114 56171 56228 56285 56342 56398 1 56676 56731 56786 56840 56894 56948 57002 57056 57109 57162 57215 57268 57320 57372 57424 57476 57527 57578 57629 57680 57730 57780 57830 57880 57930 57979 58028 58077 58126 58174 58222 58270 58318 58365 58412 58459 58506 58553 58599 58645 58691 58737 58782 58827 58872 58917 58961 59005 59049 59093 59137 59180 59223 59266 59309 59351 59393 59435 59477 59519 59560 59601 59642 59683 59724 59764 59804 59844 59884 962 60001 60040 60079 60117 60155 60193 60231 60269 60306 60343 60380 60417 60454 60490 60526 60562 60598 60634 60669 60704 60739 60774 60809 60843 60877 60911 60945 60979 61012 61045 61078 61111 61144 61176 61208 61240 61272 61304 61335 61366 61397 61428 61459 61489 61519 61549 61579 61609 61639 61668 61697 61726 61755 61784 61813 61841 61869 61897 61925 61953 61980 62007 62034 62061 62088 62115 62141 62167 62193 62245 62271 62296 62321 62346 62371 62396 62421 62445 62469 62493 62517 62541 62565 62588 62611 62634 62657 62680 62703 62726 62748 62770 62792 62814 62836 62858 62879 62900 62921 62942 62963 62984 63005 63025 63045 63065 63085 63105 63125 63145 63164 63183 63202 63221 63240 63259 63278 63297 63315 63333 63351 63369 63387 63405 63423 63440 63457 63474 63491 63508 63525 63542 63559 63575 63591 63607 63623 63639 63687 63703 63718 63733 63748 63763 63778 63793 63808 63823 63837 63851 63865 63879 63893 63907 63921 63935 63949 63963 63976 63989 64002 64015 64028 64041 64054 64067 64080 64092 64104 64116 64128 64140 64152 64164 64176 64188 64200 64212 64223 64234 64245 64256 64267 64278 64289 64300 64311 64322 64333 64343 64353 64363 64373 64383 64393 64403 64413 64423 64433

The index	probability table
	64443 64452 64461 64470 64479 64488 64497 24 64533 64542 64551 64560 64568 64576 64584 64592 64600 64608 64616 64624 64632 64640 64648 64656 64664 64672 64680 64687 64694 64701 64708 64715 64722 64729 64736 64743 64750 64757 64764 64771 64778 64785 64791 64797 64803 64809 64815 64821 64827 64833 64839 64845 64851 64857 64863 64869 64875 64881 64887 64893 64898 64903 64908 64913 64918 64923 64928 64933 64938 64943 64948 64953 64958 64963 64968 64973 64978 4988 64993 64998 65002 65006 65010 65014 65018 65022 65026 65030 65034 65038 65042 65046 65050 65054 65058 65062 65066 65070 65074 65078 65082 65086 65090 65094 65098 65101 65104 65107 65110 65113 65116 65119 65122 65125 65128 65131 65134 65137 65140 65143 65146 65149 65152 65155 65158 65161 65164 65167 65170 65173 65176 65179 65182 65185 65188 65191 65194 65197 65200 65202 65204 65206 65208 65210 65212 65214 65216 65220 65222 65224 65226 65228 65230 65232 65234 65236 65238 65240 65242 65244 65246 65248 65250 65252 65254 65256 65258 65260 65262 65264 65266 65268 65270 65272 65274 65276 65278 65280 65282

Table B.10 Basie decoding neural network parameters layer 1 CNN (convolutional kernel parameter: kernel)

Parameter value
0x1.59e8d00000000p-11, -0x1.303e2e0000000p-6, 0x1.f808ac0000000p-8, 0x1.d4da920000000p-7, -0x1.19255a0000000p-6, 0x1.a818920000000p-15, 0x1.7a2b560000000p-9, 0x1.15338c0000000p-5, 0x1.7ff9e80000000p-11, -0x1.1db39a0000000p-14, -0x1.b576c40000000p-10, -0x1.32a3780000000p-7, 0x1.076a0a0000000p-4, 0x1.2927b60000000p-10, -0x1.a75d660000000p-8, 0x1.503bf00000000p-5,
0x1.0ec3560000000p-10, 0x1.b544240000000p-7, 0x1.74d22a0000000p-6, -0x1.f3dc660000000p-7, 0x1.9fc23e0000000p-6, -0x1.536ec40000000p-11, -0x1.6218060000000p-9, 0x1.e1a0a60000000p-7, -0x1.884efa0000000p-10, -0x1.ac084c0000000p-10, -0x1.d28be60000000p-10, 0x1.40c1ba0000000p-6, -0x1.77cdb80000000p-1, 0x1.8542020000000p-12, -0x1.44e1de0000000p-5, -0x1.dce52c0000000p-7,
0x1.2bb7900000000p-10, 0x1.19f6360000000p-4, -0x1.a6dfaa0000000p-5, -0x1.6664d40000000p-5, 0x1.2117500000000p-4, 0x1.3a65380000000p-12, -0x1.0562320000000p-7, -0x1.6691ce0000000p-3, -0x1.a74f300000000p-9, 0x1.27394e0000000p-12, 0x1.1631760000000p-8, 0x1.ca4b820000000p-7, 0x1.1731260000000p-3, -0x1.229d140000000p-8, 0x1.5bd2480000000p-4, -0x1.dc34380000000p-4,
0x1.4c296c0000000p-10, -0x1.2356aa0000000p-6, 0x1.b709080000000p-7, 0x1.29d4dc0000000p-7, -0x1.333e580000000p-6, -0x1.3b4c180000000p-11, 0x1.009dcc0000000p-9, 0x1.a80dec0000000p-5, -0x1.efade20000000p-12, -0x1.b7aca60000000p-12, -0x1.b43cba0000000p-12, 0x1.68897a0000000p-7, -0x1.66d2320000000p-5, -0x1.6f6ca80000000p-11, -0x1.772ab80000000p-7, 0x1.724c820000000p-5,

0x1.42e0c20000000p-11, 0x1.163a640000000p-6, -0x1.85e8060000000p-6, -0x1.7c34180000000p-7, 0x1.774b600000000p-7, 0x1.e969a80000000p-10, 0x1.3cbab60000000p-9, -0x1.f24c1a0000000p-5, -0x1.0250100000000p-9, -0x1.5c73840000000p-11, -0x1.c3f3480000000p-11, -0x1.53a6cc0000000p-6, 0x1.3ce0760000000p-16, 0x1.1f97fc0000000p-10, 0x1.66122c0000000p-6, -0x1.0567e00000000p-6,
0x1.f09be60000000p-11, 0x1.e149060000000p-6, -0x1.23bf360000000p-5, -0x1.21e62e0000000p-6, 0x1.bd17b80000000p-8, 0x1.88a32c0000000p-9, 0x1.5c065e0000000p-13, -0x1.7b61600000000p-4, -0x1.bd8f7c0000000p-9, -0x1.0fe26c0000000p-12, 0x1.6490360000000p-10, -0x1.9a43800000000p-6, 0x1.5f6e080000000p-2, -0x1.de432c0000000p-12, 0x1.e4ad080000000p-5, -0x1.4fac560000000p-6,
-0x1.cd39b00000000p-10, -0x1.e16f580000000p-8, 0x1.abe0640000000p-7, 0x1.7f62a00000000p-8, 0x1.21d3660000000p-6, -0x1.2241fa0000000p-8, -0x1.d583ee0000000p-11, 0x1.3ce7480000000p-5, 0x1.0fa3120000000p-9, -0x1.6282d20000000p-11, -0x1.8c524a0000000p-10, 0x1.912d4e0000000p-6, -0x1.f7aee00000000p-2, 0x1.e4505e0000000p-11, -0x1.8708360000000p-5, -0x1.7e5ace0000000p-5,
0x1.355c680000000p-13, 0x1.5522a60000000p-5, -0x1.06f7b00000000p-6, -0x1.bf1a9a0000000p-6, 0x1.ecaeac0000000p-8, 0x1.605c700000000p-8, -0x1.a0040c0000000p-10, -0x1.3c05b40000000p-4, -0x1.41cb120000000p-9, 0x1.6bd0c20000000p-12, 0x1.ffd6a20000000p-10, -0x1.e283600000000p-7, 0x1.2473880000000p-3, 0x1.1c161a0000000p-12, 0x1.45797e0000000p-5, -0x1.0235900000000p-5,
0x1.1343040000000p-7, -0x1.474ab40000000p-3, -0x1.72bd740000000p-5, -0x1.5625d20000000p-5, 0x1.2a6b000000000p-5, -0x1.94492c0000000p-5, -0x1.6469a40000000p-5, -0x1.beeb820000000p-4, 0x1.dc5b440000000p-7, -0x1.7b40020000000p-7, 0x1.91742e0000000p-6, 0x1.4603940000000p-3, -0x1.22f7140000000p-3, 0x1.1b42460000000p-6, -0x1.4c612e0000000p-2, -0x1.3658be0000000p-5,
0x1.da2c6e0000000p-7, 0x1.3c2a900000000p-3, 0x1.8121480000000p-1, 0x1.dede740000000p-2, -0x1.d6ae0c0000000p-4, 0x1.83cb8c0000000p-8, -0x1.a9e4a40000000p-7, 0x1.ab9e660000000p-3, -0x1.d9e9fc0000000p-7, -0x1.a8fb320000000p-8, -0x1.f48fd60000000p-8, 0x1.a520ba0000000p-2, -0x1.31f3880000000p-2, 0x1.4b74e40000000p-9, 0x1.8a7d540000000p-6, -0x1.52c7680000000p-2,
-0x1.1468960000000p-4, 0x1.77f6520000000p-3, -0x1.2ef9680000000p-3, 0x1.177af20000000p-4, -0x1.8ba6980000000p-2, 0x1.fd51000000000p-4, 0x1.848b840000000p-3, 0x1.f84fe00000000p-2, -0x1.03f5ca0000000p-7, 0x1.66fc6a0000000p-5, -0x1.6592ce0000000p-4, -0x1.5e32080000000p-2, 0x1.309e0e0000000p-4, -0x1.4bd0380000000p-4, 0x1.16ed760000000p-1, -0x1.acd88c0000000p-4,
0x1.ee11ee0000000p-7, -0x1.e4f7720000000p-4, 0x1.76eb5a0000000p-5,

0x1.0d6ca40000000p-6, 0x1.04805c0000000p-2, -0x1.261a440000000p-5, -0x1.514d700000000p-5, 0x1.7549c00000000p-1, 0x1.307a000000000p-8, -0x1.a21c920000000p-7, 0x1.7dcb500000000p-6, 0x1.8dae920000000p-3, 0x1.1af0700000000p-2, 0x1.3d308a0000000p-6, -0x1.a4f4880000000p-3, 0x1.32d5780000000p-3,
-0x1.ab05320000000p-6, -0x1.2e86be0000000p-2, 0x1.52c3da0000000p-5, 0x1.720a380000000p-3, -0x1.5803de0000000p-1, 0x1.25f59a0000000p-9, 0x1.dd26c60000000p-5, -0x1.1d495e0000000p-3, 0x1.61892a0000000p-6, 0x1.5df5860000000p-7, -0x1.e6c5b60000000p-8, 0x1.36e0340000000p-5, 0x1.3086fa0000000p-1, -0x1.3606ea0000000p-6, -0x1.551fd20000000p-2, 0x1.b2ce540000000p-6,
-0x1.91011c0000000p-5, -0x1.3be3760000000p-3, -0x1.5f919c0000000p-2, -0x1.170c220000000p-4, -0x1.11cec00000000p-2, 0x1.d384340000000p-7, 0x1.4e515e0000000p-4, 0x1.6ed4900000000p-4, 0x1.f3f3e20000000p-6, 0x1.588fce0000000p-6, -0x1.2f0c780000000p-6, -0x1.aa2b960000000p-8, -0x1.31315a0000000p-1, -0x1.23a2720000000p-5, -0x1.38940a0000000p-3, -0x1.b95d240000000p-3,
0x1.1fff4e0000000p-5, 0x1.de7e2c0000000p-3, 0x1.d96dec0000000p-2, 0x1.865a1a0000000p-3, -0x1.9c60840000000p-5, 0x1.4641600000000p-5, -0x1.01b9560000000p-6, -0x1.a008180000000p-2, -0x1.7070c20000000p-5, -0x1.00f29c0000000p-7, -0x1.6bd2ec0000000p-7, -0x1.b9a4e00000000p-3, 0x1.8f2e040000000p-4, 0x1.906a940000000p-7, 0x1.8288900000000p-2, 0x1.155f9a0000000p-2,
-0x1.49d4ce0000000p-5, 0x1.ccf8100000000p-3, -0x1.3c0b7a0000000p-3, -0x1.d2c6ec0000000p-5, 0x1.0ee7680000000p-3, 0x1.97b0c80000000p-6, 0x1.a15dfc0000000p-5, -0x1.6a5cca0000000p-4, 0x1.e6f8d40000000p-7, 0x1.2395280000000p-6, -0x1.dbe67c0000000p-6, 0x1.0d2a000000000p-3, 0x1.02eff00000000p-1, -0x1.0aecec0000000p-5, 0x1.7681c00000000p-3, -0x1.52a75c0000000p-1,
0x1.39c67a0000000p-2, 0x1.99a6c60000000p-2, 0x1.677eca0000000p-3, -0x1.210f5a0000000p-7, -0x1.7dc66c0000000p-7, 0x1.56a8240000000p-5, 0x1.93cd7a0000000p-4, 0x1.c68bb00000000p-6, -0x1.58f8de0000000p-3, 0x1.61164a0000000p-5, -0x1.cc95c60000000p-6, -0x1.3238b60000000p-1, 0x1.729dea0000000p-5, 0x1.435e9e0000000p-3, -0x1.574bf60000000p-1, -0x1.ff5c220000000p-4,
0x1.8dd84a0000000p-6, 0x1.f8e1c00000000p-8, 0x1.2cb7d40000000p-2, -0x1.c7bd5c0000000p-6, -0x1.abe2cc0000000p-6, 0x1.540ba40000000p-2, -0x1.dbd9e20000000p-3, -0x1.0951f40000000p-6, -0x1.a9e5f80000000p-2, -0x1.ed7d000000000p-2, 0x1.1739e20000000p-3, 0x1.11220c0000000p-8, 0x1.44b9a60000000p-5, -0x1.14f44c0000000p-3, 0x1.08c0dc0000000p-3, -0x1.7ca5240000000p-4,
-0x1.19e74e0000000p-1, -0x1.6199140000000p-5, -0x1.1b37120000000p-4, 0x1.c101700000000p-4, -0x1.790a200000000p-4, 0x1.8c918a0000000p-4,

-0x1.f7ca9c0000000p-2, 0x1.eb0af20000000p-6, 0x1.6a11a40000000p-2, -0x1.3f8b2e0000000p-4, 0x1.853cbc0000000p-2, -0x1.31116a0000000p-2, -0x1.5e73d60000000p-8, -0x1.89e9040000000p-3, -0x1.00a79e0000000p-2, -0x1.05c19e0000000p-5,
0x1.9eac9e0000000p-3, 0x1.67defa0000000p-3, -0x1.083a4a0000000p-2, 0x1.86b6ba0000000p-5, -0x1.802d760000000p-2, -0x1.32cc600000000p-3, -0x1.6baad00000000p-1, 0x1.5ef5d80000000p-4, -0x1.6d150c0000000p-3, -0x1.076e540000000p-7, -0x1.0511e60000000p-2, 0x1.cb45820000000p-3, -0x1.b1a08a0000000p-4, 0x1.dfc21e0000000p-4, -0x1.867ada0000000p-3, 0x1.59579c0000000p-2,
0x1.4be16e0000000p-2, -0x1.3813860000000p-5, -0x1.3323f80000000p-1, 0x1.81acb80000000p-3, 0x1.8f04240000000p-4, -0x1.81e8ce0000000p-5, 0x1.300bf00000000p-3, -0x1.4c7f420000000p-5, -0x1.b738a20000000p-6, -0x1.6640a60000000p-3, 0x1.54b7920000000p-1, 0x1.4848940000000p-3, -0x1.233cd00000000p-4, 0x1.356d420000000p-2, -0x1.9e7de80000000p-3, 0x1.754c0c0000000p-3,
0x1.2078780000000p-3, 0x1.a2bf820000000p-2, 0x1.24cf1c0000000p-1, -0x1.a50eb60000000p-2, -0x1.5ab4700000000p-2, 0x1.c5951e0000000p-3, -0x1.a748f80000000p-4, 0x1.4472ec0000000p-6, -0x1.7669a00000000p-7, 0x1.2c32f80000000p-4, 0x1.09aad60000000p-2, 0x1.b8fa340000000p-3, 0x1.c642b40000000p-4, 0x1.37af460000000p-3, 0x1.0d3e5e0000000p-3, -0x1.8375d60000000p-5,
-0x1.75dc4a0000000p-2, 0x1.cc3bc00000000p-2, -0x1.3100700000000p-4, -0x1.0b73de0000000p-2, -0x1.e2111a0000000p-3, -0x1.0612ec0000000p-2, 0x1.9338380000000p-2, 0x1.254d2c0000000p-5, 0x1.9132e20000000p-3, -0x1.9574160000000p-3, 0x1.2c819c0000000p-4, 0x1.1dd2b20000000p-2, 0x1.5b4d300000000p-9, -0x1.e655480000000p-3, -0x1.273e560000000p-2, 0x1.a0512a0000000p-3,
-0x1.9726500000000p-3, 0x1.15dc980000000p-2, -0x1.07ed280000000p-1, -0x1.0686120000000p-10, 0x1.4a5fcc0000000p-4, 0x1.4ce72a0000000p-1, 0x1.8f08380000000p-4, -0x1.34d79a0000000p-5, -0x1.1454340000000p-3, 0x1.d163120000000p-5, -0x1.0d35440000000p-3, 0x1.d399860000000p-3, -0x1.442b6c0000000p-6, -0x1.ca9b040000000p-3, -0x1.e1a5620000000p-4, 0x1.4ed30e0000000p-3,
0x1.55cdca0000000p-1, 0x1.a038300000000p-5, -0x1.dbb8f00000000p-6, 0x1.db47260000000p-6, -0x1.82f09c0000000p-6, 0x1.ead8a00000000p-4, -0x1.1947a40000000p-6, -0x1.026a5a0000000p-5, 0x1.2fae0a0000000p-1, 0x1.a209040000000p-7, 0x1.bf47a00000000p-7, 0x1.69331a0000000p-5, -0x1.9cf3a60000000p-8, -0x1.95c1f80000000p-2, -0x1.22086c0000000p-5, 0x1.de2d7e0000000p-5,
-0x1.e5fbf60000000p-4, 0x1.5a7aac0000000p-5, -0x1.29f7b60000000p-5, -0x1.3ec9cc0000000p-6, -0x1.fa24140000000p-7, 0x1.c4ab820000000p-4, 0x1.82e2b20000000p-10, -0x1.ac17fe0000000p-9, 0x1.47e5e80000000p-8,

0x1.c2a7d00000000p-5, 0x1.223a260000000p-4, 0x1.456c8c0000000p-4, -0x1.f213ec0000000p-10, -0x1.3a72960000000p-7, 0x1.236af20000000p-7, 0x1.1872600000000p-5,
0x1.181c7c0000000p-2, -0x1.869c840000000p-9, 0x1.3d2e280000000p-8, 0x1.2ef4140000000p-7, -0x1.7a23960000000p-7, 0x1.4d9e760000000p-5, -0x1.47ba5c0000000p-6, -0x1.a791d00000000p-8, 0x1.24b8f00000000p-2, -0x1.e7bd920000000p-4, 0x1.3d99140000000p-4, -0x1.2f5f420000000p-6, -0x1.662e3a0000000p-10, 0x1.1c0c520000000p-5, -0x1.de8e480000000p-9, 0x1.34843c0000000p-8,
0x1.7a98ca0000000p-3, -0x1.feaf640000000p-4, 0x1.931a9c0000000p-4, 0x1.0595760000000p-4, 0x1.390eec0000000p-10, -0x1.33f9360000000p-2, -0x1.44fb8c0000000p-4, 0x1.178a7a0000000p-6, -0x1.c7e0380000000p-3, -0x1.583d140000000p-9, 0x1.7f94020000000p-2, -0x1.27719a0000000p-3, -0x1.f3c76a0000000p-11, -0x1.4701ce0000000p-3, -0x1.2ba7920000000p-9, -0x1.31c0340000000p-4,
0x1.7036e00000000p-3, -0x1.25467a0000000p-5, 0x1.e412c00000000p-5, 0x1.1750a40000000p-8, 0x1.9c7bce0000000p-6, -0x1.9328e40000000p-3, 0x1.760b340000000p-5, 0x1.b8e8200000000p-7, -0x1.58c8460000000p-3, -0x1.7816f80000000p-3, -0x1.d8ef200000000p-4, -0x1.c533920000000p-4, 0x1.017fc20000000p-8, 0x1.4930740000000p-5, -0x1.1c4fc60000000p-8, -0x1.c3a7120000000p-5,
-0x1.888c7a0000000p-4, 0x1.5ffae00000000p-4, -0x1.bc7c780000000p-4, -0x1.2fb71a0000000p-6, -0x1.edbd5a0000000p-5, 0x1.5fa2d20000000p-5, -0x1.dd639a0000000p-6, -0x1.764c980000000p-8, -0x1.bf212c0000000p-3, 0x1.9f69460000000p-2, 0x1.53fc460000000p-2, 0x1.a838c40000000p-3, -0x1.01993e0000000p-7, -0x1.98d9180000000p-2, 0x1.0c22b00000000p-7, 0x1.612eba0000000p-4,
0x1.1f1ed60000000p-2, -0x1.3e483a0000000p-7, -0x1.4447000000000p-9, 0x1.31a5ec0000000p-5, -0x1.9899000000000p-6, -0x1.b246900000000p-3, -0x1.918f480000000p-5, 0x1.07bb740000000p-8, -0x1.1d63a00000000p-2, 0x1.e700460000000p-3, 0x1.070bac0000000p-2, 0x1.68bfac0000000p-7, -0x1.4235b80000000p-8, -0x1.ccebb60000000p-2, -0x1.b6a7180000000p-7, 0x1.7a2f320000000p-8,
0x1.79271c0000000p-4, -0x1.5c37a80000000p-9, 0x1.a0e4840000000p-7, -0x1.e0532e0000000p-8, 0x1.35e3500000000p-7, -0x1.696bca0000000p-3, 0x1.19a6a00000000p-5, 0x1.7c86460000000p-7, -0x1.ce37860000000p-3, 0x1.813cda0000000p-6, -0x1.9d4bbe0000000p-4, -0x1.2b4f560000000p-5, 0x1.3444160000000p-9, -0x1.21c4fc0000000p-2, 0x1.1324de0000000p-8, -0x1.6fc7a60000000p-6,
0x1.1770880000000p-6, 0x1.abcd320000000p-15, 0x1.ab025a0000000p-9, -0x1.69ca560000000p-9, -0x1.17e9c60000000p-10, -0x1.87b26e0000000p-5, 0x1.26d7b00000000p-9, 0x1.7967780000000p-9, -0x1.dddfa60000000p-6, -0x1.31d51e0000000p-11, 0x1.28dbc20000000p-5, -0x1.f0a34c0000000p-9,

-0x1.fe5e600000000p-14, -0x1.8e34840000000p-6, -0x1.a6da4c0000000p-10, -0x1.47fd440000000p-8,
-0x1.3232c20000000p-7, -0x1.de6f460000000p-17, 0x1.ccd8c60000000p-15, -0x1.1e01be0000000p-13, -0x1.65c4560000000p-10, -0x1.1382320000000p-5, -0x1.85048c0000000p-10, 0x1.b096dc0000000p-9, -0x1.36d4b20000000p-4, 0x1.bda6060000000p-6, 0x1.a820ac0000000p-6, -0x1.f54d6c0000000p-13, 0x1.1cfe700000000p-13, -0x1.5555780000000p-5, 0x1.cf99660000000p-10, -0x1.15cde80000000p-9,
0x1.6d70020000000p-8, -0x1.f393d00000000p-15, 0x1.5ca03a0000000p-12, -0x1.c293ca0000000p-13, 0x1.8272300000000p-16, -0x1.2a73c80000000p-8, -0x1.b3f7720000000p-12, 0x1.6bb13e0000000p-12, 0x1.f3d3de0000000p-7, -0x1.c03a620000000p-8, 0x1.4560ce0000000p-8, -0x1.0574280000000p-9, 0x1.c25e980000000p-13, 0x1.2c5b5c0000000p-7, -0x1.e850700000000p-14, -0x1.6952960000000p-10,
0x1.05436a0000000p-6, 0x1.229a720000000p-9, 0x1.5c89680000000p-10, -0x1.03d07a0000000p-13, 0x1.7565c40000000p-14, 0x1.1a7bea0000000p-4, -0x1.bf93500000000p-10, -0x1.1d9d140000000p-8, 0x1.24db940000000p-3, -0x1.183e580000000p-4, -0x1.5dd3e00000000p-8, -0x1.ba19fe0000000p-9, 0x1.76c2ec0000000p-13, 0x1.0074620000000p-3, -0x1.d24c100000000p-10, 0x1.48cd580000000p-9,
0x1.57b3e80000000p-7, -0x1.ae09c60000000p-12, -0x1.2703400000000p-10, 0x1.9652900000000p-10, 0x1.9918e80000000p-9, 0x1.72f5060000000p-5, 0x1.0e55ca0000000p-8, -0x1.5e03820000000p-8, 0x1.9d14ac0000000p-4, -0x1.5da8d00000000p-6, -0x1.c008200000000p-5, 0x1.899aec0000000p-10, 0x1.5c1c8e0000000p-13, 0x1.10c86a0000000p-5, -0x1.cea7a80000000p-9, 0x1.05f70e0000000p-8,
-0x1.d84bc20000000p-7, -0x1.72bda80000000p-12, 0x1.7028a20000000p-9, -0x1.2af6440000000p-9, -0x1.9034ae0000000p-8, -0x1.958a300000000p-4, -0x1.fe77280000000p-11, 0x1.28d2e80000000p-7, -0x1.95f5860000000p-3, 0x1.922b940000000p-5, 0x1.76d3040000000p-4, -0x1.ebff3e0000000p-9, -0x1.7154380000000p-12, -0x1.6660300000000p-4, 0x1.4a0cfe0000000p-8, -0x1.3059420000000p-7,
0x1.d5885a0000000p-7, 0x1.0a90780000000p-11, 0x1.76068e0000000p-9, -0x1.8f2d620000000p-10, -0x1.bd5bd60000000p-10, -0x1.e41c7c0000000p-7, 0x1.b683640000000p-9, 0x1.e6cb860000000p-11, -0x1.0cef940000000p-8, -0x1.417d000000000p-6, 0x1.e5d1820000000p-6, -0x1.8a17720000000p-9, -0x1.218aee0000000p-12, 0x1.48fd140000000p-6, -0x1.6b766a0000000p-11, -0x1.582b660000000p-9,
0x1.e08a3a0000000p-10, -0x1.6f23560000000p-11, -0x1.4ed4540000000p-10, 0x1.7043c80000000p-13, 0x1.3213a60000000p-10, 0x1.6bc5540000000p-7, 0x1.7e4b0e0000000p-10, -0x1.03ee660000000p-9, 0x1.37c9600000000p-5, 0x1.0110ac0000000p-10, -0x1.cc9fee0000000p-6, 0x1.4a8fd40000000p-11, 0x1.7581960000000p-13, -0x1.70e2de0000000p-9, -0x1.d36e520000000p-10,

0x1.505c960000000p-10,

Table B.11 Basic decoding neural network parameters, layer 1 CNN (bias parameter)

Parameter value
-0x1.eb5fae0000000p-9, -0x1.9feb3e0000000p-10, 0x1.adfcfe0000000p-7, 0x1.09e3760000000p-10, -0x1.4e5c400000000p-8, 0x1.3030800000000p-9, 0x1.587aa60000000p-10, 0x1.1136a60000000p-9,

Table B.12 Parameters of the basic decoding neural network, layer 1 CNN (IGDN activation function parameter: beta)

Parameter value
0x1.75b7a60000000p+1, 0x1.f8ee3e0000000p+1, 0x1.c093e20000000p+1, 0x1.b223300000000p+1, 0x1.bfa5ca0000000p+1, 0x1.c8cf660000000p+1, 0x1.e3f8880000000p+1, 0x1.b99eba0000000p+1,

Table B.13 Basic decoding neural network parameters layer 1 CNN (IGDN activation function parameter:gamma)

Parameter value
0x1.423ea80000000p-23, 0x1.0fbbb80000000p-20, 0x1.323ad60000000p-26, 0x1.2b173c0000000p-20, 0x1.d4079e0000000p-27, 0x1.71b1280000000p-20, 0x0.0p+0, 0x1.c2c1e60000000p-22,
0x1.e4bdec0000000p-20, 0x1.8649d60000000p-20, 0x1.0ee6240000000p-21, 0x1.b89fb80000000p-21, 0x1.54ae100000000p-21, 0x1.fe03300000000p-20, 0x1.844cf60000000p-22, 0x1.330ee00000000p-22,
0x1.539eae0000000p-21, 0x1.2e78960000000p-21, 0x1.89f0cc0000000p-20, 0x1.1b027a0000000p-20, 0x1.b696820000000p-24, 0x1.e2a72c0000000p-21, 0x1.d5564a0000000p-21, 0x1.46a55c0000000p-25,
0x0.0p+0, 0x1.569d220000000p-19, 0x1.1ea8720000000p-19, 0x1.c135700000000p-20, 0x0.0p+0, 0x1.3b9fe20000000p-19, 0x1.2a67e80000000p-20, 0x1.f72f720000000p-23,
0x1.6286ca0000000p-24, 0x1.1e50920000000p-21, 0x1.09ff880000000p-20, 0x1.743d620000000p-21, 0x1.a07fac0000000p-21, 0x1.1cd0fe0000000p-23, 0x1.371da20000000p-20, 0x1.dff2c00000000p-24,
0x1.60e7c80000000p-19, 0x1.43dd440000000p-19, 0x1.1aafba0000000p-19, 0x1.9caf300000000p-20, 0x1.76cdca0000000p-20, 0x1.37c2820000000p-20, 0x1.1b7b5a0000000p-22, 0x1.60ce4a0000000p-19,
0x1.b27f140000000p-30, 0x1.5b16c60000000p-20, 0x1.3ace560000000p-25, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x1.e3ffb00000000p-20, 0x1.d07f2a0000000p-33,
0x0.0p+0, 0x0.0p+0, 0x1.e0580a0000000p-21,

0x0.0p+0, 0x1.f4b2e20000000p-22, 0x1.093efc0000000p-20, 0x1.ad02020000000p-20, 0x1.ad60fa0000000p-20,

Table B.14 Parameters of the basic decoding neural network: layer 2 CNN (convolutional kernel parameter: kernel)

Parameter value
-0x1.8080960000000p-1, -0x1.af34300000000p-7, -0x1.1dc0200000000p-2, 0x1.0db8120000000p-5, 0x1.3e01f40000000p-4, 0x1.3237c80000000p-3, -0x1.4519c00000000p-5, 0x1.8875fc0000000p-4,
-0x1.68d4780000000p-1, -0x1.06cbb60000000p-3, -0x1.1ac34e0000000p-2, 0x1.ef616a0000000p-3, 0x1.32e3e60000000p-3, 0x1.da977e0000000p-3, 0x1.d3c9a20000000p-3, 0x1.aa7b2e0000000p-3,
-0x1.207ae60000000p-4, 0x1.2219e20000000p-4, 0x1.acb9760000000p-4, -0x1.a4f0000000000p-2, -0x1.94c1820000000p-4, -0x1.7183d60000000p-2, -0x1.8e0bd00000000p-2, -0x1.cbbc5e0000000p-3,
0x1.c1c5a20000000p-3, -0x1.680e680000000p-3, -0x1.4dc3900000000p-5, -0x1.6eb7d80000000p-5, 0x1.234d1a0000000p-4, -0x1.fcd0940000000p-3, 0x1.8e84180000000p-3, 0x1.cd8d1c0000000p-2,
-0x1.ee98ba0000000p-2, 0x1.74d2a00000000p-2, 0x1.0517440000000p-8, -0x1.b1489c0000000p-3, -0x1.3056d20000000p-1, 0x1.0e99300000000p-2, -0x1.2dd36c0000000p-1, -0x1.0e6a2e0000000p-1,
-0x1.2291c60000000p-3, -0x1.2e55160000000p-3, 0x1.d3da260000000p-3, 0x1.01296a0000000p-1, 0x1.76677e0000000p-2, -0x1.d4a8200000000p-1, -0x1.54a83a0000000p-2, 0x1.31d0a00000000p-2,
0x1.1d3ec00000000p-2, 0x1.1a7bfe0000000p-4, 0x1.3e4ba60000000p-2, 0x1.58cb4c0000000p-1, -0x1.be652c0000000p-2, 0x1.03497c0000000p-2, 0x1.0c41860000000p-4, -0x1.42167a0000000p-3,
0x1.181dac0000000p-2, -0x1.2f9db60000000p-4, -0x1.1ee1f40000000p-3, -0x1.aa883c0000000p-1, 0x1.2a88e00000000p-3, -0x1.a4ad000000000p-3, 0x1.c424ea0000000p-6, 0x1.2cd3160000000p-3,
0x1.ebcf2a0000000p-4, 0x1.09e1d20000000p-1, -0x1.2fb1bc0000000p-2, 0x1.4d2f420000000p-5, -0x1.7cb27c0000000p-2, 0x1.bda4be0000000p-4, -0x1.9ffd380000000p-3, 0x1.b32a620000000p-2,
-0x1.5ba4ec0000000p-3, -0x1.43d97a0000000p-4, 0x1.1ee4fe0000000p-5, -0x1.dac2b20000000p-4, 0x1.8a33e80000000p-2, -0x1.13d6740000000p-2, 0x1.e9bf800000000p-2, -0x1.79d25e0000000p-1,
-0x1.d6520e0000000p-3, -0x1.095d6e0000000p-2, 0x1.32106e0000000p-4, 0x1.3ce10c0000000p-4, -0x1.7468e00000000p-1, -0x1.0463500000000p-1, 0x1.63b5e60000000p-2, -0x1.53df8e0000000p-5,
0x1.df30d40000000p-3, -0x1.0aa7b60000000p-3, -0x1.c6243e0000000p-1, 0x1.5628e00000000p-4, -0x1.606d3e0000000p-2, -0x1.72e9500000000p-2, 0x1.e2d9b00000000p-4, -0x1.895dba0000000p-3,

0x1.6e2d2a0000000p-2, -0x1.a606800000000p-2, -0x1.74de1c0000000p-2, 0x1.601aec0000000p-3, 0x1.b70ca20000000p-3, 0x1.1e1d5c0000000p-2, -0x1.196e640000000p-1, -0x1.ea98820000000p-3,
-0x1.0401800000000p-3, 0x1.1a0c260000000p-1, -0x1.016c140000000p-3, 0x1.d58bb20000000p-4, 0x1.9967ca0000000p-2, 0x1.a8e3540000000p-4, 0x1.fd6cc80000000p-3, 0x1.76fb920000000p-3,
0x1.0c56f20000000p-4, 0x1.e9de5c0000000p-2, -0x1.45d4aa0000000p-3, -0x1.30c3500000000p-8, -0x1.37da420000000p-2, -0x1.5d21980000000p-2, 0x1.cf72860000000p-3, 0x1.77bb6c0000000p-3,
0x1.915e400000000p-3, 0x1.74ecf80000000p-1, -0x1.1f2a360000000p-2, 0x1.2aff840000000p-4, 0x1.cd33e40000000p-2, -0x1.438fee0000000p-3, 0x1.5486b20000000p-4, -0x1.eec7a20000000p-2,
0x1.373a040000000p-4, -0x1.ae6ab40000000p-3, -0x1.25897e0000000p-5, -0x1.5437fe0000000p-7, 0x1.c309020000000p-6, 0x1.b0 gfcfc0000000p-5, -0x1.0f23200000000p-3, -0x1.2679520000000p-3,
-0x1.bdc3220000000p-6, 0x1.a39eb40000000p-17, -0x1.986b960000000p-5, 0x1.fdee220000000p-9, -0x1.3891ec0000000p-8, 0x1.931a540000000p-7, 0x1.cb77380000000p-5, 0x1.2271300000000p-4,
-0x1.1e5d600000000p-6, -0x1.f977400000000p-4, -0x1.ce4b0a0000000p-5, 0x1.5189860000000p-7, 0x1.c9fd7c0000000p-7, 0x1.3289980000000p-4, -0x1.0e84da0000000p-8, 0x1.2ff7920000000p-4,
0x1.29f4480000000p-5, -0x1.ac52340000000p-5, -0x1.dd0e2a0000000p-4, 0x1.4dba520000000p-6, 0x1.b02ef20000000p-4, 0x1.fe13f00000000p-5, -0x1.54f1560000000p-6, -0x1.b37cf80000000p-5,

Table B.15 Parameters of the basic decoding neural network, layer 2 CNN (bias parameters:bias)

Parameter value
0x1.7c47e60000000p-8, -0x1.7c8f440000000p-8, 0x1.3c2ee60000000p-7, 0x1.5192020000000p-8,

Table B.16 Parameters of the basic decoding neural network:layer2 CNN (IGDN activation function parameter beta)

Parameter value
0x1.f377ac0000000p+3, 0x1.33e7f40000000p+4, 0x1.116c040000000p+4, 0x1.33c9640000000p+4,

Table B.17 Parameters of the basic decoding neural network:layer 2CNN (IGDN activation function parameter:gamma)

Parameter value
0x1.8d38dc0000000p-24, 0x0.0p+0, 0x1.87aa380000000p-21,

0x1.86341c0000000p-34,
0x0.0p+0, 0x1.aff7280000000p-24, 0x0.0p+0, 0x0.0p+0,
0x1.b5a80c0000000p-29, 0x0.0p+0, 0x0.0p+0, 0x1.14e17c0000000p-30,
0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x1.40acb60000000p-22,

Table B.18 Parameters of the basic decoding neural network: 3-layer CNN (convolutional kernel parameter::kernel)

Parameter value
-0x1.b8e81e0000000p-3, -0x1.5958ce0000000p-5, -0x1.1584300000000p-2, -0x1.8a80b40000000p-2,
0x1.0494b00000000p-1, -0x1.f36b9e0000000p-2, 0x1.dd89840000000p-1, 0x1.ff75620000000p-1,
-0x1.5c91720000000p+0, -0x1.05b4b40000000p-2, 0x1.3ad1ee0000000p-1, -0x1.36be5e0000000p-2,
0x1.a9fa840000000p-1, -0x1.9be53c0000000p+0, 0x1.c2e5120000000p-7, -0x1.e7ea940000000p-2,
0x1.6053300000000p-1, 0x1.283cd00000000p-1, 0x1.78c36a0000000p-1, -0x1.973f980000000p-1,
-0x1.a0ce1c0000000p-7, -0x1.9b70f60000000p-3, 0x1.a71f340000000p-2, -0x1.88e55a0000000p-2,
0x1.57e9a40000000p-5, -0x1.63deb60000000p-3, -0x1.a95f460000000p-5, 0x1.0bfc700000000p-3,
0x1.a008a20000000p-4, -0x1.5de1f80000000p-7, -0x1.2492880000000p-2, 0x1.2f429e0000000p-2,
-0x1.629b440000000p-3, 0x1.57a2a40000000p-8, 0x1.c4069e0000000p-5, 0x1.19454e0000000p-2,
0x1.2414120000000p-4, -0x1.87f62e0000000p-5, -0x1.53d83c0000000p-4, 0x1.38ac100000000p-5,

Table B.19 Parameters of the basic decoding neural network: layer 3CNN (bias parameters:bias)

Parameter value
-0x1.49a5f80000000p-4, -0x1.6ea38e0000000p-5,

Table B.20 Parameters of the basic decoding neural network: layer 3 CNN (IGDN activation function parameter: beta)

Parameter value
0x1.03ca7e0000000p+8, 0x1.38580e0000000p+8,

Table B.21 Parameters of the basic decoding neural network, layer 3 CNN (IGDN activation function parameter: gamma)

Parameter value
0x1.ebbe640000000p-34, 0x1.5e6fec0000000p-36,
0x0.0p+0, 0x0.0p+0,

Table B.22 Parameters of the basic decoding neural network: layer 4 CNN (convolutional kernel parameter: kernel)

Parameter value
-0x1.04527a0000000p+1, -0x1.4c0b340000000p-4,
0x1.a286c20000000p-4, -0x1.872ccc0000000p+0,
-0x1.3a54b80000000p-3, 0x1.295ea60000000p-7,
0x1.2f833a0000000p-2, 0x1.dae1dc0000000p-2,
0x1.ebc0880000000p-9, -0x1.cf3be20000000p-4,

Table B.23 Parameters of the basic decoding neural network, fourth layer CNN (bias parameters)

Parameter value
0x1.a12a9e0000000p-2,

Table B.24 mcILD code table

Indexing	index value
0	1.777777778
1	0.750000000
2	0.562500000
3	3.200000000
4	5.333333333
5	0.812500000
6	1.066666667
7	4.000000000
8	0.187500000
9	1.142857143
10	0.437500000
11	1.454545455
12	0.125000000
13	0.625000000
14	2.285714286
15	0.500000000
16	16.00000000
17	2.000000000
18	0.875000000
19	0.250000000
20	1.333333333

Indexing	index value
21	0.375000000
22	1.600000000
23	8.000000000
24	0.687500000
25	0.062500000
26	1.230769231
27	0.312500000
28	0.937500000
29	2.666666667

Table B.25 Huffman codebook for the TNS reflection coefficient quantification indexes, (dimension 1 :tnsCodingTable0)

Indexing	code word	number of bits
1	4053	12
2	1012	10
3	507	9
4	127	7
5	30	5
6	0	3
7	1	3
8	2	3
9	2	2
10	3	3
11	6	3
12	14	4
13	62	6
14	252	8
15	2027	11
16	8105	13

Table B.26 Huffman codebook for the TNS reflection coefficient quantification index, dimension 2:tnsCodingTable1

Indexing	code word	number of bits
1	15360	15
2	7681	14
3	3841	13
4	961	11
5	241	9
6	61	7
7	14	5

Indexing	code word	number of bits
8	2	3
9	2	2
10	3	2
11	0	2
12	6	4
13	31	6
14	121	8
15	481	10
16	1921	12

Table B.27 Huffman codebook for TNS reflection coefficient quantification indexes, dimension 3 tnsCodingTable2

Indexing	code word	number of bits
1	27136	15
2	27137	15
3	3393	12
4	425	9
5	107	7
6	52	6
7	12	4
8	7	3
9	0	1
10	2	2
11	27	5
12	213	8
13	849	10
14	1697	11
15	6785	13
16	27138	15

Table B.28 Huffman codebook for TNS reflection coefficient quantification indeesx, dimension 4 tnsCodingTable3

Indexing	code word	number of bits
1	8708	14
2	8709	14
3	8710	14
4	1089	11
5	273	9
6	137	8
7	35	6

Indexing	code word	number of bits
8	5	3
9	0	1
10	3	2
11	9	4
12	16	5
13	69	7
14	545	10
15	8711	14
16	4352	13

Table B.29 Huffman codebook for the TNS reflection coefficient quantification indexes, dimension 5 tnsCodingTable4

Indexing	code word	number of bits
1	4100	14
2	4101	14
3	4102	14
4	257	10
5	65	8
6	17	6
7	5	4
8	0	2
9	1	1
10	3	3
11	9	5
12	33	7
13	129	9
14	513	11
15	4103	14
16	2048	13

Table B.30 Huffman codebook for the TNS reflection coefficient quantization indexes, dimension 6 tnsCodingTable5

Indexing	code word	bit number
1	8272	14
2	8273	14
3	2069	12
4	516	10
5	128	8
6	65	7
7	17	5

Indexing	code word	bit number
8	5	3
9	0	1
10	3	2
11	9	4
12	33	6
13	259	9
14	1035	11
15	8274	14
16	8275	14

Table B.31 Huffman codebook for the TNS reflection coefficient quantification indexes, dimension 7 tnsCodingTable6

Indexing	code word	number of bits
1	13312	14
2	13313	14
3	3329	12
4	833	10
5	209	8
6	53	6
7	12	4
8	2	2
9	0	1
10	7	3
11	27	5
12	105	7
13	417	9
14	1665	11
15	13314	14
16	13315	14

Table B.32 Huffman codebook for TNS reflection coefficient quantification indexes, dimension 8, tnsCodingTable7

Indexing	code word	number of bits
1	10490	14
2	2625	12
3	657	10
4	165	8
5	83	7
6	21	5
7	4	3

Indexing	code word	number of bits
8	3	2
9	10497	14
10	0	1
11	11	4
12	40	6
13	329	9
14	1313	11
15	10498	14
16	10499	14

Table B.33 codebook for TNS reflection coefficient scalar quantization:tnsCoeff4

The index	code word
1	-0.9957341763
2	-0.9618256432
3	-0.8951632914
4	-0.7980172227
5	-0.6736956436
6	-0.5264321629
7	-0.3612416661
8	-0.1837495178
9	0.0000000000
10	0.2079116908
11	0.4067366431
12	0.5877852523
13	0.7431448255
14	0.8660254038
15	0.9510565163
16	0.9945218954

Table B.34 codebook for High-precision LSF vector quantization , first stage, first sub-vector, lsf_stage1_CB1_hbr

The index	code word
1	12.532774 -294.914795 -839.115295 -1283.263306 -1366.740234 -1291.976929 -889.037109 -662.501465 -394.010132
2	7.659530 64.449364 -429.962616 -159.504883 -127.081932 -528.241577 -898.911499 -1261.207764 -1585.741333
3	-265.316223 -1177.764160 -1719.669189 -2321.858154 -2539.730713 -1376.201050 -393.688843 -135.207047 153.807602

The index	code word
4	-429.040771 1138.646240 1062.909912 1183.278198 1069.893311 1066.192871 987.967041 938.215393 848.846802
5	-259.962219 -841.635864 -792.817505 -1015.578674 -1039.584106 -1190.869629 -1251.823975 -1344.401611 -1400.721069
6	-255.383240 -340.604065 -225.726089 -194.386597 -82.405243 -87.643135 83.903320 127.325462 214.289505
7	-292.835663 -1187.095581 -1540.663330 -946.716309 -604.317749 -340.563690 -148.200073 -110.725548 -88.781868
8	-66.158363 288.254822 52.301933 -176.605835 -372.656982 -638.140747 -765.024902 -1038.674561 -1158.282227
9	-294.390991 -419.236633 164.241470 72.962151 184.964706 -5.999948 18.262583 -294.669708 -360.836609
10	-354.790070 -980.296875 -664.455078 154.531082 347.748291 -81.605064 -166.168503 -575.064392 -619.221313
11	-51.074921 -590.091919 -995.163879 -1449.023193 -1636.229980 -1833.939575 -2052.215088 -2393.046387 -2492.594238
12	-756.212219 607.650330 1362.533325 1448.326538 1708.366821 1743.075806 1864.355957 1851.665405 1904.776489
13	-268.823273 -670.716125 -729.266479 -1178.513184 -717.594543 1188.218018 973.420044 669.331726 253.003632
14	-380.711853 -880.759583 437.412231 377.531342 279.782745 -164.422226 -350.319489 -689.558228 -759.321899
15	199.626038 259.191193 -255.783997 -712.039185 -1172.695801 -1557.458618 -1920.221191 -2091.199219 -2199.324707
16	-45.761089 121.817169 -221.829346 -605.307129 50.221458 -352.458374 -718.818115 -1095.817383 -1017.988525
17	-324.111664 -1289.777954 -1839.569458 -2347.638672 -1012.049316 -69.315178 187.488708 379.120422 501.824005
18	-297.901764 -1236.970581 -1812.303833 -2200.946045 -986.018372 -547.798462 -307.574707 -199.468140 -167.143997
19	-107.839973 -595.928772 -649.595825 -1203.271484 -417.419617 -843.091003 -1060.114380 -1251.820312 -790.997131
20	-202.438538 -1077.976929 -1395.944458 -1834.929443 -1851.974121 -475.270538 147.567062 405.381622 628.118896
21	-140.992111 -243.299820 -374.084686 -761.737305 379.897888 146.736359 -218.489792 -693.225525 -1122.441040
22	298.091644 165.684982 -229.728912 -676.614502 -41.712887 -241.386246 -313.544312 -564.628601 -634.669128
23	-339.094910 -932.599060 -810.994873 -1159.873413 -139.622528 -477.156525 -791.750977 -613.249939 193.185974
24	192.596329 -448.119476 -199.818085 -711.967346 -599.650146

The index	code word
	-906.385376 -844.235535 -1146.109009 -1127.517456
25	-153.114761 -477.945557 -842.755737 -1287.280884 -868.664062 -659.642517 -409.744415 -252.595947 -137.149399
26	468.480865 188.345016 -232.100403 -407.251648 -446.181030 -654.295837 -737.947449 -982.220154 -1033.285034
27	-127.511642 -746.018372 -1140.810181 -1449.175049 -1522.306641 -1604.072266 -1617.172607 -1747.286011 -1815.891724
28	-670.408997 573.691101 818.152100 1135.519531 1336.889160 1511.981445 1608.480469 1687.401001 1774.689819
29	167.956970 304.036682 -168.396362 -614.536133 -1020.216125 -1307.400024 -1464.742065 -1539.064941 -1679.836670
30	-286.643921 -820.866394 -919.530457 -1296.737915 -321.350098 -247.957581 -74.895782 -46.720711 -16.407169
31	177.128052 -597.696228 -1405.832397 -661.515259 -1250.172363 -1315.480957 -1228.537109 -1394.990479 -1568.131226
32	-110.358360 228.341812 -54.777168 -180.577560 17.660156 180.577560 17.660156 -109.016502 -293.451660 -733.721802 -1050.250854
33	-155.538376 -889.169373 -1357.671143 -1947.136353 -2360.618164 -2616.920898 -2678.006104 -2436.539795 -1598.749878
34	-243.543640 -406.297119 -323.730835 -427.441620 -504.955658 -723.262573 -574.874329 -697.197388 -441.316406
35	-248.952698 -476.071716 -109.808342 -350.722839 1045.941162 772.961060 494.033112 -5.088210 -161.959808
36	151.197754 -438.898071 -938.110779 -479.895996 -675.861450 -705.350769 -794.681152 -874.259277 -977.368958
37	228.726776 -288.248199 -45.990913 -358.880219 -273.076996 -574.781677 -553.036743 -901.941895 -933.009277
38	76.154396 -272.780579 -790.993469 -1419.796875 -1771.096313 -1205.924927 -1421.059082 -1131.960205 -634.587891
39	-176.957001 -998.468262 -1355.086548 -1801.816040 -1972.916626 -2021.075684 -1891.074829 -1003.528870 -271.320404
40	-318.367218 -1027.510376 -1053.401367 -1400.671631 -688.487488 -59.555279 173.477051 293.360443 413.468353
41	-31.048168 -539.577820 -779.418274 -1198.360352 -1667.825073 -1355.676392 -248.139374 -578.224731 -848.542908
42	243.113541 -271.529938 75.644211 -120.757767 -23.166691 -275.094727 -270.071869 -566.301392 -527.317078
43	209.083649 -86.944138 -171.801407 -309.664154 -601.843628 -1093.211426 -1161.305298 -629.750732 -553.044739
44	50.228077 260.481262 -176.737579 -563.293579 -836.673584 -983.849121 -900.034058 -1054.167847 -1024.612671

The index	code word
45	-217.254745 -1059.019897 -1551.903564 -2159.453125 -2555.874512 -2660.438965 -1700.472412 -939.193237 -491.305817
46	-109.810867 -139.434006 -212.173462 189.489395 433.778625 328.265594 316.352631 29.588856 -62.139759
47	-122.472839 -77.221489 -139.844727 -493.818024 -217.068741 444.526581 186.679306 -248.982697 -697.615417
48	-283.886810 -634.963989 -187.824463 -160.884415 225.083527 -196.268967 -448.745483 -961.819641 -1293.330566
49	-205.688416 -818.517212 -1049.939453 -1471.114380 -1637.467896 569.867554 289.272095 33.614040 -107.433998
50	-470.968445 74.234940 -189.621552 93.866119 712.355530 1110.288940 1314.786499 1475.519287 1557.706787
51	-258.598328 -1029.964111 -1337.363525 -1035.258911 -921.234985 -896.027100 -776.560547 -744.058167 -680.859985
52	-304.905701 -1248.585083 -1799.832031 -2462.894287 -2100.090576 -516.581787 -119.507423 130.499710 273.351562
53	234.289627 1074.261353 614.698914 125.832085 -265.399841 -442.323151 -487.567566 -416.854156 -340.315491
54	125.100708 -360.461273 -764.823303 -1421.218750 -967.333435 -1095.811401 -1196.823486 -1400.642334 -1383.499878
55	-133.548233 -617.994385 -312.143127 -710.831909 79.074684 -298.849487 -592.688049 -1062.510376 -562.840149
56	-468.169861 1446.408569 1413.416870 1576.199707 1347.820801 1305.200928 1179.695923 1049.632812 898.322266
57	-274.492950 -345.295959 -346.863892 -393.565643 -159.954437 -288.083282 -280.803223 -615.538269 -798.523987
58	414.343719 -33.507385 -560.052307 -877.893921 -936.769043 -889.978210 -848.494446 -983.392456 -1004.623169
59	-127.857430 10.724673 -503.393402 -1047.103760 -1597.348145 23.368412 119.567314 -27.045931 -122.189880
60	50.129940 -513.716614 -175.773712 -814.073059 -183.152222 -398.482635 -736.121338 -1233.094971 -1505.156860
61	-192.924240 -1000.330994 -1506.831055 -2159.660400 -2665.731934 -3122.868652 -3047.991943 -1299.960693 -665.220581
62	-229.910477 371.929138 198.593094 147.880417 147.134155 59.440495 74.496574 -130.838730 -153.672745
63	31.351290 -454.428986 -421.578094 -1073.841797 -293.511871 -674.466675 -667.398499 -510.883423 -513.513489
64	1165.111938 1601.962036 1369.250000 1091.164673 806.724060 592.549011 437.339203 274.545990 130.017639
65	-391.330902 -1148.816284 -703.030945 -919.529114 -682.469421

The index	code word
	-552.763611 -389.571045 -372.423248 -269.741028
66	-415.906036 -1370.143433 -467.918060 400.263123 538.698425 626.269958 628.958679 609.006653 555.666260
67	-211.888199 -304.512207 -574.377808 -763.588745 -798.061340 -969.718689 -1008.344788 -1133.811157 -1208.669189
68	387.929260 -384.363983 -491.873169 -1177.873779 -2040.045410 -2299.358643 -879.417908 -600.336487 -538.996033
69	-194.664413 -432.293304 -354.330627 -721.107178 220.619720 -28.813951 -13.943194 -279.962128 -211.170929
70	-254.518509 -1089.525269 -1553.118164 -1953.478149 -1708.065063 -1163.100708 -875.388916 -675.993652 -554.956543
71	45.468208 -177.159286 -486.094971 -971.243835 -326.891663 -774.877563 -1253.826904 -1702.123291 -1697.666016
72	-617.304138 1302.192261 1183.291016 1409.274414 1356.658203 1509.198608 1565.556396 1796.875854 2312.282715
73	-318.085754 -294.912109 -243.064804 294.789520 587.472717 685.794067 779.710144 827.043884 850.107422
74	-675.562988 1130.372803 1039.005249 1216.456055 1123.337158 1227.838257 1186.562622 1320.220581 1376.252319
75	-155.287216 -653.789795 -979.381104 -1584.975708 -907.041931 -791.481995 -893.957764 -690.019653 -588.572449
76	1085.995117 433.405426 23.847609 -363.684875 -394.045135 -519.063965 -459.017670 -605.080383 -566.073059
77	-39.306290 -267.335541 -399.840454 -361.051941 -369.583893 -813.095459 -1069.663818 -1484.840576 -729.816772
78	-157.645782 -441.672302 196.467331 -31.353685 -266.225250 -728.974548 -1055.533203 -1360.301636 -1394.537109
79	-302.830658 -981.803101 -1199.857910 -1471.296997 -406.638672 -282.785950 -374.713959 -592.583313 -744.692444
80	-414.440247 -1089.211548 -650.316528 -1022.616089 -497.021057 257.376678 508.734467 967.452759 1139.718262
81	629.385315 46.781452 -475.762695 -1036.605469 -1335.133911 -1327.513062 -1000.840942 -768.826721 -775.389404
82	-14.132797 483.183777 1040.778809 889.231567 552.954224 70.982803 -318.060852 -793.120911 -1011.159302
83	135.842896 114.402382 -402.932617 -912.733643 -456.571472 -654.064758 -907.594116 -1166.712891 -1294.101074
84	-405.660950 650.800964 390.291229 402.028564 397.279541 643.243591 782.320801 996.435913 1037.156860
85	739.563538 198.752533 -274.114716 -756.031982 -1016.008545 -397.001160 -507.254028 -710.850891 -777.544189

The index	code word
86	-505.712128 -1306.856934 -302.960205 -50.899620 724.131470 892.069763 1116.432861 1241.490356 1347.699341
87	-185.285233 637.581787 570.410583 573.242920 520.846680 458.776489 506.174042 430.875732 434.773529
88	1638.158081 1885.557617 1226.245117 752.522339 329.570221 -7.930009 -429.244537 -698.395142 -824.893433
89	67.108162 145.657013 -310.819153 -690.611633 -588.102966 -149.363922 -405.786072 -809.160034 -1272.879028
90	-585.281555 595.188293 708.387085 891.753052 958.253723 1118.726318 1189.508423 1320.166870 1432.868286
91	-149.615555 -240.052521 -648.237000 -988.918823 -466.479462 -76.178154 -229.023560 -486.511444 -608.023254
92	-430.823914 -1171.099731 -536.025940 -441.452942 255.522385 338.995361 481.303986 464.989960 568.602966
93	-324.765167 -1047.405151 -1045.352539 -363.335541 -84.914948 -66.833885 30.027208 -15.760809 12.066683
94	-175.676392 -408.857758 -583.354431 -648.645386 -479.757019 -418.775604 -267.904999 -147.864532 -25.590437
95	-208.584457 -939.634705 -1357.809814 -1543.731812 -1245.787964 -1208.176758 -1149.390625 -1191.954224 -1206.649658
96	-104.840843 131.496292 -209.161987 -429.285919 -443.612244 190.636688 472.597717 768.328491 861.614197
97	-407.797485 -1443.926514 -1661.918823 207.416931 534.250854 731.394470 835.406738 833.161926 767.225098
98	1845.772217 1309.853271 668.536926 343.226593 143.572464 -49.394199 -113.645187 -29.705999 13.073053
99	56.131977 -152.148804 -464.899872 -1033.450439 -1184.909790 -460.081299 -810.854675 -1229.766235 -1627.935913
100	-452.430084 -1235.425537 -176.435577 -54.552139 201.717514 89.107384 104.389801 -15.340947 55.963818
101	-294.794617 -982.590759 -1157.254761 -1552.222290 -1173.347168 -776.471863 -508.820099 -345.842194 -264.661591
102	422.903564 -77.037788 -533.205566 -1148.150024 -1583.096802 -1563.172607 -1482.618774 -1418.075928 -1232.485107
103	349.948730 -169.888306 -473.498138 -799.142944 -1174.529297 -1534.228882 -856.638062 -1243.882568 -1346.036865
104	331.781677 -83.041771 -525.813416 -1026.352173 -1185.363159 -1167.713379 -1430.438721 -1703.381348 -1894.847290
105	-163.386047 -482.613098 -367.271667 -620.273438 -823.262390 -1089.952515 -1272.664673 -1561.849487 -1797.645264
106	-94.470627 -55.125443 -547.598450 -970.332947 -1201.722412

The index	code word
	-1190.345947 -1261.533813 -1256.466187 -1336.214600
107	-280.255554 -122.187737 222.988007 -0.161418 -149.800110 -457.114594 -539.179016 -763.223145 -744.701721
108	-226.694626 146.819641 99.686066 156.132889 264.517853 255.099182 390.046783 413.388489 484.449554
109	-193.396912 -668.117432 -935.539307 -1391.381470 -1675.302490 257.404022 755.294250 780.717102 659.994995
110	-351.291901 -1336.534912 -1761.683838 -812.096375 147.030319 253.470673 430.642029 409.021210 470.170197
111	-334.503387 -847.869446 -543.447876 -818.843140 -453.180328 -681.399109 -369.549103 -800.736877 -985.739807
112	-169.888916 188.977081 38.719604 -193.778885 663.089172 407.570740 102.907455 -395.730255 -696.857788
113	-597.549011 11.597784 173.840820 871.852783 1169.863525 1430.254272 1538.062988 1649.076782 1709.838135
114	110.810623 -260.302307 -717.694092 -1216.236084 -1650.935913 -1598.782959 -1049.980835 -991.954529 -953.349915
115	-149.068253 -724.761475 -1071.322144 -1674.264038 -2245.992676 -310.163513 -453.569458 -402.124115 -212.454956
116	-53.550934 -631.069824 -720.459900 -1071.667725 -1272.118164 -1691.381958 -1747.413452 -887.452759 -563.786804
117	93.887642 -169.664261 -540.245117 -1219.269531 -823.180481 -1033.660400 -1287.411987 -699.180481 -743.583679
118	106.536568 131.629593 -247.396606 -506.335999 -527.198425 -326.019135 14.460602 319.439056 400.146210
119	345.794647 -128.985657 -553.267151 -1045.432983 -1151.686646 -834.284668 -627.922363 -414.898682 -315.911713
120	16.523335 -81.917313 -481.277618 -28.254915 41.456417 -76.575104 -110.086128 -321.329346 -374.198547
121	25.006420 2178.584473 2119.460693 1804.463623 1368.770874 973.360657 580.718323 271.132294 10.037239
122	-207.521225 -389.666595 -658.753906 -1088.745239 -147.729385 -409.515961 -591.869751 -895.262207 -1240.875854
123	431.983582 279.939575 -40.320492 -317.882599 -521.578796 -840.770447 -1032.591431 -1336.981812 -1490.085083
124	-6.341250 951.111572 1478.494995 1295.491821 970.222351 504.117615 163.589752 -330.766846 -542.744446
125	-275.387726 -907.883240 -428.596405 -844.338684 -750.426392 520.789246 191.068069 -101.187233 -342.247009
126	-66.128357 -356.209076 -771.646179 -1201.168701 -840.965698 -289.156830 20.764372 132.631866 253.929382

The index	code word
127	566.312805 529.282288 382.089203 246.211899 92.596085 -190.611786 -343.605133 -657.513916 -751.330872
128	-89.353828 -615.056641 -164.835449 -727.441833 -718.769043 95.425873 -281.069977 -664.238403 -1059.275757
129	-246.166534 -842.018738 -1040.614258 -406.870605 -277.347656 -449.857819 -463.342133 -622.325012 -565.881592
130	-326.831329 -787.752136 -173.408951 -412.883850 580.736755 336.680817 40.913807 -444.342743 -772.719482
131	9.320523 332.287872 385.677032 785.866394 891.927979 525.718018 197.978317 -313.102997 -582.461182
132	929.624023 297.050354 -158.697464 -666.646606 -876.853760 -1016.439880 -1018.763245 -1223.214111 -1140.760864
133	140.714645 -163.534546 -663.564331 -1197.529541 -1644.409424 -1826.487671 -1873.009277 -1903.410522 -1918.154663
134	129.709396 1713.367920 1161.276245 707.854980 299.398163 162.641678 -26.087206 -77.141838 -171.849213
135	-205.154602 110.982040 -142.183319 -365.562744 -301.546692 -279.877960 -196.408676 -350.420135 -323.925201
136	-69.882439 99.225761 -316.386963 -783.445007 -774.641357 -866.159729 -460.005524 -366.746399 -196.000290
137	-161.529800 -873.052002 -820.817627 -1312.994629 -1011.838318 -781.103821 -1038.130737 533.575745 471.384552
138	-374.898529 -888.264526 -167.955841 -273.180542 -202.054932 -368.927612 -237.626297 -390.566956 -269.131531
139	194.377274 436.584747 307.389587 374.059601 419.120728 301.247375 322.779480 77.648521 34.339844
140	-77.034248 685.388672 415.089294 122.450302 -161.383041 -452.515381 -613.104004 -873.833557 -951.395569
141	-386.433350 -1145.266479 -1259.791016 -1136.691406 545.907166 747.837524 923.854492 916.237183 975.617310
142	-247.674072 -890.098083 -707.935608 -1260.291138 -1387.769531 -469.448212 -107.897461 29.525518 187.592911
143	75.124016 -594.743408 -319.550049 -1086.576904 -1389.873901 -1009.383911 -1102.857422 -1238.913208 -1034.670898
144	-213.455551 -1097.307861 -1620.846313 -2178.167725 -2369.833252 -1891.464478 -1046.413208 -597.500854 -269.395081
145	-120.505707 -545.911987 -856.895325 -1281.255371 -1845.679321 -1432.887329, 619.328125, 417.883484, 233.810257
146	-15.592245 -329.802032 -900.705811 -1522.858643 -2115.699707 -2749.846924 -3296.389648 -3688.250977 -3953.603027
147	-82.807320 -749.621643 -1257.475830 -1907.140503 -2538.343750

The index	code word
	-3129.432129 -3701.928955 -3864.471191 -1477.994141
148	-452.950867 -441.102600 869.980042 831.790283 1031.825684 875.656311 909.180115 737.284363 744.969055
149	-148.392014 -888.583252 -1215.410522 -1655.602417 -2103.372803 -2140.581055 -394.873322 -189.024429 99.190369
150	668.062195 1458.963623 1275.840820 1355.906494 1220.712769 1246.279053 1182.607300 1140.741455 993.256104
151	-256.370544 -1082.097290 -1411.395996 -1818.622192 -1726.187256 -1003.165771 -337.975769 -137.042953 38.859200
152	-366.040039 -1343.038208 -1263.489624 -12.731862 325.425690 409.669739 441.824127 415.941864 374.911804
153	-112.508049 54.832523 231.882675 534.124878 808.231689 746.702209 716.196777 473.386963 386.079987
154	-375.002533 -1194.725464 -1038.355469 -1037.824829 -11.491217 117.387360 292.925751 285.436829 373.991669
155	-110.031464 402.007935 218.209946 103.379486 8.490447 -179.653946 -258.198151 -527.337402 -586.289978
156	97.160622 1709.108643 1261.806885 869.773987 438.982056 32.777740 -373.052063 -746.220032 -967.538818
157	-47.745808 137.209152 168.656677 88.941284 -78.959335 -387.421143 -421.709259 -261.284119 -19.217987
158	525.404297 244.304626 -157.482239 -522.035645 -503.885803 -472.361633 -211.423141 -210.994324 -100.604553
159	-64.922203 -577.785645 -692.792053 -977.476746 -1072.638306 -1360.974854 -1721.664429 -2073.228027 -2290.486816
160	-250.663101 -1146.197388 -1699.822632 -2325.511963 -2795.845459 -2657.724609 -835.075684 -357.637390 10.896358
161	-171.140884 -654.061401 -598.868103 -1201.529785 -1382.656372 -849.022766 -794.400818 -573.129028 -378.523499
162	1585.175171 1531.839478 1551.516235 1452.569946 1442.305908 1338.680786 1311.629150 1214.936279 1141.125244
163	-15.817514 -411.485168 -394.904633 -753.658813 -597.352112 -668.474182 116.694031 -271.499939 -593.399780
164	68.322708 -326.461426 -433.361847 -998.881042 -920.705383 -390.451447 -750.696716 -1122.629150 -548.098206
165	-308.922272 -1033.517578 -1245.763550 -1659.946777 -963.066772 -433.620239 -130.026184 -19.373592 55.147762
166	396.746063 360.242676 2.003803 -101.434189 -69.522614 -177.138092 -174.745331 -394.647644 -427.269562
167	-199.146637 -455.867065 -788.567322 -982.193665 -794.411926 -802.438049 -647.405396 -676.345154 -567.256836

The index	code word
168	-431.786865 62.282070 216.347824 678.388000 795.189697 954.403870 1031.630981 1167.656860 1262.549561
169	708.548950 192.753342 -206.201889 -693.366821 -838.465393 -1190.832153 -358.575958 -655.519409 -667.919006
170	-24.659691 646.923035 357.575531 42.665451 -318.174011 -703.991577 -1065.087036 -1389.942993 -1617.854614
171	-457.514343 523.834534 812.696045 919.779358 959.375000 926.008667 893.313049 813.890991 772.358887
172	-252.229111 -205.577118 -99.335968 -261.883484 477.315582 0.361599 -358.287689 -819.807617 -474.220642
173	-53.019951 -151.925522 -92.089211 110.928047 -146.320724 -725.104370 -78.699577 -230.563110 -788.255493
174	-165.916931 -780.054993 -682.217590 -808.404785 -1022.207703 -1302.715820 -362.507385 -233.079498 -63.115982
175	-293.424652 -879.620972 -768.047363 -469.037689 -368.898315 -681.270874 -910.819763 -1210.304688 -1444.320190
176	-70.139114 -411.455475 -836.225708 -1157.311279 -1184.458862 -1145.269043 -1037.999146 -1040.423218 -917.642273
177	458.907898 239.671219 -274.590546 -997.059631 -456.334076 -879.237061 -834.715515 -929.808228 -453.293610
178	-201.639328 -373.349304 -552.528625 -328.857635 297.073822 401.934570 530.450989 488.733856 495.095428
179	368.688141 1257.926880 814.361023 495.116058 46.022434 -361.370819 -752.548462 -1097.315186 -1236.272583
180	85.106880 208.105011 -91.348747 -327.705048 -615.689270 -1000.071167 -1401.193359 -1803.255371 -2100.476807
181	-14.701283 -503.161835 -825.721863 -1459.594971 -2056.221924 -1266.375000 -921.267029 -558.592896 -308.952728
182	2364.062988 2268.497803 1553.899414 1021.092712 683.231995 391.977448 151.044174 16.674553 -95.852577
183	-118.223747 -668.176819 -1049.796265 -1510.749268 -1862.077271 -1833.617554 -1126.837524 -915.571106 -646.829102
184	81.282196 -137.213165 -536.142334 -1273.106079 -744.081238 -1123.636353 -557.924438 -875.544250 -944.424561
185	-146.028366 965.887390 669.985779 441.832611 227.827728 -48.675701 -282.892731 -611.419556 -752.563721
186	-215.103439 -891.118774 -1128.932861 -1478.110840 -1518.857300 -1391.129761 -784.654297 -464.452179 -218.385284
187	-104.318695 -755.709900 -1227.947144 -1774.801636 -2108.293213 -2460.826416 -2636.740479 -2869.123779 -2697.159424
188	374.387817 305.442200 17.710152 -78.148804 -160.953735

The index	code word
	-425.886536 -515.567261 -755.588318 -765.299072
189	-25.625576 344.318176 -43.530491 -324.637817 -482.693909 -559.479553 -535.363708 -679.792480 -645.745972
190	-722.385986 1108.328003 1432.110596 1615.616211 1747.338501 1839.730713 1887.988037 1897.838745 1882.956177
191	-216.053711 -774.596313 -807.091064 -1286.393799 -868.596130 -644.140198 -719.721497 -999.943665 -1312.422852
192	347.996399 -73.063454 -430.095886 -405.626465 -424.762238 -505.689728 -474.230194 -602.869690 -516.047668
193	-121.138519 599.921997 1637.786133 1673.657104 1515.356201 1099.747314 782.899292 290.842285 50.356499
194	-479.236481 -1292.459961 486.444305 617.295349 807.077637 742.250183 786.319092 690.602112 686.478699
195	-384.315399 -1041.603760 -388.681671 -720.672424 -491.007507 -261.076233 70.605843 193.263412 359.707428
196	726.636963 1068.222656 835.229492 646.974976 372.526855 81.769661 -155.821640 -467.406036 -609.194092
197	1011.585083 1131.065430 551.508789 84.949585 -427.427521 -899.412659 -1345.255493 -1725.048218 -1932.867798
198	-104.705009 -570.926758 -903.287659 -1329.082520 -1503.404053 -1593.681519 -1433.338745 -1354.490723 -1103.630737
199	684.434998 2677.031738 2640.076416 2477.602783 2097.601562 1757.809448 1344.368896 984.018860 607.138794
200	-275.864197 29.051449 -274.191254 -358.941620 46.813194 657.108032 913.113220 1191.818359 1285.592896
201	617.544373 809.540405 751.557190 656.415466 539.906250 344.674286 311.402069 104.217766 43.276100
202	-570.533142 -1292.932617 781.957703 861.536133 1279.650024 1209.266235 1395.982300 1345.671509 1472.285889
203	613.478943 498.496368 221.305801 -10.624701 -228.434753 -553.930908 -738.420349 -1059.372314 -1161.117065
204	-99.197083 -364.513275 -658.022156 -1038.899536 -1296.954346 -1541.067017 -1558.542969 -1601.610840 -1636.576050
205	1902.935669 2657.081543 2283.650879 1829.887695 1418.237427 1029.569336 635.649658 348.315186 57.349442
206	-169.365402 -779.464294 -807.007690 -1272.415161 -1381.448120 -31.502048 -271.029419 -526.351501 -776.372559
207	-372.196869 -999.805115 -67.133698 -185.357285 -272.310028 -589.583923 -690.671143 -871.234436 -813.840027
208	780.040894 540.443909 272.137726 127.595924 103.035805 -7.213268 33.308098 -92.559692 -86.642143

The index	code word
209	-43.860863 -75.046074 -498.833160 79.453178 -48.209049 -427.222076 -640.230713 -834.722412 -843.463928
210	-84.002121 -803.222839 -903.731995 -1555.773071 -1820.684082 -645.273804 -843.073975 -983.579224 -1107.764282
211	287.774628 -39.120178 -597.361511 -1199.857666 -1640.720093 -873.398071 -894.083130 -927.508362 -891.872498
212	-189.896698 782.072388 781.725647 674.643738 497.708771 241.687012 148.634705 -93.176682 -177.620422
213	-121.669731 -873.069214 -1265.429932 -1776.589233 -2045.400513 -2201.425537 -2075.754150 -2074.478760 -1888.381592
214	-169.272018 30.012857 -109.015106 465.255615 453.288849 40.586933 -249.114258 -631.611816 -837.331116
215	-362.530945 -801.328735 282.536194 243.578491 390.871216 297.866333 479.047913 369.696472 405.338074
216	-238.607315 -852.011536 -964.665527 -1365.129395 -1391.019897 -1305.390503 -1077.980591 -937.738281 -683.551453
217	-85.789406 182.220551 330.619476 318.162048 156.505722 -267.389893 -595.257080 -1019.441650 -1273.395508
218	-187.219238 -403.721039 -729.755493 -965.228516 -133.767776 126.393250 296.895660 303.930176 363.149719
219	310.347870 -47.092258 -511.695251 -1076.267456 -986.932312 -1167.762695 -1244.994751 -1354.601929 -820.385315
220	-97.799355 442.941376 811.982605 957.969604 918.645081 678.298462 573.526001 214.357635 77.677307
221	-179.466064 -953.375244 -1399.735840 -1847.744751 -1956.635498 -1822.329590 -1526.700073 -1380.293213 -1160.773560
222	-653.149902 1254.798218 1124.465698 1332.852051 1239.890015 1379.581177 1360.235107 1535.566772 1697.100464
223	-264.660797 86.838188 638.347168 474.387848 295.338104 -62.242229 -152.140320 -451.995605 -545.072205
224	-294.116180 -926.886108 -564.997986 -810.562195 -823.729614 -1049.912598 -951.003418 -904.211121 -781.321716
225	23.488888 -412.369110 -441.759216 -691.951904 -884.265442 -1368.422485 -1694.430542 -1727.004883 -1126.412109
226	-34.125507 -201.101593 -432.403564 -877.453430 -1181.488647 -619.693298 -423.591156 -702.601868 -1005.619995
227	-100.312309 -673.506653 -981.401489 -1410.046509 -1695.960571 -1886.820923 -2109.124023 -1959.750244 -1201.863892
228	-346.761017 -884.866821 -900.544067 -1077.662720 619.997192 543.461304 242.865036 -100.780441 -286.818024
229	-200.410614 109.605659 -170.653717 -421.138000 -651.408691

The index	code word
	-912.773987 -1131.077881 -1341.235229 -1498.216187
230	572.233276 755.728027 730.481140 826.995178 843.460083 827.285400 823.618469 699.820312 607.336975
231	-19.294380 -195.121170 -463.009827 -795.654175 -981.652588 -1232.025391 -832.356018 -925.299133 -594.547485
232	-406.959015 -1069.484375 -700.927673 -869.769348 138.809525 -27.963032 -146.023773 -592.793091 -904.695923
233	358.704681 2203.979248 1786.071411 1356.908936 891.832825 512.293335 67.515404 -327.043518 -622.445557
234	300.532776 129.682983 149.795502 261.271667 280.571259 67.060669 35.455791 -271.818146 -376.685242
235	-201.779694 -71.861748 512.022095 501.403564 545.430664 269.734314 290.257141 20.506559 -9.238894
236	220.352310 646.220276 485.153656 378.431824 239.117081 30.119192 -48.385849 -281.666260 -321.418243
237	-37.013084 -12.237608 -445.684906 -694.351868 -519.398560 -689.213684 -619.480469 -789.566101 -831.354065
238	-311.697540 -1214.498779 -1629.167725 -1667.692383 -252.691345 -41.316105 138.973297 128.725128 171.948929
239	-177.504532 -999.752441 -1437.215332 -2003.558228 -2320.895508 -2459.510742 -2212.731934 -1705.895630 -941.731689
240	-64.721283 798.213867 379.698395 88.914154 -168.081284 -58.058834 73.794998 323.422882 401.970367
241	124.400887 -86.299744 -713.425903 -1270.068115 -1901.768066 -2410.684326 -2521.028076 -2378.131104 -2131.198730
242	-246.546921 -936.140015 -666.568726 -711.366394 -604.071777 -503.898346 1039.701782 805.238953 313.919495
243	-288.440033 -241.610382 -246.760681 -401.584534 -492.142914 -692.678162 -740.253235 -969.517273 -1111.669189
244	-357.615021 -505.923218 1234.285034 1028.074219 764.083801 298.424377 180.949036 -154.882401 -236.654190
245	-159.627060 1235.245239 1178.883301 1088.014160 860.808533 636.503967 566.731140 383.741333 251.244156
246	-54.214455 -417.550842 -859.441040 -1392.187866 -1611.388672 -927.907532 -386.700897 -194.817215 14.651560
247	-742.290100 -15.748692 1266.636108 1328.531128 1668.744019 1669.059204 1832.402100 1788.834961 1862.470825
248	-343.283539 -1302.701172 -1851.272339 -1961.326782 -130.270493 248.502701 551.546631 607.094482 766.398682
249	107.124557 -148.659027 -554.413086 -982.619141 -1348.362915 -1730.620483 -2168.555664 -2596.479980 -2861.052490

The index	code word
250	-418.114899 -961.129211 -17.794352 661.979614 851.078003 437.627960 205.163864 -273.702789 -388.516815
251	275.978882 184.001373 -100.555817 -225.438446 74.304443 22.188887 179.736740 0.251966 10.995980
252	1615.943481 1123.951782 539.817871 175.317184 -110.204140 -465.569305 -681.310852 -827.931396 -798.271057
253	580.269958 370.878906 110.667450 134.644119 306.276093 418.459473 557.146606 516.662964 507.707855
254	36.891468 -515.519226 -762.948547 -1508.485718 -1802.767700 -1083.640381 -1172.074219 -1403.558838 -1596.932861
255	383.148956 -26.410944 -467.441589 -667.710754 -780.453552 -992.135803 -1154.880615 -1385.698730 -1454.032837
256	153.504349 -389.179504 -746.059998 -1376.398071 -2047.961426 -2373.300781 -1687.155884 -1366.466553 -1077.949463

Table B.35 codebook for High-precision LSF vector quantization , first stage, second subvector codebook, lsf_stage1_CB2_hbr

The index	code word
1	-2.419283 160.314499 -65.667160 145.171967 -234.788620 58.263897 -857.876892
2	-1078.523315 -1171.671143 -1471.139771 -1721.603516 -2394.023438 -3054.640137 -371.735413
3	-1384.490234 -722.422668 -1254.738892 -1515.970703 -1980.408691 -1571.614868 -2312.044922
4	-1211.196167 -1535.960938 -1990.369141 -1961.203735 -1703.231079 -1067.977661 -1775.004883
5	-1028.398438 -939.567017 -1238.632568 -1016.474548 -1560.545044 -1644.496826 -2429.453613
6	-1490.962769 -1297.616699 -1220.265747 -988.459229 -1302.738037 -1197.546387 -1958.636597
7	463.516296 493.455872 55.139450 115.217438 -464.511414 -580.085999 -1564.193848
8	-1785.097778 -1858.684814 -2109.224365 -2145.851074 -2486.418213 -2603.061768 -3070.082275
9	-1086.836304 -1152.029175 -1538.223999 -1379.222656 -1861.346191 -1678.717773 -2455.295898
10	-1128.577026 -1054.297852 -974.278442 -911.481689 -875.174438 -844.964905 -1078.336792
11	-469.022614 -829.216492 -1263.203735 -1220.989136 -1111.808350

The index	code word
	-834.006348 -1571.638306
12	-1552.077637 -1593.502808 -1913.150513 -1876.412720 -2260.737793 -1906.382080 -2539.385986
13	-46.287777 76.654182 -390.476898 -316.844574 -910.179382 -908.117615 -1883.781006
14	-352.165497 -324.392731 -374.813843 -377.579254 -412.347839 -616.016418 -1052.164185
15	2562.200684 2434.767578 2081.610840 1673.590088 1283.249878 942.633057 707.649902
16	-503.909973 -505.138428 -966.220215 -990.389893 -1561.319458 -1457.232422 -2308.474365
17	-1655.097412 -1696.792847 -1498.722900 -1659.318237 -1431.109619 -1221.678345 -1568.875122
18	-721.078979 -461.355804 -801.716370 -720.517578 -1222.670288 -1142.029541 -2031.396606
19	-1293.315674 -873.878784 -679.288696 31.862846 -228.983414 -440.117798 -1383.703369
20	595.191284 568.244507 557.998779 649.209656 584.837952 555.886047 474.990448
21	811.444946 775.415100 772.300293 550.483521 392.688019 -140.597336 -225.270554
22	-887.068237 -1424.254639 -2049.020752 -1434.494263 -1748.213257 -1317.314209 -2176.650635
23	-616.794067 -1045.691406 -1647.098145 -1025.717041 -1460.346680 -1325.690430 -2155.200195
24	-635.036682 -836.133301 446.604218 574.536316 437.461243 360.389191 355.061340
25	1443.341187 1918.654541 1750.556519 1440.371948 1099.758789 820.523560 634.274231
26	-372.092194 -290.193817 -417.522156 -456.368469 -676.214355 -1011.395630 -1729.396240
27	-1407.802124 -1410.329712 -1326.036133 -1297.428345 -1112.815430 -1066.590942 -1198.377930
28	-1155.173584 -470.017883 -875.280945 -991.236267 -1473.512573 -1466.203979 -2238.273926
29	-1100.306641 -265.063721 -716.102051 -924.100891 -1284.598145 -869.538757 -1762.164185
30	-1201.742798 -1308.445068 -1072.893188 -1381.481323 -1818.513550 -1411.241333 -2124.507324
31	-1093.597290 -1401.546509 -1534.675781 -1167.730591 -1508.403564 -1272.788940 -2043.262451

The index	code word
32	-754.049805 -706.918457 -1074.583252 -1259.205933 -2180.911133 -1706.644531 1.634244
33	-1318.558105 -1511.099365 -1847.709717 -1602.843018 -1996.738037 -1653.422607 -2384.769775
34	-1110.535645 -1422.926270 -1907.578003 -2039.082153 -2278.691650 -1397.641602 -2057.705566
35	-297.689423 -405.208588 -590.064941 -701.502441 -636.377380 -546.131653 -241.727249
36	-473.099213 -404.824402 -347.584503 -261.104828 -228.279114 -188.513779 -20.013456
37	-1784.105713 -1652.451172 -1898.372681 -1465.228760 -1634.671509 -1010.233643 -1834.144043
38	-1227.201172 -1219.217651 -1632.298462 -1706.958496 -2169.429443 -1836.036255 -2525.359375
39	-706.488342 -746.910095 -1253.204346 -1326.531860 -1862.745117 -1672.360107 -2445.018555
40	854.645203 292.497955 -411.134827 -850.383911 -1575.365845 -1757.057251 -2767.714600
41	-1319.187622 -1640.014404 -1963.474976 -1162.507080 -1304.337158 -958.915283 -1782.987671
42	-1232.779175 -1079.236206 -1447.466187 -1258.913452 -1644.954712 -1100.258301 -1906.573486
43	-847.552856 -713.231628 -752.985596 -389.162506 -754.285461 -648.719849 -1566.578369
44	-1708.502441 -1424.723267 -1653.111572 -1522.201782 -1966.691406 -2173.961670 -2931.311035
45	-1751.297852 -1319.098145 -1734.377686 -1953.311157 -2216.190430 -1501.015137 -2159.846436
46	-858.159241 -429.482086 -517.704590 -187.014236 -571.912231 -561.262939 -1495.169434
47	-1599.613403 -1549.241089 -1734.210693 -1790.577881 -2356.241211 -1012.164307 8.991084
48	-1529.388672 -1403.281006 -1647.208618 -1530.277222 -2019.098633 -204.429886 -1181.068848
49	-739.415649 -794.005127 -1411.415649 -1707.639160 -2181.610107 -2057.284912 -2670.123291
50	-670.362915 142.910156 -360.664429 -494.088745 -1075.005737 -949.166016 -1895.671509
51	-1492.212524 -1310.221436 -1528.393799 -1207.413574 -1402.620728 -877.879089 -1732.826782
52	-1899.612915 -1946.405640 -2189.999756 -2077.627197 -2337.402832

The index	code word
	-1881.988037 -2417.630859
53	-443.188019 -565.652710 -618.054932 -1095.713745 -1577.799927 -258.012268 195.130524
54	-1586.906616 -919.452026 -1106.189697 -755.043091 -1071.426147 -833.499817 -1684.316284
55	-1143.235718 -936.594666 -1197.897095 -1033.911987 -1462.376709 -1257.573853 -2066.716797
56	-536.623352 -206.564285 -343.659088 -62.936752 -504.874664 -529.995789 -1492.665894
57	-635.089966 -626.647522 -1009.990417 -1018.424805 -1485.962158 -1090.072388 -1937.496460
58	-620.463623 -633.232483 -1289.380615 -1406.137085 -2240.552490 -2669.604736 -3655.253418
59	385.163025 235.010010 109.594536 -140.336746 -343.256104 -936.745605 -1449.994995
60	-1792.394043 -1997.911011 -2452.838379 -2765.314941 -3405.402344 -3936.408936 -4873.289551
61	-1154.483887 -1268.832031 -1734.370239 -1847.437744 -2347.112793 -2373.519043 -3009.969238
62	-627.695007 -288.654572 -112.204475 34.272385 176.012314 283.529846 305.059326
63	-1217.558350 -1120.316528 -1583.846558 -784.825684 -1247.993896 -1176.566162 -2005.552856
64	-910.307007 -771.879333 -654.502563 -518.989929 -393.384796 -309.178009 -177.891571
65	-2529.651855 -2346.246338 -2178.039307 -1941.845825 -2070.227295 -800.921936 -31.894379
66	-3132.030029 -3499.226318 -2046.768066 -1019.603027 -549.786011 -104.957031 167.858231
67	-474.505066 -509.255920 -905.583496 -815.027100 -1272.156982 -819.950623 -1736.453125
68	-172.418259 -211.089874 -379.782471 -747.982300 -954.582886 -1373.502441 -363.987579
69	-2398.576416 -2511.631104 -2776.724854 -2771.916748 -3270.471924 -3033.739258 -508.376343
70	-1303.360962 -1687.757080 -1746.616455 -2382.338379 -2609.013184 -3633.147461 -1998.025391
71	-952.940369 -987.538635 -1416.463867 -1309.199341 -1750.525146 -1389.113770 -2180.002197
72	-574.681458 -562.496338 -678.858276 -728.855408 -818.664185 -756.459534 -1134.977417

The index	code word
73	-412.590485 448.910034 -602.397278 -842.126648 -489.682098 -746.656067 -1191.718628
74	152.910690 247.706787 214.242065 260.911499 232.637787 236.632812 182.894653
75	-1539.218384 -1439.939575 -1750.878662 -1712.403442 -2418.214600 -2109.415771 -92.771507
76	-269.296265 -194.720230 -660.341675 -704.296448 -1362.437866 -1454.097656 -2336.554688
77	-717.084900 -772.887573 -1189.133179 -1135.438721 -1627.112549 -1386.582886 -2218.122070
78	-105.389801 -78.868919 -62.281616 -27.662807 -34.128387 -25.283138 105.283974
79	-103.275963 -120.688072 -213.694702 -342.597443 -543.487488 -995.674866 -1635.099976
80	1009.061951 609.200684 -465.664246 30.097935 -210.724548 -536.370544 -807.965881
81	-1385.402832 -1392.083252 -1377.516113 -832.042542 -1012.094482 -767.382751 -1628.946655
82	-1500.500488 -846.375916 -895.946228 -1546.125366 -1017.199158 -895.583435 -1452.323242
83	1122.770508 1670.907715 1631.485596 1352.043579 1042.138550 780.370483 613.057800
84	531.805969 18.100105 -1.253166 522.595703 462.182434 442.523926 430.177887
85	-670.851379 -733.118835 -1088.392700 -611.241272 -1116.670410 -934.079407 -1845.358521
86	82.398796 412.937378 -409.110931 -275.867157 -172.803696 -533.976257 -666.394287
87	543.545166 607.136230 301.981262 172.075729 113.461922 -367.959656 -589.366028
88	-46.647766 -158.918213 -854.853210 -1275.315552 -1905.142456 -1610.375366 -2407.119385
89	521.322937 241.396042 453.540802 341.791687 266.615082 -259.359222 -238.219513
90	-3024.762939 -3473.895752 -3734.945068 -4403.958984 -2253.765869 -701.315063 -197.920502
91	-2045.555664 -2459.894775 -2769.943604 -3419.300781 -3497.661865 -956.672546 -174.634003
92	108.707832 252.321487 -208.273285 -93.021729 -641.800171 -682.776855 -1663.273682
93	-1423.165039 -1088.585571 -1452.920044 -1146.858765 -1597.936279

The index	code word
	-1454.332642 -2243.208496
94	-2298.474854 -1807.991699 -1828.818726 -1534.023926 -1638.536865 -1291.564331 -1974.960815
95	96.640167 112.615158 138.253311 75.827415 79.389519 -317.291626 -423.935577
96	-2190.903564 -2466.402344 -2937.284424 -3436.668213 -1297.438965 -498.876495 -27.772251
97	-243.354324 -515.297729 -1009.140625 -799.371338 -1319.890137 -1174.466919 -2037.242920
98	-1041.807251 -1027.113037 -1163.923096 -1349.724854 -1977.282715 -652.251343 115.361565
99	-1354.297119 -562.692932 -753.652527 -413.559052 -754.919495 -635.021240 -1544.279419
100	-1668.864868 -1325.623413 -1609.677124 -1448.219360 -1860.879028 -1637.513184 -2361.399902
101	-347.324158 -75.992462 -131.846283 291.220245 162.089828 388.920471 -653.307129
102	-2050.590332 -2310.230957 -2291.951904 -2675.141113 -2778.385986 -3633.289307 -1146.127441
103	-1614.307007 -663.231628 -1097.481689 -1164.423218 -1516.326782 -1110.013550 -1895.555176
104	-319.394135 -225.083298 -154.588684 -149.742538 -115.347519 -371.147858 -522.308655
105	-859.840576 -938.111267 -1020.927307 -1169.248535 -1277.663086 -1379.227295 -1146.013184
106	-1326.813721 -1601.993652 -1752.636230 -2242.349609 -2609.572266 -3539.369629 -913.157288
107	-2168.114014 -2284.954102 -2477.869629 -2073.338623 -2052.058105 -1417.045776 -2028.703491
108	-1867.457886 -1809.243896 -1990.184448 -1686.044189 -1962.137573 -1634.547119 -2286.456299
109	-1081.580444 -196.722565 -694.187744 -1347.482910 -605.154907 -826.458252 -1013.666016
110	-919.857666 -1200.682861 -1102.610352 -927.558167 -1131.861206 -1148.240112 -1908.182495
111	-440.644104 597.595337 1034.048462 968.113770 761.715088 594.234375 512.320557
112	391.910309 563.187866 992.584900 989.100708 791.781616 635.883789 524.414001
113	-1439.674683 -432.677399 805.322449 1533.820435 1271.657715 1052.136719 766.054626

The index	code word
114	743.810669 1176.505127 1493.295532 1480.138062 1338.440552 1121.954712 834.426086
115	-1309.833740 -1543.746216 -2007.929199 -2380.663330 -2985.001221 -3658.058105 -4591.415039
116	-1922.901245 -1399.050415 -1030.848633 -619.000916 -646.067261 -641.641907 -1374.606079
117	-1196.555542 -973.870911 -1342.077759 -1283.749268 -1889.687012 -2061.299561 -2908.992432
118	-980.406311 -728.974548 -885.837646 -752.803345 -1042.341309 -745.296265 -1563.498047
119	-1263.167725 -1426.673706 -1675.168213 -1466.998169 -1760.544067 -1011.527344 -1834.742432
120	-751.732178 -818.037720 -1138.700195 -342.462280 -658.276855 -1265.891968 -2143.573486
121	-1062.747192 -1031.713623 -1468.429077 -1521.497925 -1117.125610 -1381.837769 -2174.170410
122	-727.855774 -761.253967 -860.535095 -1033.114380 -965.472717 -817.884644 -371.561340
123	2878.902344 2563.296875 2195.727051 1742.656860 1348.161011 980.504700 733.287659
124	541.978516 672.371216 416.751801 434.956940 -161.895126 -387.416565 -1383.375610
125	273.264313 421.542664 200.308136 299.106689 -225.245010 -408.481689 -1372.519531
126	1209.753784 1304.036499 1377.753174 1216.187012 969.355408 773.580505 594.077393
127	21.863016 1291.028809 1398.661255 1895.399658 2431.829102 2305.669922 1364.550049
128	1303.329468 1405.020874 1302.691284 1044.241333 482.370239 -99.826935 -742.828918
129	-243.456650 19.171192 -169.918671 41.986885 -427.325165 -493.024017 -1455.053223
130	-1885.273560 -1884.482178 -1712.416626 -1577.402344 -1217.507446 -1040.416504 -771.315369
131	-353.943054 -561.155701 -838.340637 -301.564575 -768.600586 -660.318481 -1599.372559
132	-596.970764 -412.483307 -497.547699 -143.599548 -386.428436 59.043865 -814.205750
133	-224.299942 -247.268860 146.163208 623.048340 533.660522 471.134277 421.878693
134	-1553.117188 -1283.806396 -911.148193 -677.186279 -274.994110

The index	code word
	51.233665 148.706848
135	-2115.568604 -2261.006104 -2324.882812 -1577.229004 -1470.652100 -1025.168945 -1738.755493
136	-167.383331 -12.103893 73.544403 159.821869 283.711426 364.061676 391.078552
137	-1912.710205 -1896.303101 -1644.200806 -1082.829590 -1104.169800 -869.738037 -1651.942749
138	-1340.277466 -1241.133667 -1657.185791 -1511.284302 -2178.502197 1093.690063 45.818890
139	-1570.591797 -1679.194092 -1796.852661 -2047.197021 -2285.650879 -2350.982910 -1454.589722
140	-1231.343994 -824.596130 -996.815735 -746.322632 -1122.684814 -1111.156372 -1945.990845
141	-591.877258 516.155334 -489.766815 -64.764053 152.845764 333.220337 62.063614
142	15.653727 224.633698 17.151478 178.893738 -337.240814 -462.331940 -1436.735352
143	-880.164734 -1290.051636 -1623.288086 -1078.399658 -1245.619141 -837.299866 -1683.115723
144	-381.960052 -284.937103 -677.927490 -490.750854 -1093.306274 -1053.094482 -2001.423950
145	539.515076 387.047943 101.081024 -7.919919 -134.106995 -150.895966 135.475677
146	1593.414062 1659.969238 1600.840820 1375.510620 1092.070435 869.114746 646.936401
147	-787.252808 -1061.453613 -1590.851074 -1673.327759 -2047.322632 -1546.440063 -2271.757812
148	-876.749084 -45.474106 644.229065 755.632751 620.382935 499.973053 440.885681
149	-1919.868652 -2080.363770 -1926.503418 -2014.912842 -1927.411865 -1671.540894 -1158.850708
150	-1218.003174 -1076.153198 -932.393799 -782.836609 -592.775208 -526.451233 -449.310181
151	-2234.837158 -2223.677734 -2711.080322 -1939.675659 -578.922241 -171.547806 191.678024
152	-515.611633 583.618469 401.767639 306.167664 320.778778 322.591461 361.566620
153	-184.567017 -207.550415 -637.447937 -573.346252 -1081.125610 -787.249268 -1735.852539
154	227.247940 444.299164 297.879089 608.798340 334.543396 427.894012 -635.143921

The index	code word
155	-1812.030884 -1838.233154 -2065.830566 -1949.772827 -2039.627563 -1210.980957 -1901.968018
156	1436.209717 735.195618 -322.993958 678.544128 432.665771 592.310730 166.796082
157	-2169.908936 -2414.579346 -2538.250488 -2509.250000 -2578.761475 -2044.640625 -2299.136719
158	-1557.501587 -1493.935425 -1315.934204 -1132.046143 -782.128296 -679.114502 -560.047363
159	15.841063 1116.713013 1351.467651 1158.964600 898.157715 685.430969 553.459656
160	-1616.942993 -617.771545 -350.499329 -60.721684 76.723930 237.614853 156.796127
161	-876.453308 166.194077 -586.573547 -950.025879 -162.685486 -11.021299 -74.673676
162	-933.958252 -792.638428 -681.551208 -596.130432 -585.906128 -594.729431 -936.187195
163	-1208.862915 -1227.308350 -1181.368286 -1337.841309 -948.802124 -172.173843 113.793404
164	47.086929 9.638669 -28.048338 -108.225067 -177.868164 -537.585083 -921.853699
165	2227.242676 2299.043213 1983.756958 1611.156250 1230.987183 910.737427 687.558899
166	-2634.895264 -1341.407104 -655.939148 -435.204132 -138.849350 109.223824 175.581787
167	381.176819 172.363068 -181.324799 -255.549347 88.474831 314.105194 349.051849
168	-942.328003 -727.934448 -1051.050659 -895.382385 -1331.618530 -949.222717 -1827.845581
169	1050.846069 960.810059 899.902222 918.711304 741.007629 642.515076 427.510681
170	-1923.227295 -2332.062744 -2334.375244 -2903.227539 -2950.154785 -3899.762695 -2456.197754
171	-1321.074463 -1645.838745 -1858.400757 -2214.028320 -1537.176392 -342.966125 61.078449
172	794.880249 930.161804 695.314148 628.398499 40.544762 -332.564636 -1304.538208
173	-1196.832886 -1046.309692 -974.942627 -507.224152 -811.209106 -686.430359 -1591.003418
174	-1766.451294 -1068.532959 -1442.078491 -1631.367676 -1790.646729 -1115.237061 -1888.490234
175	-2597.554443 -3010.818359 -3857.105469 -4409.147461 -5543.684570

The index	code word
	-5077.316406 -969.496399
176	686.251831 616.379700 427.633118 373.425873 278.641876 251.032150 277.012299
177	-938.053894 -423.530273 -804.657959 -1640.446411 -1215.777222 -1003.299316 -1671.776978
178	222.797958 344.567383 353.334686 417.572205 452.120239 471.539337 452.700836
179	-193.654877 486.405945 1418.244995 1514.918335 1254.049561 1046.550415 773.944763
180	-1542.704712 -1538.845825 -1861.758179 -1613.740601 -1869.317993 -1350.750854 -2065.242920
181	-1929.660034 -1931.505859 -2094.259277 -2162.314209 -2643.336426 -3044.777344 -388.269257
182	2023.152832 2168.609131 1901.014771 1566.093262 1199.623291 905.672363 677.364563
183	-1454.306519 -1817.152954 -2259.534668 -1921.817383 -2116.793457 -1604.087891 -2239.123047
184	-2059.189697 -1293.733521 -1435.723511 -1025.210571 -1308.423828 -1063.895020 -1869.822754
185	1757.312622 2066.028564 1840.750732 1509.043823 1156.838501 859.446899 657.098877
186	-1604.242920 -1782.429321 -2060.613525 -989.568481 -304.592560 52.363155 261.436890
187	-790.060547 -677.193604 -854.483887 -1002.869568 -1361.044922 187.528214 -758.687378
188	-850.720215 -815.171509 -782.120972 -750.712524 -930.394592 -1100.443970 -1842.617432
189	-1013.528564 -619.302734 -1039.494873 -1345.197998 -1822.371460 -1228.573486 -1966.074951
190	-890.626709 -1002.113586 -1763.994995 44.655560 -635.783936 -1296.306763 -1941.137939
191	-2550.192383 -3048.042969 -3690.282471 -4373.286133 -5208.394531 -1917.806274 -581.258240
192	-46.051090 -444.285278 -621.605347 218.354416 294.350952 309.784790 355.443756
193	-832.117493 -659.459045 -481.507568 -341.173279 -48.068172 158.933624 259.165100
194	-723.183533 -566.399109 -422.477692 -387.357666 -312.310120 -495.552063 -642.440918
195	-3213.293945 -3731.129150 -3566.625977 -1970.124390 -969.271667 -349.031250 88.375351

The index	code word
196	-1493.730713 -1925.979980 -2232.583740 -1535.923706 -1746.921387 -1267.045776 -1990.320190
197	-931.412964 -793.034607 -1133.670776 -1261.493530 -1737.755371 -699.421814 -1597.601440
198	-802.901489 -780.312927 -1156.061279 -814.251770 -1303.202515 -1265.482178 -2118.627930
199	1859.657349 1899.714355 1752.933350 1489.179077 1168.854858 923.944519 675.960144
200	-758.564758 -1219.479126 -1183.540894 -239.990875 -2.090081 238.982742 254.410858
201	-654.688660 -1015.827209 -1190.445923 -605.556641 -856.632019 -642.030579 -1519.150391
202	1119.471191 858.251709 249.507751 471.759491 265.540253 -206.793472 -294.015991
203	-1211.920776 -1029.572876 -1262.090942 -1054.197144 -1343.196411 -919.689575 -1749.811035
204	-610.228638 -286.711029 -544.461487 -354.503784 -793.421814 -698.029663 -1636.272949
205	-1988.942139 -2270.791504 -2623.452881 -3106.659668 -3696.352295 -4359.229980 -1231.581909
206	-769.379578 -1117.632202 -1622.923950 -1560.120117 -1645.681274 -1032.027710 -1828.624878
207	-214.166290 389.766052 490.709106 845.222534 281.663879 -253.058563 -1178.845459
208	-1189.373657 -1266.664551 -1796.728516 -1872.993408 -2566.956055 -2864.288330 -3873.072998
209	-752.549072 -213.618332 -171.188766 526.129272 59.229225 -384.757385 -1381.908691
210	589.618896 958.856995 1043.165405 1143.152832 1853.732544 2285.578369 1410.694824
211	-1040.660400 -1191.703125 -654.014648 -941.981873 -1474.148315 -921.510010 -1640.542358
212	-1563.276001 -1639.329346 -2228.906738 -2306.195312 -2921.983398 -2888.887939 -3908.613770
213	-1378.559082 -1430.042114 -1700.228394 -53.977154 -540.871887 -542.380432 -1553.821655
214	-1160.307495 -1163.990601 -1185.203003 -1398.706299 -1303.736572 -987.148376 -471.440216
215	-1030.117188 -972.643860 -1276.948486 -738.906311 -1100.516724 -795.453491 -1693.452637
216	-468.792480 -450.322815 -974.565002 -1008.784973 -1696.910156

The index	code word
	-1940.522095 -2817.710938
217	-838.831787 274.059998 -663.343933 -1405.616699 -877.030273 -879.753784 -1595.256836
218	137.608704 69.000343 -47.363461 -233.584244 -445.194702 -970.103699 -1565.977539
219	-1042.776245 -477.652252 -729.477844 -454.572510 -946.314819 -931.773499 -1823.560181
220	42.125374, 35.638535, 740.415527, 843.886780, 668.383301 543.146301 472.985168
221	392.935059 653.371216 -448.405304 375.040161 295.584198 471.666870 103.572754
222	-154.301132 -306.378052 -466.394440 -551.980957 -192.136795 165.342453 298.238892
223	-2925.972656 -2523.248535 -1111.652954 -685.163635 -275.557953 25.750113 194.467148
224	-1574.326416 -1417.313110 -1626.486328 -1278.805542 -1589.582886 -1240.964600 -2012.671753
225	594.715515 1486.845581 1531.019653 1274.003052 970.901367 732.011169 579.845337
226	137.167023 36.624592 -517.013245 -589.374573 -1265.440552 -1145.184204 -2051.384277
227	-26.435886 -56.422054 -404.378052 -394.194000 -813.856628 -314.063995 -1064.395996
228	-1260.744629 -1497.010498 -2024.455566 -2299.268555 -2770.762207 -2045.283081 -2527.341797
229	-359.603333 -176.854752 -683.117859 -981.453491 -1492.026001 -1031.153564 -1905.748535
230	-1651.876099 -1859.713501 -2263.955811 -2451.694580 -2612.706787 -1484.526978 -2041.182739
231	-597.484070 -370.993713 -597.899780 472.524628 -203.220230 -1188.975708 -2064.148193
232	-626.137695 -534.148499 -583.699036 -581.131592 -782.097595 -1054.995117 -1791.960815
233	-1330.559326 -1746.493286 -1845.468750 -2474.347168 -2675.653564 -3675.258301 -3224.888184
234	-350.680878 -649.529663 -1278.257690 -1429.337891 -1821.152344 -1156.966309 -1977.541138
235	-1108.990601 -980.478210 -1450.680420 -1764.365967 -2155.622559 -1117.615234 -1904.928223
236	-731.516907 -960.150146 -368.916779 237.534698 298.949432 354.164429 369.252014

The index	code word
237	726.680481 970.058655 1240.952026 1122.956055 901.566833 712.591248 579.026184
238	-1509.388062 -1746.989380 -1382.398804 -1719.351562 -2064.650879 -1278.447510 -1975.246460
239	414.816895 535.429321 -51.128113 -234.962631 -1016.078186 -1202.653809 -2175.594971
240	-759.597778 -960.860474 -1123.675293 -1550.068359 -1919.764771 -2633.365967 -1350.687866
241	-1151.824707 -1196.646729 -1087.567993 -1698.596680 -1496.082275 -1052.537354 -1673.215332
242	-1385.504883 -1422.370239 -1487.047119 -1680.568115 -1802.940796 -1530.545532 -793.454041
243	1013.024414 923.160645 798.228455 699.183228 541.279236 341.881500 412.349915
244	-2169.254883 -1868.476440 -1482.921021 -1427.902588 -1178.953979 -290.343079 48.260975
245	-2174.610840 -2151.178711 -2372.573730 -2247.478760 -2823.552979 -1877.511353 -206.024292
246	1082.607422 2064.338379 2365.753174 2626.614014 2299.045410 2062.203125 1200.084229
247	144.305130 -24.135992 -270.347900 -433.131073 -458.793701 -345.861237 27.411316
248	-1911.949707 -2278.694824 -2423.027588 -2859.584961 -3014.995117 -3781.610840 -3822.277100
249	-836.404602 -933.741699 -1307.806152 -1098.735352 -1511.847290 -1059.338257 -1894.064087
250	-640.583130 -440.947906 -751.173767 -560.251831 -1045.903076 -798.479858 -1751.981079
251	-2256.432617 -1674.571045 -700.385254 756.211304 1299.046753 1050.701660 726.589233
252	-722.514709 -774.690674 -832.236450 -947.848145 -522.118652 7.550344 214.319077
253	-1925.266357 238.258560 -597.768127 -720.570435 15.188728 186.199814 8.823078
254	-1493.605347 -1635.037720 -1872.133667 -1141.085938 -1540.600220 -1550.948486 -2279.032471
255	-250.391434 -80.652458 -379.481018 -217.784698 -719.979736 -681.776978 -1644.389404
256	-1256.465210 -1254.223389 -1621.097778 -1516.847778 -1851.374390 -1392.915283 -2135.959473

Table B.36 codebook for High-precision LSF vector quantization , second stage, first subvector codebook lsf_stage2_CB1_hbr

Indexing	code word
1	-713.785767 168.407120 153.748795
2	36.340725 90.616714 -32.429771
3	52.624313 -38.090992 -364.945282
4	154.185974, 109.762367, and 355.092072
5	-375.530365 -62.235508 -134.981415
6	115.415070 -699.178345 276.090454
7	-363.505493 -245.460114 -404.869843
8	-102.644508 121.746376 -52.143639
9	250.990021 -180.223267 -60.538208
10	2.304316 254.452957 -118.709351
11	-64.000519 -172.352188 -549.504944
12	145.008041 -198.819794 74.863930
13	-319.988373 62.626167 -325.089386
14	-288.144287 -715.401611 -396.285156
15	-211.637512 -4.421244 -14.446482
16	82.578644 123.950401 -213.957626
17	-164.570007 844.651917 255.872421
18	-247.887390 55.306465 200.785889
19	-215.868759 -609.106079 -63.238937
20	392.302124 42.328953 249.753616
21	-184.973984 -69.296509 118.628799
22	51.923347 -142.208099 177.060547
23	53.448772 -305.917572 -103.890076
24	229.675934 0.439482 122.373756
25	-277.801453 166.968170 733.307129
26	170.546982 339.845001 31.960520
27	64.136490 -25.794970 65.980400
28	-43.597557 -34.969471 -37.739056
29	-212.885864 507.455505 437.958435
30	-493.030060 -311.711365 187.651596
31	-354.960724 144.233612 368.872223
32	81.155983 198.582993 -361.475037
33	-57.561897 -190.277390 -40.531013
34	225.483200 184.535919 145.773300
35	37.873772 -300.896942 273.377380
36	-161.762527 -104.531548 -353.909149
37	437.577271 -248.396957 -118.537544
38	95.924393 -536.217834 -123.140144
39	-116.965042 137.023346 -432.474640

Indexing	code word
40	-401.308441 -316.035950 -124.605537
41	265.316132 7.975056 -193.403076
42	-10.286757 -256.780396 -308.450928
43	286.242706, 221.018967, and -186.312241
44	231.734329 -155.717773 278.019806
45	-344.505493 -185.656815 515.490845
46	-210.659317 -371.243408 298.229218
47	-55.369648 -502.107391 166.864746
48	-237.739120 449.408295 71.104065
49	-197.362518 292.102844 232.818176
50	-244.392792 154.775345 58.205173
51	266.715729, 694.912415, and 70.328987
52	-204.886414 -186.953674 -33.269745
53	119.856064 -148.999146 -212.473984
54	-96.027031 -133.978561 283.992157
55	-277.930481 14.714230 -619.926331
56	108.560051 381.440857 -174.843597
57	-532.884521 158.514374 -200.185989
58	-14.112489, 326.978088, 130.464569
59	-101.656219 31.647610 -269.940765
60	-144.576035 -422.618805 -323.873138
61	65.474930 -420.618225 -505.687775
62	209.829102 -387.511017 94.998833
63	-172.908279 -60.086086 -150.022415
64	-46.326584, 260.807922, 452.773834
65	279.548889 -141.048431 -322.010864
66	393.468262, 8.009486, and -42.706268
67	-81.231201 45.355511 65.719444
68	222.150711 -141.217514 -564.965637
69	346.164856 434.299622 -66.598831
70	568.707031 -159.705505 544.176575
71	-211.341019 -216.253036 -211.727448
72	224.405930, 357.485809, and 257.797882
73	553.497620 31.112984 -678.450806
74	82.964523 135.422699 -656.731628
75	175.658020 -128.771088 503.778290
76	14.064637, 492.906281, and 239.662155
77	472.926147 -403.081818 -391.692749
78	-292.928436 -699.444397 353.090057
79	72.990135 -133.231140 -53.157795
80	-52.832638 -117.261017 69.052734

Indexing	code word
81	426.745056, 201.403336, and 31.993965
82	223.471848 449.586548 -409.097839
83	-74.437065, 170.063431, and 109.249542
84	94.061584 -8.890752 -155.487183
85	181.220139 -12.836661 -26.633982
86	-257.568481 404.635712 -478.268524
87	-118.702698 -1.801430 436.133667
88	-328.992798 -148.799011 49.605450
89	685.787781 -5.360787 84.299042
90	-92.548859 -405.149048 -942.782654
91	545.499023, 378.187408, and 237.816772
92	223.737640 689.972900 549.611572
93	-402.027008 256.815186 47.899891
94	198.374649 -338.206146 -228.664978
95	-74.177917 -279.765411 485.423126
96	592.158936, 327.568512, and -262.079163
97	-97.092148, 110.176552, and 270.185944
98	-134.869324 293.152802 -12.102485
99	196.897675 149.523315 -40.585079
100	974.516663, 442.782013, and 130.876434
101	-119.678520 183.199692 -210.154816
102	520.430542 -462.481323 137.886856
103	64.144768 -24.995043 303.479828
104	-65.387932 380.154449 -306.889679
105	312.868439 105.024971 -392.744720
106	-42.009869 -144.065552 -184.797028
107	-286.622528 -143.909866 256.411652
108	361.120209 194.673004 488.534027
109	608.696533 -6.981796 -274.527039
110	45.004539 218.194778 28.713619
111	-256.952240 -384.646057 64.113510
112	-488.355804 532.116638 224.472809
113	-128.912506 -241.478180 128.511200
114	-272.429382 330.666290 -179.248230
115	33.182674 226.608612 254.291412
116	-439.983124 8.855278 102.383743
117	53.941254 37.994209 697.273926
118	-128.799225 -350.602203 -105.367256
119	-11.603866 -330.001129 57.193336
120	-109.075554 -486.121399 795.247375
121	-183.717377 632.973999 -138.407562

Indexing	code word
122	-6.666337 486.127014 -17.339613
123	389.025299 -181.146561 137.332169
124	-271.502441 115.163071 -122.910507
125	-39.242790 21.079741 -150.635345
126	257.078369 -403.075104 437.620300
127	-45.516216 -8.866961 180.737320
128	70.438759 98.982910 139.766769

Table B.37 codebook for High-precision LSF vector quantization , second stage, second sub-vector codebook lsf_stage2_CB2_hbr

Indexing	code word
1	20.507162 117.254471 308.534973
2	167.627548 -284.581360 35.337910
3	-50.533733 262.051270 -222.744385
4	213.973526 -192.300507 227.454147
5	324.752869 154.691422 142.521759
6	-302.892273 22.365881 -268.279053
7	384.219574 -46.759758 295.384735
8	-326.932983 -142.875214 123.286591
9	462.440582, 30.680933, -644.826782
10	75.870522 100.746597 -229.091095
11	-184.132187 -518.547424 -105.319809
12	-128.916153 -172.195633 83.659973
13	63.237682 -497.342957 72.141266
14	274.313446 167.584351 -33.896770
15	-596.630493 8.026925 -321.141144
16	50.223522 -16.749166 -83.381676
17	44.889523 -767.325989 -139.284637
18	224.780106 352.491333 75.805626
19	-33.128654 305.753296 -601.859070
20	115.771713 -93.239197 107.058525
21	-148.837738 183.316940 413.980072
22	-182.227646 -697.383789 278.016632
23	445.581207, 256.918182, -61.204651
24	707.401611, 599.105469, 466.282776
25	172.835205 -255.287506 -399.850555
26	-182.281845 185.917496 198.393707
27	-354.348358 77.655319 121.351845
28	165.057236 -250.012955 -153.211365
29	15.198963 -101.545570 337.992859

Indexing	code word
30	635.096924 -22.253139 -276.124939
31	-174.264359 306.408936 -30.304029
32	63.197758 65.521347 148.829025
33	-565.097168 -720.727173 95.707863
34	173.535858, 4.769509, and 226.110519
35	-302.163788 -364.092468 40.338612
36	322.009796 -130.186035 -257.399811
37	-143.584061 432.809937 187.272064
38	-8.131482 172.260559 72.100441
39	-69.128052 -15.661174 -246.318619
40	141.381821, 678.433350, 463.580078
41	205.150635 60.560955 -127.768204
42	-396.496399 355.075836 271.316498
43	-16.061943, 261.906860, 182.079605
44	119.859367 -86.526634 -181.600311
45	-278.325073 273.584839 -346.330780
46	-848.170715 -77.039818 206.621765
47	-20.108572 -224.001541 -248.247284
48	-152.951675 146.029510 4.365578
49	62.817871 353.723999 343.701416
50	-436.317230 -275.409271 341.552063
51	147.565918 230.680481 166.706573
52	-34.370865 -308.244354 -41.257004
53	-241.203552 -430.650146 813.072693
54	368.040619 -410.771362 232.966476
55	51.651077 -146.025299 -22.975538
56	-282.722992 -620.837402 -850.400146
57	-165.943176 -55.919006 572.439575
58	-103.814415 -227.512253 -490.515442
59	124.234863 -193.956253 -844.806152
60	-505.521362 82.886086 466.838531
61	148.491516 -239.119812 546.069153
62	63.785629 -80.139122 -321.356995
63	564.061768, 129.677856, 165.186554
64	158.311157 128.742462 70.707832
65	316.238434 -27.633970 86.694901
66	-175.450073 -93.772957 -166.443024
67	-142.252975 -157.993195 255.044876
68	-313.525330 13.380783 -652.654724
69	-241.896759 28.034353 -57.149029
70	-190.798920 0.189457 116.813072

Indexing	code word
71	844.387390　　337.000793　　-19.824232
72	-564.077698　　500.165619　　-415.747192
73	213.419327　　-91.672638　　-57.745274
74	-99.660248, 74.968384, -407.527557
75	-29.572922　　-96.862167　　-131.641983
76	-135.936050　　-355.414703　　151.864426
77	222.614548　　-673.049561　　517.544067
78	111.716286, 204.121689, -51.537071
79	80.887352　　35.771717　　2.501737
80	-370.751129　　-221.242981　　-170.055420
81	-549.659729　　-200.956406　　12.992573
82	59.403713　　-418.178558　　-191.717911
83	-52.472393　　56.039600　　70.462021
84	-88.299973　　-178.931824　　-61.182095
85	125.889633　　580.681763　　-326.664459
86	-592.087524　　160.197723　　37.150238
87	362.081543, 337.822754, and 311.010651
88	186.879440　　331.649445　　-169.341782
89	-238.267609　　783.910889　　138.339188
90	-5.536943　　-490.727203　　-455.820465
91	349.078400　　-449.050262　　-113.857185
92	524.526978　　-149.489349　　603.087891
93	470.803162　　318.161041　　-352.185669
94	-166.528366　　-349.740906　　415.440033
95	159.741531, 26.906466, and 458.308716
96	123.212921　　-21.127138　　-508.872711
97	-239.674759　　-150.437744　　-346.729095
98	300.417145　　81.030838　　-299.241089
99	-400.569550　　-31.321560　　-64.911179
100	-329.600861　　264.643341　　72.342133
101	-76.098831　　23.414692　　223.034027
102	410.300262, 545.022339, and 14.200037
103	64.472435　　-380.021576　　299.929443
104	-276.012024　　-14.363681　　307.793549
105	458.341339　　-364.150879　　-473.549255
106	-134.677811　　-57.834167　　-0.576738
107	-138.862488　　111.922058　　-166.296036
108	-390.244507　　475.571930　　-62.043774
109	146.384476　　230.729202　　-393.689453
110	216.011246, 162.604935, and 315.091980
111	371.276337　　-198.172241　　-7.094508

Indexing	code word
112	-412.132812 -448.155182 -344.452454
113	21.202076 -217.792053 148.690628
114	-239.708435 -178.662338 -46.387856
115	-372.993713 190.326294 -134.271698
116	78.791969 546.357361 89.262733
117	108.147072, 201.503693, and 691.316589
118	-295.153564 468.795502 587.713989
119	11.740393 334.976410 -1.581412
120	-170.412354 -303.384949 -200.288986
121	3.908800 121.635567 -68.972488
122	183.778122 8.971548 47.254635
123	-62.340725 12.960299 -53.699871
124	422.356262 21.269390 -79.914871
125	-10.798393 -58.968788 82.892532
126	-110.142456 493.066437 -173.040512
127	-762.578003 593.424316 203.118790
128	648.862854 -213.159912 89.717255

Table B.38 codebook for High-precision LSF vector quantization , second stage, third sub-vector codebook lsf_stage2_CB3_hbr

Index of	code word
1	61.442013 88.865410 -6.914186
2	-189.400803 183.880447 453.544067
3	119.694290 122.304260 -185.256332
4	185.325165 257.642426 21.324890
5	176.223907, 376.925690, 276.048035
6	44.387566 -336.891266 -287.661438
7	364.234314 -399.658417 453.150360
8	309.771759 -396.966858 -246.510818
9	-98.734177 -268.355042 117.649399
10	68.921753 181.501190 315.960663
11	-16.736830 -112.308594 57.227196
12	-191.615204 -370.536560 -89.005638
13	-635.830200 -111.513008 426.530273
14	133.312378 -378.453064 44.851124
15	-247.431152 145.292679 33.881779
16	702.903503 405.354767 -185.583740
17	55.931442 -52.922546 225.309769
18	-329.518463 23.220282 207.375168
19	-81.797279 61.733788 214.160568

Index of	code word
20	-333.189178 -366.966156 253.709396
21	300.709991 191.407745 190.362869
22	-54.259617, 292.960663, -166.641479
23	207.949539 -137.050339 90.344116
24	292.658539 413.935455 -165.154205
25	43.520733 -285.075592 348.921387
26	-173.507782 -407.853882 -702.097595
27	576.308167 110.584236 -7.069339
28	583.669678 2.836300 -559.254211
29	331.974945 23.614412 -271.937256
30	275.383270 -28.569506 282.474884
31	311.056641, 79.100693, -21.822622
32	-192.355347 -147.341660 -184.034576
33	-439.608124 448.283508 603.143738
34	-201.011368 21.700256 -159.099167
35	135.237228 2.610675 35.422089
36	-19.653358 -37.952515 -95.742783
37	-74.458069 109.526535 -83.227531
38	-335.823456 744.129639 38.045818
39	466.931183 -218.274597 4.676877
40	-13.563426 208.090698 87.632927
41	119.996140 111.237968 156.117310
42	-259.981445 466.053467 -437.298828
43	-84.826576 11.426362 51.927937
44	-158.319885 331.992126 210.548325
45	494.739502, 174.590012, and 389.298523
46	-27.986452 -202.765732 -108.582108
47	-81.897018 -700.229736 150.311615
48	-441.722595 -63.444637 -332.879852
49	87.043427, 43.144299, and 555.890503
50	-174.406799 -471.973938 753.418884
51	154.363052 -138.182922 -528.208679
52	-610.850464 358.816376 115.910812
53	-172.365845 -105.489944 361.526398
54	-500.688629 -436.756714 -99.204269
55	156.351166 236.082245 -466.519012
56	-179.466690 -272.355408 -352.192108
57	383.152679, 591.679932, and 542.802246
58	164.616272 -115.712784 -131.835144
59	-373.097534 293.575073 -173.105423

Index of	code word
60	-251.338821 -126.143494 19.707720
61	-147.272232 61.723743 -422.298248
62	3.450175, 514.963806, and 16.579840
63	-531.877258 -14.696597 -27.526365
64	12.894713 -64.106720 -285.631409

Table B.39 codebook for High-precision LSF vector quantization , second stage, fourth subvector codebook lsf_stage2_CB4_hbr

The index	code word
1	92.195709 -173.186340 -76.764999
2	-42.733780, 402.076965, -167.067413
3	216.264893, 102.677452, and 168.312927
4	-180.997543 162.147827 -134.432327
5	67.712898 258.969391 239.192825
6	-170.611481 256.868103 173.602570
7	-8.513791 -111.140099 92.899986
8	327.391144, 205.558334, -102.128365
9	244.509750 -137.128418 -470.007751
10	-305.208832 85.310158 56.496731
11	180.332489 -404.626892 35.443607
12	-89.915100 -413.847076 440.065216
13	-49.306343, 63.195087, 62.291702
14	-56.507740 -124.494896 -224.872910
15	-117.042595 -206.133224 -17.508348
16	-199.800507 -28.671963 -490.060699
17	57.166000 181.844971 14.875186
18	-11.494995 -12.210985 -83.709663
19	83.800140 98.593323 -225.477493
20	130.287781 5.693187 39.476902
21	128.140930 -135.807297 296.940247
22	-112.687485 -389.502289 -221.875732
23	-157.652573 -37.295250 11.366231
24	-496.884033 -539.886902 -120.588898
25	-78.960876, 34.301903, 287.433350
26	269.951935 -62.663803 -131.213440
27	-538.176331 470.946381 245.755112
28	-265.331299 -83.310402 -141.434708
29	436.499817, 440.873291, 263.916779
30	-631.545959 -29.409035 -72.509338
31	-294.762054 -158.774612 187.861343

The index	code word
32	453.967224 -94.971153 122.421051

Table B.40 codebook for high-precision LSF vector quantization , second stage, fifth subvector codebook lsf_stage2_CB5_hbr

Indexing	code word
1	-446.630402 640.495911 268.249786 -67.830261
2	34.200180 144.016098 43.309258 28.019665
3	122.397560 413.036896 108.406776 21.556137
4	-291.235809 -590.999878 -4.219362 -29.149132
5	-182.353165 247.858917 -82.613281 -248.262726
6	11.704876 -19.809439 175.695541 109.505432
7	-199.381882 -162.686661 116.547264 96.769501
8	85.434540 -28.285826 18.597948 -23.235142
9	112.726555 -284.508789 -29.389679 257.062927
10	-253.303757 -54.471107 -98.781433 -31.290049
11	-28.797440 -6.548668 -64.319229 103.122360
12	102.159714 -280.140747 276.293243 -38.849163
13	-184.768158 -482.613373 -769.700989 -47.989521
14	-223.921066 166.102005 120.577484 120.780533
15	58.940697 148.444000 49.055420 347.937683
16	-194.453476 -55.881226 -203.431305 440.613892
17	271.730316 37.378754 -396.253754 157.584000
18	-125.173019 240.714401 -231.325714 77.097366
19	245.718994 72.768524 112.223206 59.880192
20	-58.394215 -204.128754 -21.877651 -69.457428
21	198.198151 152.518585 -76.095955 -92.793144
22	5.645205 -2.743056 -126.321007 -129.334778
23	140.627350 39.890167 114.086823 -290.992889
24	129.491241 165.633606 406.660248 150.717422
25	-606.185791 -12.697894 7.033066 -27.042786
26	585.682068 260.057220 63.060730 -9.845518
27	254.377533 -187.517456 -100.691185 -109.688454
28	-81.884468 -167.102570 -333.533386 -11.585288
29	216.725479 93.283714 -303.676849 -367.260162
30	-95.634460 -174.039597 -142.232117 -356.129242
31	-83.721230 -3.592948 37.293602 -44.416279
32	-173.826035 -209.999924 505.608887 329.540344

Table B.41 codebook for Low-precision LSF vector quantization, first stage, first sub-vector codebook lsf_stage1_CB1_lbr

The index	code word
1	-350.459351 -1110.657715 -1039.387939 -307.705811 -81.258949 -67.539551 27.608225 -15.766386 26.909994
2	830.518982 1316.991455 969.974976 701.664673 395.667511 140.679199 -86.249687 -326.514038 -441.620605
3	875.874268 300.750061 -135.191727 -749.033386 -624.504944 -977.145691 -270.945770 -528.141113 -484.400909
4	-37.185486 -438.739746 -198.407791 -716.461426 25.968819 -322.178650 -642.945679 -1081.934448 -619.731140
5	8.61967 -325.081543 -537.529907 -906.260193 -1086.351807 -1269.749512 -990.259827 -1082.904907 -659.676147
6	1975.103882 1380.655762 714.073425 323.243988 40.096863 -340.828369 -585.161987 -748.583984 -674.141174
7	-149.657196 -842.284973 -991.205566 -1085.922729 -1127.279663 -1483.629272 -1023.704834 -461.994324 -253.976318
8	-18.673189 189.549789 -168.876450 -405.123322 -453.465790 -77.701363 268.827789 600.122742 675.741089
9	-481.714874 -1312.720947 497.238983 617.127869 809.172363 738.139771 787.788086 698.119446 695.123840
10	165.517990 463.347443 161.873764 -94.733566 -408.583618 -801.933167 -1183.599121 -1549.846436 -1829.587524
11	-54.419785 -532.895569 -852.639648 -1328.288696 -1952.080444 -2071.530518 -92.382095 -203.139877 -186.850891
12	183.861481 -367.273651 -851.810547 -411.512238 -523.118713 -562.440063 -624.123779 -710.631714 -784.563538
13	-177.176773 -521.651245 -243.776535 -638.196167 -178.797272 619.959656 324.879456 -91.975945 -505.510773
14	-257.685272 -815.271667 -835.617249 -1264.782471 -1022.726257 1117.330078 928.825928 663.468262 264.610596
15	25.521532 100.323082 -382.839996 -812.957520 -1234.972046 -1564.814453 -1898.064453 -1977.380615 -2026.754517
16	-176.444000 -438.630615 -730.473633 -1083.432129 -1262.495728 -1234.185547 -1185.764893 -1210.682739 -1209.831421
17	-360.419434 -785.268372 -865.262695 -1157.854126 766.852356 969.479614 737.747498 532.021301 313.538544
18	73.917870 -175.426498 -555.667419 -1068.706665 -1075.443237 -587.874329 -348.189636 -173.672394 -40.342525
19	-171.413345 57.096062 -278.747833 -399.241699 -545.361328 -765.097778 -964.719727 -1209.839111 -1428.539917
20	-357.214722 -896.660034 -37.925079 -239.189606 -322.952301

The index	code word
	-631.056213 -714.007874 -913.038513 -878.441833
21	1577.066040 1529.908569 1551.067139 1455.275879 1443.303467 1338.591675 1316.248779 1216.262451 1138.473267
22	-409.347382 -896.647339 645.859741 732.300842 705.857483 302.651703 108.818642 -286.890961 -332.548187
23	-245.251160 -851.509521 -998.825500 -1403.856812 -688.652405 -72.345734 -200.590012 -436.256897 -716.309570
24	-330.863983 -905.250244 -375.980499 -700.450745 -352.954773 -106.922882 -215.295853 -600.505005 -879.973511
25	-414.539246 -976.347595 90.056046 24.310310 12.638400 -256.423431 -215.814499 -414.811096 -375.642853
26	-407.677155 67.193260 -239.487579 -109.491417 505.456665 979.732239 1202.223755 1395.712646 1486.746216
27	-103.741013 419.907928 320.453217 215.451691 83.301155 -252.383514 -505.506042 -914.186646 -1144.382202
28	22.720533 -186.878723 -341.957092 -498.801239 -536.332214 -952.614136 -1357.851318 -1808.392944 -2053.646729
29	-26.351635 -744.136047 -797.139587 -1550.414185 -1788.882568 -811.625061 -984.366882 -1143.760254 -1279.114746
30	-107.477005 -773.448425 -1269.981323 -1817.958374 -2156.203369 -2516.463135 -2683.684570 -2863.591309 -2623.000488
31	-95.678566 204.781097 -189.688644 -453.370697 -564.583740 -524.080322 -323.315308 -217.640259 -82.427811
32	304.838196 198.058044 26.587915 227.075500 279.514038 90.428169 25.509212 -293.474701 -421.430298
33	705.637146 193.382828 -315.379425 -720.216431 -1010.554382 -368.707733 -478.114960 -653.081177 -744.303284
34	-124.040001 -617.344604 -750.567200 -1259.906250 -1586.850342 -129.100784 -301.769806 -535.021301 -797.296326
35	-120.237625 945.004333 1023.360596 1063.863770 923.643372 722.150696 610.020325 326.225830 204.115326
36	-242.126205 -1014.856384 -1121.360840 -1530.979004 -1499.600098 2.104447, 449.181427, 711.969604, 828.493713
37	-87.722557 -762.384583 -1226.589966 -839.319092 -951.323608 -971.707947 -973.453064 -954.515076 -996.160034
38	-168.498444 -970.490906 -1430.185791 -1907.497803 -2064.904053 -2020.493530 -1702.496704 -1505.148682 -1141.392456
39	235.255157 -214.254913 -735.741943 -1327.962769 -1079.209229 -1155.385376 -1207.560913 -1325.105225 -1136.770874
40	489.040497 379.885406 126.575279 166.232132 351.813141 480.143921 609.508545 543.443359 531.942444

The index	code word
41	-153.286011 -209.206512 -534.360840 -915.646362 70.271286 -16.743921 -169.522858 -503.006714 -716.120972
42	-345.934845 -1309.356201 -1890.006348 -2248.306396 -439.151978 92.394310 370.706940 471.791962 618.747803
43	-310.524963 -842.749207 -696.589539 -105.589561 71.578148 -348.991364 -368.559540 -730.835938 -645.298462
44	-306.158356 -1102.411255 -1307.940552 -1490.519287 -1121.813599 -795.747864 -604.703613 -509.754211 -467.392792
45	-279.305969 -1188.364014 -1767.922607 -2403.655518 -2683.665283 -1444.281616 -463.252106 -212.524490 61.606976
46	647.597961 8.382929 -398.628387 -858.689392 -1196.260742 -1258.485107 -1150.217529 -1349.348267 -1085.179932
47	-449.228638 1142.992554 1064.484375 1191.123779 1070.723755 1070.619873 986.951904 948.657349 863.388184
48	-254.184570 69.529388 958.512634 839.154419 698.573792 330.158081 380.084473 116.397308 39.122948
49	-247.474976 -291.702637 -560.705872 -726.362122 -712.323059 -847.740417 -819.774109 -972.264526 -1000.929565
50	-102.649529 -744.442200 -1258.676880 -1895.340088 -2534.861816 -3116.099365 -3649.456787 -3755.880127 -1480.863159
51	-224.878769 -868.444153 -1144.696777 -1584.141479 -1576.102783 -1216.113770 -629.454285 -408.229340 -209.635284
52	-222.695526 203.857239 149.654663 180.832245 239.630402 195.768661 296.441437 316.698608 426.070404
53	121.947586 -357.326324 -682.028442 -1382.699463 -1620.812744 -1094.719849 -1241.071045 -1532.304321 -1752.286865
54	-403.487427 -1423.419800 -1591.178345 245.310394 599.750122 789.179199 882.052734 882.112976 816.936096
55	-36.153755 -279.553741 -632.521973 -8.765594 35.625114 -69.890617 16.580078 -204.663498 -340.181366
56	-199.492142 81.513809 32.626942 -178.653061 -278.078857 -547.297485 -676.165894 -952.851868 -1025.475952
57	237.930984 -243.357269 -671.658203 -733.092896 -758.623291 -951.332397 -1087.989868 -1268.829590 -1280.351929
58	-227.537750 -287.850098 -292.606018 -429.307404 -253.741806 -301.787720 -203.673462 -411.002045 -375.994415
59	-231.314774 6.343965 1509.542236 1552.771118 1414.968018 1010.981384 781.095398 288.140961 64.403107
60	-273.534241 -1185.445679 -1731.143311 -2246.872070 -1664.682007 -876.096619 -482.111023 -280.437042 -194.066895
61	-59.669891 -437.954163 -952.351013 -1369.370361 -1366.131226

The index	code word
	-1311.555176 -1082.967407 -927.321472 -682.334717
62	684.509644 105.415596 -391.989441 -928.875854 -1156.915527 -1280.749268 -705.104919 -712.426208 -747.950562
63	21.285646 850.948059 1489.332886 1323.255493 997.157410 536.696960 184.663040 -327.162109 -538.481995
64	-672.908691 1205.853271 1076.858276 1270.047241 1163.228638 1278.610229 1231.399780 1384.312500 1458.875610
65	1123.680298 1195.730835 596.091187 120.459366 -367.943024 -844.443298 -1278.164551 -1673.333130 -1885.995850
66	272.514954 -301.388336 -37.983318 -253.615463 -214.135483 -513.741882 -462.207184 -767.507812 -831.534363
67	87.529411 -284.147980 -737.057129 -1398.583252 -1831.413574 -1200.515869 -1424.156372 -1247.542358 -695.322876
68	190.618988 -83.082245 -404.415741 -902.791565 -341.542328 -531.072021 -452.109833 -526.579529 -438.453522
69	-356.549683 -1249.736206 -1552.698242 -1509.339844 96.601120 463.938782 772.470825 876.086670 1027.148193
70	-251.656082 -741.916626 -800.877991 -1204.293213 -898.387207 -536.743469 -540.424072 -951.805664 -1371.296997
71	-16.392891 -341.709778 -903.738708 -1518.366821 -2100.664795 -2723.664795 -3262.568848 -3655.256592 -3920.665039
72	-284.557129 -626.414917 -170.010101 -351.521912 993.011292 707.154114 430.032684 -56.580963 -208.748627
73	-63.585968 -276.151489 -456.599518 -256.501343 -333.562897 -755.818237 -1020.620972 -1435.192871 -740.306030
74	1629.834961 1146.042969 539.183167 225.645462 43.176285 -56.714531 -61.315525 51.049088 105.315742
75	-257.347992 -949.083496 -514.112061 -946.301208 -1061.262451 423.505493 64.353943 -184.519806 -310.060455
76	601.338196 730.051941 529.544189 350.136139 123.053047 -167.247162 -385.363373 -718.114075 -827.812866
77	957.477234 1673.412354 1102.213501 726.657349 193.804886 -166.666946 -647.636536 -933.063171 -1035.739258
78	-177.455978 -666.090027 -713.341553 -1062.997437 -483.726715 -690.400879 -933.267517 -1214.673828 -318.606110
79	-189.500244 -405.898071 -668.867981 -764.180420 -19.830473 181.539169 350.049530 341.817993 381.419586
80	58.198463 87.016228 -470.353455 -1019.402344 -505.580994 -476.027191 -643.724976 -953.289673 -1218.301025
81	-9.731637 35.897629 -398.662964 108.671082 -30.824179 -403.612305 -511.957275 -623.195251 -685.248840

The index	code word
82	-157.306366 -553.577942 -975.876953 -1460.082764 -992.205627 -776.317871 -511.261353 -326.743317 -198.921204
83	-662.229797 337.577576 714.611816 1115.122437 1346.081543 1525.260742 1630.367676 1702.934814 1783.298096
84	-96.698639 476.073669 356.679108 307.013367 275.333221 144.351913 131.806870 -89.757820 -125.505257
85	96.625595 -234.501587 -735.064636 -1204.421265 -1373.773438 -1125.901245 -666.270874 -459.149506 -250.652649
86	169.706879 -187.591034 -705.413025 -1239.362549 -1701.577881 -1862.408569 -1851.633179 -1883.478271 -1916.869873
87	-64.554306 -62.929207 -407.237640 103.524368 40.249016 1.853116 -21.553176 -3.703000 -1.853116 -21.553176 -3.703000 -404.697784 -763.795471 -1124.062500 -1390.584351
88	-141.843674 -793.938049 -1194.776245 -1549.655762 -1645.277832 -1719.506592 -1687.905640 -1854.041382 -1926.495483
89	-194.186035 -903.843506 -790.955811 -1279.267334 -942.369080 -715.308228 -985.681213 525.467102 483.847260
90	2144.286133 2143.108154 1424.848999 907.611938 586.665710 307.282593 24.629150 -128.423553 -254.069794
91	-168.323730 -977.983582 -1317.796509 -1770.269409 -1939.598022 -2061.373291 -1970.316895 -1014.373840 -266.364838
92	-14.177239 -456.114960 -698.976685 -1179.255615 -1664.940552 -1250.903931 -484.642120 -708.259399 -900.153687
93	-243.909988 -627.637512 -352.178253 -584.734863 317.760437 -84.799057 -425.512421 -952.116028 -1349.741211
94	84.997139 -326.942902 -436.166351 -822.967712 -793.385132 -1216.504883 -1579.634766 -1824.714111 -1103.522095
95	-78.882149 557.116882 243.507629 -59.426495 -326.818054 -656.480164 -882.566284 -1162.840576 -1292.122192
96	472.399078 324.246429 123.760132 107.621017 172.215866 100.703049 220.447205 70.769211 93.025391
97	-279.016632 319.207550 -34.997967 -125.365486 -3.664740 454.022797 673.832275 971.419556 1070.634033
98	-86.031052 -99.652267 -551.247314 -880.790283 -1066.362305 -1154.501709 -1332.679810 -1483.808594 -1698.237671
99	139.571533 -74.816330 -730.456421 -1296.350708 -1943.886841 -2471.267334 -2555.464111 -2359.309814 -2118.012939
100	-232.477631 -323.773041 -457.001678 -708.959167 -360.985809 484.481323 753.548096 1113.769897 1170.534302
101	-96.813431 -683.746643 -784.213257 -1114.412476 -1279.278809 -1705.722290 -1768.958984 -1196.400635 -768.627014

The index	code word
102	-234.763580 -1016.336548 -1436.150757 -1801.835938 -1697.735352 -1363.577026 -1055.104492 -852.366211 -672.977417
103	423.673950 204.145523 -80.427010 -237.875229 -397.674561 -692.070435 -832.088562 -1137.829102 -1263.773438
104	504.952789 140.112259 -276.739960 -574.314697 -427.731293 -264.691650 -6.429366 59.627628 128.354279
105	181.932892 -406.816956 -736.782471 -1377.915894 -2054.307373 -2382.816895 -1719.648071 -1395.232666 -1084.625366
106	89.986191 1808.005493 1425.416870 1018.296204 603.047913 200.996918 -203.648102 -614.505920 -859.780212
107	25.575348 -491.275757 -169.827484 -756.985229 -510.820648 -271.569244 -627.316101 -1105.351074 -1497.432861
108	-0.721510 752.166748 412.833252 60.089832 -264.969238 -507.899292 -573.338013 -668.694214 -629.476257
109	-157.224030 -924.664978 -1350.100952 -1907.713013 -2248.231201 -2433.884766 -2367.341064 -2260.742920 -1727.894043
110	-312.066467 -1067.247803 -1253.844849 -1673.790649 -1243.493896 -606.165710 -238.625320 -74.536827 29.102182
111	188.922134 -387.703766 -181.650040 -684.412659 -465.589478 -816.664978 -761.582275 -1098.897217 -1035.031494
112	-502.310791 -1291.180786 -377.128448 -356.472809 549.371277 798.475464 1053.768799 1193.387329 1321.974854
113	120.875381 -86.850357 -507.376892 -934.800537 -1352.639282 -1755.437500 -2217.682129 -2608.354004 -2838.226074
114	-28.809593 -518.338684 -698.639709 -1113.990356 -1242.462402 -1523.905029 -1635.930420 -1677.925537 -1646.178345
115	-2.076617 351.878967 417.553589 814.712280 924.905518 541.083313 210.906433 -301.686249 -554.606995
116	-174.367935 -101.753105 506.573730 213.724670 -62.353058 -467.419281 -549.319031 -683.690430 -647.043274
117	359.021729 415.796295 73.191391 -83.700104 -112.212723 -194.968842 -109.225288 -253.853516 -208.237640
118	-610.554260 678.981201 786.243042 980.827698 1033.276733 1177.275757 1230.203247 1353.269897 1464.978394
119	-422.542664 -1154.585815 -685.516357 -561.854980 237.946915 312.140289 475.985229 467.722260 577.558716
120	-303.906586 -299.817566 -38.045284 -111.681908 -18.812908 -235.245544 -267.668060 -654.276001 -863.731628
121	-307.668579 -1263.498169 -1795.801514 -2345.257080 -1378.010864 -224.626175 76.730064 291.228607 412.261261
122	-159.790817 -357.482483 245.199310 -26.278240 -233.085129

The index	code word
	-694.296326 -1010.374084 -1348.147705 -1435.401978
123	-341.661224 -972.107300 -596.526306 -812.299072 -721.850769 -892.498962 -719.133484 -799.860718 -747.034363
124	208.944168 -571.758667 -1403.062866 -698.768188 -1295.974854 -1408.635620 -1278.894287 -1461.294312 -1620.020142
125	2016.535767 2583.699951 2156.421387 1682.253540 1306.288452 930.015930 575.535400 332.289062 81.306969
126	-481.642883 767.079956 478.750885 549.838379 567.944458 842.335510 934.838013 1140.607788 1189.669922
127	-651.013611 1213.169678 1114.427612 1324.416138 1282.206177 1429.387817 1446.570801 1614.566772 1816.776367
128	30.436600 -268.822021 -520.411560 -1239.242188 -502.846497 -964.426086 -957.118896 -648.420837 -727.841003
129	-67.992126 -398.622040 -443.123474 -723.682251 -735.579407 -836.367432 -9.895487 -451.035370 -848.732605
130	270.295380 -93.148148 -561.977783 -1183.561768 -1104.187744 -1177.850220 -1397.009399 -728.114258 -721.127014
131	-568.377502 1.897134 -48.158859 682.458374 1064.579224 1367.183472 1499.239258 1623.660278 1682.907227
132	-332.755524 -1277.148193 -1741.189209 -1430.306396 -47.963100 90.906227 290.168091 258.427002 330.425507
133	-157.008728 -29.765123 -517.562866 -1025.533936 -1501.759155 172.473587 378.613739 263.816620 157.555740
134	373.106750 553.056580 50.987843 -386.420197 -904.769958 -1344.794800 -1750.855347 -2064.066650 -2277.853027
135	-425.244843 -1345.192139 -378.066376 387.963837 549.967407 625.941589 644.349915 621.692932 584.571045
136	-16.541977 138.275986 -180.281464 -352.161438 132.832703 87.394142 201.175293 -36.061161 -62.357914
137	-618.062744 1298.624023 1185.361084 1413.948364 1361.496704 1514.361084 1570.251099 1806.322876 2337.903564
138	-357.054291 -1350.821655 -1671.045654 -585.366516 200.789124 301.339294 449.095581 433.317352 471.774445
139	-108.307884 -546.904785 -848.436340 -1438.375000 -1839.243286 -789.302368 -314.564728 -132.880920 70.787682
140	-308.546326 -210.140747 -150.658768 375.302368 643.934448 749.838379 835.551147 891.345764 908.518005
141	-467.672546 66.437386 352.558075 733.662537 851.549316 1012.505676 1108.903809 1238.738037 1367.354126
142	-225.670258 -176.692368 -139.687531 -297.688843 484.590149 -12.994805 -385.974274 -824.333435 -420.143768

The index	code word
143	-321.209778 -609.134277 326.301758 326.337311 475.917419 347.087677 517.783081 389.418243 412.928894
144	304.724731 317.969849 168.403549 88.447319 16.958170 -236.259430 -315.584869 -580.212830 -623.322693
145	-224.797653 -70.260223 609.323975 491.570801 339.155457 -11.061495 -53.120930 -337.209778 -425.730225
146	1121.619385 1424.637451 1250.940796 1042.490601 812.568176 620.814148 503.227112 336.917236 223.762650
147	-301.173950 -982.761230 -689.736267 -1041.371948 -1144.856323 -886.875671 -277.517120 -220.478470 -55.952248
148	1.571693 303.673279 -95.214012 -438.626190 -701.699219 -824.135132 -750.147827 -931.409912 -964.330688
149	360.211334 2345.139160 1970.203003 1550.722778 1044.960815 669.019226 233.912216 -111.696175 -383.211975
150	-198.679718 -459.207184 -647.677734 -856.236145 -497.603973 -371.051819 -88.504814 -52.162579 -3.863596
151	-234.505722 -1106.629150 -1637.704224 -2245.764404 -2716.826416 -2709.702393 -860.633789 -364.690216 -3.835027
152	433.529449 360.604156 53.111431 -97.453865 -204.377487 -441.845123 -556.891479 -850.518005 -914.695190
153	-94.201759 -682.459534 -1009.064270 -1450.390747 -1754.623047 -1931.054321 -2161.267090 -2073.351562 -1264.456177
154	158.497513 -39.482288 -491.640747 -1033.636963 -1495.640747 -1644.056763 -1503.796021 -1429.203735 -1311.148682
155	-37.986122 49.700111 122.811394 363.070068 539.050903 389.771210 358.130951 42.615650 -54.583321
156	-190.028824 35.819481 -72.171303 416.761719 468.406982 48.947430 -217.165985 -629.450134 -855.864807
157	690.035156 678.191345 374.738464 116.511391 -177.495270 -559.347290 -781.556396 -1086.437988 -1198.095215
158	982.496399 394.303375 -71.543907 -523.927917 -677.260681 -894.055725 -894.495422 -1078.243774 -1019.578369
159	-59.720707 -615.157593 -1011.128235 -1471.507812 -1689.347046 -1918.099365 -2118.354004 -2456.670654 -2522.051758
160	-19.764742 -471.573608 -823.959961 -1426.643921 -1940.420166 -1354.637817 -1006.084229 -600.211182 -315.964661
161	451.760864 -386.723450 -443.880493 -1157.029419 -2024.143433 -2307.281494 -988.382568 -643.842834 -581.822632
162	29.281801 -474.824768 -717.323547 -1104.237671 -1173.256714 -1403.408569 -1757.094482 -2137.989014 -2409.224121
163	-126.811966 -660.853577 -1009.586609 -1468.573242 -1837.390503

The index	code word
	-1873.889648 -1122.959351 -944.855286 -682.774719
164	-201.716019 -376.240814 -457.417786 -95.987808 325.228302 398.688049 527.887512 476.375580 496.663727
165	-243.958618 -349.740448 -196.670685 -205.858994 -178.919907 -210.137161 -34.842102 96.661407 234.190201
166	-22.390350 489.585999 985.910645 861.128479 541.654785 74.230301 -314.271606 -788.963013 -999.877136
167	222.074677 -287.362183 74.757889 -117.507614 15.699092 -264.202545 -159.531601 -392.734039 -338.009735
168	-181.277679 -638.428589 -680.598938 -1230.816284 -1306.731812 -876.499939 -893.502136 -641.560120 -465.425415
169	45.706028 -187.878601 -227.202896 -348.698608 -655.258301 -1177.003418 -1363.528564 -834.438538 -787.763733
170	538.307739 95.790123 -343.766388 -791.648621 -1077.554932 -1263.006348 -1397.224121 -1605.978027 -1821.339966
171	-284.588654 -921.890015 -737.540161 -840.388123 -948.210571 -1147.289307 -1362.922241 -1606.361816 -1775.419800
172	-8.925940 1316.169312 874.871948 478.259766 134.867432 -152.284210 -396.394501 -642.910522 -747.362061
173	-570.521057 -1320.476807 680.706299 816.224182 1261.479004 1220.774414 1413.046021 1383.548584 1500.537842
174	-376.266327 -1358.371704 -1142.299683 117.106003 372.370209 457.582367 465.587280 445.678497 394.158661
175	-171.539291 -748.739136 -1096.384766 -1554.841553 -1886.605469 336.762848 160.452591 4.648007 -53.059750
176	57.858696 -230.532944 -734.336426 -1199.881348 -1048.929321 -844.434143 -756.553528 -898.697021 -814.052979
177	102.989395 -343.258972 -396.959747 -646.421448 -774.568970 -1126.143433 -563.837280 -424.341248 -188.013916
178	-146.991638 -804.075195 -1119.743408 -1683.964355 -2263.950439 -503.006744 -721.959473 -673.123291 -445.826538
179	-395.988495 -1070.903198 -590.672363 382.879913 644.958984 241.903732 46.419594 -411.099579 -550.546265
180	-157.615616 -459.796967 -879.255615 -1276.781128 -463.483490 -34.213669 160.186905 225.185394 315.109528
181	-193.233856 -983.809692 -1439.684448 -2042.781250 -2454.115234 -2739.922119 -2691.471436 -1722.092529 -884.103638
182	-209.261917 -1071.798706 -1602.855591 -2159.484375 -2374.191406 -1981.226807 -1148.103149 -682.483826 -329.949249
183	-112.721451 202.234741 2.389480 -264.000092 -27.009350 202.602722 26.050808 -430.921570 -765.662109

The index	code word
184	397.861053 182.528809 -235.648392 -405.027954 -136.935242 -235.972595 -246.528183 -481.237274 -535.715332
185	-278.234009 -827.781128 -752.883911 -466.989594 -320.336670 -672.032898 -863.731323 -1161.255981 -1400.910889
186	-40.973869 -131.660767 -299.178619 -742.490723 -771.245972 113.764877 -196.912857 -561.841675 -982.662415
187	-404.340363 -1134.885864 -1034.914307 -997.058594 267.367828 173.992477 -1.694684 -464.673004 -770.912231
188	-253.682114 -217.055069 -450.508270 -521.870178 -282.631500 -517.459839 -495.103638 -834.461365 -1062.342529
189	-249.738586 -937.397705 -640.001892 -675.438660 -570.580078 -407.106415 1070.533203 836.401245 326.148163
190	527.339905 719.609558 720.028137 822.540894 849.751709 825.033508 828.729248 717.622009 636.672119
191	-456.071869 -1250.948975 -104.695229 -75.758865 139.109131 132.780731 210.528854 168.443298 271.893005
192	-217.989136 -1060.941772 -1543.470825 -2165.294434 -2583.753662 -2728.703125 -1856.940430 -1027.727783 -544.276062
193	-474.045319 458.974854 837.952820 943.188660 1000.440247 950.523865 926.026123 833.391296 796.308044
194	-90.405281 -689.172913 -543.798401 -1191.090942 -779.600403 -1011.817810 -1103.439209 -1140.771606 -1069.512573
195	654.475708 1470.965454 1283.830566 1355.302246 1215.090698 1242.490967 1179.114990 1123.327759 975.381287
196	221.189468 -193.926590 -671.781799 -1185.121460 -1651.171631 -1605.885986 -1099.926270 -1008.106689 -976.504089
197	302.228058 166.080658 -291.596680 -514.976562 -334.636627 -519.004272 -632.970520 -862.890137 -927.529724
198	-304.122864 -994.066772 -893.892944 -1265.938599 -1306.123413 -1279.007935 -1051.650269 -1009.602112 -776.189697
199	398.439453 -20.591383 -555.842163 -1159.980835 -1624.051880 -894.125793 -949.559753 -885.922180 -814.496460
200	92.801064 1164.293945 802.599792 479.609894 40.354275 90.361656 -409.047546 -837.928162 -1215.925171 -1403.282349
201	-103.158302 900.035217 838.126953 700.942932 490.099823 215.066879 54.649097 -221.317123 -332.887360
202	-316.185150 -795.790527 -465.281952 -823.125916 279.398102 4.969502 -111.705475 -293.041595 -71.397591
203	-208.605103 -930.010925 -1317.236084 -1524.382568 -1237.802368 -1231.182373 -1223.147705 -1303.267090 -1338.722656
204	-306.984497 524.299561 496.007812 554.238037 526.116821

The index	code word
	552.875793 621.609985 647.903809 648.063293
205	-191.399063 106.350975 -10.322931 -235.823715 781.303772 475.559570 138.095871 -381.311462 -703.843323
206	427.002899 193.730301 -249.266571 -576.741150 -672.449402 -905.434448 -1067.168945 -1354.593628 -1497.148926
207	-470.544312 1433.881592 1415.007812 1581.021729 1347.515015 1305.963989 1181.518433 1046.481812 899.044922
208	-280.197632 -426.098328 67.108482 72.767601 313.018188 100.961258 144.139343 -174.612595 -228.310028
209	11.646732 964.122498 523.617188 150.000824 -173.893707 -157.686981 -103.815186 156.810150 247.870422
210	-332.143280 -1160.115356 -1280.343750 -767.366089 -498.519501 -533.037537 -494.996948 -569.730042 -518.864563
211	433.381531 15.187217 -449.491577 -703.293030 -803.316833 -835.974365 -792.097107 -951.533813 -945.431335
212	-749.471924 13.263083 1330.948242 1355.199341 1704.749146 1687.224976 1855.235474 1803.945068 1879.865356
213	-329.422394 -1097.037354 -1218.800781 -1606.691040 -640.537842 -167.328995 50.598976 132.925644 204.857117
214	-76.864571 1566.287720 1979.153564 1816.987061 1480.883545 1051.511841, 680.155212, 283.731506, 49.960445
215	-398.984741 -1099.112671 -441.023163 -865.695312 -596.991150 -165.189606 145.491440 313.867889 534.415955
216	-344.061218 -787.391846 314.467285 335.746521 330.660370 -155.917572 -427.322876 -874.026428 -1033.887695
217	-218.076859 -471.678925 -740.102173 -963.206055 -691.495605 -631.507080 -526.847839 -547.032471 -472.381805
218	-65.633423 1715.546143 1273.253662 891.733337 491.938904 317.231781 236.129700 258.489990 122.087456
219	-182.897858 -635.679382 -839.284912 -1327.341187 -1097.753052 -407.501709 -31.804829 98.519104 220.063461
220	-272.900055 -1190.943359 -1664.515991 -2272.859375 -2254.459961 -658.264221 -92.030678 162.460190 371.485138
221	110.549355 -97.581825 -448.147552 -1003.613464 -1313.954224 -490.750549 -771.622314 -1146.729614 -1488.419556
222	-15.722897 -343.917999 -623.659790 -1222.161865 -525.122131 -746.976440 -1098.472656 -1486.665894 -1646.623291
223	-27.274996 110.961189 -360.191864 -839.653381 -959.202759 -1052.568970 -1121.710815 -1161.902222 -1138.799072
224	2.914193 183.097900 -369.737396 -906.104187 -865.116028 -992.003296 -587.679138 -629.010742 -564.785950

The index	code word
225	-199.768204 -522.689270 -259.972870 -581.607056 -790.009460 -1049.283936 -1102.648071 -1337.240479 -1395.463989
226	66.927528 -428.277649 -187.231018 -836.323792 -1125.244873 -458.102875 -647.304199 -886.505554 -638.468018
227	-94.328537 261.429749 -97.315033 -452.707825 -832.687073 -1155.034424 -1376.725220 -1519.680664 -1655.947266
228	403.557434 222.425934 -116.075737 -299.235687 -451.025604 -742.190613 -672.085266 -684.950989 -390.703125
229	-77.066376 77.830589 277.074188 636.396851 923.212097 808.036011 707.707886 389.819733 273.664062
230	-233.448212 -258.093109 -270.512939 -414.142883 -485.810974 -690.496765 -622.794006 -712.351135 -551.438660
231	571.873657 673.336548 634.134155 580.569336 501.235016 329.346832 329.521454 114.622795 51.585625
232	-101.469490 666.245056 543.401917 582.935486 546.431091 420.524933 404.157104 195.331772 161.434845
233	-176.970886 -737.287842 -1058.790771 -1613.152466 -855.213684 -747.337891 -887.670715 -818.685181 -779.836792
234	-374.160767 -992.195374 -447.817047 -538.550659 -421.040131 -537.537476 -373.479462 -352.113800 -141.020050
235	-754.974487 635.823425 1339.891724 1442.483521 1692.018677 1734.460083 1852.739746 1843.592163 1893.666260
236	-158.565567 610.178833 436.004883 295.670258 169.214249 -54.113548 -182.365295 -487.801361 -587.581665
237	-238.826248 200.013123 110.359848 71.252274 -9.610732 -190.478989 -175.310699 -294.996704 -249.046890
238	156.508057 -156.490112 -465.772675 -913.607361 -1022.254211 -1363.447388 -615.717407 -1028.598267 -1266.942139
239	-356.656403 -1146.559814 -1022.871277 -1108.460815 -90.339676 72.129295 232.148758 237.532684 313.416077
240	-297.429688 -711.554810 -216.735733 -505.421326 551.118713 250.093857 -38.674564 -525.157959 -849.864563
241	-295.815125 -1209.349854 -1776.149536 -1998.250122 -592.952271 -384.668030 -185.576477 -164.222015 -136.108200
242	-132.807831 -638.202820 -917.321838 -1318.292114 -1810.082275 -1220.721802, 685.909424, 556.612610, 370.619812
243	-197.379715 -1072.747314 -1440.673584 -1876.071411 -2089.344238 -1721.490356 -494.098083 -140.939713 217.494400
244	508.745697 620.538208 498.007721 371.627930 241.868118 6.471931 -64.585320 -294.206207 -329.333954
245	-461.752197 -504.665894 834.920532 809.721191 1020.176880

The index	code word
	871.390442 903.949707 739.781250 752.165588
246	68.185127 -25.366402 -289.149689 -775.257812 -47.512859 -551.142700 -992.717712 -1406.638184 -1423.804077
247	1074.732666 523.538391 143.826492 -187.822311 -245.405121 -337.596924 -392.422150 -526.609680 -543.828674
248	-121.817963 286.786957 -32.153019 -268.764130 -310.116547 -382.739136 -381.658600 -611.214905 -667.152649
249	368.183838 129.406418 -327.912201 -1042.670898 -555.348694 -921.933716 -976.043030 -1177.621948 -504.788055
250	-243.511139 -747.707458 -671.397400 -1178.495239 -75.772865 -466.295319 -582.133057 -871.793884 -1050.080688
251	-106.184364 -608.038757 -968.961609 -1434.189453 -1641.399658 -1630.353271 -1443.817383 -1404.703247 -1230.599854
252	718.401611 2704.733887 2630.791748 2413.644775 2020.989502 1672.132812 1268.989136 930.174011 549.528198
253	-280.844727 -837.520813 -893.299866 -1385.495483 -334.480225 -482.172333 -454.969421 -286.658356 -111.712273
254	-294.975677 -1109.926758 -1316.428345 -987.775269 -629.906128 -331.063782 -88.151436 -42.998192 -9.167728
255	-720.846436 1115.457275 1445.276978 1626.742798 1758.635132 1845.389893 1893.553589 1901.911011 1885.918091
256	-10.630882 173.645126 -194.461044 -520.689392 145.682388 -76.744125 -411.265472 -869.935303 -1199.078491

Table B.42 codebook for Low-precision LSF vector quantization Level 1 Subvector codebook lsf_stage1_CB2_lbr

The index	code word
1	-1025.445557 -1558.926147 -2144.454346 -1791.063965 -1952.295288 -1405.597290 -2150.003418
2	-954.523376 -818.689392 -1113.715698 -887.345154 -1365.084351 -1268.915771 -2110.815186
3	-619.806885 -685.579651 -746.767395 -691.805176 -616.305969 -647.728027 -512.941956
4	-59.775761 22.873430 -414.587616 -322.859131 -903.828430 -888.348755 -1863.307739
5	-1225.429932 -1281.655762 -1576.963623 -1762.252441 -2420.828369 -2961.331543 -318.643402
6	-847.398743 -1271.069458 -1061.816650 -168.675690 50.615589 259.891388 311.872589

The index	code word
7	1678.143066 1741.549927 1650.775269 1412.182495 1118.326782 889.213501 657.603821
8	-1893.017090 -2061.548584 -1934.615967 -2040.489502 -1998.668701 -1757.438721 -1278.423218
9	-1981.158325 -2000.392334 -1779.247070 -1688.792236 -1332.873413 -1121.153931 -940.593201
10	-1115.811279 -1152.664795 -1552.353027 -1439.754517 -1908.486694 -1673.207275 -2451.110107
11	-379.387024 -26.146738 41.422009 164.160645 123.430641 175.891678 62.278313
12	-2213.671631 -1141.692993 -609.784058 -353.606750 -85.206703 148.116455 181.632812
13	-1154.319214 -1227.523071 -1489.456421 -1601.720459 -2058.670654 -814.973206 -1702.502808
14	-918.795044 -1343.674194 -1183.565918 -950.312866 -1186.982422 -1103.976562 -1854.349609
15	227.948730 1136.904053 1219.321167 1506.619507 2232.180908 2348.839111 1403.756592
16	-2236.907715 -2289.355713 -2560.764893 -2482.412842 -3092.014160 -2176.867676 -317.259705
17	-1555.807617 -501.324615 -1023.675842 -1040.626343 -1486.283691 -1266.904053 -2026.519897
18	-1669.823242 -1464.875244 -1696.568970 -1326.180298 -1452.729004 -840.359619 -1714.870850
19	-1532.789062 -1729.420166 -2049.086426 -1779.276611 -1770.308472 -1014.531860 -1772.082520
20	-1528.967285 -1655.654541 -1899.280884 -1819.910645 -2133.318115 -1590.653442 -2254.575684
21	-1144.653076 -948.210571 -870.286560 -501.640564 -793.606384 -671.439697 -1547.295288
22	-461.364410 682.552795 461.194458 359.740967 362.942017 339.776062 376.410309
23	-1149.120239 -1575.110596 -1927.880615 -1335.437256 -1518.165649 -1044.578857 -1843.897095
24	2135.116699 2256.741455 1956.162842 1594.127441 1218.817749 904.284485 682.448364
25	-1041.697021 -1173.235107 -633.627747 -966.614746 -1525.846680 -983.940491 -1708.915771
26	-1837.993042 -2091.420898 -2478.027588 -2809.757080 -3339.826416 -3897.479736 -4707.816406
27	-445.076660 -157.336899 0.462463 312.914917 378.175018

The index	code word
	418.287964 437.912292
28	-439.980408 -449.660858 -1115.516235 -1478.943726 -2040.065186 -1754.303345 -2473.741211
29	183.339447 101.839279 -21.999655 -217.910965 -431.363098 -963.968079 -1546.019775
30	-1504.246826 -1618.718872 -1747.502930 -2033.336304 -2296.113037 -2512.910645 -1610.453125
31	-917.428162 -986.813293 -1067.608032 -1200.509155 -1362.467285 -1514.312012 -1158.368652
32	1395.400391 1494.203003 1504.630981 1298.671509 1035.527832 821.061829 624.906738
33	-448.509827 -513.075562 -838.923401 -349.190704 -993.107971 -1118.479248 -2049.759033
34	-612.845703 -1007.675659 -1485.587158 -1165.256592 -1222.697632 -840.847656 -1658.234619
35	-1450.915405 -1349.162354 -1323.501709 74.000221 -380.690308 -498.892334 -1499.937378
36	-2156.536133 -2291.489014 -2427.126465 -1819.702637 -1754.847168 -1190.418701 -1890.954834
37	-1499.903687 -444.774536 768.410950 1536.175415 1272.848511 1048.861816 772.685303
38	-887.627563 -822.545837 -998.152100 -562.538330 -786.750061 -142.196915 -868.241516
39	1133.573730 1022.729675 933.447632 929.575195 746.131165 643.459045 421.243073
40	-594.492798 448.852051 1012.362915 956.231873 752.287537 587.962708 512.185059
41	-1410.218628 -1474.849854 -1449.908081 -1601.166992 -1158.019897 -255.972961 72.685135
42	-1266.662720 -1197.473999 -1101.059326 -1019.961609 -935.622437 -897.695129 -1165.877075
43	-1161.196167 -1358.582031 -1438.956055 -1154.027466 -1487.140015 -1287.429932 -2068.938477
44	-1951.491943 -2276.684082 -2605.463135 -3121.375732 -3703.884521 -4444.492188 -1389.477295
45	513.975647 12.077785 -122.189568 475.613800 431.415344 426.029419 416.788300
46	-847.774170 -475.462006 -815.791504 -800.997925 -1365.104858 -1477.232422 -2320.281250
47	264.021484 246.813354 64.843918 40.896435 -145.363602 -482.314117 -1039.475708

The index	code word
48	-855.705627 -193.679138 587.207397 741.479309 611.131592 490.605042 419.768677
49	-904.709534 -993.312683 -997.528381 -1657.625854 -1188.919189 -997.200623 -1495.383057
50	-931.204895 -1047.634766 -1584.752808 -1791.148193 -2180.735107 -1455.360474 -2169.037109
51	-1015.164124 -1246.681641 -1685.658813 -1876.436157 -1603.031738 -1116.275635 -1803.888672
52	-851.682434 -633.694946 -451.774994 -389.725128 -313.773590 -480.187469 -692.924622
53	-712.982483 -691.948669 -657.795349 -648.190430 -834.174927 -1056.077148 -1796.616211
54	1951.557739 2124.905762 1876.367065 1546.324097 1187.195190 894.609985 670.870239
55	73.852234 65.499107 665.957153 829.415833 664.944092 553.647522 477.308777
56	-225.363541 470.226196 1420.814209 1524.770996 1257.211914 1054.867676 779.712891
57	-3066.772217 -3320.171875 -1755.439575 -913.461670 -465.759613 -57.672546 181.598816
58	394.747803 543.978943 301.814484 373.118195 -203.041214 -410.210175 -1401.083496
59	-254.991013 6.490180 -86.547020 334.854797 192.452530 419.970276 -669.483948
60	-853.813477 -937.095398 -1324.438965 -1171.276611 -1614.367432 -1207.909180 -2010.941772
61	-79.464409 -308.357544 -878.415833 -1053.853882 -1480.095215 -1042.867920 -1868.481201
62	1119.224121 2373.954834 2685.428467 2891.306641 2396.660889 2056.481934 1200.541382
63	714.623291 438.046265 73.563614 -58.022953 -9.994848 127.793358 296.390991
64	-672.743042 -884.477173 -1117.022827 -1600.467896 -2110.626709 -2974.947021 -1047.465210
65	-1300.258667 -1228.864258 -1260.032227 -648.009460 -942.031982 -747.062378 -1653.133667
66	2883.623047 2563.917480 2196.644043 1742.524658 1349.104370 980.756714 733.060547
67	-1098.610962 -1080.493530 -1496.681274 -1381.791016 -1795.001709 -1327.081787 -2094.705811
68	198.491592 526.795959 1006.147949 980.373901 778.986816

The index	code word
	607.859619 511.755981
69	-1.237812 160.743134 234.740402 367.119659 406.874481 440.592163 422.110687
70	-1550.515137 -851.167358 -1311.250366 -1574.810425 -1835.150879 -1107.781616 -1898.006836
71	-284.272217 -433.876221 -428.981812 -981.543457 -1270.818359 -40.644142 220.977402
72	1028.936279 1198.602417 1347.095581 1191.527466 947.432373 748.339233 588.323792
73	-527.319885 -372.557434 -520.435181 -530.666870 -745.792786 -1036.270386 -1784.524292
74	-1261.415161 -1271.482300 -1285.284912 -1491.556152 -1492.168945 -1121.455566 -542.928772
75	-1051.774536 -575.885498 -880.983459 -893.896545 -1280.546509 -1003.587708 -1856.981445
76	-1484.438599 -1497.676758 -1417.937378 -1478.414917 -1270.368530 -1210.548706 -1377.488403
77	-2284.488281 -2475.568848 -2549.678711 -2380.119385 -2334.494873 -1691.260498 -2079.139648
78	-849.849915 -808.925293 -1187.607544 -1324.695801 -2218.496094 -1798.911377 -7.794962
79	-1739.335327 -1621.678223 -1923.265503 -1880.257202 -2534.694092 -1862.062500 -86.207451
80	-2400.431152 -2023.654663 -1612.980591 -1507.007935 -1438.144409 -414.243439 18.127321
81	1379.186890 734.271179 -343.965485 666.540344 418.169128 586.979736 159.339020
82	-1327.495117 -1011.947632 -1257.065674 -1106.393188 -1519.401245 -1203.832642 -1988.876465
83	-2900.826904 -2071.155273 -931.973999 -620.055481 -238.298386 51.354084 185.485703
84	1416.857788 1443.416748 1396.016602 1061.671143 539.757629 -57.588993 -529.872070
85	-1381.020996 -1011.073425 -1117.733521 -799.515869 -1151.570068 -1151.280762 -1968.326904
86	-664.578979 -340.874969 -581.869263 -385.350647 -855.842957 -723.654907 -1668.381348
87	-239.082840 -358.530243 -462.077606 -755.325012 -1069.406006 -1435.389771 -362.738647
88	-2198.786377 -2450.488281 -2962.151123 -3407.308594 -1153.890381 -478.794434 -34.776772

The index	code word
89	-1491.307373 -1808.472168 -2021.277832 -2369.602783 -2064.542236 -511.397156 -23.106594
90	1012.056763 930.190796 809.964172 712.060120 556.017761 356.482849 418.835175
91	-223.605896 -162.689224 -623.514648 -634.457458 -1285.401611 -1279.381470 -2197.202148
92	-2013.476807 -1931.635864 -2086.846191 -1884.910889 -2132.437012 -1781.376221 -2355.531250
93	-1478.611694 -1502.686279 -1579.426392 -1776.563843 -1922.639282 -1700.766479 -863.249451
94	399.884247 1336.809937 1467.834839 1231.440308 944.319824 714.730347 566.275085
95	-1909.513794 -1941.199341 -2085.629395 -2205.229248 -2642.804443 -3147.793457 -475.752045
96	649.063477 491.458344 -353.614777 -123.980179 -189.024261 -512.889526 -374.362457
97	-255.760773 -218.515747 -651.565857 -579.347717 -1121.250610 -875.253906 -1822.844360
98	-356.398987 -322.802887 -341.252716 -337.389313 -368.309387 -564.473328 -961.036682
99	-628.832153 -520.285034 -588.919617 -597.740173 -655.028503 -689.380981 -1164.055420
100	-715.569885 -1016.947021 -1246.564453 -613.046509 -899.559570 -700.425415 -1602.584961
101	-495.605225 -498.591705 -890.112549 -794.450500 -1308.796021 -1155.602417 -2031.677734
102	-875.373779 -971.543274 -1524.570923 -1737.737549 -2204.225342 -2113.908936 -2749.268311
103	-1709.141968 -1925.645508 -2331.198242 -2283.702637 -2462.921387 -1692.611084 -2252.493164
104	720.386292 1149.667725 1467.922485 1450.620361 1317.223022 1116.553223 841.229187
105	885.497620 1587.753906 1888.884277 2303.653809 2150.790527 2051.243652 1198.554810
106	-13.404860 -174.803833 -402.282806 -536.339722 -521.674011 -470.419830 -92.618591
107	212.016647 135.590973 -435.995789 -544.691711 -1228.437378 -1122.961548 -2034.787964
108	-125.149994 -583.985229 -662.346069 246.242020 307.632996 329.847107 357.718689
109	751.541626 577.168945 -540.336487 58.593849 -367.797974

The index	code word
	-486.880280 -1335.964600
110	-771.941772 -908.973206 -1379.661743 -1369.286865 -1839.978516 -1582.273926 -2354.780518
111	2588.802734 2444.061523 2091.616943 1677.830322 1289.599731 942.811218 707.786316
112	483.501984 217.483292 386.499664 296.597534 220.394058 -279.699463 -232.500107
113	750.680847 671.408386 492.794983 466.070251 331.014160 265.037689 262.980225
114	-931.252686 -739.344910 -479.008026 -292.997284 -39.842056 155.129913 252.702530
115	-699.944885 -320.508942 -448.116058 -140.793747 -555.594910 -550.571533 -1499.539185
116	-3182.762207 -3706.974365 -3368.149658 -1724.299561 -899.661133 -304.383423 102.869270
117	-2198.285400 -2661.550781 -2924.803711 -3695.177734 -3522.947998 -893.561279 -200.487762
118	-1914.781372 -2263.327148 -2204.333252 -2708.312744 -2737.251709 -3691.747559 -1746.551514
119	-1176.847168 -1399.460693 -1944.353516 -2252.302734 -2727.296387 -1979.486816 -2509.687744
120	-617.079163 -400.202545 -169.513504 -64.215126 141.336349 273.932709 350.984192
121	-146.712021 29.761538 -185.886520 36.444355 -317.681915 -9.635806 -882.568787
122	-853.681030 -618.070862 -848.745422 -567.171326 -964.919678 -700.323547 -1625.511230
123	-1866.847534 -1855.031616 -2043.105835 -1959.685913 -2075.854004 -1290.863892 -1966.472046
124	-1240.036987 -1385.001587 -1153.131470 -1487.872192 -1927.276245 -1474.927979 -2165.958252
125	-1160.221924 -1394.681763 -1689.331177 -963.545776 -1117.765137 -785.958801 -1655.615601
126	-2506.828857 -2412.121826 -2366.885010 -2094.813232 -2321.790039 -1103.879517 -68.931801
127	116.747658 309.537476 102.929665 244.603302 -300.030518 -443.569061 -1433.695190
128	-311.663879 326.289520 452.395294 832.174316 276.240356 -265.085205 -1203.591797
129	-312.455383 -534.556335 -898.104919 -421.191711 -870.713501 -686.010254 -1610.913574

The index	code word
130	-2223.857178 -1749.410156 -732.078979 776.504517 1279.655273 1057.796753 730.522949
131	-1278.438965 -1337.653198 -1735.267212 -1699.908691 -2139.395508 -1795.072876 -2496.341064
132	1878.921997 1922.607544 1767.357666 1498.063232 1173.502563 926.899414 677.734863
133	-860.766418 -959.988586 -1574.841675 -130.846207 -605.896606 -1274.775879 -2029.413574
134	672.132080 784.561218 542.281128 505.435944 -81.187279 -364.267731 -1346.734863
135	-679.825806 -396.701569 -747.309204 -612.425232 -1114.258667 -951.520203 -1883.500000
136	273.454254 505.299377 380.777863 720.950867 446.219635 470.014709 -593.205750
137	-552.414307 -614.149353 -771.000549 -820.348267 -315.271545 76.449310 226.295868
138	-1588.281372 -1638.489868 -1975.302124 -1913.472290 -2280.515137 -2005.639771 -2615.034180
139	-1591.169922 -903.552734 -947.961975 -1538.241333 -1246.838745 -920.043213 -1608.986206
140	933.789246 1132.058594 909.458252 843.237366 217.935349 -259.025299 -1224.878418
141	-819.524170 -796.189087 -839.038879 -872.878601 -965.350586 -881.141785 -1175.653076
142	-985.351685 -982.313110 -1018.421204 -1146.665039 -1041.144531 -862.111694 -429.493561
143	-2147.105469 -2150.295898 -2634.779297 -1851.966553 -574.587769 -173.353073 201.615067
144	808.396484 711.239441 766.214478 544.480957 387.048828 -159.360245 -213.043732
145	-835.451721 -901.315674 -1511.963867 -1617.422241 -2408.831055 -2809.031738 -3807.552979
146	-681.278564 -663.108459 -1050.592529 -1039.863647 -1489.105103 -1050.743896 -1903.991455
147	-1231.333252 -1653.905273 -1746.697510 -2400.019775 -2611.556152 -3640.648193 -2618.129395
148	-823.225830 -994.271667 34.345436 465.466858 403.638428 371.257141 349.227234
149	-308.299561 -348.854034 -380.349731 -274.439667 -135.211472 29.159761 168.604477
150	189.439529 -19.790514 -354.154694 -546.065247 -146.602478

The index	code word
	230.009827 295.738068
151	461.968658 626.050415 47.854416 -136.378067 -974.916626 -1239.504639 -2210.014404
152	-146.661850 514.339966 -594.032837 -584.835510 -429.045593 -687.339600 -1210.203613
153	-36.429043 -63.248245 -169.160934 -306.868805 -515.846008 -979.940063 -1618.352295
154	-1450.773315 -1292.733765 -1625.638428 -1334.478027 -1652.320068 -1156.253296 -1948.120972
155	-1609.528809 -1748.195923 -1849.325317 -902.303650 -317.236542 59.964432, 245.630280
156	-478.842133 -551.974731 -931.206116 -845.584106 -1238.124756 -782.011475 -1684.930542
157	-1868.412720 -2019.276978 -2302.041748 -2320.242676 -2630.770020 -2504.333252 -2883.652832
158	-1334.282593 -1380.305420 -1712.473755 -1599.545898 -1922.840820 -1364.126953 -2102.723389
159	674.909668 593.001526 632.620483 739.557922 647.171631 598.846130 504.963593
160	-1293.485718 -1619.509521 -1743.204712 -2296.322266 -2625.175537 -3608.674561 -1111.967285
161	-1551.716309 -1261.823730 -1537.043457 -1439.098389 -1946.865112 -2143.446289 -2936.749756
162	-1865.563477 -2266.884277 -2327.579102 -2886.662109 -2986.587402 -3896.322510 -3199.838867
163	-1297.908936 -1507.185547 -2026.442505 -2387.808105 -3053.241699 -3704.563477 -4686.282227
164	-1578.633423 -1579.114258 -1440.448486 -1311.780762 -939.062073 -843.284424 -714.103027
165	1687.707886 2044.316162 1825.541992 1497.671753 1145.952026 849.316101 651.482178
166	-1009.696899 -222.117264 -771.609741 -1619.151855 -1208.036255 -1003.212463 -1714.239868
167	-1810.316895 -1231.567627 -1636.892090 -1864.545288 -2074.797607 -1385.536133 -2063.006836
168	-710.491760 492.150574 -503.805817 -229.187119 110.906113 282.697723 55.507629
169	-1055.189941 -1082.506836 -1631.291016 -832.915344 -1290.385132 -1288.410645 -2099.172119
170	-677.468689 -1213.786987 -1832.875732 -1311.399902 -1655.118896 -1257.517700 -2133.393066

The index	code word
171	439.705566 475.338715 70.628548 94.696815 -488.101837 -589.449707 -1577.500610
172	-1090.651245 -966.298645 -1281.871216 -1071.899048 -1602.906494 -1546.179932 -2356.489746
173	-176.466660 -259.544586 -842.928284 -904.868774 -1627.998169 -1901.671753 -2790.327637
174	-465.968689 -549.631042 -734.263306 -1057.186890 -976.384277 -689.167419 -222.912125
175	-1158.937134 -119.719742 -646.479370 -644.535522 -933.463501 -792.865967 -1670.845459
176	-750.801086 -706.406555 -713.155640 -272.636993 -658.693359 -627.088867 -1560.627197
177	-1711.215698 -1495.088745 -1775.548950 -1505.336792 -1877.358032 -1675.769531 -2388.443604
178	-1407.030518 -739.424866 -1274.515137 -1506.798096 -1997.677368 -1659.833252 -2381.872070
179	-1128.046753 -615.983215 -803.808105 -489.734253 -953.664368 -980.357361 -1857.874634
180	1321.423096 1831.520020 1710.042847 1410.556519 1080.634644 804.950562 626.732788
181	-1208.621948 -1512.455566 -1852.088623 -1282.296753 -1691.754395 -1564.541748 -2293.062256
182	-130.666595 106.064713 -89.260017 103.645401 -379.526367 -480.569031 -1442.557129
183	-846.357117 -764.076843 -1203.165894 -1197.817749 -1811.429077 -1983.140259 -2796.902344
184	-46.024593 -110.736679 -447.505859 -469.773193 -874.538391 -402.937805 -1133.668335
185	-1509.996582 -1677.197876 -2105.592041 -2329.006592 -2809.195801 -3156.773926 -3939.870605
186	-1452.266235 -1189.537476 -1349.120117 -1023.163513 -1286.727051 -908.575500 -1733.368286
187	53.716125 98.533348 124.961006 58.117867 82.433022 -320.471771 -455.971619
188	-1663.746948 -1640.456543 -1816.988037 -1481.121338 -1737.681274 -1288.965454 -2014.165039
189	-1192.195312 -1001.089722 -831.286682 -678.389160 -372.874237 -121.623199 6.853171
190	-593.864868 172.604919 -302.387390 -386.411194 -1001.882935 -940.392395 -1903.361816
191	-2012.852295 -1209.255737 -1386.427612 -1058.992920 -1368.542480

The index	code word
	-1097.503174 -1899.640991
192	-1302.134644 -1512.447388 -1917.826904 -2187.393311 -2412.989014 -1257.125000 -1899.332275
193	-662.509155 -142.376114 -597.944763 -952.603516 -1486.605835 -941.209778 -1875.773926
194	-766.835876 -813.700745 -965.409729 -1245.255371 -1896.465210 -555.912415 139.788239
195	-53.709496 -24.457977 -27.835449 -9.611705 202.381714 296.835175 376.950104
196	-1525.039551 -1650.326904 -1216.550537 -1621.969482 -1727.015625 -1065.248413 -1784.243774
197	-813.587952 -693.967896 -843.175720 -1081.308472 -1468.924072 210.317993 -761.495422
198	105.552757 71.800415 -42.032394 -72.381523 -146.560120 -183.135468 85.448723
199	265.414490 642.176758 -456.374176 320.947174 278.549408 459.789032 103.696960
200	220.106293 364.429077 130.036377 291.826294 -106.766251 113.313423 -802.879395
201	-3134.160400 -3552.298096 -3854.004883 -4320.645508 -1937.848022 -665.023315 -176.597946
202	-1004.107605 -1031.160889 -1016.486206 -1210.363159 -849.197205 -107.791985 161.588196
203	-693.122864 325.670166 -643.304443 -1307.331299 -789.680725 -839.081665 -1511.067627
204	-391.568237 -99.078201 -259.886230 -22.610729 -472.509125 -513.719727 -1472.088257
205	-1575.965454 -1609.202637 -1605.129883 -1001.017700 -1327.703369 -1221.082031 -2007.426270
206	-354.735535 -381.940735 -894.146545 -998.646545 -1582.024902 -1441.162598 -2270.900391
207	-750.359741 -745.182007 -1095.111572 -693.184387 -1186.341431 -954.111694 -1859.068237
208	250.793350 308.514526 257.658905 259.137177 223.083923 209.800003 187.700897
209	-398.730713 -282.424469 -167.861862 -148.836700 -112.436821 -333.931335 -371.274994
210	1144.176147 854.793945 247.951218 476.229004 262.055573 -210.412064 -311.474915
211	549.641846 657.539246 324.278534 175.408035 147.500793 -372.890747 -527.594421

The index	code word
212	-1552.106812 -1189.027100 -1516.479858 -1235.234619 -1642.160400 -1497.831909 -2275.606689
213	-1900.223633 -1642.089966 -1345.290283 -844.898010 -877.631287 -742.815796 -1521.429077
214	-1037.835571 -656.155457 -1014.410461 -1315.275879 -1811.045044 -1302.612793 -2036.575439
215	-1133.035889 -952.475220 -746.429382 -676.345276 -574.932373 -664.157715 -847.545410
216	-277.608704 -261.225098 -345.695862 -430.000031 -623.311157 -1011.414001 -1672.150635
217	-624.576355 -378.763763 -600.394714 450.444885 -208.235550 -1186.607300 -2060.245605
218	-1379.375122 -1278.502930 -1671.380737 -1521.290283 -2184.201172 1036.537231 14.498406
219	830.555298 273.704865 -430.866608 -879.656616 -1596.880859 -1735.605835 -2732.404785
220	-862.293884 -338.837738 -256.978302 453.634369 21.184637 -388.895355 -1367.653931
221	-1692.275391 -837.354309 -996.297546 -650.886047 -921.391785 -735.284485 -1599.094971
222	-1439.049561 -403.948120 -264.716797 34.880165 133.721527 270.342712 130.799301
223	-1024.433105 -954.402954 -1288.265259 -1510.096436 -1241.741699 -1407.657593 -2138.514893
224	-451.752625 -810.942505 -1316.806030 -927.019775 -1375.180420 -1263.507812 -2100.465088
225	-1834.794678 -2015.035034 -2055.714844 -1205.373779 -1243.619385 -921.998596 -1739.512573
226	-653.094360 321.666351 -575.164124 -1054.779297 -423.627563 -749.007141 -649.139587
227	-1019.843872 -932.372925 -1270.553223 -954.567322 -1360.970947 -982.806152 -1841.252563
228	656.237000 825.421204 1135.276611 1071.027466 868.291321 698.187012 569.556580
229	-164.890488 1052.856323 1300.618042 1116.814819 866.946289 658.868591 540.566589
230	406.070679 248.316833 124.479065 -133.411728 -337.961334 -940.607117 -1446.928711
231	-2312.506348 -2472.395020 -2646.736816 -2790.495605 -3112.582520 -3451.777344 -701.623169
232	-1843.943604 176.875397 -623.110596 -896.002991 -45.831070

The index	code word
	140.156006 -0.054655
233	-932.922363 -900.730530 -913.869141 -806.471497 -986.032654 -1149.484009 -1910.793213
234	-133.844696 -514.168762 390.051361 641.783997 484.533081 417.025787 398.798676
235	-459.463898 -717.394775 -1327.284668 -1522.364502 -1866.756714 -1091.245850 -1919.993530
236	-1220.196655 -560.840759 -629.177979 -229.373505 -581.638794 -572.932739 -1513.422974
237	2318.115723 2330.241455 2003.659424 1627.261719 1242.322510 922.694458 694.189758
238	-2558.335205 -3061.049561 -3702.576660 -4377.168945 -5217.957520 -1919.715210 -578.802551
239	-1606.604858 -1942.337036 -2280.985107 -1590.558960 -1840.323120 -1495.487305 -2178.358887
240	47.630093 198.778152 -192.687698 -91.508957 -656.806152 -685.909973 -1680.821411
241	-1399.591064 -1436.676147 -1885.677856 -1912.264404 -2472.140137 -2558.057861 -3365.300781
242	-1179.167236 -329.757782 -726.824158 -1418.054688 -688.230408 -842.688477 -1137.900513
243	-1112.851807 -863.788086 -1080.140869 -825.756531 -1136.570923 -786.616638 -1648.041382
244	-662.255981 -671.808655 -1132.820679 -1111.957642 -1657.906616 -1473.291992 -2316.884277
245	-58.572517 -21.614277 -155.525177 -194.482086 -169.745590 -534.487610 -758.021912
246	-2220.477051 -1790.342407 -1814.036011 -1498.163818 -1578.185303 -1200.352905 -1899.312378
247	-996.253418 -764.938782 -1122.369385 -1230.562012 -1659.632324 -761.955811 -1652.573120
248	897.895508 1630.975220 1602.244385 1327.910034 1011.544312 757.971924 595.457275
249	-1431.946777 -1347.628540 -1499.096924 -1541.816772 -2171.504150 -898.291260 66.963020
250	-312.534912 -152.314102 -438.497650 -254.288010 -734.177368 -682.732117 -1636.434814
251	-1506.427002 -1305.687256 -1081.984497 -917.416138 -629.043396 -482.883453 -376.623718
252	-672.532898 -546.122559 -512.605530 -442.461212 -371.147522 -294.251678 -130.954529

The index	code word
253	-616.184143 -447.972778 -481.961853 -102.225723 -291.078766 145.353958 -757.344055
254	383.866699 442.064697 416.969147 467.443085 480.903381 487.482300 455.388672
255	-1118.679810 -1169.146851 -1470.901733 -1265.922729 -1537.622925 -955.582031 -1795.824219
256	-2596.727295 -3005.560547 -3863.063232 -4400.398926 -5535.787598 -5088.401367 -931.938293

Table B.43 codebook for Low-precision LSF vector quantization , second stage, first sub-vector codebook lsf_stage2_CB1_lbr

The index	code word
1	125.176781 97.578979 -336.364807 137.200378 596.080078
2	-65.084419 60.324146 216.620468 217.536072 -1.865530
3	-271.406830 -56.965103 -308.899261 -197.953033 -211.553497
4	-53.075191 110.288887 -125.435249 -134.959381 106.253815
5	-208.034668 -478.204865 -54.979763 -170.765671 56.116074
6	-351.061218 -100.707382 4.522793 -203.290604 -63.801029
7	-15.212132 -196.821518 -594.479004 -396.369141 340.373474
8	233.424438 -0.900044 -146.513824 45.203060 199.356506
9	-175.750717 -504.816986 -123.821861 272.267731 17.651171
10	56.609001 -164.182388 282.474365 -167.583649 -611.753967
11	-115.305000 -410.567474 -245.159256 32.249302 472.335541
12	-395.985168 -152.604843 -179.300735 98.311966 40.804863
13	-58.728832 -182.516876 -255.976562 -256.143646 22.885551
14	316.159882 151.374481 -191.210144 7.382407 -124.037529
15	267.551727 -143.205856 -556.498352 10.446942 -139.945602
16	-59.872601 -218.755066 -135.179184 17.986374 126.528053
17	-167.446899 404.004425 89.689842 215.293472 99.381721
18	23.880964 436.191742 -66.432892 294.669983 -230.850113
19	-97.411232 -77.451683 -39.728432 151.893845 400.719330
20	-189.941666 -360.634338 305.063385 -129.827194 -229.681717
21	147.476151 -121.121750 123.489090 198.466431 133.996948
22	168.695541 -282.628235 57.746059 -110.763184 256.777191
23	466.524017 48.549519 3.054227 -309.880829 455.355286
24	-96.707848 -226.300293 -348.300476 437.114319 -237.053360
25	-159.994415 266.700043 385.393860 -41.254078 155.542038
26	124.722549 68.716454 374.974396 -59.638531 -5.237550
27	765.235229 351.720734 289.651245 234.858963 174.149719

The index	code word
28	241.708282 -199.616089 212.995590 -351.008759 -104.327087
29	1.665737 -141.787033 -396.943237 249.341492 187.570786
30	-58.401596 -344.893921 223.540710 343.499237 307.385132
31	-53.936222 375.296906 -315.383698 102.585754 150.957932
32	21.016300 155.413589 -21.852629 207.617325 200.649414
33	10.351093 92.124763 -347.863464 -212.420975 -146.219879
34	3.016294 200.229645 119.715279 -4.462936 58.314323
35	-63.068295 -357.047424 646.101807 171.314423 -429.449341
36	177.134491 163.830048 123.773827 -95.167198 -304.159729
37	46.081257 204.553513 -387.171906 633.753296 87.968590
38	-169.514145 252.454620 -264.691772 -435.691376 153.001617
39	120.640579 405.465973 -192.274933 -221.965805 -202.758636
40	100.166435 -400.800293 -40.715820 -107.465210 -118.487724
41	45.016270 65.268402 171.456894 302.890778 -417.200684
42	347.150360 -242.992111 -209.205505 -246.726746 38.139465
43	194.945053 351.289307 -99.387756 -158.804657 213.550888
44	-129.357178 -340.776123 -39.346504 -359.011292 -283.851349
45	31.403564 -107.484909 242.595520 21.619331 -228.102585
46	-262.826965 -117.488831 -73.219154 -197.742828 284.209808
47	-60.193638 -38.268238 159.151459 -35.138390 194.001358
48	-317.376831 -240.991592 144.735809 76.405945 161.191895
49	-194.797623 -231.669067 -88.555389 1.277639 -171.221588
50	-252.915497 141.291977 -215.599533 349.899689 233.891418
51	-216.871674 19.676451 -397.275146 -56.477779 232.499542
52	-85.279602 84.387878 -18.888111 -115.487076 -158.464539
53	245.224274 -426.197693 303.512543 63.986469 -74.643738
54	-236.141190 103.960800 -59.016613 284.933868 -190.134613
55	34.146214 243.138809 -90.727913 53.836540 -75.016983
56	-270.712738 -726.983887 315.456696 119.656967 -48.197346
57	-31.662683 5.897125 3.455140 53.694481 -2.451202
58	729.026001 175.908218 -257.285645 -153.161713 41.570004
59	-80.404160 261.090393 192.832947 51.316048 -202.484619
60	-158.006607 145.411636 565.739990 175.046204 -235.165543
61	310.425751 -37.598225 47.160507 402.864685 373.127075
62	50.817093 -32.576046 -161.691788 -209.549042 349.112793
63	-279.980255 181.749924 117.845192 -292.787567 156.011307
64	237.036133 177.224197 174.540649 30.305742 297.236847
65	358.010071 -172.392334 -15.699339 31.589804 -312.457031
66	539.975342 455.723785 92.737114 -77.091827 -409.111603
67	-45.966713 -147.063065 34.420399 -154.320145 -20.449684

The index	code word
68	429.404053 -49.871758 462.804718 47.656757 -296.449646
69	486.055054 -2.306022 -436.431915 346.355042 134.472702
70	-93.373451 -316.287323 -203.803635 731.280029 355.487061
71	-309.597534 214.576782 -197.971817 -42.248268 -97.342346
72	315.710754 365.675140 -113.759560 257.418457 151.386566
73	-54.277527 575.995667 116.280495 -313.935638 326.100006
74	-2.422986 157.679749 -178.431274 21.119404 -412.958069
75	265.604034 144.857193 114.580612 191.633926 -72.416084
76	45.641788 312.367981 157.248138 -349.953979 -87.191002
77	-65.918320 150.779114 -131.731110 -531.736023 662.466064
78	-159.697388 -246.035385 244.156631 381.940033 -146.819397
79	230.185669 -366.364471 -172.252045 174.231308 92.061836
80	-76.539986 -14.540029 -51.299156 -457.502167 -38.845375
81	-118.276863 -387.540985 -433.180511 -33.551891 -79.331772
82	-61.141945, 508.815582, 467.931915, 527.722839, 420.139313
83	-131.588577 -167.306580 485.843109 63.184635 89.237114
84	94.761421 97.921158 179.863037 -344.325256 229.774002
85	520.248596 -109.993576 51.674213 101.569778 76.834473
86	24.268560 -203.155319 -323.396484 -30.644506 -457.271484
87	-111.438065 -399.305115 -865.804260 309.888092 138.058884
88	-82.622826 -54.742317 254.196701 -139.716690 566.830811
89	29.335989 -128.033279 -40.821259 172.080994 -200.548294
90	-233.433609 -12.658308 46.226269 -44.890251 -430.050598
91	40.063583 -70.127205 -63.214340 -248.680176 -306.242096
92	-40.049488 -286.559692 141.962418 62.360870 34.843357
93	189.553772 74.619942 -83.881447 -261.958984 -27.939610
94	403.209381 68.722786 -173.985245 -335.583771 -369.518097
95	457.780670 167.100967 149.813095 -182.236130 -8.315154
96	203.499512 111.717392 -456.987671 -102.090157 163.226791
97	-101.386177 -25.736250 -280.759399 72.861252 -55.210712
98	-103.929649 -491.284943 291.325806 -111.859535 334.475250
99	-144.490921 281.077942 -23.609737 -27.741974 417.479828
100	264.139496 186.067474 -222.433640 -646.080383 103.886513
101	377.383392 131.654785 -307.225342 329.011566 -396.618927
102	-173.476822 472.666779 -5.357996 -132.365311 -48.892284
103	245.283829 -84.957413 457.927094 321.619659 42.520683
104	-131.979996 -138.226730 -30.602535 320.700684 101.862259
105	-6.157870 97.928215 -209.740662 -431.855286 -817.070190
106	-3.690514 -179.861206 -476.954803 -632.629822 -250.939194
107	-66.380966 170.722198 -530.042786 177.100327 -181.131012

The index	code word				
108	-128.159744	55.080872	308.354065	-254.569229	-221.356033
109	-201.901703	242.691742	-86.607887	-396.883148	-314.213501
110	205.063766	462.954620	155.144760	-16.457201	-29.848045
111	327.753082	-196.080566	433.168854	-82.308937	279.670837
112	-25.943148	122.535789	106.418846	524.088684	64.240387
113	126.005486	57.947956	-185.083878	293.347504	-32.417767
114	204.149628	-38.046509	58.536194	-31.194141	-16.386127
115	-86.873398	-414.818848	21.891113	142.845123	-476.217682
116	117.195274	-132.432159	-209.501282	-48.684799	-105.391930
117	-282.344055	-42.621487	202.447464	49.988632	-101.511032
118	-149.238113	-321.226227	742.572449	467.619019	257.926819
119	-55.879326	65.658493	287.207520	217.585556	307.118652
120	243.938828	-203.829315	10.253199	480.966309	-107.561493
121	-268.738800	92.606926	8.622302	64.133263	114.917183
122	-90.888931	497.001007	161.134674	-130.725739	-558.346558
123	-467.650482	288.785370	160.522598	-0.405135	-159.286697
124	-399.703735	89.198013	259.508423	295.884003	167.580093
125	-146.541641	-195.395798	298.586151	-316.311310	100.641792
126	-148.101120	743.981140	366.386505	121.370277	-161.657700
127	134.723831	320.460175	349.293152	238.967743	33.517555
128	-35.735043	-292.962158	-26.472088	-518.628357	271.610901

Table B.44 codebook for Low-precision LSF vector quantization , second stage, second sub-vector codebook lsf_stage2_CB2_lbr

Indexing	code word			
1	-243.409409	-116.480858	389.801025	181.432846
2	-696.340149	-287.063507	446.367493	236.489014
3	-393.174835	117.744064	-62.679790	-412.519104
4	-74.848740	27.573660	285.320068	-59.181179
5	116.752983	-1.356940	-109.929138	113.496178
6	-225.366104	-189.137146	-44.427967	-286.845917
7	242.165924	287.599548	-181.383621	-330.778229
8	-179.347458	66.509262	109.463470	87.632050
9	-253.711777	323.794830	338.500244	-337.053680
10	160.067596	-163.665115	6.405066	-264.836487
11	-60.688374	-185.087067	-191.619583	-197.485458
12	21.429399	-370.080780	-42.411572	-108.452370
13	-52.254684	-23.956074	-313.852173	-7.787478
14	12.098438	230.482193	-478.094971	-100.934822

Indexing	code word			
15	-37.458061	288.877838	10.201681	475.521515
16	2.881128	343.488373	450.687256	-47.208767
17	-83.777214	151.401154	322.103760	253.128464
18	-316.890259	28.818686	-616.391968	192.355240
19	511.084839	-133.957230	361.529755	198.506775
20	72.080055	199.831650	-108.111671	-84.174294
21	-98.012787	-39.761772	-68.415688	178.787384
22	-265.631104	164.766037	-440.029663	823.557129
23	-168.251541	702.906860	207.797424	-79.284523
24	305.986115	272.766815	292.596832	-235.731766
25	-788.239197	239.276917	113.054337	-212.844467
26	258.902313	-333.383759	-243.586655	-307.619171
27	-121.466507	174.642380	-293.016357	272.726562
28	39.102711	-165.410400	-337.241791	313.644287
29	-10.405048	-185.301270	-512.177002	-270.207581
30	101.790581	11.252160	-62.398804	392.750671
31	-239.751587	-471.905090	-310.683197	-300.936493
32	-155.268570	119.035522	79.837418	-192.250656
33	131.482040	86.621811	93.051872	-150.859161
34	200.261765	223.326935	-433.248749	433.448395
35	-94.155045	-43.422302	131.647949	330.752167
36	311.755371	50.656456	49.977379	-428.572540
37	-312.415009	-121.180763	-232.275406	138.695938
38	209.342743	687.162781	184.681885	-401.803741
39	114.690254	171.625977	181.704712	260.692871
40	-381.737579	-85.716354	179.320496	-116.409515
41	90.773277	-43.356819	633.900757	6.079812
42	671.235840	336.139923	-112.772232	-600.057617
43	371.775330	-1.344244	163.382965	-95.445984
44	-193.736588	-71.884460	-77.847572	-49.722527
45	-141.227814	-446.522247	236.406113	184.287979
46	-268.798889	352.709106	39.056961	-68.754677
47	-221.551651	-119.258545	-121.718758	479.259888
48	676.735718	194.002365	-362.131866	175.913193
49	50.821251	-591.166016	616.756592	-97.901886
50	382.693909	-181.652420	-680.908813	676.854553
51	-80.215393	-282.486908	-509.045990	-791.799927
52	53.088028	499.772308	-195.334656	77.658592
53	17.863188	292.266754	71.577980	-618.104736
54	120.337517	-7.530244	-264.265137	-287.812256
55	-394.066956	219.687286	295.375671	72.552650

Indexing	code word
56	179.996841 -192.677536 -261.940826 -25.612436
57	58.660305, 336.429840, 100.187775, -220.980881
58	42.412331 13.519630 112.433083 138.155304
59	266.368958 21.970327 -107.287674 -144.994812
60	78.719635 -430.507874 168.567307 -456.712982
61	-411.224457 74.529732 -57.504768 -21.765814
62	196.090912 137.380432 57.631134 50.901695
63	-123.902313 -284.127167 288.213501 -152.852875
64	-302.251831 -356.747955 204.819641 551.967896
65	-393.012970 -43.004662 636.058228 -192.525909
66	-127.849014 434.849792 -159.721878 -301.210571
67	21.238861 -452.225281 -153.344681 734.341736
68	10.870827 185.948196 -6.938921 175.038879
69	-432.968109 -610.992554 -137.377045 243.536591
70	180.154404, 423.220062, 163.796448, and 72.456429
71	-452.403168 175.101013 299.354309 512.337463
72	38.909637 -7.877390 262.278534 613.609680
73	-47.382046 -109.140800 42.966789 -158.798386
74	-425.121552 -512.733276 249.457809 -226.062881
75	182.071060 -206.442108 -688.257446 108.594162
76	2.062111 224.044220 155.120468 19.599276
77	38.487358 -31.999537 -109.859627 -119.361366
78	162.551880 67.492264 290.018524 45.786263
79	436.423676 -43.198994 -77.049904 569.098450
80	363.950043 281.895386 -25.208874 -89.876564
81	-248.373856 -321.788391 -56.249428 -39.337593
82	425.436371 -16.661833 -59.625412 116.543587
83	-82.381096 -163.117569 114.577087 70.018883
84	253.342102 -523.466125 201.246658 378.887482
85	-131.377869 66.285393 -167.358292 -217.760086
86	-566.463745 -226.344803 -157.164017 -86.413437
87	390.181671 -371.196930 13.734019 -36.191559
88	446.689575 -241.156555 -321.963715 233.878906
89	77.666321 -131.525879 320.331818 256.978943
90	367.632355 216.511093 243.643234 123.523415
91	-657.771362 41.172512 -83.689575 283.212250
92	-460.604584 638.931152 35.756577 -559.100403
93	-226.586746 -80.584587 233.980896 -493.453033
94	417.722504 -1.672927 -464.180389 -184.742569
95	167.272629 -281.216431 276.785431 -22.157265
96	-284.334778 -108.795586 -299.789734 -209.318359

Indexing	code word
97	-132.045181 395.118500 158.724670 211.790054
98	301.987091 -0.899439 -280.349152 -661.502075
99	578.751221 626.476074 518.695251 378.556610
100	257.378601 -25.404896 135.438293 242.261215
101	132.840515 -251.884521 -2.454656 241.139893
102	22.451145 63.981472 -25.862547 -355.621521
103	-132.091568 -329.954651 -77.058594 239.968750
104	-34.870598 -171.217773 -174.181763 -465.647217
105	449.525177 -237.710693 438.640564 -306.627014
106	-20.192402 -701.768494 79.301132 -45.662354
107	-29.979303 -361.198029 703.003723 443.174042
108	591.450317 -28.069363 -93.527534 -223.932785
109	-472.069946 -989.679260 528.279358 340.102905
110	114.742538 -549.570740 -281.955597 145.624893
111	-292.186951 138.453705 13.866644 271.594849
112	307.743439 269.438049 -34.875519 267.321228
113	-33.110497 -172.138855 -109.525803 26.296240
114	246.703857 123.510437 -305.353668 83.845627
115	-102.935699 587.943848 636.555054 524.072510
116	-145.242615 -315.349030 -352.720276 21.209959
117	142.747467 -102.298622 50.486584 -9.182832
118	234.382019 261.100342 365.964935 399.349396
119	684.732361 396.310455 181.284805 -108.301056
120	-241.690918 -467.369324 -675.536865 491.443207
121	-100.938423 147.491653 -313.448547 -511.904236
122	-698.902588 653.364136 431.230652 -23.328299
123	-15.995284 31.354193 3.822088 -5.892229
124	-432.100098 260.371490 -357.567444 -122.324028
125	-354.313080 -164.696030 75.725403 181.991409
126	-447.009247 496.912720 -161.698349 245.110306
127	77.673477 -7.057706 335.725311 -319.795929
128	-162.106491 166.707016 -136.834305 26.008549

Table B.45: Codebook for Low-precision LSF Vector Quantization , Second Stage, Third Subvector Codebook lsf_stage2_CB3_lbr

Indexing	code word
1	-120.858948 -66.756027 54.656181 64.874451 124.259438 20.630352 458.284790
2	54.381855 279.556610 -216.506119 -67.174606 1.014068 17.655251 6.228757

Indexing	code word
3	-28.685160 154.050797 -48.445076 -277.829315 285.749939 195.247452 132.268265
4	-141.355896 -64.183372 -85.978325 75.814301 73.956757 249.112961 100.836151
5	-395.490082 105.968681 -137.138885 -185.565430 -4.196878 9.040785 9.331719
6	297.102386 -264.661957 -128.039383 -27.582905 -86.045662 -90.526764 -60.119183
7	174.266235 -103.852974 -37.978733 31.690355 302.096497 135.048508 114.836746
8	-101.046234 -23.895374 -147.228592 31.045322 -344.268677 149.099213 -37.257492
9	-61.336628 37.914291 10.385083 105.648895 6.490855 109.133385 -364.720398
10	-57.522472 -73.206619 -200.797119 -141.121109 -115.150620 650.165649 423.394958
11	-73.722351 -140.067551 140.425919 -391.595581 -5.604278 -10.986897 -15.726768
12	-108.406639 -6.762465 -37.700020 -6.168937 -11.448340 0.249742 0.123609
13	152.156693 28.136551 -168.495224 65.982376 -84.628181 -83.325134 -141.856110
14	486.470673 77.363564 -187.013657 136.576614 96.876122 25.852430 7.105801
15	-983.513672 399.680298 283.328339 145.344055 54.366695 -53.572399 39.212997
16	-220.661285 -47.986832 179.123917 401.111053 340.343872 159.414078 69.568336
17	-105.138153 51.941540 56.188911 -144.363174 -119.869408 141.778366 128.125656
18	-263.076965 254.405991 333.602570 -42.307457 -451.265350 -73.605690 22.996130
19	-29.157436 69.872826 346.867462 -87.169640 26.287106 -3.849262 4.497209
20	-24.435114 -195.265182 -99.388878 206.267960 83.080887 -0.377817 -45.230667
21	-187.647476 181.213882 -273.944153 255.762146 -67.340736 23.068657 10.287804
22	-172.619736 -140.707123 -190.551239 -6.177309 -41.383221 -111.614410 -169.822540
23	27.315220 -127.491776 -76.529587 -380.704071 712.483704 168.066162 -282.497314

Indexing	code word
24	144.456070 74.449486 73.299232 -89.281288 -230.136108 -50.344418 -61.720192
25	71.039864 16.484489 -81.132729 -146.860245 -239.453995 -276.474915 -495.753235
26	-6.601482 -6.596558 -135.847580 -200.303955 -149.754517 -46.271084 -42.693810
27	114.541161 96.925179 -62.422073 267.284790 92.719643 138.007202 0.382021
28	39.763325 -115.202148 -418.437439 -42.130184 56.940830 87.226730 38.288715
29	21.468893 -166.728149 -67.645279 -66.803993 -17.396999 36.986813 13.436744
30	4.862719 -45.827774 -68.863770 -164.614624 -305.732239 -554.339478, 19.752028
31	6.885021 -95.595200 -104.018166 -184.963974 31.702078 -84.178284 256.128448
32	-192.003845 -394.069550 -488.481445 -438.397797 -190.934586 -44.327446 -26.086609
33	-125.266785 137.131226 39.229233 -10.948144 -105.625397 -123.229942 -139.748444
34	184.016785 264.055878 123.471939 -34.399540 -232.265396 397.860321 90.333214
35	80.903946 -43.319683 180.592911 -59.142773 138.443069 -390.676544 205.455032
36	-132.122040 -139.576950 106.337486 -21.377464 174.604553 16.855715 61.933849
37	88.327904 -498.666840 137.356384 33.944885 67.351425 20.773945 24.755754
38	-345.485718 -27.660803 67.980339 83.968163 23.501289 -11.475863 -47.268600
39	178.483002 -24.934628 -96.635849 -13.439441 -88.224274 176.098663 124.763161
40	-26.483379 21.979994 -20.658539 330.616333 -43.313259 -384.421143 48.723835
41	62.266487 -44.714783 -115.789307 -188.385208 183.125153 -185.326904 -155.693787
42	53.820332 81.532997 98.294876 40.696548 98.454292 119.502266 147.300720
43	254.267975 70.164246 47.383190 -142.257462 37.144730 -19.954918 38.457348
44	-82.691055 -20.630274 185.650543 180.139053 -90.897530 109.889763 58.255798

Indexing	code word
45	244.058670 -122.199280 189.862457 132.944275 46.770733 22.384722 -2.599370
46	-236.754898 -243.830826 -54.952366 -73.321976 -94.426300 -12.912512 69.587036
47	91.892441 -262.573792 314.933350 -58.419174 -324.563995 88.949524 50.423519
48	417.443909 69.775948 -251.358078 -512.123352 4.932464 -0.540782 29.553900
49	-150.129364 -145.058929 114.207970 211.513779 194.664597 -268.673645 -373.467438
50	66.813667 16.556433 26.886477 15.414439 15.461973 -7.944495 -0.863844
51	302.242676 324.145844 329.172577 244.085281 176.245163 87.874321 56.691006
52	-36.683731 -139.869324 80.175735 -27.114138 -77.579376 -157.658203 -124.447487
53	108.132103 97.285461 7.401071 -2.834207 -210.823380 -171.585175 446.059509
54	-244.690735 -307.984222 598.741272 230.457870 -28.186348 -101.380302 -8.740450
55	-70.319702 127.248039 -167.226410 85.655022 303.577606 -59.247124 -66.811310
56	-215.468704 348.959717 98.189171 90.742363 79.830116 84.431984 36.955971
57	-36.783245 69.040504 133.008469 157.655502 128.536774 -34.705322 -65.879082
58	-73.992271 343.438080 48.778431 -304.844391 57.568405 -77.251152 -63.522530
59	200.285736 120.431190 115.817978 93.692749 40.653152 -164.645035 -240.228683
60	110.406593 221.153152 92.144363 56.062359 -36.240662 27.389029 -19.072336
61	-588.968384 -505.493042 -121.743179 46.453411 157.052521 44.954498 34.388012
62	526.978088 425.036041 189.527222 -62.570236 -241.602249 -253.744858 -42.391441
63	239.768356 44.924934 -128.932877 -433.974670 -694.861633 37.230545 13.897585
64	32.482452 -241.068497 -579.445068 523.904236 267.373016 4.412733 -53.777256

Table B.46 code table for LSF parameter mean vector

The index	index value
1	816.510986
2	2231.826660
3	3647.142334
4	5062.458008
5	6477.773682
6	7893.089355
7	9308.405029
8	10723.720703
9	12139.036377
10	13554.352051
11	14969.667725
12	16384.983398
13	17800.299072
14	19215.614746
15	20630.930420
16	22046.246094

Table B.47 table for Subband division of frequency domain noise shaping

Starting/ending points of sub-band division
0, 4, 8, 12, 16, 20, 24, 28, 32, 36,
40, 48, 56, 64, 72, 80, 88, 96, 108, 120,
132, 144, 160, 176, 196, 216, 240, 264, 292, 320,
352, 384, 416, 448, 480, 512, 544, 576, 608, 640,
672, 704, 736, 768, 800, 832, 864, 896, 928, 1024

Table B.48 Table of preset values for virtual speakers

Indexing	index value
0	2,768
1	2,791
2	146,791
3	293,791
4	439,791
5	585,791
6	731, 791
7	878,791
8	2,815
9	79,815
10	158,815

Indexing	index value
11	236,815
12	315 and 815
13	394,815
14	473,815
15	551 815
16	630 and 815
17	709 and 815
18	788 815
19	866 815
20	945 815
21	2,838
22	54,838
23	108,838
24	162,838
25	216,838
26	269,838
27	323,838
28	377,838
29	431,838
30	485,838
31	539,838
32	593,838
33	647,838
34	701 838
35	755 838
36	808 838
37	862 838
38	916 838
39	970 838
40	2,861
41	41,861
42	82,861
43	123 861
44	164,861
45	205,861
46	246,861
47	287,861
48	328,861
49	369,861
50	410 861
51	451,861

Indexing	index value
52	492,861
53	532,861
54	573,861
55	614 861
56	655 861
57	696,861
58	737 861
59	778,861
60	819 861
61	860 and 861
62	901 861
63	942,861
64	983,861
65	2,884
66	34,884
67	68,884
68	102,884
69	137,884
70	171,884
71	205,884
72	239,884
73	273,884
74	307,884
75	341,884
76	375,884
77	410 884
78	444 884
79	478,884
80	512,884
81	546,884
82	580 884
83	614,884
84	649,884
85	683 and 884
86	717 884
87	751 884
88	785 884
89	819 884
90	853 and 884
91	887, 884
92	922 884

Indexing	index value
93	956,884
94	990 884
95	2,908
96	29,908
97	59,908
98	88,908
99	117,908
100	146,908
101	176,908
102	205,908
103	234,908
104	263,908
105	293,908
106	322,908
107	351,908
108	380 908
109	410 908
110	439,908
111	468,908
112	497,908
113	527,908
114	556,908
115	585,908
116	614,908
117	644,908
118	673,908
119	702 and 908
120	731,908
121	761 908
122	790 908
123	819,908
124	848,908
125	878,908
126	907 and 908
127	936, 908
128	965 908
129	995 908
130	2,931
131	27,931
132	54,931
133	81,931

Indexing	index value
134	108,931
135	135,931
136	162,931
137	189,931
138	216,931
139	243,931
140	269,931
141	296,931
142	323,931
143	350,931
144	377,931
145	404,931
146	431,931
147	458,931
148	485,931
149	512,931
150	539,931
151	566,931
152	593,931
153	620,931
154	647,931
155	674,931
156	701 931
157	728 931
158	755,931
159	781,931
160	808 931
161	835,931
162	862,931
163	889,931
164	916 and 931
165	943 931
166	970 931
167	997 931
168	2,954
169	25,954
170	50,954
171	75,954
172	100,954
173	125,954
174	150,954

Indexing	index value
175	175,954
176	200954
177	225,954
178	250,954
179	275,954
180	300 954
181	325,954
182	350,954
183	375,954
184	400 954
185	425,954
186	450,954
187	475,954
188	500 954
189	524,954
190	549,954
191	574,954
192	599,954
193	624,954
194	649,954
195	674,954
196	699,954
197	724 954
198	749,954
199	774,954
200	799,954
201	824,954
202	849,954
203	874,954
204	899,954
205	924 and 954
206	949 and 954
207	974 and 954
208	999 954
209	2,977
210	23,977
211	47,977
212	70,977
213	93,977
214	116,977
215	140,977

Indexing	index value
216	163,977
217	186,977
218	209,977
219	233,977
220	256,977
221	279,977
222	303,977
223	326,977
224	349,977
225	372,977
226	396,977
227	419,977
228	442,977
229	465,977
230	489,977
231	512,977
232	535,977
233	559,977
234	582,977
235	605,977
236	628,977
237	652,977
238	675,977
239	698,977
240	721,977
241	745,977
242	768 977
243	791,977
244	815 977
245	838,977
246	861,977
247	884,977
248	908 977
249	931 977
250	954 and 977
251	977, 977
252	1001 977
253	2 1001
254	23 1001
255	46 1001
256	68 1001

Indexing	index value
257	91 1001
258	114 1001
259	137,1001
260	159 1001
261	182,1001
262	205 1001
263	228 1001
264	250 1001
265	273 1001
266	296 1001
267	319 1001
268	341 1001
269	364 1001
270	387 1001
271	410 1001
272	432 1001
273	455 1001
274	478 1001
275	501 and 1001
276	523 1001
277	546 1001
278	569 1001
279	592 1001
280	614 1001
281	637,1001
282	660 1001
283	683 1001
284	705 1001
285	728 1001
286	751 1001
287	774 1001
288	796,1001
289	819 1001
290	842 1001
291	865 1001
292	887 and 1001
293	910 1001
294	933 1001
295	956 1001
296	978 1001
297	1001 1001

Indexing	index value
298	2 256
299	2,230
300	128 230
301	256 230
302	384,230
303	512 230
304	640 230
305	768 230
306	896,230
307	2 205
308	73,205
309	146 205
310	219 and 205
311	293,205
312	366,205
313	439,205
314	512 205
315	585 205
316	658 205
317	731 205
318	805 and 205
319	878 205
320	951 205
321	2 179
322	49,179
323	98,179
324	146 and 179
325	195,179
326	244,179
327	293 179
328	341,179
329	390 179
330	439,179
331	488,179
332	536 179
333	585 179
334	634 179
335	683,179
336	731 179
337	780 and 179
338	829 179

Indexing	index value
339	878 179
340	926 179
341	975 179
342	2,154
343	38,154
344	76 154
345	114 and 154
346	152 and 154
347	190 and 154
348	228,154
349	265 154
350	303 154
351	341,154
352	379,154
353	417,154
354	455 154
355	493,154
356	531 154
357	569 154
358	607 154
359	645 154
360	683,154
361	721 154
362	759 154
363	796 154
364	834,154
365	872 154
366	910 154
367	948 154
368	986 154
369	2 2
370	11 2
371	23.2
372	34.2
373	45.2
374	56.2
375	68.2
376	79.2
377	90.2
378	101 2
379	113 2

Indexing	index value
380	124 2
381	135 2
382	146 2
383	158 2
384	169 2
385	180 2
386	191 2
387	203 2
388	214 2
389	225 2
390	236 2
391	248 2
392	259 2
393	270 2
394	281 2
395	293 2
396	304 2
397	315 2
398	326 2
399	338 2
400	349 2
401	360 2
402	371 2
403	383 2
404	394 2
405	405 2
406	416 2
407	428 2
408	439 2
409	450 2
410	461 2
411	473 2
412	484 2
413	495 2
414	506 2
415	518 2
416	529 2
417	540 2
418	551 2
419	563 2
420	574 2

Indexing	index value
421	585 2
422	596 2
423	608 2
424	619 2
425	630 2
426	641 2
427	653 2
428	664 2
429	675 2
430	686 2
431	698 2
432	709 2
433	720 2
434	731 2
435	743 2
436	754 2
437	765 2
438	776 2
439	788 2
440	799 2
441	810 2
442	821 2
443	833 2
444	844 2
445	855 2
446	866 2
447	878 2
448	889 2
449	900 2
450	911 2
451	923 2
452	934 2
453	945 2
454	956 2
455	968 2
456	979 2
457	990 2
458	1001 2
459	1013 2
460	2 12
461	11 and 12

Indexing	index value
462	23 December
463	34 12
464	46 and 12
465	57 12
466	68 12
467	80 12
468	91 12
469	102 and 12
470	114 and 12
471	125 and 12
472	137 12
473	148 12
474	159 12
475	171 12
476	182 12
477	193 12
478	205 12
479	216 12
480	228 12
481	239 12
482	250 12
483	262 12
484	273 12
485	284 12
486	296 12
487	307 12
488	319 12
489	330 12
490	341 12
491	353 12
492	364 12
493	375 12
494	387 12
495	398 12
496	410 12
497	421 12
498	432 12
499	444 12
500	455 12
501	466 12
502	478 12

Indexing	index value
503	489 12
504	501 12
505	512 12
506	523 12
507	535 12
508	546 12
509	558 12
510	569 12
511	580 12
512	592 12
513	603 12
514	614 12
515	626 12
516	637 12
517	649 12
518	660 12
519	671 12
520	683 12
521	694 12
522	705 12
523	717 12
524	728 12
525	740 12
526	751 12
527	762 12
528	774 12
529	785 12
530	796 12
531	808 12
532	819 12
533	831 12
534	842 12
535	853 12
536	865 12
537	876 12
538	887 12
539	899 12
540	910 12
541	922 12
542	933 12
543	944 12

Indexing	index value
544	956 12
545	967 12
546	978 12
547	990 12
548	1001 12
549	1013 12
550	2 23
551	11 23
552	23, 23
553	34 23
554	46 and 23
555	57.23
556	68,23
557	80 23
558	91 23
559	102 23
560	114 23
561	125 23
562	137 23
563	148 23
564	159 23
565	171 23
566	182 23
567	193,23
568	205 and 23
569	216, 23
570	228, 23
571	239 and 23
572	250 23
573	262 23
574	273 23
575	284 23
576	296 23
577	307 23
578	319 23
579	330 23
580	341 23
581	353 23
582	364 23
583	375 23
584	387 23

Indexing	index value
585	398 23
586	410 23
587	421 23
588	432 23
589	444 23
590	455 23
591	466 23
592	478 23
593	489 23
594	501 23
595	512 23
596	523 23
597	535 23
598	546 23
599	558 23
600	569 23
601	580 23
602	592 23
603	603 23
604	614 23
605	626 23
606	637 23
607	649 23
608	660 23
609	671 23
610	683 23
611	694 23
612	705 23
613	717 23
614	728 23
615	740 23
616	751 23
617	762 23
618	774 23
619	785 23
620	796 23
621	808 23
622	819 23
623	831 23
624	842 23
625	853 23

Indexing	index value
626	865 23
627	876 23
628	887 23
629	899 23
630	910 23
631	922 23
632	933 23
633	944 23
634	956 23
635	967 23
636	978 23
637	990 23
638	1001 23
639	1013 23
640	2 35
641	12 35
642	23 to 35
643	35, 35
644	47 and 35
645	58 and 35
646	70 and 35
647	81.35
648	93 35
649	105 and 35
650	116 35
651	128 35
652	140 and 35
653	151 35
654	163 35
655	175 35
656	186 35
657	19835
658	209 35
659	221 35
660	233 35
661	244 35
662	256 35
663	268 35
664	279 35
665	291 35
666	303, 35

Indexing	index value
667	314 35
668	326, 35
669	337 and 35
670	349 and 35
671	361 35
672	372 35
673	384 35
674	396 35
675	407 35
676	419 35
677	431 35
678	442 35
679	454 35
680	465 35
681	477 35
682	489 35
683	500 35
684	512 35
685	524 35
686	535, 35
687	547 35
688	559 35
689	570 35
690	582 35
691	593 35
692	605 35
693	617 35
694	628 35
695	640 35
696	652 35
697	663 35
698	675 35
699	687 35
700	698 35
701	710 35
702	721 35
703	733 35
704	745 35
705	756 35
706	768 35
707	780 35

Indexing	index value
708	791 35
709	803 35
710	815 35
711	826 35
712	838 35
713	849 35
714	861 35
715	873 35
716	884 35
717	896 35
718	908 35
719	919 35
720	931 35
721	943 35
722	954 35
723	966 35
724	977 35
725	989 35
726	1001 35
727	1012 35
728	2 47
729	12 47
730	24 47
731	35 to 47
732	47, 47
733	59.47
734	71 47
735	82.47
736	94.47
737	106 47
738	118 47
739	129 47
740	141 47
741	153,47
742	165,47
743	177,47
744	188 47
745	200 47
746	212 47
747	224 47
748	235 47

Indexing	index value
749	247 47
750	259 47
751	271　47
752	282 47
753	294　47
754	306　47
755	318　47
756	330　47
757	341　47
758	353　47
759	365 and 47
760	377 47
761	388　47
762	400　47
763	412　47
764	424　47
765	435 and 47
766	447, 47
767	459, 47
768	471, 47
769	483, 47
770	494　47
771	506　47
772	518 47
773	530 47
774	541 47
775	553　47
776	565 47
777	577 47
778	589 47
779	600　47
780	612　47
781	624　47
782	636 47
783	647 47
784	659 47
785	671　47
786	683,47
787	694　47
788	706 47
789	718　47

Indexing	index value
790	730 47
791	742 47
792	753 47
793	765 47
794	777 47
795	789 47
796	800 47
797	812 47
798	824 47
799	836 47
800	847 47
801	859 47
802	871 47
803	883 47
804	895 47
805	906 47
806	918 47
807	930 47
808	942 47
809	953 47
810	965 47
811	977 47
812	989 47
813	1000 47
814	1012 47
815	2 58
816	12 58
817	24 and 58
818	36 and 58
819	48 and 58
820	60 and 58
821	72 58
822	84.58
823	96.58
824	108 58
825	120 58
826	133.58
827	145,58
828	157 and 58
829	169 and 58
830	181 58

Indexing	index value
831	193 58
832	205 58
833	217 58
834	229 58
835	241 58
836	253.58
837	265 58
838	277.58
839	289 58
840	301 58
841	313 58
842	325 58
843	337.58
844	349 58
845	361 58
846	373 58
847	386 and 58
848	398 58
849	410 58
850	422 58
851	434 58
852	446 58
853	458 and 58
854	470 and 58
855	482 58
856	494 58
857	506 and 58
858	518, 58
859	530, 58
860	542 58
861	554 58
862	566 and 58
863	578 and 58
864	590 58
865	602 58
866	614 58
867	626 58
868	638 58
869	651 58
870	663 58
871	675 58

Indexing	index value
872	687.58
873	699 58
874	711 58
875	723 58
876	735 58
877	747 58
878	759 58
879	771 58
880	783 58
881	795 58
882	807 58
883	819 58
884	831 58
885	843 58
886	855 58
887	867 58
888	879,58
889	891 58
890	904 58
891	916 58
892	928 58
893	940 58
894	952 58
895	964 58
896	976 58
897	988 58
898	1000 58
899	1012 58
900	2 70
901	12 70
902	25 70
903	37 and 70
904	50-70
905	62 and 70
906	75 70
907	87 and 70
908	100 70
909	112 70
910	125,70
911	137,70
912	150 70

Indexing	index value
913	162 70
914	175 70
915	187.70
916	200 70
917	212 70
918	225 70
919	237,70
920	250 70
921	262 70
922	275 70
923	287 70
924	300 70
925	312 70
926	325 70
927	337 70
928	350 70
929	362 70
930	375 70
931	387 70
932	400 70
933	412 70
934	425 70
935	437 70
936	450 70
937	462 70
938	475 70
939	487 70
940	500 70
941	512 70
942	524 70
943	537 70
944	549 70
945	562 70
946	574 70
947	587 70
948	599 70
949	612 70
950	624 70
951	637 70
952	649 70
953	662 70

Indexing	index value
954	674 70
955	687 and 70
956	699 and 70
957	712 70
958	724 70
959	737 70
960	749 70
961	762 70
962	774 70
963	787 70
964	799 70
965	812 70
966	824 70
967	837,70
968	849,70
969	862 70
970	874 70
971	887 70
972	899,70
973	912 70
974	924 70
975	937 70
976	949 70
977	962 70
978	974 70
979	987 70
980	999 70
981	1012 70
982	2 81
983	13 81
984	26 and 81
985	39 and 81
986	52 and 81
987	65 and 81
988	78 and 81
989	91 and 81
990	104 81
991	117,81
992	130 and 81
993	143,81
994	156,81

Indexing	index value
995	169 and 81
996	181 and 81
997	194 81
998	207,81
999	220 81
1000	233 81
1001	246 81
1002	259 81
1003	272,81
1004	285 81
1005	298,81
1006	311 81
1007	324 81
1008	337 81
1009	350 81
1010	363 81
1011	376,81
1012	389 81
1013	402 81
1014	415 81
1015	428 81
1016	441 81
1017	454 81
1018	467 81
1019	480 81
1020	493 81
1021	506 81
1022	518 81
1023	531 81
1024	544 81
1025	557 81
1026	570 and 81
1027	583,81
1028	596 81
1029	609 81
1030	622 81
1031	635 81
1032	648 81
1033	661 81
1034	674 81
1035	687 81

Indexing	index value
1036	700 and 81
1037	713 81
1038	726 81
1039	739 and 81
1040	752 81
1041	765 81
1042	778 81
1043	791 and 81
1044	804 and 81
1045	817 and 81
1046	830 81
1047	843 81
1048	855 81
1049	868 81
1050	881 81
1051	894 81
1052	907 81
1053	920 81
1054	933 81
1055	946 81
1056	959 81
1057	972 81
1058	985 and 81
1059	998 81
1060	1011 81
1061	2 93
1062	13 93
1063	27.93
1064	40 and 93
1065	54 93
1066	67 and 93
1067	81 and 93
1068	94 and 93
1069	108 93
1070	121,93
1071	135 and 93
1072	148 and 93
1073	162 93
1074	175 93
1075	189 and 93
1076	20293

Indexing	index value
1077	216 93
1078	229 93
1079	243 93
1080	256 93
1081	269 93
1082	283 93
1083	296 93
1084	310 93
1085	323 93
1086	337 93
1087	350 93
1088	364 93
1089	377,93
1090	391 93
1091	404 93
1092	418 93
1093	431 93
1094	445 93
1095	458,93
1096	472 93
1097	485 93
1098	499 93
1099	512 93
1100	525 93
1101	539 93
1102	552 93
1103	566 93
1104	579 93
1105	593 93
1106	606 93
1107	620 93
1108	633 93
1109	647,93
1110	660 93
1111	674 93
1112	687 93
1113	701 93
1114	714 93
1115	728 93
1116	741 93
1117	755 93

Indexing	index value
1118	768 93
1119	781 93
1120	795 and 93
1121	808 93
1122	822 93
1123	835 and 93
1124	849 93
1125	862 93
1126	876 and 93
1127	889 and 93
1128	903 and 93
1129	916 and 93
1130	930 and 93
1131	943 93
1132	957 and 93
1133	970 93
1134	984 and 93
1135	997 93
1136	1011 93
1137	2,105
1138	14,105
1139	28,105
1140	42 105
1141	56 and 105
1142	70 105
1143	84 and 105
1144	98 and 105
1145	112 and 105
1146	126 and 105
1147	140 and 105
1148	154 and 105
1149	168 and 105
1150	182,105
1151	196 and 105
1152	210 105
1153	224,105
1154	238 105
1155	252 105
1156	267 105
1157	281 105
1158	295 and 105

Indexing	index value
1159	309 105
1160	323 105
1161	337,105
1162	351 105
1163	365 105
1164	379 105
1165	393,105
1166	407 105
1167	421 105
1168	435 105
1169	449 105
1170	463 105
1171	477 105
1172	491,105
1173	505 105
1174	519 105
1175	533 105
1176	547,105
1177	561 105
1178	575 105
1179	589 105
1180	603 105
1181	617 105
1182	631 105
1183	645 105
1184	659 105
1185	673 105
1186	687 105
1187	701 105
1188	715 105
1189	729 105
1190	743 105
1191	757 105
1192	772 105
1193	786,105
1194	800 105
1195	814 105
1196	828 105
1197	842 105
1198	856 105
1199	870 105

Indexing	index value
1200	884,105
1201	898 and 105
1202	912　105
1203	926 105
1204	940 and 105
1205	954 and 105
1206	968 and 105
1207	982 and 105
1208	996 and 105
1209	1010　105
1210	2 116
1211	15 116
1212	30,116
1213	45,116
1214	59,116
1215	74 and 116
1216	89 and 116
1217	104 and 116
1218	119 and 116
1219	134 116
1220	148 and 116
1221	163 and 116
1222	178 and 116
1223	193,116
1224	208 116
1225	223　116
1226	237 116
1227	252 116
1228	267 116
1229	282 116
1230	297,116
1231	312 116
1232	326,116
1233	341 116
1234	356 116
1235	371 116
1236	386 116
1237	401　116
1238	416 116
1239	430 116
1240	445 116

Indexing	index value
1241	460 116
1242	475 116
1243	490 116
1244	505 116
1245	519 116
1246	534 116
1247	549 116
1248	564 116
1249	579 116
1250	594 116
1251	608 116
1252	623 116
1253	638 116
1254	653 116
1255	668 116
1256	683 116
1257	698 116
1258	712 116
1259	727 116
1260	742 116
1261	757 116
1262	772 116
1263	787 116
1264	801 116
1265	816 116
1266	831 116
1267	846,116
1268	861 116
1269	876 116
1270	890 and 116
1271	905 116
1272	920 116
1273	935 116
1274	950 116
1275	965 116
1276	979 116
1277	994 116
1278	1009 and 116
1279	2 128
1280	16 128
1281	32 128

Indexing	index value
1282	48 and 128
1283	64, 128
1284	80 and 128
1285	96 128
1286	112 128
1287	128, 128
1288	144 128
1289	160 128
1290	176 128
1291	192 128
1292	208 128
1293	224 128
1294	240 128
1295	256 128
1296	272 128
1297	288 128
1298	304 128
1299	320 128
1300	336 128
1301	352 128
1302	368 128
1303	384 128
1304	400 128
1305	416,128
1306	432 128
1307	448 128
1308	464 128
1309	480 128
1310	496 128
1311	512 128
1312	528 128
1313	544 128
1314	560 128
1315	576 128
1316	592 128
1317	608 128
1318	624 128
1319	640 128
1320	656 128
1321	672 128
1322	688 128

Indexing	index value
1323	704 128
1324	720 128
1325	736 128
1326	752 128
1327	768 128
1328	784 128
1329	800 128
1330	816 128
1331	832 128
1332	848 128
1333	864 128
1334	880 128
1335	896 128
1336	912 128
1337	928 128
1338	944 128
1339	960 128
1340	976 128
1341	992 128
1342	1008 128

Table B.49 Table for Pitch Trigonometric Function and Table of Horizontal Trigonometric Function

Indexing	index value
0	0.000000
1	0.006136
2	0.012272
3	0.018407
4	0.024541
5	0.030675
6	0.036807
7	0.042938
8	0.049068
9	0.055195
10	0.061321
11	0.067444
12	0.073565
13	0.079682
14	0.085797
15	0.091909
16	0.098017

Indexing	index value
17	0.104122
18	0.110222
19	0.116319
20	0.122411
21	0.128498
22	0.134581
23	0.140658
24	0.146730
25	0.152797
26	0.158858
27	0.164913
28	0.170962
29	0.177004
30	0.183040
31	0.189069
32	0.195090,
33	0.201105
34	0.207111
35	0.213110
36	0.219101
37	0.225084
38	0.231058
39	0.237024
40	0.242980
41	0.248928
42	0.254866
43	0.260794
44	0.266713
45	0.272621
46	0.278520
47	0.284408
48	0.290285
49	0.296151
50	0.302006
51	0.307850
52	0.313682
53	0.319502
54	0.325310
55	0.331106
56	0.336890
57	0.342661

Indexing	index value
58	0.348419
59	0.354164
60	0.359895
61	0.365613
62	0.371317
63	0.377007
64	0.382683,
65	0.388345
66	0.393992
67	0.399624
68	0.405241
69	0.410843
70	0.416430
71	0.422000
72	0.427555
73	0.433094
74	0.438616
75	0.444122
76	0.449611
77	0.455084
78	0.460539
79	0.465977
80	0.471397
81	0.476799
82	0.482184
83	0.487550
84	0.492898
85	0.498228
86	0.503538
87	0.508830
88	0.514103
89	0.519356
90	0.524590
91	0.529804
92	0.534998
93	0.540171
94	0.545325
95	0.550458
96	0.555570,
97	0.560662
98	0.565732

Indexing	index value
99	0.570781
100	0.575808
101	0.580814
102	0.585798
103	0.590760
104	0.595699
105	0.600616
106	0.605511
107	0.610383
108	0.615232
109	0.620057
110	0.624860
111	0.629638
112	0.634393
113	0.639124
114	0.643832
115	0.648514
116	0.653173
117	0.657807
118	0.662416
119	0.667000
120	0.671559
121	0.676093
122	0.680601
123	0.685084
124	0.689541
125	0.693971
126	0.698376
127	0.702755
128	0.707107,
129	0.711432
130	0.715731
131	0.720003
132	0.724247
133	0.728464
134	0.732654
135	0.736817
136	0.740951
137	0.745058
138	0.749136
139	0.753187

Indexing	index value
140	0.757209
141	0.761202
142	0.765167
143	0.769103
144	0.773010
145	0.776888
146	0.780737
147	0.784557
148	0.788346
149	0.792107
150	0.795837
151	0.799537
152	0.803208
153	0.806848
154	0.810457
155	0.814036
156	0.817585
157	0.821102
158	0.824589
159	0.828045
160	0.831470,
161	0.834863
162	0.838225
163	0.841555
164	0.844854
165	0.848120
166	0.851355
167	0.854558
168	0.857729
169	0.860867
170	0.863973
171	0.867046
172	0.870087
173	0.873095
174	0.876070
175	0.879012
176	0.881921
177	0.884797
178	0.887640
179	0.890449
180	0.893224

Indexing	index value
181	0.895966
182	0.898674
183	0.901349
184	0.903989
185	0.906596
186	0.909168
187	0.911706
188	0.914210
189	0.916679
190	0.919114
191	0.921514
192	0.923880,
193	0.926210
194	0.928506
195	0.930767
196	0.932993
197	0.935184
198	0.937339
199	0.939459
200	0.941544
201	0.943593
202	0.945607
203	0.947586
204	0.949528
205	0.951435
206	0.953306
207	0.955141
208	0.956940
209	0.958703
210	0.960431
211	0.962121
212	0.963776
213	0.965394
214	0.966976
215	0.968522
216	0.970031
217	0.971504
218	0.972940
219	0.974339
220	0.975702
221	0.977028

Indexing	index value
222	0.978317
223	0.979570
224	0.980785,
225	0.981964
226	0.983105
227	0.984210
228	0.985278
229	0.986308
230	0.987301
231	0.988258
232	0.989177
233	0.990058
234	0.990903
235	0.991710
236	0.992480
237	0.993212
238	0.993907
239	0.994565
240	0.995185
241	0.995767
242	0.996313
243	0.996820
244	0.997290
245	0.997723
246	0.998118
247	0.998476
248	0.998795
249	0.999078
250	0.999322
251	0.999529
252	0.999699
253	0.999831
254	0.999925
255	0.999981
256	1.000000

Annex C (Informative) 3D audio rendering

C.1 Metadata restriction

For the metadata used in this Annex, the attributes and elements defined in ITU-R BS.2076-2 for content and format are used, and some attributes or sub-elements defined in ITU-R BS.2076-2 are restricted as follows.

For restrictions on audioProgramme, refer to Table C.1.

Table C.1 Restrictions on audioProgramme

Attribute/sub-element	Restrictions	Mandatory/optional
audioProgrammeName	The value contains a maximum of 32 bytes. Otherwise, the value is truncated.	Mandatory
start	The duration defined by the start and end fields needs to be the same as that of the audio file. Otherwise, the duration of the audio file is used.	Optional
end		Optional

For restrictions on audioContent, refer to Table C.2.

Table C.2 Restrictions on audioContent

Attribute/sub-element	Restrictions	Mandatory/optional
audioContentName	The value contains a maximum of 32 bytes. Otherwise, the value is truncated.	Mandatory

For restrictions on audioObject, refer to Table C.3.

Table C.3 Restrictions on audioObject

Attribute/sub-element	Restrictions	Mandatory/optional
audio Object Name	The value contains a maximum of 32 bytes. Otherwise, the value is truncated.	Mandatory
audioObjectIDRef	It indicates the ID of another nested audioObject. A maximum of four layers are supported.	Optional

For restrictions on audioStreamFormat, refer to Table C.4.

Table C.4 Restrictions on audioStreamFormat

Attribute/sub-element	Restrictions	Mandatory/optional
audioStreamFormatName	The value contains a maximum of 32 bytes. Otherwise, the value is truncated.	Mandatory

formatLabel	0001: PCM stream	Mandatory

For restrictions on audioTrackFormat, refer to Table C.5.

Table C.5 Restrictions on audioTrackFormat

Attribute/sub-element	Restrictions	Mandatory/optional
audioTrackFormatName	The value contains a maximum of 32 bytes. Otherwise, the value is truncated.	Mandatory
formatLabel	0001: PCM stream	Mandatory

For restrictions on audioPackFormat, refer to Table C.6.

Table C.6 Restrictions on audioPackFormat

Attribute/sub-element	Restrictions	Mandatory/optional
audioPackFormatName	The value contains a maximum of 32 bytes. Otherwise, the value is truncated.	Mandatory

For restrictions on audioChannelFormat, refer to Table C.7.

Table C.7 Restrictions on audioChannelFormat

Attribute/sub-element	Restrictions	Mandatory/optional
audioChannelFormatName	The value contains a maximum of 32 bytes. Otherwise, the value is truncated.	Mandatory

For restrictions (HOA) on audioBlockFormat, refer to Table C.8.

Table C.8 Restrictions on audioBlockFormat

Attribute/sub-element	Restrictions	Mandatory/optional
order	A maximum of seven orders are supported.	Mandatory

For restrictions on extended metadata, refer to Table C.9.

Table C.9 Restrictions on extended metadata

<vrExt >	Description	Example
version	Version number of the extended metadata	0.0.1
name	Name of the extended metadata	vrExt
level	Priority of the extended metadata	1
presenceInfo	Content-related part of the extended metadata	
staticControl	Static content of the extended metadata	
dynamicControl	Dynamic content of the extended metadata	

For restrictions on presenceInfo, refer to Table C.10.

Table C.10 Restrictions on presenceInfo

Attribute	Description	Specifications
descriptor	Description of presenceInfo.	The value can contain a maximum of 32 characters.
sampleRate	Audio sampling rate.	The value is an integer, for example, 44100.
audioProgrammeReferID	It is associated with an AudioProgramme item in ITU-R BS.2076-2.	APR_1001
instanceReferID	It is associated with an AudioChannelFormat item in ITU-R BS.2076-2.	INS_00010001
isEncoded	It indicates whether the process is an encoding process.	0/1, optional
avdata Aligned	It indicates whether to align with the video frame.	0/1, optional
frameRate	A frame rate used for video synchronization	int, optional
renderMode	It corresponds to	0/1
loudnessGain	audioChannelFormat. A	0 to 16, optional

For restrictions on instance, refer to Table C.11.

Table C.11 Restrictions on instance

Attribute	Description	Specifications
id	It uniquely identifies the instance.	INS_0001_0001
type	Corresponding audio type code	{0001, 0003, 0004}
typeLabel	A corresponding audio type name	{DirectSpeaker, Objects, HOA}
audioChannelFormatRefID	ID indexes used to match the ITU-R BS.2076-2 elements	AC_00010001
unitInfo	It corresponds to audioChannelFormat. A plurality of values are supported.	

For restrictions on unitInfo, refer to Table C.12.

Table C.12 Restrictions on unitInfo

Attribute	Description	Specifications
id	It uniquely identifies the unit.	UNI_00010001

start	It indicates the start time of the unit. This field is valid only when typeLabel is Objects.	00:00:00.00000
duration	It indicates the duration of the unit. This field is valid only when typeLabel is Objects.	00:00:00.00000
When typeLabel is DirectSpeakers:		
azimuth	Horizontal angle, in degrees	-180-180
elevation	Horizontal angle, in degrees	-90 to 90
distance	Distance, in meters	0-50
gain	Linear gain	0-16
When typeLabel is Objects:		
azimuth	Horizontal angle, in degrees	-180-180
elevation	Horizontal angle, in degrees	-90 to 90
distance	Distance, in meters	0-50
gain	Linear gain	0-16
When typeLabel is HOA:		
order	Corresponding channel order	0 to 7
degree	An angle of a corresponding channel	-7 to +7
normalization	Normalization manner	{0,1...}
gain	Linear gain	0 to 16

For restrictions on staticControl, refer to Table C.13.

Table C.13 Restrictions on staticControl

Attribute	Description	Specifications
ambisonicOrder	Spherical harmonic coding order	1 to 7
acousticEnv	Related to Acoustic environment	
RendererInfo	Post-processing related to rendering	

For restrictions on acousticEnv, refer to Table C.14.

Table C.14 Restrictions on acousticEnv

Attribute	Description	Specifications
type	Acoustics environment type	{0, 1, 2}
typeLabel	Acoustics environment type label	{Physical / Artificial / Sample}
earlyReflectionGain	Early reflection gain	[0.0, 1.0]
lateReverbGain	Late reverberation gain	[0.0, 1.0]
lowFreqProFlag	Low-frequency separation processing	The options include 0 and 1. Reverberation processing is optional for low frequencies.
convolutionReverbType	Sampling reverberation type	{0, 1, 2…}

surface	Reflective surface of geometric space	A space model can consist of an unlimited number of reflectors.

For restrictions on surface, refer to Table C.15.

Table C.15 Restrictions on surface

Attribute	Description	Specifications
material	Material type in the acoustic environment. In total, 25 types of materials are supported.	{0, 1,2…24}
materialLabel	Material type label in the acoustic environment	{brick, water…}
vertex	Geometric model vertices. Three vertices form a triangle. An unlimited number of triangles are supported.	[x1, y1, z1], [x2, y2, z2]…
absorption	Absorption rates of different bandwidths. This field is optional.	[0.0, 1.0]
scattering	Absorption rates of different bandwidths. This field is optional.	[0.0, 1.0]

For restrictions on rendererInfo, refer to Table C.16.

Table C.16 Restrictions on rendererInfo

Attribute	Description	Specifications
targetDevice	Playback device type	{0, 1, 2…}
hrtfType	HRTF type that complies with the SOFA standard	The options are 0, 1, ..., and N. For example, 0 indicates THK and 1 indicates MIT.
headphoneType	Headphone type	{0, 1, 2…}
audioEffect	Post-processing audio effect	

For restrictions on audioEffect, refer to Table C.17.

Table C.17 Restrictions on audioEffect

Attribute	Description	Specifications
EQ	Post-EQ processing	
DRC - Democratic Republic of Congo	Post-DRC processing	
Gain	Post-gain processing	

For restrictions on EQ, refer to Table C.18

Table C.18 Restrictions on EQ

Attribute	Description	Specifications
index	Sequence of sound effect links	{0, 1, 2…}
type	Filter type	{0, 1, 2…}
typeLabel	Filter type label	{LowPass，HighPass，BandPass，BandReject，AllPass，LowShelving，HighShelving，Peaking...}
frequency	cut-off frequency	20 to 16000
gain	Gain	[-40,-40]dB
Q	quality factor	0.1 to 12

For restrictions on DRC, refer to Table C.19.

Table C.19 Restrictions on DRC

Attribute	Description	Specifications
index	Sequence of sound effect links	{0, 1, 2…}
attackTime	Start time	[0 to 100]ms
release time	Release time	[50 to 300]ms
threshold	Threshold	[-80 to 10]dB
preGain	Pregain	[-10 to 10]dB
postGain	Postgain	[0 to 20]dB
ratio	Compression ratio	1 to 100

For restrictions on gain, refer to Table C.20.

Table C.20 For restrictions on gain, refer to Table C.20.

Attribute	Description	Specifications
index	Sequence of sound effect links	{0, 1, 2…}
gain	Gain	-20db to 20dB

To ensure device compatibility, content interoperability, and controllable complexity of encoding, decoding, and rendering systems, a level-based control mechanism is used for the number and combination of metadata. Five levels are defined: level 0 to level 4. Level 0 is used to maintain interoperability with existing audio content. This level supports "typeDefinitions = DirectSpeakers" and "SpeakerLabel = M + 000/M + 022/M – 022". Level 1 to level 3 limit the maximum number of audio content elements. Level 4 supports an unlimited number of audio content elements.
For restrictions on level classification, refer to Table C.21.

Table C.21 Level classification table

<audioformatExtended> Element	Description	Level				
		0	1	2	3	4
audioProgramme	Number of audio programs in an audio file or an audio stream	1	1	4	8	Unlimited
audioContent	Number of program audio content items in a	2	4	8	16	Unlimited

	file or a stream					
audioObject	An audio source in a file or a stream	2	8	64	128	Unlimited
concurrentAudioObject	Number of concurrent audio sources in a time segment	2	8	16	32	Unlimited
audioPackFormat	Number of audio format groups in a file (excluding audio streams)	1	8	32	64	Unlimited
audioChannelFormat	Number of audio formats in a file (excluding audio streams)	2	32	64	128	Unlimited
audioStreamFormat	Number of track group formats in a file (excluding audio streams)	2	32	64	128	Unlimited
audioTrackFormat	Number of audio track formats in a file (excluding audio streams)	2	32	64	128	Unlimited
audioTrackUID	Number of unique identifiers in an audio file or an audio stream	2	32	64	128	Unlimited

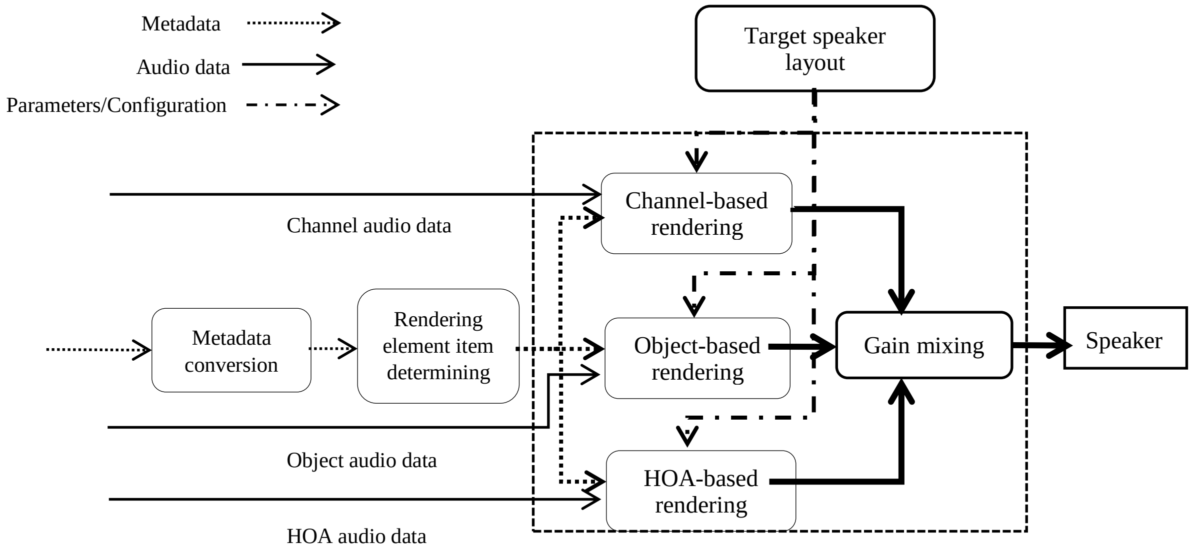
C.2 Speaker Rendering

C.2.1 Speaker Rendering System Framework

The speaker rendering system renders input metadata and audio data based on a specified replay configuration to obtain an audio signal for replaying. Speaker rendering is classified into channel-based rendering, object-based rendering, and HOA-based rendering. Channel-based rendering converts an input channel signal into a signal required by the target speaker layout, and object-based rendering and HOA-based rendering use metadata and replay configurations to reproduce object-based and HOA-based audio data. The three rendering manners may be used in a combination or separately based on actual application requirements.

A speaker rendering system framework is shown in Figure C-1. The metadata is converted based on typeDefinition in the metadata to obtain metadata required by different speaker rendering types. Then, a rendering element item determining module is used to obtain paths of rendering items. Corresponding metadata and audio data are sent to different rendering modules, and then rendered based on a target speaker layout. Finally, a rendered signal is processed by a gain mixing module to obtain a signal finally used for replaying.

Figure C-1 Overall architecture of speaker rendering system



(1) Metadata conversion

The metadata required for speaker rendering is saved as metadata type items through metadata conversion to correspond to audio types. The metadata types are classified into three types: channel type metadata, object type metadata, and HOA type metadata. According to different audio types, the track index information track index corresponding to the channel in the audio data is reserved, and is combined with the metadata type item to generate a rendering element item for rendering different types of audio in a next phase.

● Channel type

Channel type metadata contains an audioBlockFormat item. If there is general data, it further contains general data collected from external data, and is constructed as channel type metadata DirectSpeakersTypeMetadata in the metadata.

Each piece of channel type metadata can be independently processed. Therefore, the rendering item contains only one piece of track index information, and is constructed as the channel type rendering item DirectSpeakersRenderingItem.

● Object type

The object type metadata ObjectTypeMetadata contains one audioBlockFormat item. If there is general data, it further contains one piece of general data collected from external data.

Similar to the channel type metadata, each piece of object type metadata can be independently processed. Therefore, the rendering item also contains only one piece of track index information, and is constructed as the object type rendering item ObjectRenderingItem.

● HOA type

The HOA type metadata is different from the channel type metadata and the object type metadata. The system needs to process a group of audioChannelFormats at the same time (for example, in the case of order 1, the system needs to process a group of four channels). The metadata does not contain audioBlockFormat or external data. Necessary information (such as the start time, end time, order, and degree) is extracted from audioBlockFormats and directly stored in the HOA type metadata HOATypeMetadata.

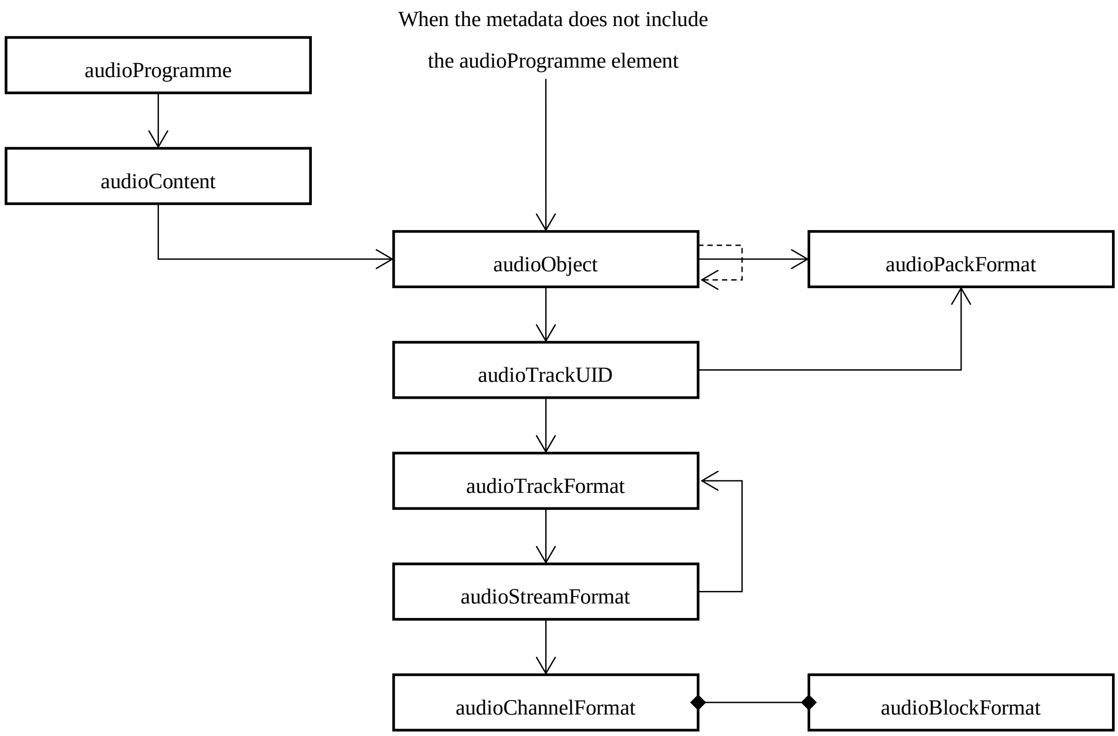
(2) Rendering element item determining

The rendering element item RenderingItem indicates a to-be-rendered metadata element item, and also includes all information required for performing this operation. The rendering element item is a single audioChannelFormat or a group of audioChannelFormats. Because each audio type has different requirements, different metadata types need to be used to meet rendering requirements of corresponding types.

The HOA rendering element item HOARenderingItem constructed by the system is different from that of the other two types. The HOA rendering element item includes one piece of track index information and a vector including the track.

To determine and construct various types of rendering element items, a structure analysis needs to be performed on the metadata to finally determine a rendering path, as shown in Figure C-2.

Figure C-2 Path of rendering item determining



The start point of rendering item determining is generally an audioProgramme element. If data includes a plurality of audioProgramme elements, the program with the lowest ID is used by default. The audioProgramme element can also be selected based on audioProgrammeID. If there is no audioProgramme element, a set of all audioObject items are used as the start point, and other audioObject do not reference these audioObject items.

During the determining process, the audioPackFormats referenced by each audioObject item and the audioTrackUID referenced by each audioObject item are cross-checked to verify the consistency and integrity of metadata elements.

When a reference loop is detected, audioObjects can be nested.

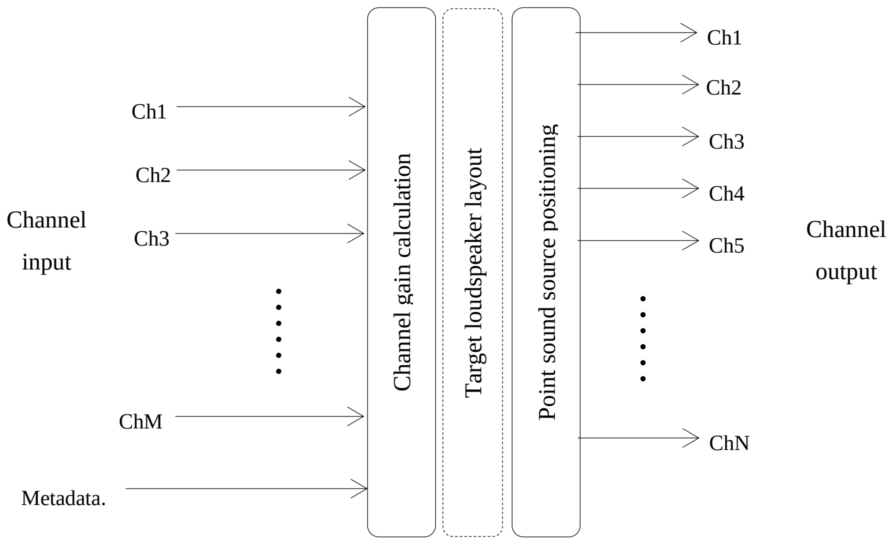
As reference from audioTrackFormats back to audioStreamFormat is optional, the mapping from audioTrackFormat to audioStreamFormats is done reversely from audio StreamFormation.

C.2.2 Channel-based rendering

C.2.2.1 Overview

A block diagram of channel-based rendering is shown in Figure C-3:

Figure C-3 Block diagram of channel-based rendering



The speaker position corresponding to the input channel signal is determined based on metadata speakerLable. The gain of each channel signal is determined according to the target speaker layout. During gain calculation, when the number of input channels is less than the number of channels in the target speaker layout, the upmixing gain is calculated, and then the output signal is obtained through point sound source positioning. When the number of input channels is greater than the number of channels in the target speaker layout, the downmixing gain is calculated, and then, the output signal is obtained through point sound source positioning. When the number of input channels is the same as the number of channels in the target speaker layout, the channel signal is directly sent to the corresponding speaker.

The screen position corresponding to the audio signal when the terminal replays the audio signal is determined based on the metadata screenEdgeLock screen edge lock. If the speaker coordinates corresponding to the input channel signal are Cartesian coordinates (x, y, z), the speaker coordinates are first converted into polar coordinates (d, φ, θ). Refer to formula (C.1).

$$d = \sqrt{x^2 + y^2 + z^2}$$
$$\varphi = \cos^{-1}\frac{z}{d} \qquad \text{.........................} \ (C.1)$$
$$\theta = \tan^{-1}\frac{y}{x}$$

The screen edge lock is divided into lock in the horizontal direction and lock in the vertical direction.

Horizontal direction: When the left is locked, the left is set as a replay sound source point for the azimuth. When the right is locked, the right is set as a sound source point for the azimuth. If the lock is disabled, the azimuth of the sound source point remains unchanged.

Vertical direction: When the top is locked, the top is set as a replay sound source point for the azimuth. When the bottom is locked, the bottom is set as a sound source point for the azimuth. If the lock is disabled, the azimuth of the sound source point remains unchanged.

C.2.2.2 Gain Calculation

When the number of input channels does not match the number of sound boxes in the target speaker layout, the gain of each input channel is calculated according to section C.2.2.3.

When the input is 5.1 channel and the number of sound boxes in the target speaker layout is less than 3, the 5.1 channel signal is downmixed into a stereo signal in the stereo downmixing manner. The steps are as follows:

(a) A sound source position of 0+5+0 is used as an input direction, and a sequence is M+030, M–030, M+000, M+110, and M–110. A corresponding gain vector is g', and a range of each gain value is 0 to 1.

(b) Stereo gains g'' corresponding to M+030 and M–030 are calculated according to formula (C.2):

$$g'' = \begin{bmatrix} 1 & 0 & \sqrt{\frac{1}{3}} & \sqrt{\frac{1}{2}} & 0 \\ 0 & 1 & \sqrt{\frac{1}{3}} & 0 & \sqrt{\frac{1}{2}} \end{bmatrix} \cdot g' \qquad \text{..........................} (C.2)$$

(c) The g'' power is normalized according to formula (C.3) to a value determined by balancing the front and rear speakers a_{front} and a_{rear} in g', so that the source between M+030 and M–030 is not attenuated, and the source between M–110 and M+110 is attenuated by 3 dB:

$$\begin{aligned} a_{\text{front}} &= \max\{g'_1, g'_2, g'_3\} \\ a_{\text{rear}} &= \max\{g'_4, g'_5\} \\ r &= \frac{a_{\text{rear}}}{a_{\text{front}} + a_{\text{rear}}} \\ g &= g'' \frac{\frac{1}{2}^{\frac{r}{2}}}{\|g''\|_2} \end{aligned} \qquad \text{............................} (C.3)$$

max{g'_1, g'_2, g'_3} indicates the maximum value in g'_1, g'_2, g'_3, and max{g'_4, g'_5} indicates the maximum value in g'_4, g'_5.

C.2.2.3 Point sound source positioning

If the number of input channels M is not equal to the number of output channels N, it means that the position of the input signal speaker may not match the position of the actual replay speaker. In this case, point sound source positioning needs to be performed, and the actual speaker virtualizes positions corresponding to the N outputs. Point sound source positioning is performed by using a triangular area method. Basic VBAP is implemented in a spherical triangular area formed by three speakers to obtain a position of a virtual speaker. A direction of the virtual speaker is defined as a three-dimensional unit vector shown in formula (C.4):

$$P = \begin{bmatrix} p_1 \\ p_2 \\ p_3 \end{bmatrix} \text{. ....(C.4)}$$

P is the virtual speaker position, and p_1, p_2, p_3 are positions of three target speakers closest to P. The three positions with the minimum distance d between the target speaker and P are calculated. If the nearest speakers cannot be determined from d, the positions are compared according to the sequence of azimuth and pitch angle $\{|\theta|, \theta, |\varphi|, \varphi\}$.

The speakers p_1, p_2, p_3 are set on the surface of the sphere. The three-dimensional vector $l_1 = \begin{bmatrix} l_{11} \\ l_{12} \\ l_{13} \end{bmatrix}$. Its origin is the center of the sphere, and the vector points to the direction of the speaker p_1. The three-dimensional vector $l_2 = \begin{bmatrix} l_{21} \\ l_{22} \\ l_{23} \end{bmatrix}$. Its origin is the center of the sphere, and the vector points to the direction of the speaker p_2. The three-dimensional vector $l_3 = \begin{bmatrix} l_{31} \\ l_{32} \\ l_{33} \end{bmatrix}$. Its origin is the center of the sphere, and the vector points to the direction of the speaker p_3. The virtual speaker vector P is represented as a linear combination of three speaker vectors l_1, l_2, l_3, and is represented in a matrix form. Refer to formula (C.5):

$$P^T = g_1 l_1 + g_2 l_2 + g_3 l_3 = g L_{123}. \quad . \text{ ....(C.5)}$$

g_1, g_2, g_3 are gain factors, $g = [g_1 \quad g_2 \quad g_3]$, and $L_{123} = \begin{bmatrix} l_1 \\ l_2 \\ l_3 \end{bmatrix}$. The virtual speaker P corresponds to the gain vector g. Refer to formula (C.6):

$$g = P^T L_{123}^{-1} = [p_1 \quad p_2 \quad p_3] \begin{bmatrix} l_{11} & l_{12} & l_{13} \\ l_{21} & l_{22} & l_{23} \\ l_{31} & l_{32} & l_{33} \end{bmatrix}^{-1} \text{ ....(C.6)}$$

For example, if the input is 5.1.4, without considering the LFE channel, a three-dimensional vector is defined for the nine channels:$p_{i1}, p_{i2,\dots}\, p_{i9}$ The target speaker layout is 5.1, defining three-dimensional vectors for five actual channels as$p_{r1}, p_{r2,\dots}\, p_{r5}$At this point, it is necessary to use actual 3D vectors to virtually generate each virtual gain vector for the 9 input channels through point source localization.g_{i9}See formula (C.7):

For example, the input is 5.1.4, the LFE channel is not considered, and the three-dimensional vectors are defined for nine channels: $p_{i1}, p_{i2,\dots}\, p_{i9}$. The target speaker layout is 5.1. The threedimensional vectors for 5 actual channels are defined as $p_{r1}, p_{r2,\dots}\, p_{r5}$. In this case, each virtual gain vector g_{i9} needs to be virtualized for the nine input channels one by one by using an actual three-dimensional vector in a point sound source positioning manner. Refer to formula (C.7):

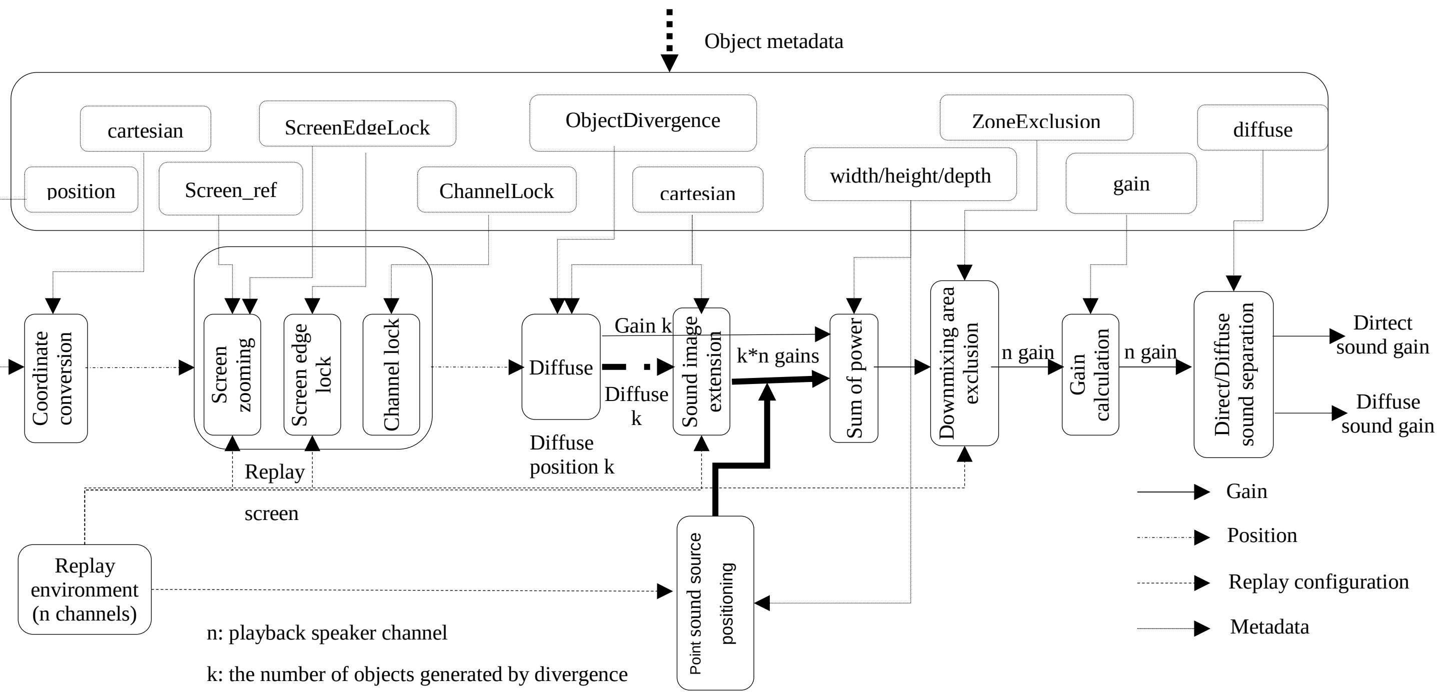
$$g_{i1} = P_{i1}^{T} L_{r123}^{-1} = [p_{r1} \quad p_{r2} \quad p_{r3}] \begin{bmatrix} l_{r11} & l_{r12} & l_{r13} \\ l_{r21} & l_{r22} & l_{r23} \\ l_{r31} & l_{r32} & l_{r33} \end{bmatrix}^{-1} \text{.................(C.7)}$$

C.2.3 Object-based rendering

C.2.3.1 Overview

Different objects of object-based audio content data are rendered. typeDefinition provides the input of metadata and audio data. The metadata enters the renderer in an input form of an object-based metadata type. An output of metadata and audio data based on object content is obtained through processing by the metadata pre-processing module and object gain calculation. A signal flow process of gain calculation between metadata elements of non-LFE content is shown in Figure C-4.

Figure C-4 Signal flow process of gain calculation between metadata elements



C.2.3.2 Coordinate Conversion

If the position coordinates of the input object are spherical coordinates, formula (C.8) is used to convert spherical coordinates (d, θ, φ) into Cartesian coordinates (x, y, z):

$$x = \sin\left(-\frac{\pi}{180}\varphi\right)\cos\left(\frac{\pi}{180}\theta\right)d$$

$$y = \cos\left(-\frac{\pi}{180}\varphi\right)\cos\left(\frac{\pi}{180}\theta\right)d \text{ ....(C.8)}$$

$$z = \sin\left(-\frac{\pi}{180}\varphi\right)d$$

C.2.3.3 Screen Zooming

If Sreen_ref exists in the metadata, screen zooming is used to convert the screen into a Cartesian central position and two vectors (in the x and z directions). The position is updated according to formula (C.9):

$centre = cart(\varphi, \theta, d)$

$\mathrm{width} = \mathrm{w}/2$ ....(C.9)

$\mathrm{height} = \mathrm{width}/a$

w is the width of the display screen, and a is the width-to-height ratio of the display screen. The default value of w is 3840 × 2160, and the default value of a is 1.78.

For calculation of x and z vectors of the screen, refer to formula (C.10):

$v_x = \{\mathrm{width}, 0, 0\}$
$v_z = \{0, 0, \mathrm{height}\}$ ....(C.10)

C.2.3.4 Screen Edge Lock

If ScreenEdgeLock exists in the metadata, screen edge lock is used, and the object position is updated based on the screen edge parameter position.

C.2.3.5 Channel Lock

If ChannelLock exists in the metadata, channel lock is used to update the position. When the Cartesian coordinate position or the width, height, and depth of the spherical coordinates of the metadata is or are received, and the channel lock is enabled, the system compares and calculates the speakers in a group of possible speakers and locks the speaker closest to the position as the output channel. If the nearest speaker cannot be obtained from the distance, the positions are compared according to the sequence $\{|\theta|, \theta, |\varphi|, \varphi\}$ based on the azimuth and pitch angle.

C.2.3.6 Diffuse

The azimuthRange or positionRange are used to obtain a diffuse value. This is implemented by adding two additional source positions P_l and P_r to the left and right sides of the original sound source position P_c. Each position is associated with gains g_c, g_l and g_r. For calculation of g_c, refer to formula (C.11). For calculation of g_l and g_r, refer to formula (C.12):

$g_c = \frac{1-x}{x+1} g$ ....(C.11)

$g_l = g_r = \frac{x}{x+1}$............................ (C.12)

x is the diffuse value, and $0 \leq x \leq 1$.

C.2.3.7 Sound Image Extension

The sound image extension is applicable to each position p corresponding to diffuse. A gain vector $gains\_for\_each\_pos$ of each speaker is generated for each position p. The gain is mixed with power determined based on the diffuse gain $diverged\_gains$ to form the sum of power. For the sum of power, refer to formula (C.13):

$$gains[i] = \sqrt{\sum_j diverged\_gains\,[j] \times gains\_for\_each\_pos[j,i]^2}. ....(C.13)$$

The point sound source positioning used in the channel-based rendering may be used for the sound image extension. The virtual speaker gain of the corresponding object is calculated based on the position, width, height, and depth of the object metadata.

C.2.3.8 Downmixing area exclusion

Downmixing area are determined by excluding a speaker. Only the nominal position of the speaker is considered in the calculation. A slight change of the position of the speaker does not affect the behavior of the area exclusion.

For the CartesianZone object, the following formula is used to determine whether the speaker is in the area. $\{x, y, z\}$ is the nominal position of the speaker, and is converted from polar coordinates with a radius of 1. Refer to formula (C.14):

$$\begin{aligned} \mathrm{minX} - \epsilon < \ & x < \mathrm{maxX} + \epsilon \\ \mathrm{minY} - \epsilon < \ & y < \mathrm{maxY} + \epsilon \\ \mathrm{minZ} - \epsilon < \ & z < \mathrm{maxZ} + \epsilon \end{aligned} ....(C.14)$$

$\epsilon = 10-6$ is a safety margin that allows a rounding error during conversion between polar coordinates and

Cartesian coordinates. minX, maxY and maxZ indicates corner vertices of a cuboid in the three-dimensional space. These corner vertices are excluded from rendering of Cartesian coordinates. A value of the attribute of each corner vertex is a floating point value, and ranges from –1.0 to 1.0. If coordinate values of a speaker are within this range, the speaker is excluded from this area.

The gain vector generated after the area exclusion is extended by adding the LFE channel gain with the value of 0. After the processing in Figure C.4, all gains $gains\_full$ are generated. One gain value is obtained for each speaker.

C.2.3.9 Separation of direct sound and diffuse sound

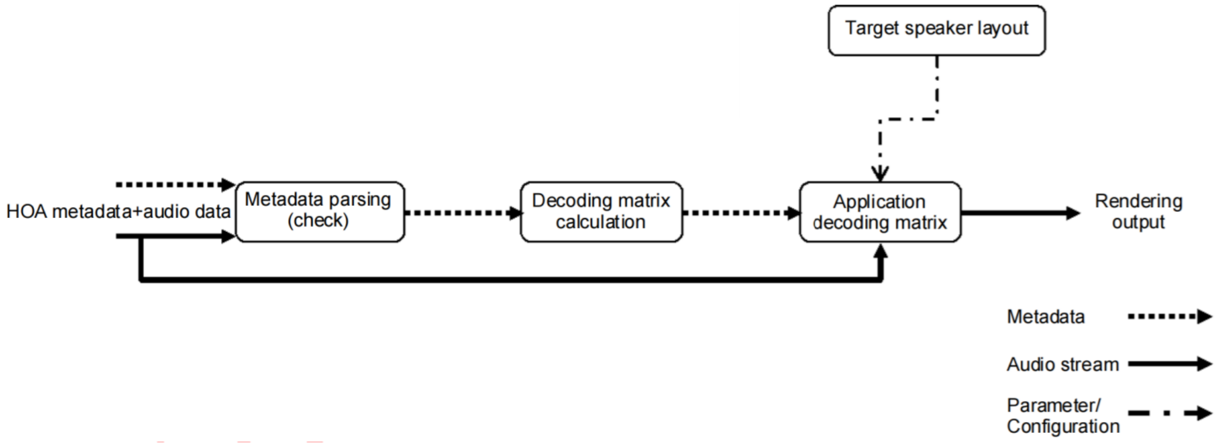
All gains are divided into a direct sound vector $direct$ and a diffuse sound vector $diffuse$ to control the direct and divergence paths, depending on the diffuse metadata diffuse parameter. For the calculation process, refer to formula (C.15).

$$\begin{aligned} direct &= gains\_full \times \sqrt{1 - diffuse} \\ diffuse &= gains\_full \times \sqrt{diffuse} \end{aligned} ....(C.15)$$

C.2.4 HOA-based Rendering

A block diagram of HOA-based rendering is shown in Figure C.5:

Figure C.5 Block diagram of HOA-based rendering



In this rendering system, the HOA signal can be rendered at a maximum of six orders. The HOA signal is represented by a normalized HOA type sub-element. The rendering system supports three normalization manners: N3D, SN3D, and FuMa. The same normalization manner needs to be used for all HOA channels in audioBlockFormat. The FuMa supports only 3-order normalization. The HOA rendering process is as follows:

The HOA object format is determined by parsing the metadata, and whether the signal can be rendered is checked. It is determined that the same normalization and screenRef sub-element values are used by all HOA channels in audioBlockFormat. Then, the speaker decoding matrix is calculated, and the HOA signal rendering output is obtained according to the formula (C.16):

$S_{spk} = DS_{HOA}$...........................(C.16)

S_{spk} is a target speaker signal matrix, and has $N_{\mathrm{spk}} \times N_{\mathrm{samp}}$ dimensions;

S_{HOA} is an HOA audio signal matrix, and has $N_{\mathrm{HOA}} \times N_{\mathrm{samp}}$ dimensions;

D is an HOA decoding matrix, and has $N_{\mathrm{spk}} \times N_{\mathrm{HOA}}$ dimensions;

$\mathrm{N_{HOA}}$, $\mathrm{N_{spk}}$ and $\mathrm{N_{spk}}$ respectively indicates the HOA signal, the speaker signal, and the number of samples.

The AllRAD-based HOA decoding method is used for rendering. The decoder D of the HOA calculates the gain value HOAnspN_gain of each HOA track for each sound box, and outputs the multi-track HOA signal to an independent sound box. The decoding matrix D calculated for the HOA channel through the HOA gain calculation is directly applied to the input audio channel to produce the output audio channel.

AllRAD describes the Ambisonic gain $\mathrm{D}g_{AllRAD}(\theta)$=$D_{y_N}(\theta)$ by using the decoder D. The result of D is the most matching gain $g_{\mathrm{VBAP}}(\theta)$ of VBAP-based point sound source positioning. If there is no maximum weight, D is used to define AllRAD for rendering. The integral of D indicates the minimum mean square error of the integral in all directions θ. For specific calculation, refer to formula (C.17):

$\min_{D} \int_{S^2} \left\| g_{VBAP}(\theta) - D_{y_N}(\theta) \right\|^2 d\theta$..................(C.17)

When the sampling function $\mathrm{g_{AMBI}}(\theta) = \mathrm{y_N}(\theta)\mathrm{diag}\{\mathrm{a_N}\}\mathrm{y_N}(\theta_s)$ at the optimal layout of the virtual speaker is used as a plurality of virtual source inputs, AllRAD may be defined as a VBAP synthesis on a physical speaker.

The VBAP synthesis g is an integral on an infinite plurality of virtual speakers θ. For specific calculation, refer to formula (C.18):

$$g = \int g_{VBAP}(\theta) g_{AMBI}(\theta)\, d\theta = \int g_{VBAP}(\theta) y_N(\theta) diag\{a_N\} y_N(\theta_s)\, d\theta$$

$$= \underbrace{\int g_{VBAP}(\theta) y_N^T(\theta)\, d\theta}_{D}\, diag\{a_N\} y_N(\theta_s) \text{..........(C.18)}$$

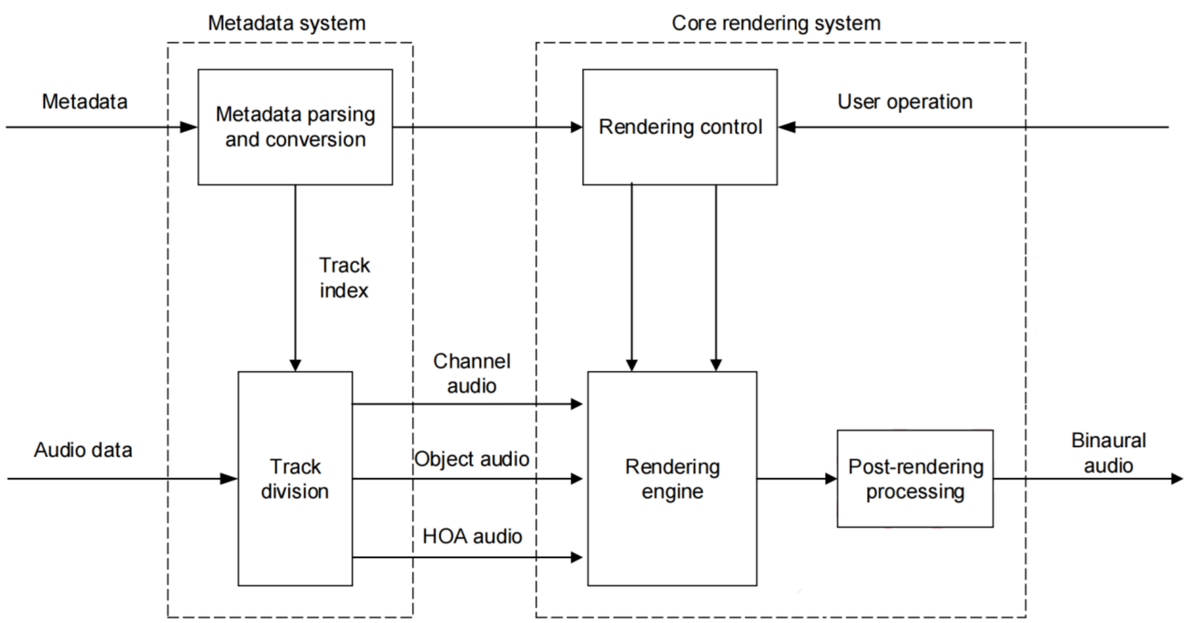
The item $diag\{a_N\}y_N(\theta_s)$ is extracted from the integral. The remaining integral defines the matrix D of AllRAD, which is used as the transform of the VBAP speaker gain function $g_{\mathrm{VBAP}}(\theta)$ to the polar coordinate coefficient. This method may provide the most matching HOA decoding on an irregular speaker layout. The HOA signal may be decoded based on the matrix D of AllRAD to virtual speakers evenly distributed on the sphere, and virtual speaker signals can be generated on actual speakers through point sound source positioning.

C.3 Binaural Rendering

C.3.1 Binaural Rendering System Framework

The binaural rendering system mainly includes a metadata system and a core rendering system. The metadata system parses and converts the metadata. The metadata includes control information that describes audio content and the rendering system, for example, whether an input audio format is channel audio, object audio, or HOA, and sound source position information of the object audio. If the input audio is in the interleaved format, the audio track further needs to be divided based on the audio track index in the metadata.. The core rendering system performs binauralizing rendering on different audio signals and corresponding metadata to output binaural audio. For the system framework, refer to Figure C.6:

Figure C.6 Binaural rendering system framework



C.3.1.1 Binaural Rendering System Input

The input of the rendering system includes audio data and metadata. The audio data supports channel audio, object audio, and HOA audio. The audio data and the metadata may be read from a local file, or may be read from a decoded bitstream. The former is applicable to an offline production scenario, and the latter is applicable to a streaming rendering scenario.

The metadata includes audioProgramme, audioContent, audioObject, audioTrackUID, audioPackFormat, audioTrackFormat, audioStreamFormat, audioChannelFormat and audioBlockFormat. The first four are content-related metadata, and the rest are format-related metadata.

When a file is input for binaural rendering, the file needs to include both audio data and metadata. Generally, a file in a BW64 format is used as a carrier, the metadata is stored in axmlChunk, and a correspondence between an audio track index and the metadata is stored in chnaChunk. For details about how to parse a file in the BW64 format, refer to ITU-R BS.2088.

When a real-time decoded bitstream is input for binaural rendering, the decoded metadata is required to indicate the correspondence between the audio track and the metadata.

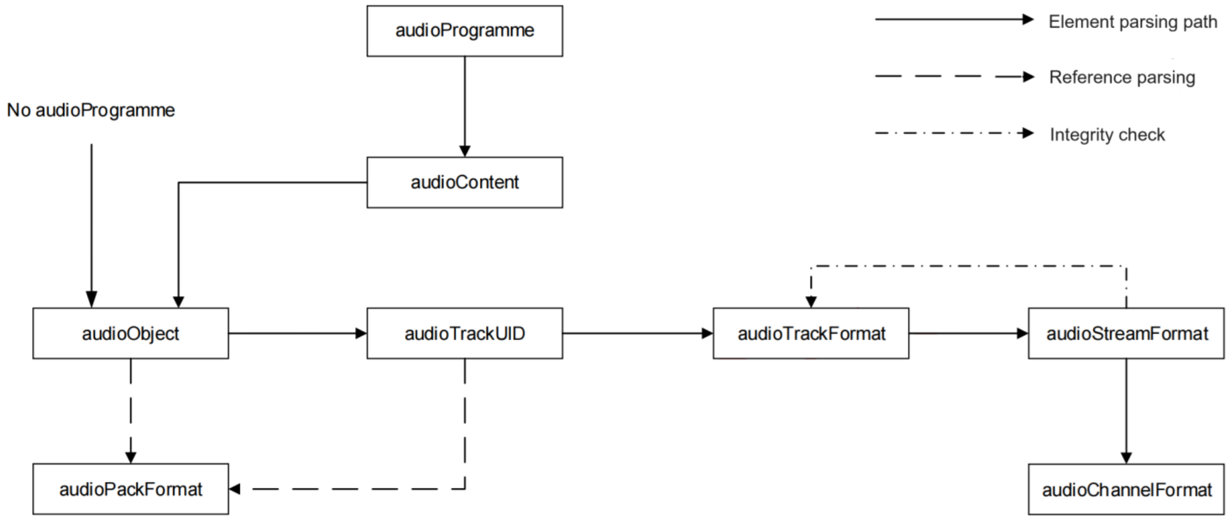
C.3.1.2 Metadata Parsing and Conversion

After the metadata is read from the BW64 file or the decoded bitstream, the metadata needs to be further parsed. To adapt to use of the renderer, metadata conversion usually needs to be further performed, to convert the metadata obtained through parsing into a format that can be supported by the renderer. The metadata obtained from the decoded bitstream does not need to be parsed additionally, but metadata conversion also needs to be performed to meet requirements in different scenarios.

The BW64 file or decoding bitstream is parsed into an element consistent with the metadata definition. Some metadata that cannot be readily used by the renderer, such as speakerLabel,needs to be converted into metadata that can be readily used by the renderer. For dynamic metadata, such as position information of the object audio, interpolation needs to be further performed to prevent audio jump or break after rendering.

Elements of the metadata have a mutual inclusion relationship and a mutual dependency relationship. During parsing, the zeroth audioProgramme element is used as an entry by default. For a metadata parsing process, refer to Figure C.7.

Figure C.7 Metadata parsing process



The following should be specially noted during metadata parsing:

(a) The default value of audioProgramme is allowed. In this case, audioObject is used as the metadata parsing entry.

(b) Check whether the reference of audioPackFormat in audioObject is the same as that in audioTrackUID.

(c) The audioTrackFormats referenced in audioStreamFormat is optional. The mutual reference between audioTrackFormat and audioStreamFormat is reverse to each other.

If audioChannelFormat in the channel audio includes only speakerLabel but does not include the speaker layout position of the corresponding channel, the corresponding sound source position parameter needs to be found based on speakerLabel for rendering. For the conversion method, refer to GY/T 316-2018. The following is an example of the conversion method:

```
convert_label_to_positiion() {
    switch speaker_label:
        case FrontLeft:
          return {30, 0, 1};
        case Center:
         return {0, 0 , 1};
        ......
}
```

When a file is input, interpolation needs to be performed for dynamic metadata, for example, object audio position parameters, to ensure the rendering effect. This is because the frame length of the renderer is different from the duration of audioBlockFormat. When the duration of two adjacent blocks is greater than the frame length T_d, a break or jump may occur in the auditory sense. The frame length is determined according to section C.3.2 Core Rendering Engine.To obtain the continuous auditory effect, interpolation needs to be performed on the dynamic metadata. The linear interpolation method is used, and the main steps are divided into framing and interpolation.

(1) Framing

Each frame of data includes N sampling points, and the sampling rate is f_s. For the number T_d of milliseconds corresponding to the duration of each frame of data, refer to the formula (C.19):

$$T_d = 1000\frac{N}{F_s} \qquad (C.19)$$

The block 1 and the block 2 are two consecutive blocks. A relative start time and duration of the block 1 are T_1 and D_1, and a relative start time and duration of the block 2 are T_2, and D_2.

The number of frames in block 1 is $\frac{D_1}{T_d}$. If D_1 cannot be exactly divided by T_d, the block 1 is split into two segments. The duration of the first segment can be exactly divided by T_d to obtain the largest value. For the corresponding number N_1 of frames, refer to formula (C.20):

$$N_1 = \lfloor\frac{D_1}{T_d}\rfloor \qquad (C.20)$$

The remaining part and the block 2 are combined into a new block, and this framing operation is repeated. For a relative start time T_2' of the new block, refer to formula (C.21):

$$T_2' = T_2 - (D_1 - T_d * N_1) \qquad (C.21)$$

For calculation of the duration D_2', refer to formula (C.22):

$$D_2' = D_2 + (D_1 - T_d * N_1) \qquad (C.22)$$

Each block is framed according to a sequence until all blocks are processed.

(2) Interpolation

The position parameter of audioBlockFormat1 is p_1, and the position parameter of audioBlockFormat2 is p_2. The start point position of interpolation is the block1 (x_1, y_1, z_1), and the end point position is the block2(x_2, y_2, z_2). The start point and end point of interpolation are determined by the values of jumpPosition and interpolationLength in the metadata.

When jumpPosition is 0, interpolation is performed on the entire data block. The start point block 1 of interpolation is the same as that of p_1, and the end point block 2 is the same as that of p_2.If the length of interpolationLength is 0, interpolation is not performed. The duration of p_1 is the same as the duration of audioBlockFormat1. When interpolationLength is greater than 0, interpolation is performed only on the first interpolationLength-th samples of audioBlockFormat1, and interpolation is not performed on the remaining part.It can be learned from framing that the block 1 is divided into N1 frames. For an x-coordinate linear interpolation step Δx from the block 1 to the block 2, refer to formula (C.23):

$$\Delta x = \frac{x_2 - x_1}{N_1} \qquad (C.23)$$

It is assumed that the x coordinate of the block 1 is x_0. For the coordinates $x_1, x_2, x_3 ... x_n$ after interpolation, refer to the formula (C.24):

$x_{n+1} = x_n + \Delta x$ ....(C.24)

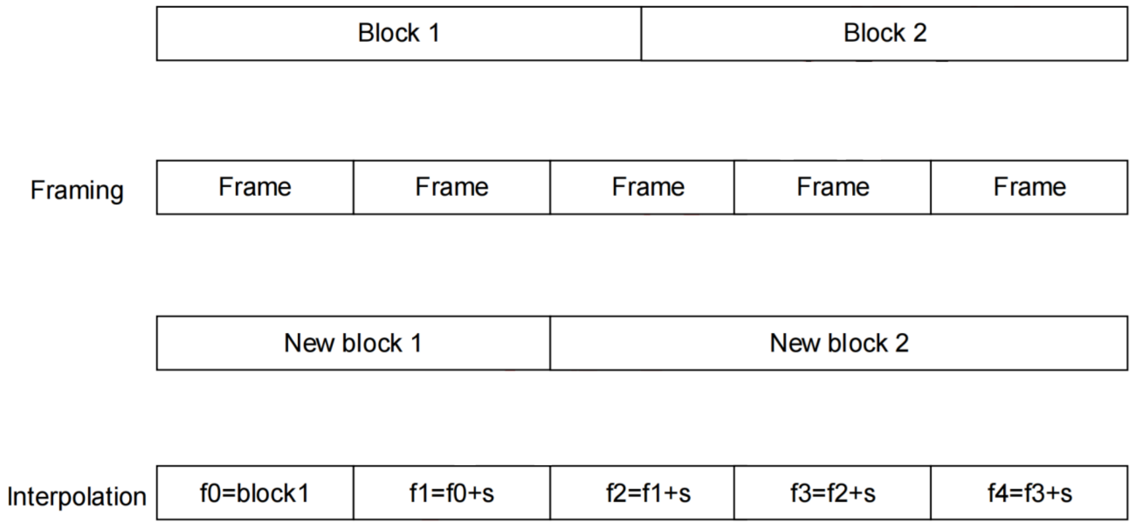
$n \in [0, N_1)$.

Coordinates of the block 1 after interpolation are (x_n, y_n, z_n), and $n \in [0, N_1)$.

The method for calculating the step of the y coordinate and the z coordinate is the same as that for calculating the step of the x coordinate.

For the process of framing and interpolation, refer to Figure C.8.

Figure C.8 Flowchart of dynamic metadata framing and interpolation



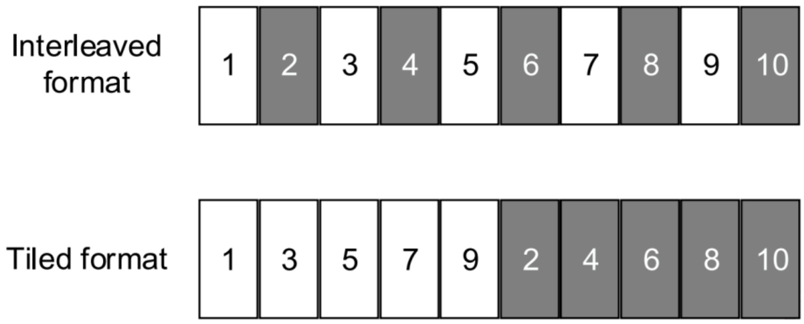
The value range of the horizontal azimuth is [0, ±180]. There is a critical point of ±180. When the horizontal azimuth increases continuously, the horizontal azimuth returns to the origin. The interpolation calculation uses the proximity principle. For example, the interpolation is performed from azimuth 1 = 170 to azimuth 2 = –170. If counterclockwise interpolation is performed, the absolute difference between two points is 20. If clockwise interpolation is performed, the absolute difference between two points is 340. Therefore, the counterclockwise difference is selected, and the interpolation is performed according to a sequence of 170–180– (–170).

C.3.1.3 Track division

When the input audio data is in the interleaved format, the audio data of the channels is aliased together. Because metadata needs to be associated and rendered by channel during rendering, the audio in the interleaved format needs to be separated into audio in the tiled form. In this way, each channel has a one-to-one correspondence to an audio track index in the metadata.

The dual-channel audio is used as an example. Figure C.9 shows the principle of audio separation. The upper part of the figure is the audio in the interleaved format. The oddnumbered unit and even-numbered unit respectively indicate the sampling points of the two channels. The lower part is the separated audio in the tiled format. After the separation, the sampling points of each channel are stored in the same audio data block.

Figure C.9 Audio separation principle



The following is an example of the track division code:

```
convert_interleave_to_plannar() {
    for (int i = 0; i < channel; ++i) {
        for (int j = 0; j < sample; ++j) {
            plannar_audio[i][j] = interleave_audio[j * channel + i];
        }
    }
}
```

After track division, the channel audio, the object audio, and the HOA audio can be separated based on the track index in the metadata. An example of the method is as follows:

```
get_channel_base_audio() {
    return pannar_audio[channels_index];
}
get_object_base_audio() {
    return pannar_audio[objects_index];
}
get_hoa_base_audio() {
    return pannar_audio[hoa_index];
}
```

C.3.1.4 Rendering Control

Rendering control controls the renderer behavior based on the parameters provided in the metadata, adds sound sources based on the audio track index in the metadata, audio type, and position parameters of channels of the channel audio and object audio, and adds the HOA audio based on the type, order, and degree of the HOA audio.

The following is an example of adding various types of sound sources:

```
if (type == DirectSpeaker) {
    add_channel_base_audio_by_index()
```

```
} else if (type == Object) {
    add_object_base_audio_by_index()
} else if (type == HOA) {
    add_hoa_base_audio_by_index()
}
```

Rendering control updates the position information of the object audio in real time based on the dynamic metadata, and obtains the audio effect of the motion in the space through rendering. An example of the method for setting the real-time position parameter of the object audio is as follows:

```
set_object_base_audio_position() {
    update_source_position_by_index()
}
```

Other functions of rendering control, such as controlling program switching, are implemented by using a similar method.

C.3.1.5 Rendering Engine

The rendering engine implements binaural rendering on the input audio based on the metadata, and outputs the binaural audio. Content of the core rendering engine is described in detail in section C.3.2.

C.3.1.6 Post-rendering Processing

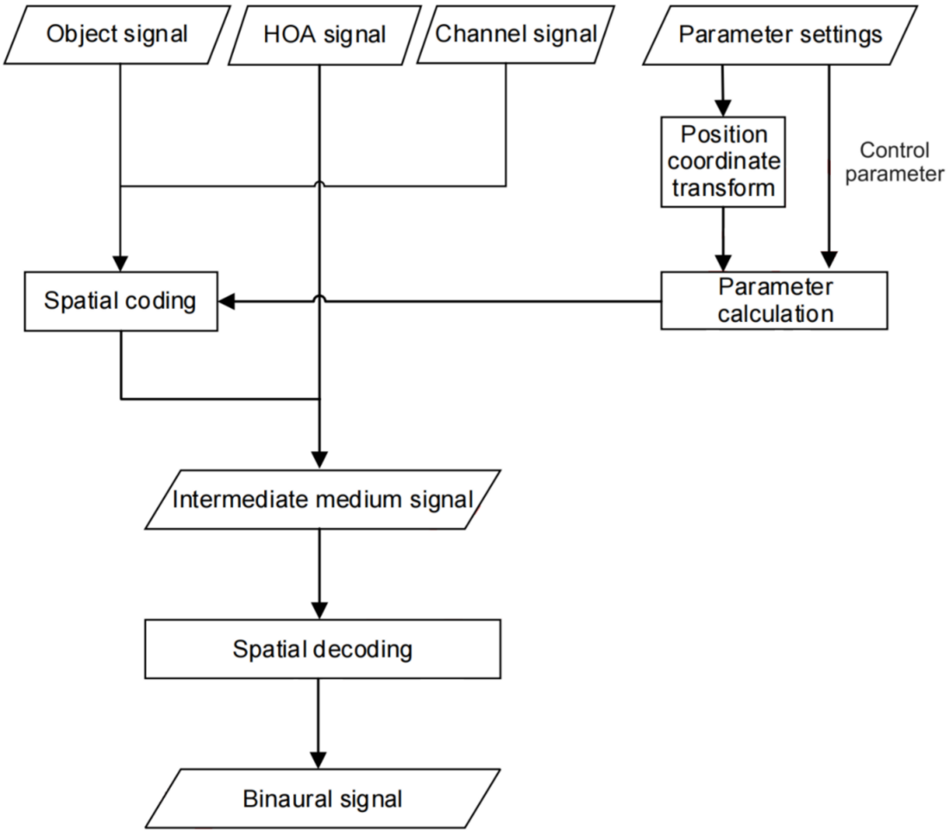
During post-rendering processing, the output binaural audio is corrected, for example, dynamic range control and loudness control. After binauralizing rendering, the amplitude and loudness of the binaural audio obtained through rendering change due to the gain of the header transmission function. When the dynamic and loudness differences between the output audio and the input audio are great, dynamic control and loudness control should be used for adjustment to accurately recover the expression intention of the rendering sequence.Otherwise, extreme cases such as crackle and crack sound may occur. For the loudness control, refer to ITU-R BS.1770. Dynamic control uses a limiter to ensure the dynamic range of the output audio.

C.3.2 Principle of Binaural Rendering Engine

C.3.2.1 Overview

The binaural rendering engine uses the sound field reconstruction technology based on the Ambisonic kernel, uses the spherical harmonic function to code input audio to the spherical harmonic domain based on metadata, and stores the input audio in the Ambisonic format as an intermediate medium signal. Spatial encoding includes spatial coding of channel audio and spatial coding of object audio. Because the HOA audio is in the Ambisonic format, it only needs to be superimposed on the intermediate medium signal without spatial coding. During spatial coding, coordinate transform needs to be performed on the sound source position parameter before the parameter is used. In addition, spatial coding also needs to respond to the control parameter in the metadata and the user interaction. Finally, the binaural audio is output after spatial decoding is performed on the Ambisonic signal. Parameter calculation indicates calculation and conversion of control parameters, for example, coordinate system conversion of position parameters and object audio position update. For the flowchart of the binaural rendering engine, refer to Figure C.10.

Figure C.10 Principle diagram of binaural rendering engine



C.3.2.2 Position parameter coordinate conversion

The coordinate system used by metadata supports the Cartesian coordinate system and the spherical coordinate system. The metadata spherical coordinate system is shown in (a) in Figure C.11, and the metadata Cartesian coordinate system is shown in (b) in Figure C.11. The audio coordinate system shown in (d) in Figure C.11 is used during spatial encoding. The external interface of the renderer provides the function of setting the position information of multi-channel audio and object audio. This function uses the world coordinate system shown in (c) in Figure C.11. The coordinate systems are described as follows:

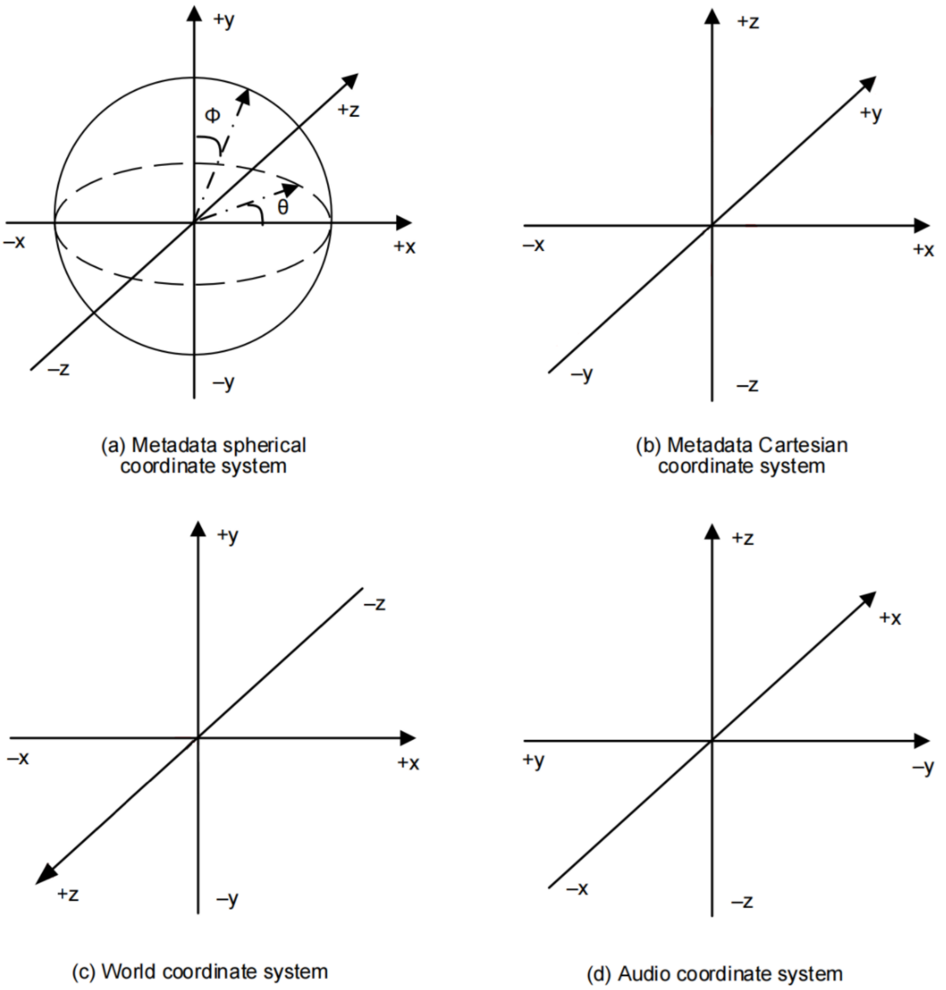
Metadata Cartesian coordinate system: X points to the right, Y points to the inside of the screen, Z points to the sky, and a human view direction is the positive direction of the Y axis.

Metadata spherical coordinate system: θ is an angle between a projection of the target point on the xy plane and a positive direction of the x axis. φ is an angle between a connection line between the target point and the origin and a positive direction of the z axis. r is a distance from the target point to the origin.

World coordinate system: X points to the right, Y points to the sky, Z points to the outside of the screen, and a human view direction is the positive direction of the Z axis.

Audio coordinate system: X points to the inside of the screen, Y points to the left, Z points to the sky, and a human view direction is the positive direction of the X axis.

Figure C.11 Definitions of coordinate systems



The method for converting the metadata spherical coordinates (r, azimuth, elevation) into the metadata Cartesian coordinates (x, y, z) is as follows:

```
polar_to_cartisian() {
    x = r * sin(-azimuth) * cos(elevation)
    y = r * cos(-azimuth) * sin(elevation)
    z = r * sin(elevation)
    return {x, y, z}
}
```

The method for converting the metadata Cartesian coordinates (x, y, z) into the world coordinates (x', y', z') is as follows:

```
cartisian_to_world() {
    x' = -x
    y' = z
```

```
        z'= y
        return { x', y' ,z' }
    }
```

The method for converting the world coordinates (x', y', z') into the audio coordinates (x", y", z") is as follows:

```
    world_to_audio() {
        x" = z'
      y" = x'
      z" = y'
       return { x", y", z"}
    }
```

C.3.2.3 Spatial Coding

The Ambisonic technology is used for spatial coding. The spherical harmonic function is used to perform spatial coding on the channel audio and object audio. The coded intermediate media are uniformly in the ACN SN3D format. The HOA audio is in the Ambisonic format. It only needs to be superimposed on the intermediate media signals obtained through spatial coding. The input HOA audio supports two formats: ACN SN3D and ACN N3D. The format of the input HOA audio is determined through parameter setting. For the spherical harmonic function Y_n^m, refer to formula (C.25):

$$Y_n^m = (-1)^m \sqrt{\frac{(2n+1)(n-|m|)!}{4\pi(n+|m|)!}} P_n^m(cos\theta)e^{im\varphi} \text{ ....(C.25)}$$

n is an order of the spherical harmonic function, and m is a degree of the spherical harmonic function. In subsequent content of this chapter, n is used as an order, and m is used as a degree by default. θ and φ describe the horizontal azimuth and pitch angle of the spatial position information of the sound source. In an actual application, a real number form of the spherical harmonic function is usually used, and $e^{im\varphi}$ is replaced with $\Phi_m(\varphi)$. Refer to formula (C.26):

$$\Phi_m(\varphi) = \begin{cases} \sqrt{2}sin(|m|\varphi) & m < 0 \\ 1 & m = 0 \\ \sqrt{2}cos(|m|\varphi) & m > 0 \end{cases} \text{.......................(C.26)}$$

P_n^m is an accompanying Legendre polynomial. Refer to formula (C.27):

$$P_n^m(x) = (1-x^2)^{|m|/2} \frac{d^{|m|}}{dx^{|m|}} P_n(x) \text{.......................(C.27)}$$

$P_n(x)$ is n-order Legendre polynomial. Refer to formula (C.28):

$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2-1)^n \text{ . ...(C.28)}$$

Y_n^m supports the order 1 to order 7, that is, $N \in [1,7]$. For the N-order spherical harmonic function, $n \in [0, \mathrm{N}]$, and $m \in [-N, N]$. The higher order of the spherical harmonic function indicates the higher precision and a better sense of space and surrounding after binauralization.

During spatial coding, an audio signal $\omega(\theta, \varphi)$ is coded to a spherical harmonic domain according to a spherical harmonic function Y_n^m, to generate an n-order Ambisonic signal S_{HOA}. Refer to formula (C.29):

$S_{HOA}(\theta,\varphi) = Y_n^m \cdot \omega(\theta,\varphi)$ . ...(C.29)

$\omega(\theta,\varphi)$ indicates input audio at a certain position of the space, and includes audio data and metadata.

After spatial coding is performed by channel, all input signals are superimposed on S_{HOA} for storage as intermediate medium signals $S_{HOA}(n)$. Refer to formula (C.30):

$S_{HOA}(n) = \sum_{i=0}^{L-1} S_{HOA}(\theta,\varphi)_i$ . ...(C.30)

L is the number of sound sources participating in spatial coding.

C.3.2.4 Spatial Decoding

The intermediate medium signal $S_{HOA}(n)$ obtained through spatial coding indicates the Ambisonic signal reconstructed by the three-dimensional audio field of the input audio. Based on this, the $S_{HOA}(n)$ signal is filtered according to the spherical harmonic domain header transmission function h_s to obtain the binaural output signal b_ω. Refer to formula (C.31):

$b_\omega(n) = \sum_{m=0}^{M-1} S_{HOA}(n) \cdot h_s(n-m)$ . ...(C.31)

M is a length of the header transmission function h_s, and is fixed at 256, and n is a length of binauralized data. The spherical harmonic domain header transmission function h_s is obtained by converting the time-domain header transmission function h. The least square method is used to obtain the error of h_s and h. When the error reaches the minimum, the rendering effect of h_s and h is considered to be the same. For the definition of the error e, refer to formula (C.32):

$e = min \sum_{\Omega \in S^2} |h_s \cdot Y_n^m(\Omega) - h(\Omega)|^2$ . ...(C.32)

Ω is the angle at any position on the sphere. The h_s calculated at the minimum error e is the header transmission function in spherical harmonic domain.

Because the length of the header transmission function is fixed, the length of the data for each binauralization is also fixed. Therefore, the lengths of the input and output data of each frame of the renderer should be determined during renderer initialization. Typical frame lengths (numbers of sampling points) supported by the renderer are 128, 256, 512, 1024, and 2048. The frame length is also used for framing and interpolation of dynamic metadata.

C.3.2.5 LFE Channel Processing

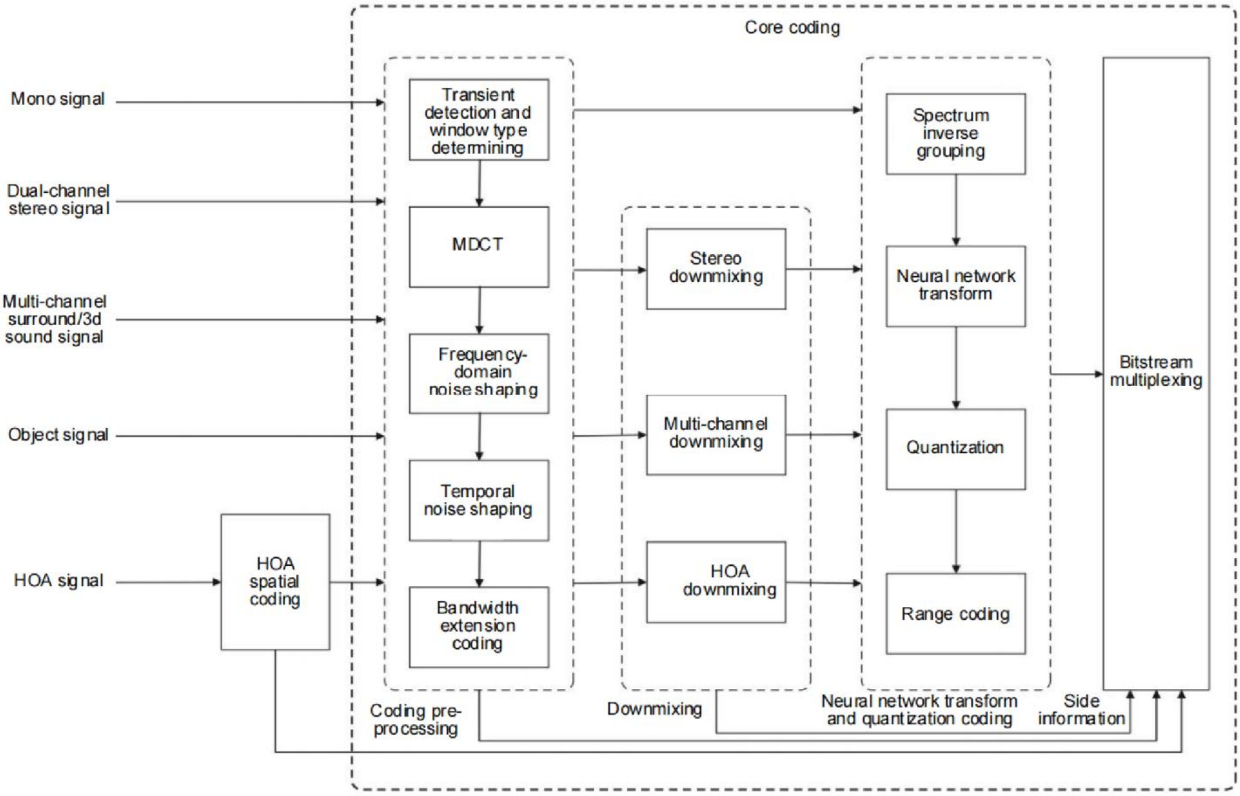
The multi-channel audio usually has an LFE bass channel. During speaker rendering, the bass channel can be rendered by using a high-power subwoofer to obtain the stunning effect. The binaural rendering uses headphones as a playback device. Because the power of the headphones is low, and the low-frequency effect is not obvious, the bass LFE channel may be ignored during binaural rendering.

Annex D (Informative) General Full-rate Audio Coding

D.1 Coding Framework

The general full-rate audio coding includes core coding and HOA spatial coding. The core coding includes coding pre-processing, downmixing, spectrum grouping, neural network transform, quantization, and range coding. Coding pre-processing includes transient detection, window type determining, MDCT, frequency-domain noise shaping, temporal noise shaping, and bandwidth extension coding. A channel signal and an object signal are coded into bitstreams through core coding, and an HOA signal is coded into a bitstream through HOA spatial coding and the core coding. Figure D.1 is a schematic diagram of the coding framework.

Figure D.1 General full-rate audio coding framework



Each channel signal is transformed from time domain to frequency domain and pre-processed through coding pre-processing. The pre-processed frequency-domain signal is downmixed through signal downmixing in different coding modes to remove the correlation between channels. During neural network transform, quantization, and range coding, a neural network is used to transform and code each downmixed channel. The HOA signal is converted through HOA spatial coding into a transmission channel signal. The following describes each mode coding module.

a) General full-rate audio mono coding

Figure D.2 and Figure D.3 are schematic diagrams of basic structures of the general full-rate audio mono coding. The mono coder performs coding pre-processing on the time-domain mono signal to obtain a processed MDCT coefficient, performs neural network transform to obtain a transform-domain coefficient, and finally performs quantization and range coding to obtain a bitstream. The coding pre-processing module includes a transient detection and window type determining module, a frequency-domain noise shaping module, a temporal noise shaping module, and a bandwidth extension coding module.

1) Transient detection and window type determining

The transient detection module determines, based on the energy of the input time-domain signal, whether there is a transient signal in the current frame. The window type determining module obtains a windowed control parameter of the current frame based on the transient signal detection result. The windowed control parameter includes a 2048- point sine window, a 256-point sine window, and a 2048-point switching window.
− Input: the time-domain mono signal
− Output: the windowed control parameter

2) MDCT

The MDCT module performs windowing and MDCT on the input time-domain signal based on the windowed control parameter.
− Input: the mono time-domain signal and the windowed control parameter
− Output: an MDCT coefficient of the mono signal

3) Frequency-domain noise shaping

The frequency-domain noise shaping module obtains quantized spectral envelope information based on the input time-domain signal, and adjusts the MDCT coefficient based on the quantized spectral envelope information to implement MDCT spectrum shaping, thereby controlling distribution of quantized noise in frequency domain.
− Input: the windowed time-domain signal and the MDCT coefficient of the mono signal
− Output: an MDCT coefficient of the mono signal after frequency-domain noise shaping

and a frequency-domain noise shaping parameter

4) Temporal noise shaping

The temporal noise shaping module obtains a temporal noise shaping parameter based on the MDCT coefficient after frequency-domain noise shaping, and shapes the MDCT coefficient based on the temporal noise shaping parameter, to control distribution of quantized noise in time domain.
− Input: the MDCT coefficient of the mono signal after frequency-domain noise shaping
− Output: an MDCT coefficient of the mono signal after temporal noise shaping and the temporal noise shaping parameter

5) Bandwidth extension coding

The bandwidth extension coding module obtains a bandwidth extension parameter based on the MDCT coefficient obtained after temporal noise shaping, to indicate a correlation between high and low frequencies of the MDCT spectrum of the signal, so as to assist the decoder in recovering the high frequency component.
− Input: the MDCT coefficient of the mono signal after temporal noise shaping
− Output: a bandwidth extension parameter

6) Neural network transform

The neural network transform module transforms, by using a neural network, the MDCT coefficient after coding pre-processing, to further remove information redundancy in the spectral coefficient. An output of the neural network is referred to as a transform-domain coefficient, and the transform-domain coefficient is used for quantization and range coding.

− Input: the pre-processed MDCT coefficient of the mono signal

− Output: the transform-domain coefficient

7) Quantization and range coding

The quantization module performs linear scalar quantization on the transform-domain coefficient obtained through neural network transform, and the coding module performs range coding on a quantization result to obtain a bitstream.

− Input: the transform-domain coefficient

− Output: a bitstream

Figure D.2 General full-rate audio mono coder

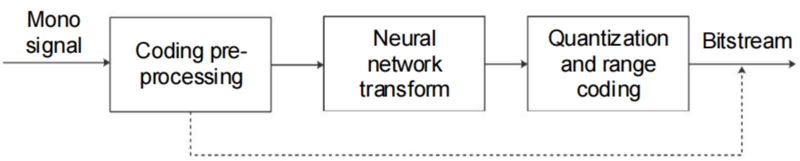
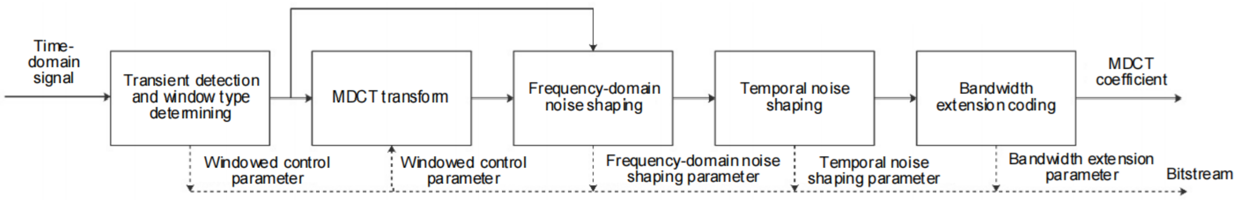


Figure D.3 General full-rate audio coding pre-processing



b) General full-rate audio dual-channel stereo coding

Figure D.4 is a schematic diagram of a basic structure of the general full-rate audio dualchannel stereo coding. The dual-channel stereo coder performs dual-channel stereo coding pre-processing on a time-domain dual-channel stereo signal to obtain a processed dualchannel stereo MDCT coefficient, obtains a downmixed dual-channel stereo MDCT coefficient through a dual-channel stereo downmixing and bit allocation module, obtains a transformdomain coefficient through neural network transform, and finally obtains a bitstream through quantization and range coding. The dual-channel stereo coding pre-processing module includes a transient detection and window type determining module, a frequency-domain noise shaping module, a temporal noise shaping module, and a bandwidth extension coding module.

1) Dual-channel stereo coding pre-processing

The dual-channel stereo coding pre-processing module performs coding pre-processing on each channel of the dual-channel stereo, and includes a transient detection and window type determining module, a frequency-domain noise shaping module, a temporal noise shaping module, and a bandwidth extension coding module.

− Input: a time-domain dual-channel stereo signal

− Output: an MDCT coefficient of the pre-processed dual-channel stereo signal, a windowed control parameter, a frequency-domain noise shaping parameter, a temporal noise shaping parameter, and a bandwidth extension parameter

2) Dual-channel stereo downmixing and bit allocation

The dual-channel stereo downmixing and bit allocation module performs MCR or M/S downmixing and bit allocation on the left and right channel MDCT coefficient based on the dual-channel stereo signal feature.

− Input: the MDCT coefficient of the pre-processed dual-channel stereo signal

− Output: a downmixed channel MDCT coefficient and a bit allocation parameter

3) Neural network transform

− Input: the downmixed channel MDCT coefficient

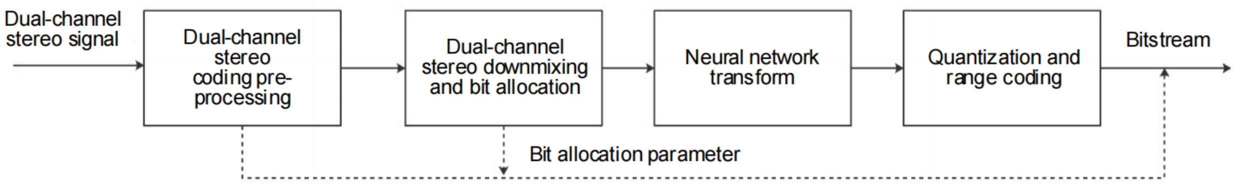
− Output: a downmixed channel transform-domain coefficient

4) Quantization and range coding

− Input: the downmixed channel transform-domain coefficient

− Output: a bitstream

Figure D.4 General full-rate audio dual-channel stereo coder



c) General full-rate audio multi-channel coding

Figure D.5 is a schematic diagram of a basic structure of the general full-rate audio multi-channel coding. The multi-channel coder performs coding pre-processing on a time-domain multi-channel signal to obtain a processed MDCT coefficient, obtains a multi-channel downmixing parameter through the multi-channel mode determining module, obtains a downmixed multi-channel MDCT coefficient through a multi-channel downmixing and bit allocation module, obtains a transform-domain coefficient through neural network transform, and finally obtains a bitstream through quantization and range coding. The coding pre-processing module includes a transient detection and window type determining module, a frequency-domain noise shaping module, a temporal noise shaping module, and a bandwidth extension coding module.

1) Multi-channel coding pre-processing

The multi-channel coding pre-processing module performs coding pre-processing on each channel.

− Input: the time-domain multi-channel signal

− Output: an MDCT coefficient of the pre-processed multi-channel signal, a windowed control parameter, a frequency-domain noise shaping parameter, a temporal noise shaping parameter, and a bandwidth extension parameter

2) Multi-channel mode determining

The multi-channel mode determining module determines a multi-channel signal coding mode parameter based on the multi-channel signal features and the signal correlation.
− Input: the MDCT coefficient of the pre-processed multi-channel signal
− Output: the multi-channel signal coding mode parameter

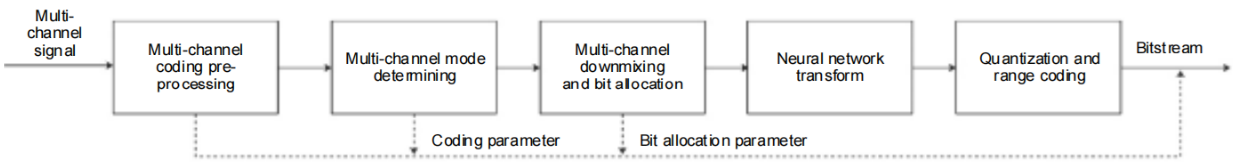
3) Multi-channel downmixing and bit allocation

The multi-channel signal downmixing module performs multi-channel downmixing on the MDCT coefficient of the pre-processed multi-channel signal based on the multi-channel signal coding mode parameter, and performs M/S downmixing on MDCT coefficients of two channels in each group based on a pair parameter. The bit allocation module is configured to determine a bit allocation parameter.
− Input: the MDCT coefficient of the pre-processed multi-channel signal and the multi-channel signal coding mode parameter
− Output: a downmixed multi-channel MDCT coefficient and the bit allocation parameter

4) Neural network transform
− Input: the downmixed multi-channel MDCT coefficient
− Output: a downmixed multi-channel transform-domain coefficient

5) Quantization and range coding
− Input: the downmixed multi-channel transform-domain coefficient
− Output: a bitstream

Figure D.5 General full-rate audio multi-channel coder



d) General full-rate audio HOA coding

Figure D.6 and Figure D.7 are schematic diagrams of basic structures of the general full-rate audio HOA coding. HOA spatial coding is performed on the HOA signal to obtain a transmission channel signal, and then transmission channel coding pre-processing is performed to obtain a processed MDCT coefficient. The HOA downmixing and bit allocation module obtains a downmixed transmission channel MDCT coefficient. Neural network transform is performed to obtain a transform-doamin coefficient. Finally, quantification and coding are performed to obtain a bitstream. HOA spatial coding includes a sound field component analysis module, a sound field component synthesis module, and an other component calculation module. The coding pre-processing module includes a transient detection and window type determining module, a frequency-domain noise shaping module, a temporal noise shaping module, and a bandwidth extension coding module.

1) Sound field component analysis

The sound field component analysis module performs sound field component analysis on an HOA signal through linear decomposition to determine the sound field distribution features, such as the number of sound sources, directivity of sound sources, and dispersion of sound sources.
− Input: the HOA signal
− Output: a sound field analysis parameter

2) Sound field component synthesis

The sound field component synthesis module configures the coder based on the sound field analysis parameters and other configuration parameters, determines a sound field component parameter based on the main sound field component of the HOA signal, and synthesizes a transmission channel signal through linear reversible conversion. The sound field component parameter includes virtual speaker attribute information, and the transmission channel signal includes a virtual speaker signal.
− Input: the HOA signal and the sound field analysis parameter
− Output: a sound field component parameter and a transmission channel signal

3) Other component calculation

The remaining component calculation module configures the encoder based on the sound field analysis parameter and other configuration parameters, and determines a transmission channel signal and an other component parameter based on the HOA signal, the virtual speaker signal, and the sound field component parameter. The transmission channel signal includes a residual signal.
− Input: the HOA signal, the sound field analysis parameter, and the sound field component parameter
− Output: the transmission channel signal and the other component parameter

4) Transmission channel coding pre-processing

The transmission channel coding pre-processing module performs coding pre-processing on each channel, including a transient detection and window type determining module, a frequency-domain noise shaping module, a temporal noise shaping module, and a bandwidth extension coding module.
− Input: the time-domain transmission channel signal
− Output: an MDCT coefficient of the pre-processed transmission channel signal, a windowed control parameter, a frequency-domain noise shaping parameter, a temporal noise shaping parameter, and a bandwidth extension parameter

5) Transmission channel mode determining

The transmission channel mode determining module determines the transmission channel signal coding mode parameter based on the transmission channel signal features and the sound field analysis parameter, for example, the grouping parameter, the bandwidth parameter, the downmixing parameter, and the initial bit allocation parameter.
− Input: the MDCT coefficient of the pre-processed transmission channel signal and the sound field analysis parameter
− Output: a transmission channel coding mode parameter

6) HOA downmixing and bit allocation

The HOA downmixing and bit allocation modules perform downmixing and bit allocation on the transmission channel MDCT coefficient.

− Input: the MDCT coefficient of the pre-processed transmission channel signal and the transmission channel coding mode parameter

− Output: a downmixed channel MDCT coefficient and a bit allocation parameter

7) Neural network transform

− Input: the downmixed channel MDCT coefficient

− Output: a downmixed channel transform-domain coefficient

8) Quantization and coding

− Input: the downmixed channel transform-domain coefficient

− Output: a bitstream

Figure D.6 General full-rate audio HOA spatial coding

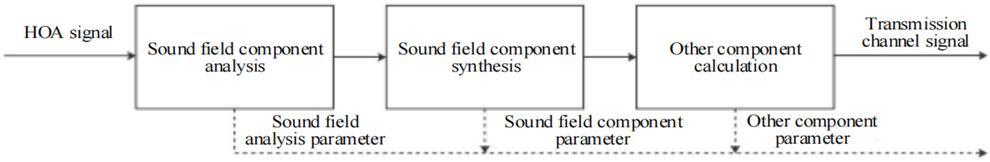
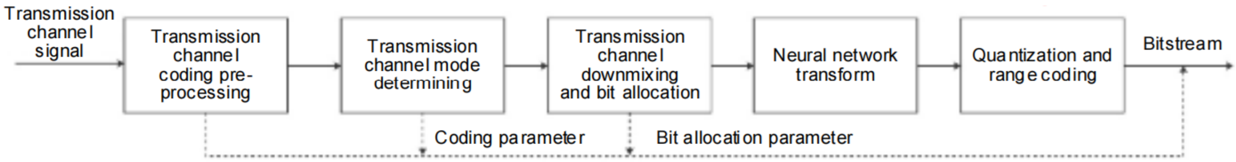


Figure D.7 General full-rate audio HOA coder



D.2 Coding Pre-processing

D.2.1 Transient Detection and Window Type Determining

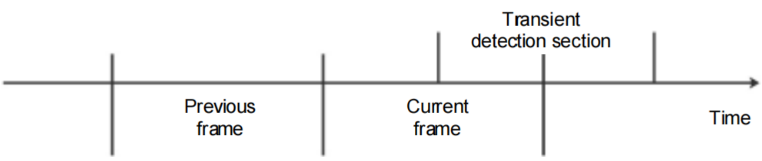
To better code audio signals with different characteristics, a transform-domain coder needs to add a short window to a transient signal to ensure a good time-domain resolution, and needs to add a long window to a steady signal to ensure a good frequency-domain resolution.

Therefore, before the window type determining is performed, transient detection needs to be performed on the input audio signal first. The transient detection determines whether the current frame is a transient signal.

The basic principle of the transient detection algorithm is as follows:

Figure D.8 is a schematic diagram of signal framing in the transient detection algorithm.

Figure D.8 Schematic diagram of signal framing in the transient detection algorithm



The length of the input audio signal of the previous frame is 1024 sampling points. The length of the input audio signal of the current frame is also 1024 sampling points. The length of the transient detection section is 1024 sampling points. The first 512 sampling points are the last 512 sampling points of the input audio signal of the current frame, and the last 512 sampling points are the 512 sampling points of the future frame, that is, the lookahead length is 512 points. The transient detection of the current frame is performed in the transient detection section. The basic process is as follows:

Step 1: Perform high-pass filtering on a signal in the transient detection section.

The energy of an audio signal is usually concentrated in a low-frequency part, and a signal whose high-frequency energy changes suddenly may be missed when transient detection is performed directly on the input audio signal.

Therefore, before the transient detection, high-pass filtering may be performed on the audio signal in the transient detection section, to suppress a low-frequency signal component to some extent, thereby facilitating detection of the transient signal.

Step 2: Divide the signal in the transient detection section into blocks, and calculate block energy and a corresponding energy threshold.

The signal in the transient detection section is divided into eight equal-length blocks. A length of the signal in the transient detection section is 1024 sampling points, and a length of a block is 128 sampling points. After the signal is divided into blocks, the energy blockEner of the signal block may be calculated, and is represented by formula (D.1):

$$blockEner[\mathrm{i}] = \sum_{n=blockStart}^{blockEnd} signal^2[n] \qquad \text{(D.1)}$$

i is a sequence number of a signal block, n is a sampling point sequence number, blockStart is a sequence number of a start point of the signal block, blockEnd is a sequence number of an end point of the signal block, and signal[n] is an audio signal of the n-th sampling point.

The transient detection requires a signal energy threshold parameter corresponding to each signal block, and a calculation process of the signal energy threshold parameter is described as follows:

It is assumed that signal energy of eight blocks is blockEner[8], a corresponding signal energy threshold is enerThresh[8], and a signal energy threshold history is enerThreshHist (initialized to a preset minimum energy value 103.37).

A manner of calculating the signal energy threshold is as follows:

```
for i = 0 to 7:
  enerThresh[i] = enerThreshHist
   enerThreshHist *= 0.8125
   if blockEner[i] > enerThreshHist:
      enerThreshHist = blockEner[i]
   end
End
```

That is, for each signal block, the signal energy threshold history enerThreshHist is used as a signal energy threshold of the current i-th block. Then, the signal energy threshold is attenuated. An attenuated signal energy threshold is compared with energy of the current block. If the energy of the current block is large, the signal energy threshold is updated.

Step 3: Perform transient detection on the current frame

Based on the signal energy blockEner of each block in the current frame and the corresponding signal energy threshold enerThresh, logic of determining the transient identifier curIsTransient of the current frame is as follows:

```
if initFrame:
  curIsTransient = 0
else:
   for i = 0 to 7:
       if blockEner[i] > 8.0 * enerThresh[i]:
          curIsTransient = 1
         break
     end
   end
end
```

That is, the transient detection result of the first frame is 0, and if a block exists in subsequent frames, and the signal energy of the block is greater than several times the signal energy threshold, it is considered that the transient signal exists, and the transient identifier is set to 1.

The window type of the current frame may be determined based on the transient detection results of the current frame and the previous two frames.

If the current frame is the i-th frame, a transient detection result of the (i–2)-th frame is denoted as preIsTransient[0], and a transient detection result of the (i–1)-th frame is denoted as preIsTransient[1].

There are four windows types windowType: a long window ONLY_LONG_WINDOW, a cut-in window LONG_SHORT_TRANS_WINDOW, a cut-out window SHORT_LONG_TRANS_WINDOW, and a short window ONLY_SHORT_WINDOW.

```
if preIsTransient[0] == 0 && preIsTransient[1] == 0 && curIsTransient == 0:
   windowType = ONLY_LONG_WINDOW
else if preIsTransient[0] == 0 && preIsTransient[1] == 0 && curIsTransient == 1:
   windowType = LONG_SHORT_TRANS_WINDOW
else if preIsTransient[0] == 1 && preIsTransient[1] == 0 && curIsTransient == 0:
  windowType = SHORT_LONG_TRANS_WINDOW
else:
   windowType = ONLY_SHORT_WINDOW
end
```

D.2.2 MDCT

Windowing and MDCT may be performed on the input audio signal of the current frame based on the window type.

The definition of each window type is as follows:

a) Long window: LONG_SHORT_TRANS_WINDOW, a sine window with a length of 2048 points.

b) Cut-in window: LONG_SHORT_TRANS_WINDOW, consisting of a left half sine window of 1024 points, 448 points of 1, a right half sine window of 128 points, and 448 points of 0

c) Cut-out window: SHORT_LONG_TRANS_WINDOW, consisting of 448 points of 0, a left half sine window of 128 points, 448 points of 1, and a right half sine window of 1024 points

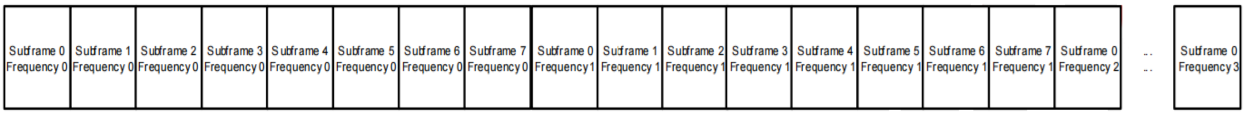
d) Short window: ONLY_SHORT_WINDOW, a sine window with a length of 256 points. Eight short windows are added to each frame.

The object of windowing and MDCT processing is a 2048-point audio signal constituted by the previous frame input signal frame_past and the current frame input signal frame_curr. The time-frequency transform is MDCT transform.

Short frame MDCT spectrum interleaving: If the window type of the current frame is ONLY_SHORT_WINDOW, interleaving needs to be performed on the MDCT spectra of eight subframes of the current frame (the length of the MDCT spectrum of each subframe is 128 frequencies) to perform subsequent coding pre-processing.

Figure D.9 is a schematic diagram of spectrum interleaving.

Figure D.9 Schematic diagram of spectrum interleaving



D.2.3 Frequency-domain Noise Shaping

The frequency-domain noise shaping algorithm is an MDCT spectrum shaping technology based on the LPC parameter, and may include: signal pre-emphasis, autocorrelation coefficient calculation, LPC parameter solving, conversion from LPC to LSF, LSF parameter quantization coding, spectrum shaping, and the like.

Pre-emphasis:

The pre-emphasis coefficient is 0.9.

The length of the windowed audio signal is 2048. The pseudocode of the pre-emphasis process is as follows:

```
for i = 2047 to 1
  preemphWinSignal[i] = winSignal[i] - preemphFactor * winSignal[i-1]
end
preemphWinSignal[0] = winSignal[0]
```

winSignal is the windowed audio signal, preemphWinSignal is the pre-emphasis audio signal, and preemphFactor is the pre-emphasis coefficient.

Autocorrelation coefficient calculation:

The LPC parameter order lpcOrder is 16, and the autocorrelation coefficient of the input signal whose length is 17 needs to be calculated. The signal used for the autocorrelation calculation is the audio signal obtained through the pre-emphasis processing.

LPC parameter solving:

The Wiener-Levinson-Durbin iterative algorithm is used to calculate the LPC parameter with the autocorrelation coefficient as the input. The parameter order is 16.

Conversion from LPC to LSF:

The LSP parameter is solved by using Chebyshev polynomial method with 16-order LPC parameter as the input.

The LSP parameter is converted to the LSF parameter. The value range of the LSF parameter is [0, samplingRate/2]. samplingRate is fixed at 48 kHz.

The conversion from the LPC parameter to the LSF parameter must comply with section 5.1.9 in 3GPP TS 26.445 (Release 17).

LSF parameter quantization coding:

The LSF parameter quantization coding uses a vector quantization technology, and the LSF parameter has 16 dimensions.

The structure of the VQ codebook is multi-stage split vector quantization. For different coding rates, two sets of vector quantization codebooks are used: high-rate vector quantization codebook and low-rate vector quantization codebook.

The method for determining whether to use the high-rate or low-rate vector quantization codebook is as follows: If the average coding rate of each channel is greater than 32 kb/s, the high-rate VQ codebook is used; otherwise, the low-rate VQ codebook is used. The average coding rate of the channels is equal to the total coding rate divided by the number of channels of the input signal.

For the structure of the high-rate codebook and the low-rate codebook, refer to section 7.11.3.

The LSF VQ process is as follows:

Step 1: mean subtraction of LSF vector

The LSF mean value is subtracted from the LSF parameter calculated for the current frame to obtain a residual LSF vector, which is used as an input vector of the VQ algorithm.

Step 2: stage 1 vector quantization

The LSF vector is divided through stage 1 vector quantization into two sub-vectors respectively having 9 and 7 dimensions. VQ codebooks respectively corresponding to the two sub-vectors are searched for to obtain several candidate stage 1 quantization results with the minimum error.

In addition, there are four candidate stage 1 quantization results.

Step 3: stage 2 vector quantization

The high rate mode is used as an example, in two stage 1 VQ sub-vectors, a sub-vector having 9 dimensions is further divided into three stage 2 sub-vectors (respectively have 3, 3, and 3 dimensions).

In the stage 2 VQ, a stage 2 residual vector is first separately calculated for the four candidate quantization results of the stage 1 VQ. Then, split vector quantization is performed on the stage 2 residual vectors to obtain stage 2 VQ errors corresponding to the four candidate quantization results. A stage 1 VQ index with a minimum stage 2 VQ error and three stage 2 VQ indexes are used as a final vector quantization result.

Spectrum shaping:

Spectrum shaping includes three steps: conversion from LSF to LPC, spectrum shaping gain calculation, and spectrum shaping.

Step 1: conversion from LSF to LPC

The quantized LSF parameter obtained through vector quantization is converted to obtain the quantized LPC parameter.

The conversion from the LSF parameter to the LPC parameter includes two steps: conversion from the LSF parameter to the LSP parameter and conversion from the LSP parameter to the LPC parameter.

Step 2: spectrum shaping gain calculation

First, weighting is performed on the quantized LPC parameter. A weighting process is as follows:

An LPC weighting coefficient is obtained. The pseudocode is as follows:

```
GAMMA_LPC = 0.939999998
weightFactor[0] = 1.0
for i = 1 to lpcOrder:
  weightFactor[i] = weightFactor[i-1] * GAMMA_LPC
End
```

GAMMA_LPC is the initial value of the LPC weighting coefficient, and weightFactor[lpcOrder+1] is the calculated LPC weighting coefficient.

The LPC weighting coefficient is multiplied by the quantized LPC parameter to obtain a weighted LPC parameter weightedLpc.

Second, the low-precision LPC spectrum shaping gain is calculated:

Pre-rotation is performed on the weighted LPC parameter, complex FFT is performed on the pre-rotated LPC parameter rotateLpc, and the low-precision spectrum shaping gain is calculated.

The pre-rotation of the LPC parameter is the same as that in the FFT-based MDCT implementation. The pseudocode is as follows:

```
for (i = 0; i < lpcOrder + 1; i++) {
    tmp = i * PI / 512
```

```
        realPart[i] = weightedLpc[i] * cos(tmp)
        imagPart[i]= -weightedLpc[i] * sin(tmp)
}
```

The number of complex FFT points is 512. For the low-precision spectrum shaping gain calculation, refer to formula (D.2):

$$rawLpcGain = \frac{1}{\|FFT(rotateLpc)\|_2} \quad \text{(D.2)}$$

The number of points of the obtained low-precision spectrum shaping gain is 256.

Thirdly, a spectrum shaping gain of interpolation is obtained.

4-fold linear interpolation is performed on rawLpcGain to obtain the 1024-point interpolation spectrum shaping gain, which is denoted as interpretLpcGain.

Finally, intra-subband averaging is performed on the interpolation spectrum shaping gain to obtain the final LPC shaping gain.

Step 3: spectrum shaping

The MDCT spectrum is divided by the LPC spectrum shaping gain lpcGain to obtain the shaped MDCT spectrum.

D.2.4 Temporal Noise Shaping

The temporal noise shaping reduces a dynamic range of a to-be-coded MDCT spectrum through linear prediction processing in the MDCT domain, thereby improving quantization coding efficiency.

The input of the temporal noise shaping module is the MDCT spectrum after the temporal noise shaping.

TNS filter configuration:

TNS processing is performed on the MDCT spectrum. The entire MDCT spectrum is divided into two filters, respectively covering [660 Hz, 5400 Hz] and [5400 Hz, 20000 Hz].

Both the two TNS filters can be disabled or enabled, or only one of the two TNS filters is enabled. This is determined according to the TNS filter enabling algorithm.

TNS parameter calculation:

The parameter used by the TNS filter is the reflection coefficient parcor (the maximum order is 8), which is an equivalent representation of parameters such as LPC and LSF. The reflection coefficient is separately calculated for the two TNS filters.

The basic calculation process is as follows:

Step 1: Calculate a band-based normalized frequency-domain autocorrelation coefficient.

A frequency range corresponding to each TNS filter is divided into three frequency bands with an equal width, and spectrum energy in the three frequency bands is separately calculated.

Autocorrelation coefficients in the three frequency bands are separately calculated, and corresponding spectrum energy is used to perform normalization.

The sum of the normalized autocorrelation functions in the three frequency bands is used as the autocorrelation coefficient of the frequency range of the current filter.

Step 2: Calculate the reflection coefficient.

The autocorrelation coefficients corresponding to the frequency ranges of the two TNS filters are used as the inputs, and the LeRoux-Gueguen algorithm is used to calculate the reflection coefficient parcor.

TNS filter enabling determining

The TNS filter is enabled based on the following conditions:

Condition 1: The filter order is greater than 0.

Condition 2: The mean square value of the Parcor parameter is greater than a threshold (set to 0.06), and the predicted gain of the filter is greater than a threshold (set to 1.35).

Condition 3: The current frame is a short frame.

When condition 1 is met and either condition 2 or 3 is met, the TNS filter is enabled.

TNS parameter quantization coding:

The bitstream parameters of the TNS module include the TNS filter enabling flag, filter order, and reflection coefficient.

The non-uniform scalar quantization is used as the reflection coefficient. The number of quantization orders is 16. For details, refer to Table B.33.

Huffman coding is performed on the quantization index of the reflection coefficient, and each dimension of the reflection coefficient has a corresponding Huffman code table.

TNS filtering:

In a frequency range corresponding to the TNS filter, if the TNS filter is enabled, linear prediction analysis filtering based on a reflection coefficient is performed on the MDCT spectrum within the frequency range, to obtain the MDCT spectrum after the TNS processing.

Short frame TNS processing method:

If the frame type of the current frame is ONLY_SHORT_WINDOW, inverse interleaving processing needs to be performed before the foregoing TNS processing, and interleaving processing is performed again after the TNS processing.

D.2.5 Bandwidth Extension Coding

At the encoder, the bandwidth extension algorithm is used to calculate a bandwidth extension parameter based on the correlation between high and low frequencies of an MDCT spectrum, so as to reconstruct a high-frequency spectrum at the decoder based on a core band spectrum obtained through decoding.

The enabling conditions and configuration parameters of bandwidth extension are determined by the input signal format and coding rate.

The parameters extracted through bandwidth extension coding include the high-frequency band envelope and whitening level. For details about the bitstream syntax, refer to the descriptions of the decoder.

Calculation of high-frequency envelope parameters:

High-frequency band (SFB) division manner is used to calculate the MDCT spectrum energy of each SFB in the high frequency band, which is used as the high-frequency sub-band envelope parameter of bandwidth extension.

For the calculation method, refer to formula (D.3):

$$sfbEnvelope = \frac{1}{sfbWidth}\sum_{i=sfbStart}^{sfbEnd-1}(mdctSpectrum[i])^2 \quad \text{(D.3)}$$

sfbStart and sfbEnd are the start frequency sequence number and end frequency sequence number of the current sfb, and sfbWidth is the width of the current sfb (that is, the number of frequencies), which is represented as sfbWidth = sfbEnd – sfbStart + 1.

A non-uniform scalar quantization manner is used for quantization of the high-frequency envelope parameter. For the quantization manner, refer to formula (D.4):

$$sfbEnvQIdx = floor\big(0.5 + 4.24966 * (log2(sfbEnvelope) + 4.0)\big) \quad \text{(D.4)}$$

floor indicates rounding down.

The value of the envelope parameter quantization index sfbEnvQIdx is limited within the range of [0, 127], and 7-bit transmission is used.

High-frequency spectrum whitening level determining:

The whitening level of the high-frequency spectrum is determined within each target frequency area (target tile).

The whitening level indicates a type of post-processing that needs to be performed after the decoder copies the spectrum from the source frequency area (source tile). Whitening levels are classified into BWE_WHITENING_OFF, BWE_WHITENING_MID, and BWE_WHITENING_HIGH, corresponding to different post-processing manners. For details, refer to the description of the decoder algorithm.

The high-frequency spectrum whitening level is determined based on spectrum features of the source frequency area and the target frequency area, and the spectrum features include a spectrum flatness measure (Spectral Flatness Measure, SFM) parameter and a spectrum peak-to-average ratio (Peak-to-Average Ratio, PAR) parameter.

The method for calculating the spectrum flatness measure SFM parameter is described as follows:

First, an average value of the log energy spectrum logEnerSpec and the energy spectrum enerSpec in the frequency band is calculated. A value of each frequency of the energy spectrum is energy of each frequency of the MDCT spectrum, and a value of each frequency of the log energy spectrum is a logarithm of energy of each frequency of the MDCT spectrum.

An average value of the log energy spectrum is denoted as avgLogEnerSpec, and an average value of the energy spectrum is denoted as avgEnerSpec.

For calculation of the SFM parameter, refer to formula (D.5):

$$sfm = min(1.0, pow(2.0, avgLogEnerSpec + 0.5)/avgEnerSpec) \quad \text{(D.5)}$$

The spectrum peak-to-average ratio PAR parameter is defined as a ratio of the maximum value maxLogEnerSpec to the average value avgLogEnerSpec of the log energy spectrum logEnerSpec in the current frequency band. Refer to formula (D.6):

$$par = \frac{maxLogEnerSpec}{avgLogEnerSpec} \quad \text{(D.6)}$$

The spectrum flatness measure parameter and the spectrum peak-to-average ratio parameter are separately calculated for each frequency band (SFB) of the source frequency area and the target frequency area to obtain the following parameters:
SFM and PAR parameters of each frequency band in the source frequency area, that is, sfmSrcSfb and parSrcSfb;
SFM and PAR parameters of each frequency band in the target frequency area, that is, sfmTarSfb and parTarSfb.
These parameters are averaged in each frequency band of the frequency area to obtain:
SFM and PAR parameters of the source frequency area, that is, sfmSrcTile and parSrcTile;
SFM and PAR parameters of the target frequency area, that is, sfmTarTile and parTarTile.
The normalized SFM parameter used for determining the final whitening level is expressed as follows:
Source frequency area: sfmSrcTileNorm = sfmSrcTile/parSrcTile
Target frequency area: sfmTarTileNorm = sfmTarTile/parTarTile

In the standard, a condition for determining a whitening level of a frequency area is as follows:

a) BWE_WHITENING_OFF, that is, the condition for no whitening is as follows: sfmTarTileNorm < sfmSrcTileNorm or sfmTarTileNorm < 0.19

b) BWE_WHITENING_MID, that is, the condition for the medium whitening level is as follows:

sfmTarTileNorm >= sfmSrcTileNorm && sfmTarTileNorm < (sfmSrcTileNorm + 0.15)

or

sfmTarTileNorm >= 0.19 && sfmTarTileNorm < 0.3

c) BWE_WHITENING_HIGH, that is, the condition for the high whitening level is as follows:
sfmTarTileNorm >= (sfmSrcTileNorm + 0.15) or sfmTarTileNorm > 0.4

D.3 Downmixing

D.3.1 Stereo Downmixing and Bit Allocation

M/S downmixing determining:

The M/S downmixing manner is used for the stereo mode. Before downmixing, whether to perform downmixing is determined based on the correlation between the MDCT spectra of the left and right channels.

M/S downmixing is determined based on the normalized cross-correlation coefficient crossCorr of the MDCT spectra of the left and right channels to the ratio lrRatio of the energy of the MDCT spectra of the left and right channels.

For a method for calculating the normalized cross-correlation coefficient, refer to formula (D.7):

$$crossCorr = \frac{<mdctSpecL, mdctSpecR>}{\sqrt{\|mdctSpecL\|_2 * \|mdctSpecR\|_2}} \qquad \text{(D.7)}$$

<, > indicates an inner production operation, || ||2 indicates a two-norm, and MdctSpecL and MdctSpecR are respectively the MDCT spectra of the left and right channels.

For the method for calculating the ratio of the energy of the MDCT spectra of the left and right channels, refer to formula (D.8):

$$lrRatio = \sqrt{\frac{\|mdctSpecL\|_2}{\|mdctSpecR\|_2}} \qquad \text{(D.8)}$$

The M/S downmixing is determined based on the window types of the left and right channels, the normalized cross-correlation coefficient, and the energy ratio, and is represented as the following pseudocode:

```
isMs = 0
if transformTypeL == transformTypeR && crossCorr > 0.3:
  if lrRatio < 3.0 && lrRatio > 1/3:
      isMs = 1
    end
end
```

transformTypeL and transformTypeR are the window types of the left and right channels, or referred to as transform types.

M/S downmixing:

When the M/S flag isMs is 1, the M/S downmixing is required.

Before M/S downmixing, energy equalization needs to be performed on the MDCT spectra of the left and right channels. The energy balancing is implemented based on the ILD parameter. For the ILD parameter calculation expression, refer to formula (D.9):

$$energyRatio = \frac{\sqrt{\|mdctSpecL\|_2}}{\sqrt{\|mdctSpecL\|_2} + \sqrt{\|mdctSpecR\|_2}} \qquad \text{(D.9)}$$

4-bit uniform quantization is performed on the ILD parameter. For the quantization manner, see formula (D.10):

$$energyRatioQIdx = max(1, min(15, 16 * energyRatio + 0.5)) \qquad \text{(D.10)}$$

For calculation of the quantized ILD parameter, refer to formula (D.11):

$$energyRatioQ = \frac{16}{energyRatioQIdx} - 1 \qquad \text{(D.11)}$$

Energy equalization is performed based on the quantized ILD parameter. The pseudocode is as follows:

```
if energyRatioQ > 1.0:
  mdctSpecR *= 1.0/energyRatioQ
else:
  mdctSpecL *= energyRatioQ
end
```

M/S downmixing is performed on the MDCT spectra of the left and right channels after the energy equalization. For a method, refer to formulas (D.12) and (D.13):

$$mdctSpecM = \frac{\sqrt{2}}{2}(mdctSpecL + mdctSpecR) \quad \text{(D.12)}$$

$$mdctSpecS = \frac{\sqrt{2}}{2}(mdctSpecL - mdctSpecR) \quad \text{(D.13)}$$

mdctSpecM and mdctSpecS are respectively the M and S spectra obtained through downmixing.

Before bits are allocated to the MDCT spectra of the two downmixed channels, a bit allocation ratio parameter bitsRatio needs to be determined. The bit allocation ratio is calculated based on the energy ratio energyRatioDownMix of the MDCT spectra of the two downmixed channels.

The 3-bit uniform quantization is performed on the bitsRatio. The calculation pseudocode is as follows:

```
bitsRatioQIdx = 4
if energyRatioDownMix >= 0:
   bitsRatioQIdx = floor(8 * bitsRatio + 0.5)
  if isMs == 0:
     if bitsRatioQIdx <= 3:
        bitsRatioQIdx += 1
     else if bitsRatioQIdx >= 5:
        bitsRatioQIdx -= 1
    end
  end
end
```

When the M/S downmixing is not performed, if the bit allocation ratio is too large or too small, the bit allocation ratio is adjusted to be more even. For the quantized bit allocation ratio parameter bitsRatioQ, refer to formula (D.14).

$$bitsRatioQ = bitsRatioQIdx\ /\ 8 \quad \text{(D.14)}$$

The remaining bits can be allocated based on the quantized bit allocation ratio parameter bitsRatioQ to the two downmixed channels. The allocation ratio of the downmixed channel 1 is bitsRatioQ, and the allocation ratio of the downmixed channel 2 is (1 – bitsRatioQ).

D.3.2 Multi-channel Downmixing and Bit Allocation

Channel coupling algorithm

The channel coupling algorithm used in the multi-channel mode is referred to as the MCAC (Multi-channel Adaptive Coupling) algorithm. The MCAC algorithm is used to determine the multi-channel signal coding mode parameter based on the signal correlation, including the pair parameter and the downmixing parameter, to effectively reduce the redundancy between channels and improve the multi-channel coding efficiency.

A multi-channel signal usually includes a low-frequency effect channel (that is, an LFE channel), and the low-frequency effect channel has a valid audio component only at a low frequency. The LFE channel does not participate in the queuing algorithm and the bit allocation algorithm in the multi-channel mode.

The basic principle of the multi-channel coupling algorithm is to maximize the sum of the normalized cross-correlation of the coupled channels.

The basic steps of the coupling algorithm are as follows:

Step 1: Calculate a normalized cross-correlation matrix of all channels participating in coupling.

In a 5.1 multi-channel example, there are five channels participating in coupling, and a size of a normalized cross-correlation matrix is 5×5.

The symmetry of the cross-correlation matrix is considered, and the autocorrelation values on the diagonal are excluded. The effective cross-correlation information is the upper triangular part of the cross-correlation matrix.

Each value of the normalized cross-correlation matrix corresponds to a channel pair, and a channel pair that meets a certain condition may participate in a subsequent channel coupling algorithm.

The filtering condition includes: 1. The normalized cross-correlation coefficient of the channel pair is greater than 0.5; 2. The energy difference between the MDCT spectra of two channels in a channel pair is less than a threshold. The default threshold is 2.

Step 2: Determine several coupled start channel pairs.

It is assumed that the number of channel pairs with the largest cross-correlation coefficient used in the search is numPairCondidate, and the value of numPairCondidate is related to the number of channels. Refer to formula (D.15).

$$numPairCondidate = (numChannels - 1)/2 \quad \text{(D.15)}$$

numChannels indicates the total number of channels. If the value is decreased by 1, the LFE channel is excluded.

numPairCondidate channel pairs with a largest cross-correlation coefficient are selected from the normalized cross-correlation matrix obtained after screening, and are used as the coupled start channel pairs.

Step 3: Determine the coupling manner.

A channel pair with the largest correlation in the numPairCondidate coupled start channel pairs is used as an example. For example, in the 5.1 mode, the channel pair with the largest correlation is (0, 2). In a subsequent search process, all matrix elements related to the channel 0 and the channel 2 are excluded, and then a channel pair with the largest correlation value is found and used as a second channel pair, for example, (1, 4). The entire search process is completed by analogy, and the first group coupling manner is obtained.

It is assumed that the channel pair with the second largest cross-correlation is (0, 1). All matrix elements related to the channel 0 and the channel 1 are excluded in the subsequent search process, and then a channel pair with a largest correlation value is found as a second channel pair, for example, (2, 4), and so on, the entire search process is completed, and the second group of pair manners are obtained.

This search process is repeated, and numPairCondidate coupling manners may be obtained. A coupling manner with a largest cross-correlation sum is a finally determined channel coupling manner.

The content of object signals differs greatly between channels. Therefore, MCAC coupling is not performed for object signals.

Channel pair downmixing

In the multi-channel mode, intra–channel pair equalization is performed for energy equalization. The target amplitude value of the intra–channel pair equalization algorithm is an average value of amplitudes of two channels. The intra–channel pair equalization algorithm is implemented by performing ILD processing on the MDCT spectrum of the downmixed channel. In the ILD processing, the ratio of the MDCT spectrum amplitude to the equalization amplitude of the downmixed channel is used as an input to search for the ILD parameter in the quantization code table. The index mcIld[i] corresponding to the matched codeword is found based on the principle of minimum distance. Then, the spectrum is equalized. The pseudocode for equalization is as follows:

```
factor = mcIldCodebook[mcIld[i]]
mdctSpectrum[i] = factor * mdctSpectrum[i]
```

factor is the amplitude adjustment factor corresponding to the ILD parameter of the i-th channel, mcIldCodebook is the quantization code table of the ILD parameter, mcIld[i] indicates the quantization index corresponding to the ILD parameter of the i-th channel, and mdctSpectrum[i] indicates the MDCT coefficient vector of the i-th channel.

Silencing

Step 1: silent channel detection

a) The average energy of each channel signal of the current frame is calculated.

It is assumed that the frame length is FRAME_LEN, and the energy of the ch-th channel of the current frame is shown in formula (D.16):

$$energy(ch) = \frac{1}{FRAME\_LEN} \cdot \sum_{i=0}^{FRAME\_LEN-1} (orig_{ch}(i))^2 \quad \text{(D.16)}$$

$orig_{ch}$ is the input signal of the ch-th channel of the current frame, and energy(ch) is the energy of the ch-th channel of the current frame.

b) A silence detection parameter of each channel of the current frame is determined based on energy of each channel signal of the current frame.

The silence detection parameter of each channel of the current frame is calculated, and the silence detection parameter of each channel of the current frame meets formula (D.17):

$$energyDB[ch] = 10 * log10(energy[ch] \,/\, Bit\_Depth \,/\, Bit\_Depth) \quad \text{(D.17)}$$

energyDB[ch] is the silence detection parameter of the ch-th channel of the current frame, energy(ch) is the energy of the ch-th channel of the current frame, and Bit_Depth is the full offset value of the bit width. For example, if the sampling bit depth is 16 bits, the full offset value of the bit width is 216 = 65536.

c) The silence flag of each channel of the current frame is determined based on the silence detection parameter and the silence detection threshold g_MuteThrehold of each channel of the current frame.

The silence detection parameter of each channel of the current frame is compared with the silence detection threshold. If the silence detection parameter of the ch-th channel of the current frame is less than the silence detection threshold, the ch-th channel of the current frame is a silent frame, that is, the ch-th channel is a silent channel at the current moment, and the silence flag silFlag [ch] of the ch-th channel of the current frame is 1. If the silence detection parameter of the ch-th channel of the current frame is greater than or equal to the silence detection threshold, the ch-th channel of the current frame is a non-silent frame, that is, the ch-th channel of the current frame is a non-silent frame, and the silence flag silFlag [ch] of the ch-th channel of the current frame is 0.

The pseudocode for determining the silence flag of the ch-th channel of the current frame based on the silence detection parameter and the silence detection threshold of the ch-th channel of the current frame is as follows:

```
silFlag [ch] = 0;
if (energyDB[ch] < g_MuteThrehold)
{   silFlag [ch] = 1; }
```

Step 2: silence side information coding

The side information of the silent frame includes silence enabling flag HasSilFlag and the silence flag silFlag[ch].

a) When the silent channel processing function is disabled, only the silence enabling flag HasSilFlag needs to be coded and the value of HasSilFlag is 0. The silence flag silFlag[ch] does not need to be coded.

b) When the silent channel processing function is enabled and the silence flags silFlag[ch] of all channels participating in coupling are 0, it indicates that all the channels participating in coupling are non-silent channels. In this case, only the silence enabling flag HasSilFlag needs to be coded and the value of HasSilFlag is 0, and the silence flag silFlag[ch] does not need to be coded.

c) When the silent channel processing function is enabled and the silence flags silFlag[ch] of all channels participating in coupling are not all 0, it indicates that there is a non-silent channel in the channels participating in coupling. In this case, the silence enabling flag HasSilFlag needs to be coded and the value of HasSilFlag is 1, and the silence flag silFlag[ch] needs to be coded.

Step 3: bit allocation of silent channel

Silent frames are not involved in the bit allocation algorithm. Eight bytes are fixedly allocated to the channel of the silent frames.

Bit allocation algorithm

The bit allocation algorithm supports three types of input: a sound bed signal, an object signal, and a sound bed and object mixed signal. In the bit allocation algorithms for the sound bed signal and the object signal, only some steps of the bit allocation algorithm for the sound bed and object mixed signal need to be performed.

Step 1: Obtain the ratio factor bedBitsRatio of the sound bed to the total number of bits (only for the mixed signal).

Case 1: When the total bit rate is 384 kb/s, the value of bedBitsRatio is fixed at 0.583335280.

Case 2: When the total bit rate is 768 kb/s, the value of bedBitsRatio is fixed at 0.507143021.

Case 3: Except for case 1 and case 2, the value of the ratio factor bedBitsRatio of the sound bed to the total number of bits is calculated based on the number of sound bed signal channels bedChNum and the number of object signal channels objChNum. Refer to formula (D.18).

$$bedBitsRatio = bedChNum / (bedChNum + objChNum) \quad \text{(D.18)}$$

Step 2: Update the allocation strategy mixAllocStrategy for mixed signal (only for the mixed signal).

mixAllocStrategy is used to identify the allocation direction of the number of bits reduced by the silent channel of the object signal. There are two allocation strategies for the mixed signal: MIX_ALLOC_STRATEGY_INTERNAL indicates that the number of bits is allocated to another object signal, and MIX_ALLOC_STRATEGY_OBJ2BED indicates that the number of bits is allocated to the sound bed signal. The details are listed below:

When the MIX_ALLOC_STRATEGY_INTERNAL strategy is used:

a) The silent frame processing function is disabled.

b) The input is a non-mixed signal, that is, there is only a sound bed signal or only an object signal.

c) The number numBedNoSil of non-silent channels of the sound bed signal is less than the number safetyChNum of safety channels.

When the MIX_ALLOC_STRATEGY_OBJ2BED strategy is used:

The number numBedNoSil of non-silent channels of the sound bed signal is greater than or equal to the number safetyChNum of safety channels.

The number numBedNoSil of non-silent channels of the sound bed signal is the number of channels whose silent flag silFlag[ch] is 0 in the channels participating in coupling. The number safetyChNum of safety channels is calculated based on the total bit rate totalBitrate, the frame length FRAME_LEN, and the sampling rate AVS3_SAMPLING_48KHZ.

Step 3: Pre–bit allocation processing

The pre–bit allocation processing is used to calculate the bit allocation ratio factor chBitRatios of the mixed signal and the non-mixed signal. The following steps are performed:

a) The energy ratio chBitRatiosFloat[ch] of each channel is calculated based on the channel energy.

b) The total number objBits of bits of the object is calculated based on the total number totalBits of bits and the ratio factor bedBitsRatio of the sound bed to the total number of bits (only for the mixed signal).

c) The estimated number objAvgBytes[ch] of bits of the object signal is calculated based on the total number objBits of bits of the object, the number objNum of object signals, the allocation strategy mixAllocStrategy, and the silence flag silFlag[ch] (for the mixed signal and the object signal).

d) The estimated number bedChBytes[ch] of bits of the sound bed signal is calculated based on the total number totalBits of bits, the total number objBits of bits of the object, the channel energy ratio chBitRatiosFloat[ch], and the silence flag silFlag[ch] (for the mixed signal and the sound bed signal).

e) The bit allocation ratio factor chBitRatios is calculated based on the ratios of the estimated number bedChBytes[ch] of bits of the sound bed signal and the estimated number objAvgBytes[ch] of bits of the object signal to the total number of bits. The value of the bit allocation ratio parameter ranges from 0 to 1. The 6-bit even quantization is performed on the parameter.

D.3.3 HOA Downmixing and Bit Allocation

The coder determines the HOA downmixing configuration based on the HOA signal order and the bit rate. For related information, refer to Table 23 to Table 25. For example, when the coded signal is a 3-order HOA and the bit rate is 512 kb/s, the value of nTotalChanGroups is 2, indicating that the downmixed HOA channel is divided into two groups, and the value of groupChans is 2, 10, indicating that the number of channels in the downmixed channels of the virtual speaker signal group is 2, and the number of channels in the downmixed channels of the residual signal group is 10. The inter-group bit allocation ratio parameter and intra-group bit allocation ratio parameter of the downmixed channel may be calculated by using a method similar to that of multi-channel bit allocation.

D.4 Neural Network Transform, Quantization, and Range Coding

D.4.1 MDCT Quantization Coding based on Neural Network

The MDCT quantization coding based on the neural network includes spectrum grouping, neural network transform, entropy coding, noise filling parameter extraction, and quantization.

Figure D.10 is a schematic principle diagram of MDCT quantization coding based on the neural network.

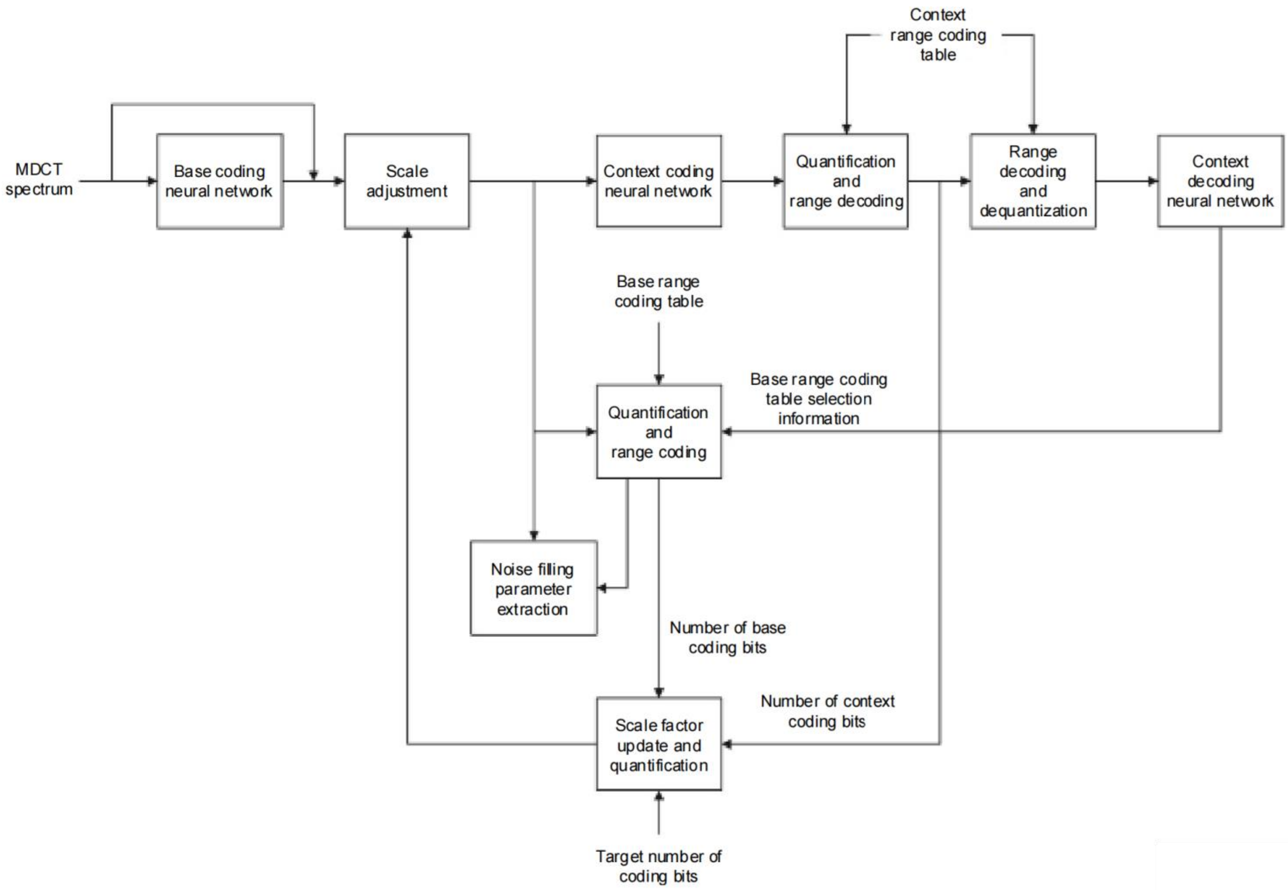
The basic process is as follows:

In the basic configuration, the MDCT spectrum after spectrum grouping is input to the base coding neural network to obtain a transform-domain parameter of the base coding neural network, and scale adjustment is performed on the transform-domain parameter. The transform-domain parameter after scale adjustment is input to the context coding neural network. Context information quantization and range coding are performed on the transformdomain coefficient output by the context coding neural network to obtain a context range coded bitstream. After the context range coded bitstream is decoded and dequantized, code table selection information of base range coding is obtained through context decoding neural network transform. Quantization and range coding are performed on the transform-domain parameter after scale adjustment based on the code table selection information and the base range coding table, to obtain a base range coded bitstream.

In a low-complexity configuration, scale adjustment is performed on an MDCT spectrum after spectrum grouping. An MDCT spectrum obtained through scale adjustment is input to a context coding neural network. Context information quantization and range coding are performed on a transform-domain coefficient output by the context coding neural network, to obtain a context range coded bitstream. After the context range coded bitstream is decoded and dequantized, code table selection information of base range coding is obtained through context decoding neural network transform. Quantization and range coding are performed on the MDCT spectrum after scale adjustment based on the code table selection information and the base range coding table, to obtain a base range coded bitstream.

In an MDCT quantization coding process based on the neural network, a scale factor needs to be updated based on the target number of coding bits, the number of base range coding bits, and the number of context range coding bits. This coding process is repeated until the number of coding bits is less than or equal to the target number of coding bits.

Figure D.10 Schematic principle diagram of MDCT quantization coding based on neural network



D.4.2 Spectrum Grouping

A basic processing manner of spectrum grouping is: If the window type of the current frame is a short window, grouping is determined on MDCT spectra of eight short frames of the current frame. If grouping is required, the MDCT spectra are divided into a transient group and a nontransient group. Spectrum interleaving is performed in each group, and an MDCT spectrum with a length of 1024 is obtained through concatenation and input into the neural network transform algorithm.

The spectrum grouping can effectively improve the coding efficiency of the spectra of several subframes belonging to the transient group in the eight subframes of the short frame, and can respectively extract the noise filling parameters from the transient group and the non-transient group to improve the noise filling effect.

The coding parameter of the spectrum grouping includes two parts: the number of groups and the grouping flag information. The number of groups indicates the number of spectrum groups of the current frame, and the grouping flag information indicates the groups to which the respective spectra of the eight subframes of the current frame belong.

Method for obtaining spectrum grouping information:

If the window type of the current frame is a long window, a cut-in window, or a cut-out window, the group number parameter numGroups is set to 1, and the grouping flag information of all the eight subframes is 0.

If the window type of the current frame is a short window, the number of groups and the grouping flag parameter need to be determined based on the MDCT spectra of the eight subframes. The obtaining method is described as follows:

The MDCT spectra of the eight interleaved short frames of the current frame are de-interleaved, to obtain de-interleaved MDCT spectra.

Whether the MDCT spectra of the eight subframes should be divided into two groups, and the group to which each subframe belongs are determined based on the de-interleaved MDCT spectra.

First, spectrum energy of the de-interleaved MDCT spectra of eight subframes is calculated, and is denoted as blockEner[8].

Secondly, the sum sumBlockEner of spectrum energy and the maximum value maxBlockEner of each subframe are calculated, and the average spectrum energy avgBlockEner with the maximum subframe energy removed is obtained accordingly, that is, the subframe with the maximum energy is excluded from the calculation of the average spectrum energy, which is expressed as formula (D.19):

$$avgBlockEner = \frac{sumBlockEner - maxBlockEner}{numBlock - 1} \quad \text{(D.19)}$$

numBlock is number of subframes (or referred to as sub-blocks) in a short frame, and is set to 8.

Thirdly, the spectrum energy of each subframe is compared with the average spectrum energy, and the subframe whose spectrum energy is more than several times greater than the average spectrum energy belongs to the transient group; otherwise, the subframe belongs to the non-transient group.

if all subframes belong to the transient group or all subframes belong to the non-transient group, a group number parameter numGroups is set to 1, and grouping flag parameters of all eight subframes are set to 0.

Otherwise, the group number parameter numGroups is set to 2, the grouping flag parameter of the subframe belonging to the transient group is set to 0, and the grouping flag parameter of the subframe belonging to the non-transient group is set to 1.

Short frame MDCT spectrum grouping:

If the current frame is a short frame and the group number parameter numGroups = 2, the MDCT spectra of the eight subframes in the short frame need to be grouped.

Step 1: Group and arrange the de-interleaved MDCT spectra to obtain the grouped and arranged MDCT spectrum with the length of 1024 frequencies. The MDCT spectrum of the subframe belonging to the transient group is placed before the MDCT spectrum of the subframe belonging to the non-transient group.

For example, it is assumed that the grouping flag information of the eight subframes is 1 0 0 0 1 1 0 0, that is, spectra of subframes 1, 5, and 6 belong to the non-transient group, and spectra of subframes 2, 3, 4, 7, and 8 belong to the transient group. Therefore, the MDCT spectra after grouping and arrangement may be represented as 2 3 4 7 8 1 5 6, that is, the spectra of subframes 2, 3, 4, 7, and 8 are placed in the front part of the spectra after grouping and arrangement, and the spectra of subframes 1, 5, and 6 are placed in the rear part of the spectra after grouping and arrangement.

Step 2: Perform intra-group interleaving on the grouped and arranged MDCT spectra. In the example in section D.2.2, interleaving needs to be performed on spectra of subframes 2, 3, 4, 7, and 8, and interleaving needs to be performed on spectra of subframes 1, 5, and 6.

D.4.3 Base Coding Neural Network

The base coding neural network (BaseEncoder) performs the neural network transform on the input MDCT spectral coefficient to obtain the transform-domain coefficient for subsequent quantization and coding.

The basic composition unit of the base coding neural network is a CNN. For the model structure related information, refer to Table D.1.

Table D.1 Structure configuration of base coding neural network

Item	Value
Number of CNN layers	4
Convolution kernel size	5, 5, 5, 5
Stride	2, 2, 2, 2
Number of channels	2, 4, 8, 16
Activation function	GDN, GDN, GDN, None
HasBias	1, 1, 1, 0

In the table, Stride is the CNN convolutional step parameter, HasBias indicates whether there is an offset parameter, and None in the activation function indicates that there is no activation function at the current layer.

For related information of parameters of each CNN layer of the base coding neural network, refer to Table D.3 to Table D.15. The 1024-point MDCT spectrum is input into the base coding neural network. The dimension of the output transform coefficient obtained through neural network transform is 16 channels, and each channel has 64 coefficients.

D.4.4 Scale Adjustment

The scale adjustment module performs scale adjustment on the transform coefficient output by the base coding neural network, to enlarge or narrow a dynamic range of the transform coefficient, and adjust the number of bits required by range coding.

The parameter of the scale adjustment module is the feature scale adjustment factor (featureScale). The value range of featureScale is [0, 29.97].

The scale adjustment factor is multiplied by the transform coefficients output by the neural network one by one. If featureScale is less than 1, it is equivalent to performing amplitude attenuation on the transform coefficient. If featureScale is greater than 1, it is equivalent to performing amplitude amplification on the transform coefficient.

D.4.5 Context Coding Neural Network

The context coding neural network (ContextEncoder) extracts the context information (referred to as the base range coding table selection information) of range coding from the transform coefficient obtained through scale adjustment, to guide range coding of the transform coefficient output from the base coding neural network.

The input of ContextEncoder is the absolute value of the base coding neural network transform coefficient obtained through scale adjustment.

The composition unit of ContextEncoder is a CNN. For the model structure information, refer to Table D.2.

Table D.2 Structure configuration of context coding neural network

Item	**Value**
Number of CNN layers	3
Convolution kernel size	3, 3, 3
Stride	1, 2, 2
Number of channels	16, 16, 16
Activation function	ReLu, ReLu, None
HasBias	1, 1, 0

For the parameters of CNNs at each layer of the context coding neural network, refer to Table D.16 to Table D.20. The input of the context coding neural network is the transform coefficient with 16 channels, and each channel has 64 dimensions. The transform coefficient of the context coding neural network obtained through the neural network transform still has 16 channels, and each channel has 16 dimensions.

D.4.6 Context Quantization and Range Coding

The scalar quantization manner is used for the transform coefficient of the context coding neural network.

Range coding of the transform coefficient quantization index is performed based on several groups of pre-trained range coding tables, and each channel of the transform coefficient of the context coding neural network corresponds to one range coding table. For the code table used for context range coding, refer to Table B.1.

The bitstream obtained through range coding is referred to as the context coded bitstream, and the number of bits occupied by the bitstream is referred to as the number contextNumBytes of context coding bits. (Note: A byte is used as the minimum unit for range coding in the standard.)

D.4.7 Base Quantization and Range Coding

The scalar quantization manner is used for the transform coefficient of the base coding neural network obtained through scale adjustment.

The range coding is performed based on several preset groups of range coding tables. For the code tables used in base range coding, refer to Table B.9. The range coding tables used here are a series of cumulative probability density tables (CDF) of Gaussian distribution with different standard deviation information. The number of range coding tables is numContextScale = 64, and a corresponding standard deviation is denoted as contextScale.

Base range coding table selection information obtained through decoding is used to determine which one of these groups of range coding tables is used to code each dimension of the transform coefficient of the base coding neural network, that is, to determine a CDF index.

The CDF index of the base range coding is denoted as baseCdfIndex, and its determining process is described as the following pseudocode:

```
for i = 0 to baseNumLatentEncode-1:
  for j = 0 to baseNumLatentChannels-1:
    for index = 0 to numContextScale – 1:
      if contextScale[index] >= ctxDecOutput[i][j]
        baseCdfIndex[i][j] = index
        break
      end
    end
     if index == numContextScale:
       baseCdfIndex[i][j] = numContextScale - 1
    end
  end
end
```

ctxDecOutput is base range coding table selection information obtained through decoding, baseNumLatentEncode is a dimension of the transform-domain coefficient of the base neural network, and baseNumLatentChannels is the number of channels of the transform-domain coefficient of the base neural network.

This pseudocode means that, for each dimension of the transform coefficient of the base coding neural network, a standard deviation that is greater than the base range coding table selection information is searched for in a variance table of the base range coding, and an index corresponding to the standard deviation is an index of the code table used by the range coding.

The decoder also obtains the range coding table index from the output of the context decoding neural network in a same manner.

A bitstream obtained through range coding is referred to as a base coded bitstream, and the number of bits occupied by the bitstream is referred to as the number baseNumBytes of base coded bits.

D.4.8 Scale Factor Update and Quantization

Scale factor update strategy:

A final objective of iterative update of the scale factor is to adjust the transform coefficient of the base coding neural network, so that the number of context coding bits and the number of base coding bits are less than or equal to the target number of coding bits.

The target number of coding bits is denoted as targetBytes, and a target of scale factor update may be represented as:$(contextNumBytes + baseNumBytes) < targetNumBytes$.

In the iterative update of the scale factor, the following needs to be recorded: the upper limit (upBoundBytes) of the number of coding bits and the corresponding upper limit (upBoundScale) of the scale factor, and the lower limit (lowBoundBytes) of the number of coding bits and the corresponding lower limit (lowBoundScale) of the scale factor. The dichotomy is used to update the scale factor.

It is assumed that the current number of coding bits is currBytes, and the current scale factor is currScale. In this case, the update manners for the upper limit and the lower limit are shown in the following pseudocode:

```
if currBytes < targetBytes:
   if lowBoundBytes < currBytes:
     lowBoundScale = currScale
      lowBoundBytes = currBytes
   else if lowBoundBytes == currBytes:
     lowBoundScale = max(lowBoundScale, currScale)
   end
else if currBytes > targetBytes:
   if upBoundBytes > currBytes:
     upBoundScale = currScale
      upBoundBytes = currBytes
   else if upBoundBytes == currBytes:
     upBoundScale = min(upBoundScale, currScale)
   end
end
```

This pseudocode may be explained as follows:

a) If the current number of coding bits is less than the target number of bits: if the lower limit of the number of bits is less than the current number of bits, the lower limit of the scale factor is updated to the current scale factor, and the lower limit of the number of bits is updated to the current number of bits. If the lower limit of the number of bits is equal to the current number of bits, the lower limit of scale factor is updated to a larger value of the current scale factor and the lower limit of scale factor.

b) If the current number of coding bits is greater than the target number of bits: if the upper limit of the number of bits is greater than the current number of bits, the upper limit of the scale factor is updated to the current scale factor, and the upper limit of the number of bits is updated to the current number of bits. If the upper limit of the number of bits is equal to the current number of bits, the upper limit of the scale factor is updated to a smaller value of the current scale factor and the upper limit of the scale factor.

In conclusion, the foregoing strategy is: the upper limit and the lower limit of the scale factor are updated, so that the upper limit and the lower limit of the number of bits are close to the target number of bits.

The adjustment of the scale factor is divided into two phases. In phase 1, the current number (currBytes) of coding bits does not reach the target number (targetBytes) of coding bits. In phase 2, the current number of encoding bits has passed through the target number of coding bits.

If the target number of coding bits is not reached, it indicates that: (1) the number of coding bits is greater than the target number of coding bits (currBytes > targetBytes) at all times from the start of scale factor iteration to the current iteration; or (2) the number of coding bits is less than the target number of coding bits (currBytes < targetBytes) at all times from the start of iteration to the current iteration.

In phase 1, only one of the upper limit and the lower limit exists. In the phase 2, both the upper limit and the lower limit exist.

A method for updating the scale factor in phase 1 is formula (D.20):

$$newScale = currScale * \left(\frac{targetBytes}{currBytes}\right)^2 \qquad \text{(D.20)}$$

newScale is the updated scale factor.

The purpose of updating the scale factor in phase 1 is to enable the current number of bits to pass through the target number of bits as soon as possible.

A method for updating the scale factor in phase 2 is formula (D.21):

$$newScale = lowBoundScale + lowerFac\frac{targetBytes - lowBoundBytes}{upBoundBytes - lowBoundBytes}(upBoundScale - lowBoundScale) \qquad \text{(D.21)}$$

The purpose of update in phase 2 is to enable the current number of bits to converge between the upper limit and the lower limit of the number as soon as possible.

Quantization method of scale factor:

In the basic configuration, the segmented quantization method is used for the scale factor based on different values of the scale factors.

If the value of the scale factor is within the range of [0, 1], 7-bit uniform quantization is performed, and the quantization index is expressed as formula (D.22):

$$scaleQIdx = floor(0.5 + 127.0 * featureScale) \qquad \text{(D.22)}$$

The scale factor of quantization is expressed as formula (D.23):

$$featureScaleQ = scaleQIdx/127.0 \qquad \text{(D.23)}$$

If the value of the scale factor is greater than 1, 7-bit non-uniform quantization is performed, and the quantization index is expressed as formula (D.24).

$$scaleQIdx = floor(0.5 + 86.0 * log10(featureScale)) \qquad \text{(D.24)}$$

The value of the quantization index is limited to [0, 127].

The scale factor of quantization is expressed as formula (D.25):

$$featureScaleQ = 10.0^{scaleQIdx/86.0} \qquad (D.25)$$

The value range of the scale factor is specified by the isFeatAmplified parameter. The value 0 of the parameter indicates that featureScale is less than or equal to 1.0. Otherwise, featureScale is greater than 1.0.

In the low-complexity configuration, a logarithm domain uniform quantization method is used for quantization of the scale factor, and a quantization index is expressed as formula (D.26):

$$scaleQIdxLc = \lfloor 31.875 * log10(featureScale) + 255 + 0.5 \rfloor \qquad (D.26)$$

The value of the quantization index is limited to [0, 255].

The scale factor of quantization is expressed as formula (D.27):

$$featureScale = 10^{(scaleQIdxLc - 255.0) / 31.875} \qquad (D.27)$$

The updated and quantized scale factor is used for scale adjustment in the next rate iteration.

The maximum number of rate iterations is set to 5. If the number of bits in the last iteration is greater than the target number of bits, a scale factor that is closest to and less than the target number of bits, a corresponding base coded bitstream, and a corresponding context coded bitstream are used.

D.4.9 Noise Filling Parameter Extraction

The noise filling parameter indicates an average error between the transform coefficients of the base coding neural network after scale adjustment and the quantized transform coefficients.

Before the noise filling parameter is extracted, the number of transform coefficients for noise filling needs to be determined, which is denoted as numLatentNF, and is determined based on the number numLinesNonZero of valid spectral lines input through quantization coding. The number of valid spectral lines is equal to the number of spectral lines of the core frequency band except the BWE frequency band.

In the main profile, the pseudocode for calculating numLatentNF is as follows:

```
numLatentNF = numLinesNonZero
for i = 0 to baseNumLayers-1:
  numLatentNF /= stride[i]
end
```

baseNumLayers indicates the number of layers of the base coding neural network (baseEncoder), and stride[i] indicates the stride parameter of the CNN at the i-th layer of the baseEncoder.

That is, the number numLatentNF of transform coefficients that require noise filling is equal to the number numLinesNonZero of spectral lines of the core band divided by the stride parameter of the CNN at each layer.

In the low-complexity configuration, for calculation of numLatentNF, refer to formula (D.28):

$$numLatentNF = numLinesNonZero \,/\, numLatentChannels \qquad (D.28)$$

numLatentChannels indicates the number of channels of the neural network transform-domain coefficient.

The range of the transform coefficient that requires noise filling is determined based on the spectrum grouping information.

If the spectrum group number parameter numGroups is 1, the start point startIdx of noise filling is 0, and the end point endIdx is numLatentNFC.

If the spectrum group number parameter numGroups is 2, noise filling is performed in two segments, one segment corresponds to the spectral coefficients in the transient group of the short frame, and the other segment corresponds to the spectral coefficients in the nontransient group of the short frame.

The number of subframes in the transient group is denoted as numTransientBlock, and the number of subframes in the non-transient group is denoted as numOtherBlcok. Therefore, the pseudocode of the transform coefficient range corresponding to the spectral coefficient of the transient group is:

```
startIdx[0] = 0
endIdx[0] = numTransientBlock * (numLatentNF / N_BLOCK_SHORT)
```

N_BLOCK_SHORT is the number of subframes in the short frame, and a value is 8.

The transform coefficient range corresponding to the spectral coefficient of the non-transient group is as follows:

```
startIdx[1] = numTransientBlock * (numLatentDim / N_BLOCK_SHORT)
endIdx[1] = startIdx[1] + numOtherBlock * (numLatentNF / N_BLOCK_SHORT)
```

numLatentDim is the dimension of each channel of the transform coefficient output by the base coding neural network, and is 64 in the current configuration.

The process of calculating the noise filling parameter is as follows:

First, for each channel of the transform coefficient of the base coding neural network, within the calculated transform coefficient range, an average value of absolute values of quantization errors of transform coefficients quantized to 0 is calculated.

Then, an average value of these quantization errors in all channels is calculated, and is used as the noise filling parameter nfParam.

Quantization of noise filling parameter:

3-bit uniform scalar quantization is performed, and the quantization index is expressed as formula (D.29):

$$nfParamQIdx = floor(0.5 + nfParam * 23.34) \quad \text{(D.29)}$$

The value of the quantization index is limited to [0, 7].

For the quantized noise filling parameter, refer to formula (D.30):

$$nfParamQ = nfParamQIdx/23.34 \quad \text{(D.30)}$$

D.5 HOA Spatial Coding

The HOA spatial coder may include sound field component analysis, sound field component synthesis, and other component calculation, and conversion from the HOA signal into a transmission channel signal and side information.

The sound field component analysis includes virtual speaker configuration, virtual speaker set generation, coding analysis, and virtual speaker selection.

The virtual speaker configuration is used to generate virtual speaker configuration parameters based on the coder configuration information, to obtain a plurality of virtual speakers. The coder configuration information includes but is not limited to an HOA order, a coding bit rate, and the like. The virtual speaker configuration parameters include but are not limited to: the number of virtual speakers, the orders of the virtual speakers, and the position coordinates of the virtual speakers. The position coordinates of the virtual speakers include the horizontal angles and the pitch angles. For the position coordinates in a non-uniform distribution of virtual speakers, refer to Table B.48.

The coding analysis is used to perform coding analysis on the HOA signal, and analyze a sound field distribution feature of the HOA signal, including features such as number of of sound sources of the HOA signal, directivity of the sound sources, and diffuseness. Singular value decomposition method can be used for coding analysis to analyze the sound sources based on the singular values. For example, a ratio temp[i] between singular values is used, and the value of temp[i] is sequentially determined from i=0. When the m-th sound field classification parameter meets temp[m] ≥ TH1, the sound field is directional and there are (m+1) sound sources; if temp[m] ≥ TH1 does not exist, the sound field type is a diffuse sound field, and TH1 is a preset sound source determining threshold, which may be a constant, for example, a value of TH1 may be 30.

The virtual speaker selection is used to determine a target virtual speaker matching the HOA signal and attribute information of the target virtual speaker based on the HOA signal, the sound field distribution feature of the HOA signal, and the coefficients of the plurality of virtual speakers. A common method is to perform a projection operation based on the HOA signal and the HOA coefficient of the virtual speaker, and screen the main virtual speakers used to represent the sound field components. Refer to formula (D.31).

$$P_{jil} = B_{ji}(\theta, \varphi) \times B_l(\theta, \varphi) \qquad \text{(D.31)}$$

θ indicates a horizontal angle of the virtual speaker, φ indicates a pitch angle of the virtual speaker, $B_{ji}(\theta, \varphi)$ indicates the j-th Ambisonic coefficient of the HOA signal in the i-th round of screening, and $B_l(\theta, \varphi)$ indicates the Ambisonic coefficient of the l-th virtual speaker. When the maximum value of P_{jil} is obtained, the l virtual speakers are the target virtual speakers of the HOA signal, and the horizontal angle information and the azimuth information of the virtual speakers are the attribute information of the target virtual speakers. The number of initial target virtual speakers may be set to 2.

The sound field component synthesis is mainly used to generate virtual speaker signals in the transmission channels. The virtual speaker signal is generated based on the HOA signal and the attribute information of the target virtual speakers. For details about the synthesis of virtual speaker signals, refer to formula (D.32).

$$w = A^{-1}X \qquad \text{(D.32)}$$

w indicates a virtual speaker signal, a matrix A indicates a coefficient of a target virtual speaker, A^{-1} indicates an inverse matrix of the matrix A, a matrix X indicates a coefficient of an HOA signal, a size of the matrix A is

（M × C）, C indicates the number of target virtual speakers, M indicates the number of channels of an N-order HOA signal,a size of the matrix X is（M × L）, and L indicates the number of coefficients of the HOA signal.

The other component calculation is used to obtain the residual signal in the transmission channel. The residual signal may be obtained based on a difference between the HOA signal and the reconstructed sound field signal. The reconstructed sound field signal is a sound field signal reconstructed based on the virtual speaker signal and the target virtual speaker. For implementation steps, refer to the HOA spatial decoding process in section 7.13. Finally, the virtual speaker signal and the residual signal form a transmission channel signal. The transmission channel signal and the side information represented by the virtual speaker are jointly coded by the core coder to obtain a coded bitstream.

D.6 Tables of Parameters of Coding Neural Network

The parameters of Coding Neural Network are shown in Tables D.3-D.20.

Table D.3 Layer 1 CNN (convolutional kernel parameter kernel) of base coding neural network parameter

Parameter value
0x1.653c4a0000000p-7, -0x1.2df6900000000p-6,
-0x1.ea704a0000000p-7, 0x1.4e0c2c0000000p-6,
0x1.08852c0000000p-8, -0x1.d873b40000000p-11,
0x1.f20f720000000p-6, 0x1.34c98e0000000p-6,
0x1.7285d80000000p-9, 0x1.f5d3720000000p-10,

Table D.4 Layer 1 CNN (bias parameter bias) of base coding neural network parameter

Parameter value
0x1.1c2e720000000p-4, -0x1.9981880000000p-6,

Table D.5 Layer 1 CNN (GDN activation function beta parameter) of base coding neural network parameter

Parameter value
0x1.c855b20000000p+3, 0x1.2c9cc00000000p+4,

Table D.6 Layer 1 CNN (GDN activation function gamma parameter) of base coding neural network parameter

Parameter value
0x0.0p+0, 0x0.0p+0,
0x0.0p+0, 0x0.0p+0,

Table D.7 Layer 2 CNN (convolutional kernel parameter kernel) of base coding neural network parameter

Parameter value
0x1.22a83c0000000p-3, 0x1.6042960000000p-3, 0x1.132b3a0000000p-3, 0x1.1510840000000p-2,
0x1.9c67040000000p-2, -0x1.ad7f9e0000000p-6, 0x1.f6abb60000000p-4, 0x1.3d6d2c0000000p-7,

0x1.5e1a420000000p-3, 0x1.78d15c0000000p-4, -0x1.7c56060000000p-3, 0x1.bd23b40000000p-3,
-0x1.74cd8c0000000p-2, -0x1.4a11720000000p-2, -0x1.fad6c000000000p-3, 0x1.6e17b60000000p-4,
0x1.5807d80000000p-4, -0x1.24e5620000000p-4, -0x1.691da40000000p-4, 0x1.0f94c20000000p-4,
0x1.7c700e0000000p-6, -0x1.ce30300000000p-11, 0x1.705f660000000p-3, -0x1.ee89be0000000p-3,
0x1.5406560000000p-4, 0x1.17d8f80000000p-7, -0x1.c443700000000p-6, 0x1.337cb80000000p-5,
-0x1.90a85e0000000p-5, 0x1.4a2aa60000000p-6, -0x1.43d3be0000000p-5, -0x1.8259300000000p-4,
-0x1.6e82060000000p-7, -0x1.41b5e60000000p-7, -0x1.8236620000000p-6, -0x1.7b40a40000000p-7,
-0x1.1a9c1e0000000p-4, -0x1.633cb40000000p-6, 0x1.0e4cf80000000p-4, 0x1.3e03da0000000p-5,

Table D.8 Layer 2 CNN (bias parameter bias) of base coding neural network parameter

Parameter value
-0x1.5894220000000p-8, -0x1.5b11d80000000p-9, -0x1.783dc80000000p-9, -0x1.f69d920000000p-10,

Table D.9 Layer 2 CNN (GDN activation function beta parameter) of base coding neural network parameter

Parameter value
0x1.cfa2680000000p+0, 0x1.425d460000000p+0, 0x1.a1cc0c0000000p-1, 0x1.84e8f40000000p+0,

Table D.10 Layer 2 CNN (GDN activation function gamma parameter) of base coding neural network parameter

Parameter value
0x1.bc167e0000000p-31, 0x0.0p+0, 0x1.1976f80000000p-32, 0x1.0926de0000000p-30,
0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0,
0x1.4e9dd00000000p-28, 0x0.0p+0, 0x1.9fac280000000p-38, 0x1.3399c20000000p-34,
0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0,

Table D.11 Layer 3 CNN (convolutional kernel parameter kernel) of base coding neural network parameter

Parameter value
-0x1.3a932a0000000p-6, 0x1.ccae2e0000000p-10, 0x1.80cb680000000p-3, -0x1.714d440000000p-3, 0x1.8b8fd20000000p-10, -0x1.21c3800000000p-3,

0x1.308c720000000p-5, 0x1.7912dc0000000p-3,
-0x1.a6d08c0000000p-3, -0x1.23c6820000000p-8, -0x1.7ec64a0000000p-6, -0x1.8153da0000000p-3, -0x1.aae2920000000p-3, -0x1.5f67600000000p-4, -0x1.17b5520000000p-5, 0x1.8767a20000000p-5,
-0x1.2d0b740000000p-4, -0x1.760afe0000000p-4, 0x1.5cfdac0000000p-3, -0x1.84ef860000000p-5, -0x1.2a88fc0000000p-5, -0x1.49c2280000000p-3, 0x1.f163660000000p-6, 0x1.c563100000000p-4,
0x1.14d6d60000000p-3, 0x1.9056aa0000000p-7, 0x1.edead60000000p-5, 0x1.6c1f340000000p-5, 0x1.9b6a780000000p-4, -0x1.0dd4180000000p-5, 0x1.ddbee20000000p-6, 0x1.65926e0000000p-3,
-0x1.0ee9b60000000p-3, -0x1.8619380000000p-2, 0x1.c987ae0000000p-2, 0x1.aba5660000000p-3, 0x1.0212e40000000p-2, -0x1.98908e0000000p-2, 0x1.8b95f40000000p-3, 0x1.2cc4920000000p-4,
-0x1.c696c20000000p-2, -0x1.2a94460000000p-4, -0x1.28236c0000000p-4, -0x1.7fe2b00000000p-3, -0x1.2b63f40000000p-2, -0x1.27f4ec0000000p-3, 0x1.f764180000000p-4, -0x1.18befc0000000p-1,
0x1.2526900000000p-1, 0x1.d5aa580000000p-3, 0x1.0e85320000000p-4, -0x1.51ccac0000000p-5, 0x1.a18ec20000000p-4, 0x1.79064e0000000p-7, 0x1.1892980000000p-2, -0x1.8da1ce0000000p-3,
-0x1.cce77c0000000p-7, -0x1.b948520000000p-3, -0x1.5b65280000000p-3, 0x1.565d960000000p-1, 0x1.d700c00000000p-3, 0x1.130b120000000p-3, -0x1.04d9b20000000p-3, -0x1.20eb620000000p-4,
0x1.abac260000000p-4, -0x1.c8eb980000000p-5, 0x1.e836580000000p-2, 0x1.6b4d740000000p-4, -0x1.10469e0000000p-1, 0x1.2c9fd40000000p-3, -0x1.ec69e00000000p-3, -0x1.e710920000000p-3,
0x1.bca5460000000p-3, 0x1.af19540000000p-3, -0x1.7a2a400000000p-2, -0x1.8c92660000000p-4, -0x1.95c20e0000000p-2, -0x1.824db80000000p-2, -0x1.c3643c0000000p-5, 0x1.7982980000000p-3,
-0x1.1b89220000000p-6, -0x1.4515580000000p-3, -0x1.bce3640000000p-4, -0x1.05f2dc0000000p-2, 0x1.57e9f60000000p-1, -0x1.53536c0000000p-3, -0x1.9cfed40000000p-3, -0x1.86c4e80000000p-4,
0x1.ea45a20000000p-3, -0x1.0d6ca40000000p-1, -0x1.1697ac0000000p-2, -0x1.0c642c0000000p-2, -0x1.29bf060000000p-3, 0x1.0901940000000p-3, 0x1.9251f80000000p-5, -0x1.fb8f980000000p-6,
0x1.d793880000000p-5, 0x1.ac848c0000000p-5, -0x1.5319f80000000p-3, 0x1.9100a40000000p-3, -0x1.fa51a80000000p-2, 0x1.c7a96a0000000p-5, 0x1.baa0b80000000p-2, 0x1.7bdbe00000000p-4,
0x1.ad0e440000000p-4, -0x1.3e29d20000000p-3, 0x1.ca83760000000p-4, 0x1.2454300000000p-4, -0x1.8ddfb60000000p-3, 0x1.395a2e0000000p-3, 0x1.9464fc0000000p-4, -0x1.2e13ce0000000p-6,
0x1.47e46e0000000p-3, -0x1.5c4f700000000p-4, -0x1.9f047c0000000p-4, 0x1.d5a4ee0000000p-4, -0x1.8b86ee0000000p-2, -0x1.7adf100000000p-3,

-0x1.c4431e0000000p-5, -0x1.3bf2d40000000p-8,
0x1.b1b58e0000000p–3, –0x1.868ece0000000p–3, –0x1.3e04f80000000p–3, 0x1.8bbb9a0000000p–5, –0x1.161a460000000p–2, –0x1.08bfd00000000p–2, –0x1.d921240000000p–4, –0x1.467dda0000000p–6,
0x1.cf2d060000000p-7, -0x1.d6af500000000p-4, -0x1.eeeb480000000p-5, 0x1.04faa40000000p-3, -0x1.65ed500000000p-3, -0x1.37d4200000000p-5, -0x1.025d1c0000000p-7, 0x1.0f25b60000000p-5,
-0x1.8b21400000000p-3, 0x1.88fe340000000p-6, 0x1.45ddca0000000p-4, -0x1.da07560000000p-4, 0x1.a477480000000p-2, 0x1.e68c760000000p-4, -0x1.8524540000000p-4, -0x1.f7db780000000p-11,
-0x1.9377920000000p-5, -0x1.c9b9380000000p-4, 0x1.2947920000000p-7, 0x1.1c3d700000000p-3, -0x1.1d80e80000000p-3, 0x1.466b920000000p-7, -0x1.5890960000000p-4, 0x1.d99ca00000000p-6,
0x1.1f5e7a0000000p-6, -0x1.5ba5b80000000p-5, -0x1.4490840000000p-4, -0x1.cebfa60000000p-6, 0x1.71ce4a0000000p-4, -0x1.725bec0000000p-4, -0x1.6c43600000000p-5, 0x1.454cba0000000p-8,

Table D.12 Layer 3 CNN (bias parameter bias) of base coding neural network parameter

Parameter value
0x1.1020de0000000p-10, 0x1.0a7c0c0000000p-7, 0x1.e1953e0000000p-9, -0x1.2de4e20000000p-8, 0x1.9fa7720000000p-8, -0x1.a156500000000p-11, -0x1.b491540000000p-18, -0x1.27bb900000000p-10,

Table D.13 Layer 3 CNN (GDN activation function beta parameter) of base coding neural network parameter

Parameter value
0x1.d0d8fc0000000p-1, 0x1.becb2e0000000p-1, 0x1.3b81b00000000p-1, 0x1.dca0400000000p-1, 0x1.66fece0000000p+0, 0x1.b422b60000000p-2, 0x1.a465040000000p-1, 0x1.34fb960000000p-2,

Table D.14 Layer 3 CNN (GDN activation function gamma parameter) of base coding neural network parameter

Parameter value
0x1.94d3c00000000p-41, 0x0.0p+0, 0x0.0p+0, 0x1.34ee820000000p-24, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0,
0x0.0p+0, 0x1.040c120000000p-23, 0x0.0p+0, 0x1.3924620000000p-23, 0x1.43042c0000000p-21, 0x1.d3232a0000000p-28, 0x1.8898000000000p-30, 0x0.0p+0,
0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x1.8a89340000000p-30, 0x1.f394900000000p-39,
0x1.3ed34a0000000p-26, 0x1.9681e60000000p-29, 0x0.0p+0, 0x0.0p+0, 0x1.c2da620000000p-23, 0x0.0p+0, 0x1.75d6240000000p-31, 0x0.0p+0,
0x0.0p+0, 0x1.1e513a0000000p-32, 0x0.0p+0, 0x1.59a2b00000000p-25,

0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0,
0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0,
0x1.f72bfc0000000p-34, 0x1.40ffd60000000p-34, 0x1.ccc9100000000p-26, 0x1.2ca0c20000000p-22, 0x0.0p+0, 0x0.0p+0, 0x1.579bee0000000p-24, 0x1.a591000000000p-35,
0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x0.0p+0, 0x1.92c9240000000p-36, 0x1.2e93800000000p-34, 0x0.0p+0,

Table D.15 Layer 4 CNN (convolutional kernel parameter kernel) of base coding neural network parameter

Parameter value
0x1.3397da0000000p-10, 0x1.8433d00000000p-7, 0x1.152e8a0000000p-5, -0x1.7766a20000000p-6, 0x1.93eb580000000p-7, 0x1.1427ac0000000p-10, 0x1.05abea0000000p-10, 0x1.7f9d400000000p-5, -0x1.0359920000000p-11, -0x1.947a260000000p-12, -0x1.11a51a0000000p-8, -0x1.e55b720000000p-7, -0x1.2146160000000p-3, 0x1.d1846e0000000p-12, -0x1.1ad2a20000000p-6, 0x1.435bce0000000p-5,
-0x1.8a68160000000p-11, 0x1.19dd6e0000000p-8, -0x1.3494720000000p-6, -0x1.4db3f00000000p-7, 0x1.4748b20000000p-8, 0x1.65ed780000000p-9, -0x1.9ddc5e0000000p-9, -0x1.df5c880000000p-6, 0x1.441fb60000000p-11, -0x1.b8a4880000000p-12, 0x1.7beae20000000p-8, 0x1.c24f640000000p-6, -0x1.faf3bc0000000p-5, -0x1.336ac00000000p-11, 0x1.12ce740000000p-5, -0x1.85e6180000000p-6,
0x1.30544a0000000p-15, -0x1.e1fec60000000p-7, -0x1.32b0a40000000p-5, 0x1.accf460000000p-8, 0x1.ffbc080000000p-9, -0x1.0a3a0e0000000p-9, -0x1.ab52d00000000p-12, -0x1.94515e0000000p-5, 0x1.07e5600000000p-13, -0x1.42eaae0000000p-11, 0x1.5551ec0000000p-8, 0x1.0c170c0000000p-5, 0x1.3aea700000000p-6, -0x1.a182540000000p-13, -0x1.1f6a7a0000000p-9, -0x1.a9b0d20000000p-7,
-0x1.95b1f60000000p-13, 0x1.433bf40000000p-8, -0x1.1e17b00000000p-6, -0x1.ab7f420000000p-9, -0x1.a150400000000p-6, 0x1.e8e83c0000000p-10, -0x1.5ede280000000p-11, -0x1.1a5c220000000p-5, -0x1.2991fc0000000p-12, 0x1.f2f0080000000p-11, 0x1.da6c8e0000000p-9, 0x1.824a7a0000000p-7, 0x1.bef4ac0000000p-3, -0x1.3e62ee0000000p-11, -0x1.4feb900000000p-8, -0x1.a7842e0000000p-6,
-0x1.b8c0080000000p-10, -0x1.1eb5b60000000p-7, -0x1.74100e0000000p-9, 0x1.18e7740000000p-7, 0x1.d5fd860000000p-5, 0x1.d36b7c0000000p-14, 0x1.2297700000000p-9, 0x1.d4a7d40000000p-6, 0x1.496fe00000000p-14, -0x1.a955ac0000000p-12, -0x1.c510820000000p-10, -0x1.b2d8120000000p-6, -0x1.c5aafe0000000p-2, -0x1.62bfe40000000p-13, 0x1.1d88ac0000000p-5,

0x1.d4ccc20000000p-11,
0x1.894ee40000000p-12, -0x1.60a90c0000000p-6, -0x1.09ad1e0000000p-5, 0x1.2249460000000p-5, -0x1.54ec660000000p-6, -0x1.17b76a0000000p-8, -0x1.106ffe0000000p-12, -0x1.d640e00000000p-5, 0x1.2513b00000000p-10, 0x1.4354760000000p-14, 0x1.f1c07c0000000p-9, 0x1.74f8f60000000p-5, 0x1.2047ec0000000p-2, 0x1.9ff14c0000000p-12, 0x1.50efc00000000p-10, -0x1.7839a20000000p-6,
0x1.f0e0940000000p-12, -0x1.5e23640000000p-8, -0x1.9a4a040000000p-10, 0x1.50d2920000000p-5, -0x1.4651ae0000000p-4, -0x1.3da02a0000000p-9, -0x1.2dab180000000p-9, -0x1.c69d120000000p-5, 0x1.58fcac0000000p-9, 0x1.37bb140000000p-10, 0x1.179b060000000p-8, 0x1.dea4360000000p-5, 0x1.5bc8700000000p-1, 0x1.9a5c8c0000000p-11, 0x1.2d66920000000p-7, -0x1.d576020000000p-6,
-0x1.678a720000000p-17, 0x1.08afcc0000000p-9, -0x1.3369200000000p-8, 0x1.c1164a0000000p-8, -0x1.96a1a80000000p-6, 0x1.45053c0000000p-13, 0x1.8d1c620000000p-12, -0x1.72d4040000000p-7, 0x1.70bbb00000000p-12, 0x1.0b3f960000000p-11, 0x1.b0f29a0000000p-11, 0x1.e9c99e0000000p-12, 0x1.4299f40000000p-3, 0x1.21b6a80000000p-12, -0x1.c71b0e0000000p-10, -0x1.16d3d40000000p-6,
0x1.37f0d60000000p-8, -0x1.6f3c040000000p-5, 0x1.4b46820000000p-3, 0x1.687f480000000p-3, 0x1.03c9860000000p-1, -0x1.338c640000000p-5, -0x1.3e1ece0000000p-5, 0x1.8db7140000000p-2, 0x1.d79fc40000000p-6, 0x1.8233b40000000p-7, 0x1.3fe3460000000p-9, 0x1.2d59ca0000000p-2, 0x1.9206000000000p-2, -0x1.eebc3e0000000p-11, -0x1.395c9e0000000p-2, 0x1.33c3760000000p-4,
-0x1.6884be0000000p-6, 0x1.3f046c0000000p-3, 0x1.8099680000000p-5, 0x1.011a8a0000000p-3, 0x1.84a9560000000p-4, 0x1.d6456a0000000p-6, 0x1.97cfdc0000000p-6, 0x1.12a13c0000000p-1, -0x1.26537e0000000p-7, -0x1.dc2e560000000p-10, -0x1.aa300a0000000p-6, 0x1.2da42c0000000p-5, 0x1.ac2e480000000p-3, -0x1.c3a01a0000000p-11, 0x1.21f5f20000000p-1, -0x1.35c6e60000000p-1,
0x1.0e068a0000000p-7, 0x1.a488da0000000p-7, -0x1.db32a60000000p-9, -0x1.1c951a0000000p-5, -0x1.12c25c0000000p-1, 0x1.5fff2c0000000p-6, 0x1.9526040000000p-5, 0x1.2cc3b40000000p-1, -0x1.af202e0000000p-6, -0x1.ce0ac60000000p-8, -0x1.fc51b80000000p-8, -0x1.564fa00000000p-4, 0x1.f164140000000p-4, 0x1.09213c0000000p-8, -0x1.2a6c080000000p-3, 0x1.be0dd00000000p-8,
0x1.0a9de00000000p-11, 0x1.69a44c0000000p-6, -0x1.acf6700000000p-3, 0x1.8926020000000p-4, -0x1.3d15360000000p-2, 0x1.0a34f00000000p-7, 0x1.e752380000000p-7, -0x1.1f9a820000000p-2, -0x1.57c61c0000000p-7, -0x1.8e738e0000000p-9, 0x1.c1fd1c0000000p-7, 0x1.dece720000000p-3, -0x1.c39f1a0000000p-5, -0x1.68dfee0000000p-12, 0x1.ec5ed20000000p-5, -0x1.e80e6c0000000p-2,

-0x1.b2428c0000000p-6, 0x1.cf2ad20000000p-4, 0x1.ae13000000000p-2, -0x1.32397c0000000p-3, -0x1.5f9d2e0000000p-4, 0x1.5bc4060000000p-7, -0x1.5da6d60000000p-7, -0x1.babeb60000000p-3, 0x1.afebf00000000p-8, 0x1.6cf7f40000000p-10, -0x1.c35d7c0000000p-5, -0x1.e1d99e0000000p-2, 0x1.7015360000000p-6, -0x1.0ba0720000000p-9, 0x1.0b3ca60000000p-1, 0x1.b1b4a40000000p-2,
0x1.2bbdf20000000p-6, -0x1.1e856c0000000p-4, -0x1.0696ea0000000p-2, -0x1.4243ec0000000p-2, -0x1.8805720000000p-2, 0x1.f1fc980000000p-6, 0x1.ba14fe0000000p-5, 0x1.82d4e80000000p-3, -0x1.899a800000000p-5, -0x1.45f58a0000000p-6, 0x1.2db58a0000000p-6, -0x1.7a29520000000p-2, 0x1.12b36e0000000p-3, 0x1.fee1a60000000p-9, -0x1.1ac2180000000p-2, 0x1.efab1e0000000p-3,
0x1.d876200000000p-7, -0x1.9b38aa0000000p-4, -0x1.6b4d960000000p-1, -0x1.a00dae0000000p-2, 0x1.1387b20000000p-1, 0x1.495d6e0000000p-5, 0x1.3292380000000p-5, -0x1.64d4680000000p-6, -0x1.c5a1b80000000p-5, -0x1.e02e1e0000000p-6, 0x1.c6cea80000000p-5, -0x1.a62fc20000000p-2, -0x1.4431920000000p-3, 0x1.bd31520000000p-11, 0x1.90772c0000000p-5, -0x1.8757b00000000p-3,
0x1.330b020000000p-9, -0x1.411fe80000000p-6, -0x1.51f92c0000000p-3, -0x1.8ef5040000000p-5, -0x1.1adcc60000000p-4, 0x1.d778280000000p-8, 0x1.f07dc40000000p-9, -0x1.55 Creel8000000000p-2, -0x1.d30fac0000000p-8, -0x1.216baa0000000p-8, 0x1.11243a0000000p-6, -0x1.10456a0000000p-8, 0x1.4d9eb00000000p-1, -0x1.5892900000000p-13, -0x1.1d39880000000p-8, -0x1.7cb6e80000000p-4,
0x1.2878da0000000p-2, 0x1.2821560000000p-2, -0x1.75ff440000000p-2, 0x1.2b22a00000000p-1, -0x1.3c61660000000p-6, -0x1.57fc0a0000000p-4, -0x1.6b9b100000000p-2, 0x1.0645aa0000000p-3, -0x1.20d40a0000000p-2, -0x1.6ddafe0000000p-3, -0x1.0257a20000000p-1, -0x1.51bd780000000p-3, -0x1.c6879e0000000p-6, 0x1.a935e80000000p-5, -0x1.6e84d60000000p-3, 0x1.2865a80000000p-2,
-0x1.2066320000000p-1, 0x1.cfbdbe0000000p-3, -0x1.c4400e0000000p-3, -0x1.6690540000000p-3, 0x1.802e220000000p-3, 0x1.3ba2c80000000p-1, -0x1.1c9e100000000p-1, -0x1.8e6c160000000p-4, -0x1.489bdc0000000p-5, -0x1.0f74ba0000000p-3, -0x1.92ab800000000p-4, -0x1.31bdfa0000000p-9, 0x1.5a54f20000000p-10, -0x1.3ab7fa0000000p-3, -0x1.2324180000000p-3, -0x1.f8f89e0000000p-4,
0x1.3f70240000000p-3, -0x1.7fc8520000000p-3, -0x1.357b100000000p-3, 0x1.841eb80000000p-3, -0x1.8177080000000p-3, -0x1.115a160000000p-6, -0x1.2265fc0000000p-1, 0x1.2904680000000p-4, 0x1.982ea80000000p-4, 0x1.4d03100000000p-5, 0x1.0ed69e0000000p-1, 0x1.5943620000000p-3, -0x1.03bb300000000p-5, -0x1.59fa9c0000000p-7, 0x1.fb3b600000000p-2, 0x1.654bd20000000p-2,
-0x1.4193500000000p-4, -0x1.c9aa5c0000000p-4, 0x1.35537e0000000p-5,

0x1.0eb11a0000000p-1, -0x1.25d1d80000000p-3, 0x1.da35bc0000000p-2, 0x1.42572a0000000p-2, -0x1.07df960000000p-3, -0x1.ec34700000000p-3, -0x1.7e9d320000000p-4, 0x1.44ca300000000p-2, -0x1.99a3b80000000p-2, -0x1.23c90c0000000p-8, -0x1.351ed60000000p-6, 0x1.8d28620000000p-3, 0x1.25a1b60000000p-2,
-0x1.0989be0000000p-1, -0x1.76f8f80000000p-5, -0x1.48face0000000p-8, 0x1.812cdc0000000p-2, 0x1.135a220000000p-6, -0x1.b475dc0000000p-2, 0x1.f354040000000p-3, -0x1.b03c5a0000000p-5, 0x1.e5e2e00000000p-2, 0x1.0a565e0000000p-3, 0x1.ad21140000000p-4, -0x1.86160e0000000p-3, -0x1.5e14940000000p-6, -0x1.f3eeac0000000p-4, 0x1.47928c0000000p-3, 0x1.1336b60000000p-2,
0x1.f3e7d60000000p-3, 0x1.18edb20000000p-2, -0x1.cf80ea0000000p-4, 0x1.7167640000000p-3, -0x1.ad45220000000p-7, -0x1.074e300000000p-2, -0x1.79c60e0000000p-3, -0x1.778d6c0000000p-7, 0x1.86c7760000000p-2, 0x1.3de1280000000p-2, 0x1.8293ee0000000p-2, -0x1.1166d40000000p-3, 0x1.54cc3c0000000p-7, 0x1.1250cc0000000p-4, -0x1.f87c160000000p-2, -0x1.300bee0000000p-3,
-0x1.504e520000000p-4, -0x1.2e863a0000000p-2, 0x1.39b1ba0000000p-3, 0x1.24ef040000000p-3, -0x1.7787820000000p-2, 0x1.7604fe0000000p-3, 0x1.fdeee00000000p-5, -0x1.2e887c0000000p-3, 0x1.a680f40000000p-2, 0x1.a968900000000p-2, -0x1.1df04e0000000p-1, 0x1.2828a00000000p-7, -0x1.3948ac0000000p-6, 0x1.45dd540000000p-4, 0x1.622e880000000p-2, 0x1.0ee7320000000p-2,
-0x1.18119c0000000p-6, 0x1.be7d060000000p-2, -0x1.537fb20000000p-1, -0x1.4fc14c0000000p-5, 0x1.70fc1c0000000p-9, 0x1.64217c0000000p-4, 0x1.69514a0000000p-2, -0x1.3813660000000p-6, -0x1.01da880000000p-10, 0x1.c7f2760000000p-5, 0x1.fb9be60000000p-5, 0x1.dcf3f40000000p-2, -0x1.1ac8200000000p-4, 0x1.4c9ff60000000p-6, 0x1.3ffdd40000000p-5, 0x1.a525940000000p-3,
0x1.3b1f640000000p-3, -0x1.0d64900000000p-6, 0x1.9c622a0000000p-6, 0x1.0715d80000000p-9, -0x1.b36d540000000p-4, -0x1.0d7bd80000000p-2, -0x1.e518440000000p-4, -0x1.3e434c0000000p-7, 0x1.55027a0000000p-3, -0x1.144ca00000000p-1, 0x1.c09af20000000p-6, -0x1.15937c0000000p-6, -0x1.4ffbcc0000000p-11, -0x1.22db9a0000000p-2, -0x1.0f5cb80000000p-5, 0x1.a042740000000p-6,
0x1.24dd560000000p-3, -0x1.b8e4820000000p-9, 0x1.f9557c0000000p-12, 0x1.e310b60000000p-5, -0x1.6d8f300000000p-5, 0x1.20e5e20000000p-3, 0x1.b364b20000000p-4, -0x1.41d4900000000p-5, -0x1.2797da0000000p-9, 0x1.93833c0000000p-3, -0x1.8ba3cc0000000p-3, 0x1.f655f00000000p-7, -0x1.ca9fde0000000p-9, -0x1.f56a980000000p-3, -0x1.4ae2380000000p-6, 0x1.2e31520000000p-7,
-0x1.f04fb40000000p-2, -0x1.8ac6e80000000p-6, 0x1.fa11ea0000000p-7, -0x1.8a2f6a0000000p-4, 0x1.d5006a0000000p-5, -0x1.54b5bc0000000p-2,

-0x1.3cb5340000000p-4, 0x1.98a5ac0000000p-4, -0x1.5d29340000000p-3, -0x1.4e841e0000000p-3, 0x1.77a26c0000000p-3, -0x1.2b3fc20000000p-5, 0x1.279e9c0000000p-7, 0x1.93cc0e0000000p-3, 0x1.9a10720000000p-5, -0x1.dde7aa0000000p-6,
-0x1.79f6d80000000p-3, 0x1.2274aa0000000p-9, 0x1.5044800000000p-10, -0x1.4360420000000p-4, -0x1.905db80000000p-8, -0x1.45ee160000000p-2, 0x1.08c0a60000000p-3, -0x1.817fb20000000p-5, 0x1.95fd1e0000000p-2, -0x1.1327840000000p-1, 0x1.0c0f5a0000000p-3, -0x1.1c646c0000000p-8, -0x1.5dde460000000p-8, 0x1.8e1ff80000000p-4, 0x1.1676b60000000p-6, 0x1.2fb4380000000p-7,
-0x1.434d3c0000000p-3, -0x1.07eafa0000000p-8, 0x1.75a4700000000p-6, -0x1.16a0160000000p-4, -0x1.459f920000000p-7, -0x1.162e820000000p-2, 0x1.99efc20000000p-5, -0x1.0d59a80000000p-7, 0x1.76a9140000000p-3, -0x1.a3c98a0000000p-2, 0x1.f42cc80000000p-9, -0x1.d1afea0000000p-7, -0x1.eeddc60000000p-10, 0x1.394b240000000p-5, 0x1.6b8a400000000p-7, 0x1.9ab77c0000000p-7,
0x1.0143900000000p-1, 0x1.fa47cc0000000p-8, -0x1.a168260000000p-8, 0x1.0189a00000000p-4, -0x1.51e7f80000000p-4, 0x1.271c540000000p-3, 0x1.492ce40000000p-6, -0x1.d0488a0000000p-5, 0x1.f464280000000p-4, -0x1.6e44ee0000000p-3, -0x1.7fcec60000000p-12, 0x1.9a63ca0000000p-9, -0x1.f7bf460000000p-9, -0x1.0861300000000p-2, -0x1.5369940000000p-5, 0x1.01a3c20000000p-6,
-0x1.5948fe0000000p-2, -0x1.c24d160000000p-9, 0x1.4de2d20000000p-7, -0x1.70ddfc0000000p-4, 0x1.4cceb20000000p-4, -0x1.154d020000000p-2, 0x1.170b260000000p-3, 0x1.5097a80000000p-5, -0x1.93dc0a0000000p-7, -0x1.4410020000000p-3, 0x1.58f5f40000000p-2, -0x1.99e6aa0000000p-7, 0x1.瑄2f600000000p-9, 0x1.34d5ce0000000p-2, 0x1.6222e40000000p-5, -0x1.bdfeb40000000p-6,
-0x1.2be4c80000000p-4, -0x1.9b64100000000p-5, 0x1.c891c00000000p-5, 0x1.1d8f6c0000000p-5, -0x1.420cbe0000000p-4, -0x1.d74a620000000p-3, 0x1.1bc7fe0000000p-6, 0x1.89dca60000000p-4, -0x1.e4499c0000000p-2, 0x1.45b6de0000000p-5, -0x1.81cb0a0000000p-6, -0x1.2f70500000000p-5, 0x1.7162580000000p-7, -0x1.c4e78c0000000p-2, -0x1.69e43c0000000p-6, -0x1.2bf70e0000000p-6,
0x1.53d2ce0000000p-5, 0x1.bb17b20000000p-11, -0x1.0954a40000000p-14, 0x1.2f784a0000000p-9, 0x1.1db78e0000000p-9, -0x1.d435f60000000p-7, 0x1.6358400000000p-7, 0x1.fb23860000000p-13, 0x1.2f22120000000p-6, -0x1.1588d00000000p-6, 0x1.7b11aa0000000p-4, -0x1.2f661a0000000p-9, -0x1.a403d40000000p-15, 0x1.a979a00000000p-6, 0x1.6114040000000p-12, 0x1.c897920000000p-13,
0x1.464d940000000p-6, -0x1.78e9d60000000p-13, 0x1.3e25bc0000000p-9, -0x1.ada1700000000p-9, -0x1.07289c0000000p-10, -0x1.6d324e0000000p-6, 0x1.20aa300000000p-5, 0x1.6bdd380000000p-11, -0x1.0347660000000p-7,

-0x1.9307060000000p-5, 0x1.4148160000000p-5, -0x1.15c1ee0000000p-9, 0x1.b93f760000000p-13, 0x1.0715080000000p-8, 0x1.57d9820000000p-12, -0x1.2dcf3a0000000p-9,
-0x1.e280b80000000p-6, 0x1.2f9ddc0000000p-10, -0x1.e863e60000000p-8, 0x1.516b5e0000000p-8, 0x1.1bc7ea0000000p-9, 0x1.80e7a00000000p-6, -0x1.3d1ec20000000p-4, -0x1.0618a20000000p-10, 0x1.2779d40000000p-6, 0x1.eb05980000000p-5, -0x1.21eada0000000p-4, 0x1.8cbf640000000p-9, -0x1.c48cde0000000p-12, 0x1.b88f640000000p-8, 0x1.b5f23e0000000p-12, 0x1.f5575e0000000p-8,
-0x1.382ec20000000p-7, 0x1.89194e0000000p-13, 0x1.c090620000000p-8, -0x1.595d840000000p-11, 0x1.b016c60000000p-12, -0x1.46502e0000000p-7, 0x1.7106820000000p-5, -0x1.06197e0000000p-10, -0x1.0a06f60000000p-7, 0x1.2dcfb80000000p-5, 0x1.c500d00000000p-11, -0x1.75ec400000000p-11, 0x1.6918d20000000p-13, -0x1.40a0d20000000p-7, -0x1.a934860000000p-11, -0x1.0f46ce0000000p-10,
-0x1.b29f020000000p-8, 0x1.1075040000000p-10, 0x1.4808a20000000p-9, 0x1.da1f480000000p-10, 0x1.9d197a0000000p-10, -0x1.dd81220000000p-10, 0x1.12819c0000000p-7, -0x1.0ae4b60000000p-10, 0x1.68f3dc0000000p-8, 0x1.360b740000000p-5, 0x1.ecb9aa0000000p-8, 0x1.8240760000000p-10, 0x1.fcb0320000000p-14, 0x1.1795b20000000p-8, -0x1.fcb58a0000000p-11, 0x1.81e9740000000p-10,
0x1.1e0aea0000000p-5, 0x1.eb29dc0000000p-13, 0x1.c2784a0000000p-10, -0x1.4b65860000000p-9, -0x1.33f54a0000000p-9, -0x1.2304cc0000000p-6, 0x1.72ce620000000p-5, 0x1.aa09680000000p-10, -0x1.2ea3aa0000000p-9, -0x1.6cbd040000000p-5, 0x1.54c66e0000000p-4, -0x1.6ae3520000000p-9, 0x1.7b98bc0000000p-12, 0x1.9b9de20000000p-8, 0x1.d738ec0000000p-12, -0x1.9c14760000000p-8,
-0x1.1ff94e0000000p-5, 0x1.6765c60000000p-14, -0x1.78521c0000000p-10, 0x1.5412620000000p-9, 0x1.1221ca0000000p-12, 0x1.67aea40000000p-6, -0x1.23eb0a0000000p-5, -0x1.d0af120000000p-11, 0x1.2140c80000000p-9, 0x1.cb77860000000p-5, -0x1.3c430e0000000p-4, 0x1.484ab40000000p-10, -0x1.793a120000000p-14, -0x1.a82c960000000p-7, -0x1.90b2ac0000000p-12, 0x1.f26f880000000p-9,
0x1.3e4fc40000000p-5, -0x1.c629ba0000000p-13, -0x1.6b53920000000p-7, 0x1.012f2e0000000p-8, 0x1.6b9d200000000p-9, -0x1.4fb38e0000000p-9, -0x1.3f13960000000p-4, 0x1.9a47680000000p-11, 0x1.1e548c0000000p-5, -0x1.904d6c0000000p-5, 0x1.9c929e0000000p-5, -0x1.896a7e0000000p-9, 0x1.6ffe540000000p-15, 0x1.5ce2280000000p-5, 0x1.ddb7460000000p-11, 0x1.2786760000000p-8,

Table D.16 Layer 1 CNN (convolutional kernel parameter kernel) of context coding neural network parameter

Parameter value
0x1.082fb40000000p-4, 0x1.80aa080000000p-3, -0x1.33c5d40000000p-4, -0x1.5ad6000000000p-5, 0x1.52699c0000000p-4, 0x1.1b68400000000p-3, -0x1.b676280000000p-6, -0x1.e9dc7a0000000p-5, -0x1.43a4880000000p-7, -0x1.91d32e0000000p-8, -0x1.2c6fe80000000p-4, -0x1.b4aa720000000p-4, -0x1.ab04400000000p-5, -0x1.9412920000000p-8, 0x1.4641cc0000000p-3, -0x1.06cd7a0000000p-5,
0x1.634b1c0000000p-4, -0x1.a6ba9a0000000p-3, -0x1.37ad280000000p-5, -0x1.2aacac0000000p-7, -0x1.36fc220000000p-6, 0x1.31406c0000000p-4, -0x1.7d49b80000000p-7, -0x1.513a6e0000000p-7, -0x1.c372ee0000000p-7, 0x1.baa7f00000000p-10, 0x1.d77d3c0000000p-10, -0x1.be4ab40000000p-4, -0x1.6708bc0000000p-6, 0x1.a224a80000000p-9, 0x1.2529640000000p-3, -0x1.9535ae0000000p-6,
0x1.8b756e0000000p-4, 0x1.a4c2040000000p-3, -0x1.044a140000000p-6, 0x1.bbee820000000p-10, -0x1.1de1140000000p-7, 0x1.3854880000000p-5, -0x1.aee8400000000p-7, -0x1.088cbc0000000p-4, -0x1.0990940000000p-7, 0x1.398f740000000p-9, -0x1.c38e5c0000000p-8, -0x1.d661e80000000p-4, -0x1.fbc7540000000p-7, -0x1.7e3fa00000000p-9, 0x1.10c3580000000p-3, -0x1.e3a0ec0000000p-7,
0x1.4475c80000000p-4, -0x1.8dfabc0000000p-3, -0x1.90d80c0000000p-5, -0x1.77bb8e0000000p-8, -0x1.26b2ac0000000p-7, 0x1.f66ef40000000p-5, -0x1.3dfe6a0000000p-8, 0x1.a1ea8e0000000p-11, -0x1.14db860000000p-9, -0x1.6c95cc0000000p-8, 0x1.5033d40000000p-9, -0x1.1231200000000p-3, -0x1.8bc5a60000000p-7, -0x1.00ba3a0000000p-8, 0x1.f49d6c0000000p-4, -0x1.7484b80000000p-7,
0x1.45edbc0000000p-4, -0x1.8dd5940000000p-3, -0x1.00e3c80000000p-5, -0x1.82afde0000000p-7, -0x1.20cb3e0000000p-6, 0x1.2af7500000000p-5, -0x1.057ebe0000000p-10, -0x1.对您而言，以下哪个选项最符合您的真实想法？ -0x1.c078000000000p-8, 0x1.b0b1060000000p-9, -0x1.1b97920000000p-3, -0x1.c6e1260000000p-7, -0x1.e76ef20000000p-13, 0x1.df21bc0000000p-4, -0x1.5845b60000000p-8,
0x1.4f28900000000p-5, -0x1.3f9c0a0000000p-3, -0x1.0cf4a20000000p-4, 0x1.4428d60000000p-3, 0x1.7a85040000000p-4, 0x1.c4df120000000p-4, -0x1.ceea5e0000000p-6, -0x1.a2dec40000000p-6, -0x1.e993a20000000p-5, -0x1.0cc9f20000000p-6, -0x1.0e28760000000p-4, -0x1.bea5b80000000p-4, -0x1.e97f1a0000000p-8, -0x1.465c5c0000000p-7, 0x1.768d940000000p-4, -0x1.7077740000000p-5,
0x1.23c3fe0000000p-4, 0x1.a546d80000000p-3, -0x1.9c30ae0000000p-5, -0x1.e0ff9c0000000p-7, -0x1.673d440000000p-7, 0x1.8336c80000000p-4, -0x1.0f00d60000000p-7, -0x1.df60ce0000000p-8, -0x1.d2b4c80000000p-7, 0x1.bec3720000000p-9, -0x1.5447a60000000p-8, -0x1.79e6040000000p-4, -0x1.60c3b80000000p-6, -0x1.cdb5620000000p-7, 0x1.11d58c0000000p-3, -0x1.c4f9a80000000p-6,

	0x1.92efb60000000p-4, -0x1.075b800000000p-3, -0x1.2183f40000000p-6, 0x1.e77bc00000000p-10, -0x1.4b942c0000000p-6, 0x1.a592ea0000000p-7, -0x1.a52ca00000000p-7, -0x1.c287540000000p-5, -0x1.3467e40000000p-9, 0x1.7a0b380000000p-8, 0x1.f1c2e00000000p-9, -0x1.38e8980000000p-3, -0x1.7dc61c0000000p-7, -0x1.0a4dee0000000p-8, 0x1.047b580000000p-3, -0x1.25beb60000000p-7,
	-0x1.6c68c80000000p-8, -0x1.dc6c240000000p-3, -0x1.8e72f00000000p-4, -0x1.c778e60000000p-6, -0x1.68d5dc0000000p-9, 0x1.3fda4e0000000p-3, -0x1.6dac040000000p-7, 0x1.08142e0000000p-3, -0x1.86d4ee0000000p-6, -0x1.7e4e9c0000000p-5, -0x1.aaf6b00000000p-6, -0x1.6dfa040000000p-4, -0x1.f6d9cc0000000p-9, -0x1.21e3340000000p-9, 0x1.c844200000000p-5, -0x1.4bbde60000000p-5,
	0x1.c4b8220000000p-5, -0x1.017f360000000p-3, -0x1.a5b44c0000000p-4, -0x1.bef33c0000000p-4, -0x1.14750e0000000p-7, 0x1.cd268c0000000p-5, -0x1.9daf580000000p-6, 0x1.b20d840000000p-3, 0x1.cd3fb20000000p-4, -0x1.0b3f440000000p-4, -0x1.0276d20000000p-6, -0x1.2a5e600000000p-3, -0x1.857e720000000p-10, -0x1.bdbe4e0000000p-6, 0x1.3b7f200000000p-4, 0x1.bd11420000000p-4,
	0x1.f8b2b20000000p-9, -0x1.45b3d60000000p-3, -0x1.18aaa80000000p-4, -0x1.17b3720000000p-5, -0x1.25b0260000000p-5, 0x1.5a88c00000000p-3, -0x1.c81af40000000p-8, -0x1.e108080000000p-6, -0x1.8b571e0000000p-5, 0x1.d45bfe0000000p-9, -0x1.4c26420000000p-8, -0x1.a8836a0000000p-4, -0x1.f7ab420000000p-6, -0x1.51045e0000000p-6, 0x1.8324be0000000p-4, -0x1.edaef60000000p-5,
	0x1.3a0eb40000000p-4, -0x1.5e3fdc0000000p-3, -0x1.c1d2ec0000000p-5, -0x1.8672100000000p-6, -0x1.0444700000000p-6, 0x1.7a56300000000p-5, 0x1.5373b60000000p-9, -0x1.dc1a5e0000000p-6, -0x1.c0eb580000000p-7, 0x1.07d1da0000000p-11, -0x1.61f14a0000000p-11, -0x1.e07dae0000000p-4, -0x1.3172fc0000000p-6, 0x1.2281e00000000p-12, 0x1.e566360000000p-4, -0x1.5bfbd20000000p-6,
	0x1.c6cd660000000p-4, -0x1.95ab020000000p-3, -0x1.3217b40000000p-5, -0x1.280e540000000p-6, -0x1.27d4de0000000p-7, 0x1.72563c0000000p-6, -0x1.74690e0000000p-8, -0x1.167f980000000p-4, -0x1.219b500000000p-9, -0x1.fa63c00000000p-8, 0x1.add2160000000p-8, -0x1.b0f6fe0000000p-3, -0x1.26a0660000000p-7, 0x1.bccc680000000p-9, 0x1.1ce4a60000000p-3, -0x1.a432ba0000000p-6,
	0x1.55d7280000000p-5, -0x1.acfdf60000000p-4, -0x1.2851de0000000p-3 0x1.ac136e0000000p-3, 0x1.bc0eea0000000p-4, 0x1.06379c0000000p-4, -0x1.89d3280000000p-5, -0x1.42ab3e0000000p-4, 0x1.4e3ff20000000p-4, -0x1.4a687e0000000p-5, -0x1.97cc1c0000000p-7, -0x1.41a9a20000000p-3, 0x1.93cea60000000p-8, -0x1.adacee0000000p-6, 0x1.c96c580000000p-5, 0x1.05de880000000p-10,
	0x1.39abc00000000p-4, -0x1.b284420000000p-3, -0x1.3de8520000000p-5,

-0x1.b577a40000000p-8, -0x1.319d680000000p-8, 0x1.e04c760000000p-6, -0x1.64e2700000000p-10, -0x1.bcf5b20000000p-5, 0x1.078b0c0000000p-8, -0x1.2efaca0000000p-9, 0x1.27fb460000000p-9, -0x1.f5eff00000000p-5, -0x1.d8f8c40000000p-8, -0x1.4cb75a0000000p-8, 0x1.ae8e640000000p-4, -0x1.03083e0000000p-8,
0x1.2fbaea0000000p-4, 0x1.50ee5e0000000p-3, -0x1.1b99100000000p-4, -0x1.a7e8840000000p-7, -0x1.944db40000000p-6, 0x1.9139420000000p-5, -0x1.27fc4a0000000p-8, -0x1.c7282a0000000p-5, -0x1.7093300000000p-9, 0x1.31318a0000000p-12, -0x1.a596d60000000p-9, -0x1.afb6880000000p-4, -0x1.4521180000000p-7, -0x1.dc89780000000p-9, 0x1.c63e2c0000000p-4, -0x1.5c1efc0000000p-6,
0x1.1ce2040000000p-5, -0x1.6d8f2c0000000p-5, -0x1.1a19000000000p-3, -0x1.3a03780000000p-4, -0x1.7d7aa00000000p-7, 0x1.22c25c0000000p-5, -0x1.d3693e0000000p-6, -0x1.2c51720000000p-2, -0x1.4ab0960000000p-6, 0x1.a82bf40000000p-9, -0x1.2354820000000p-4, -0x1.a5db080000000p-5, 0x1.d9c9ce0000000p-5, -0x1.06da060000000p-5, -0x1.c0bde80000000p-7, -0x1.f7f40c0000000p-6,
0x1.62b1240000000p-5, -0x1.ec00060000000p-4, -0x1.03936c0000000p-3, -0x1.6a6a2c0000000p-4, -0x1.3834520000000p-5, 0x1.0dbee00000000p-8, 0x1.bf3f960000000p-4, -0x1.2c29b40000000p-3, -0x1.0ba6220000000p-4, 0x1.172d8c0000000p-4, -0x1.51357a0000000p-4, -0x1.04fcec0000000p-4, 0x1.e7078e0000000p-5, -0x1.ec8e940000000p-6, -0x1.3e372e0000000p-6, -0x1.00c1be0000000p-4,
0x1.71e79a0000000p-5, -0x1.7e65aa0000000p-4, -0x1.f580200000000p-4, -0x1.aadddc0000000p-4, 0x1.c075420000000p-4, -0x1.a987f40000000p-10, 0x1.cc86ce0000000p-4, -0x1.a530760000000p-3, -0x1.33fd500000000p-4, -0x1.2985b80000000p-7, -0x1.35119c0000000p-4, -0x1.33bb540000000p-3, 0x1.db97780000000p-5, -0x1.75b26a0000000p-5, -0x1.feb5440000000p-7, -0x1.1e5d180000000p-8,
0x1.5b73140000000p-5, -0x1.5725920000000p-5, 0x1.1ec2d40000000p-2, -0x1.7ef67e0000000p-4, -0x1.f87df80000000p-6, -0x1.fbbb040000000p-5, 0x1.a92e8a0000000p-4, -0x1.2903000000000p-3, 0x1.b253f00000000p-4, 0x1.1217aa0000000p-4, -0x1.5f47ee0000000p-4, -0x1.5a6ee00000000p-4, 0x1.68ffd60000000p-6, -0x1.afc9d40000000p-6, -0x1.209d7a0000000p-7, -0x1.99342c0000000p-6,
0x1.7463da0000000p-5, -0x1.5129460000000p-3, -0x1.38a8140000000p-3, -0x1.34f9e00000000p-4, -0x1.ee5e540000000p-7, 0x1.0f8a000000000p-7, -0x1.b114080000000p-5, -0x1.31d7560000000p-3, -0x1.b1ba220000000p-5, 0x1.117a840000000p-4, -0x1.12334e0000000p-4, -0x1.2b20120000000p-4, 0x1.f8cc8c0000000p-5, -0x1.243acc0000000p-5, -0x1.eb23660000000p-7, 0x1.ada34e0000000p-4,
0x1.6e922c0000000p-6, -0x1.be28fe0000000p-6, -0x1.11431e0000000p-3, 0x1.6d4b000000000p-3, -0x1.311e280000000p-7, 0x1.864c3c0000000p-5,

-0x1.05542a0000000p-5, -0x1.b36c480000000p-4, 0x1.be2bc20000000p-8, -0x1.41d4c40000000p-6, -0x1.cdc33e0000000p-4, -0x1.de19940000000p-5, 0x1.9440040000000p-5, -0x1.fe42e40000000p-6, -0x1.8a8ee00000000p-7, -0x1.b1b4400000000p-6,
-0x1.66e9060000000p-7, -0x1.13902e0000000p-4, -0x1.43a2ec0000000p-3, -0x1.689a860000000p-4, -0x1.9ab1c00000000p-6, 0x1.d2c81e0000000p-5, 0x1.b9d0040000000p-4, -0x1.07448e0000000p-2, 0x1.353ebe0000000p-4, -0x1.92c95a0000000p-5, -0x1.faa7460000000p-4, -0x1.75000a0000000p-4, 0x1.9d94bc0000000p-7, -0x1.1813fe0000000p-5, -0x1.be11ce0000000p-7, -0x1.47cab40000000p-6,
0x1.19529e0000000p-4, -0x1.8fcc420000000p-4, 0x1.2979560000000p-2, -0x1.3c0c800000000p-4, -0x1.8278fe0000000p-8, -0x1.2a22060000000p-4, -0x1.be40920000000p-6, -0x1.191bac0000000p-3, 0x1.0d84c00000000p-3, 0x1.20d67e0000000p-4, -0x1.ddc8d60000000p-5, -0x1.dae8b60000000p-4, 0x1.8fe30a0000000p-6, -0x1.37693e0000000p-5, 0x1.8608900000000p-7, 0x1.7fa4a60000000p-4,
0x1.6fef940000000p-4, -0x1.96f3ce0000000p-5, -0x1.00b56a0000000p-4, -0x1.c5bc2e0000000p-4, -0x1.27dd340000000p-6, -0x1.1d2a580000000p-5, -0x1.1a26d80000000p-6, 0x1.3c4aa80000000p-3, 0x1.08fb920000000p-4, -0x1.918f820000000p-5, -0x1.9b36b80000000p-4, -0x1.2a54960000000p-4, 0x1.97de940000000p-4, -0x1.33fedc0000000p-5, -0x1.1d1e300000000p-6, -0x1.c27ee40000000p-6,
0x1.059e540000000p-5, 0x1.2a6b440000000p-6, -0x1.0243060000000p-3, -0x1.6292ba0000000p-4, -0x1.5c43380000000p-6, 0x1.6e7d6a0000000p-7, -0x1.54eb240000000p-6, -0x1.5abb7a0000000p-3, -0x1.6f13b00000000p-8, -0x1.c5aad80000000p-8, -0x1.8f73560000000p-4, -0x1.88adc80000000p-5, 0x1.8bbe260000000p-5, -0x1.17e8720000000p-5, -0x1.b75f940000000p-7, -0x1.1c10280000000p-6,
0x1.8e6acc0000000p-5, -0x1.56ed7a0000000p-6, -0x1.db2f0a0000000p-4, -0x1.3387ea0000000p-4, -0x1.6b42f00000000p-5, 0x1.bad01e0000000p-6, -0x1.3af65e0000000p-7, -0x1.7b687e0000000p-3, 0x1.68f8260000000p-4, -0x1.9e6f2e0000000p-5, 0x1.dc9fc80000000p-3, -0x1.32d9e60000000p-4, 0x1.18646e0000000p-4, -0x1.ef8ef20000000p-6, -0x1.47fac60000000p-6, -0x1.a94b360000000p-5,
-0x1.29b3fe0000000p-11, -0x1.2c623e0000000p-3, -0x1.8507b40000000p-3, -0x1.2fa6060000000p-4, -0x1.4d10c20000000p-5, 0x1.4cc2820000000p-4, -0x1.8a4e420000000p-5, -0x1.70dde80000000p-3, -0x1.92b8b60000000p-4, 0x1.19f9e00000000p-5, -0x1.3480ba0000000p-4, -0x1.7e90aa0000000p-4, 0x1.3899f80000000p-5, -0x1.22d7ee0000000p-5, -0x1.5dd8c40000000p-6, 0x1.0d503e0000000p-3,
0x1.00c1ce0000000p-3, -0x1.5669780000000p-3, 0x1.0ba81e0000000p-2, -0x1.fa70fc0000000p-4, 0x1.584ac20000000p-4, -0x1.21b81e0000000p-4, -0x1.4543800000000p-5, -0x1.88d2220000000p-4, 0x1.378e520000000p-4,

0x1.5ecde80000000p-4, -0x1.7b51a60000000p-4, -0x1.a43c760000000p-4, 0x1.b95e240000000p-6, -0x1.b30d260000000p-6, 0x1.0cd4a40000000p-4, -0x1.268ede0000000p-6,
0x1.21187e0000000p-5, 0x1.094aae0000000p-5, -0x1.4e29100000000p-4, -0x1.cfb1580000000p-4, -0x1.cdf7ce0000000p-7, -0x1.19b14a0000000p-6, -0x1.82dd8a0000000p-6, -0x1.a06a9c0000000p-4, -0x1.dd95ac0000000p-7, -0x1.65edc60000000p-14, -0x1.0e03340000000p-3, -0x1.cc372a0000000p-7, 0x1.91decc0000000p-5, -0x1.ab2fb00000000p-5, -0x1.a084460000000p-6, -0x1.4025640000000p-8,
-0x1.556ed40000000p-7, -0x1.26d3b00000000p-4, -0x1.3c92100000000p-3, -0x1.5ec60c0000000p-4, -0x1.913b8c0000000p-8, 0x1.97091a0000000p-5, 0x1.0ba3340000000p-3, 0x1.d7cfb80000000p-3, -0x1.4af7f00000000p-5, -0x1.86a8c00000000p-5, -0x1.a60e200000000p-4, -0x1.b22df80000000p-4, 0x1.0d7a7e0000000p-6, -0x1.2d89600000000p-5, -0x1.038e120000000p-6, 0x1.93aea60000000p-4,
-0x1.3c64540000000p-6, -0x1.7860fa0000000p-3, -0x1.9731640000000p-3, -0x1.9637de0000000p-5, -0x1.05cf860000000p-6, 0x1.d648100000000p-4, -0x1.4ead220000000p-8, -0x1.ae310e0000000p-3, -0x1.13f9400000000p-4, -0x1.1374c20000000p-4, -0x1.1f64620000000p-4, -0x1.56afb00000000p-4, 0x1.b917fc0000000p-6, -0x1.d6a0e20000000p-6, -0x1.f6b39a0000000p-8, 0x1.1ef8420000000p-3,
0x1.2030720000000p-8, 0x1.a067aa0000000p-9, -0x1.1f86f20000000p-4, -0x1.0788b40000000p-4, -0x1.09f2ec0000000p-11, 0x1.c102720000000p-6, -0x1.34cb8e0000000p-7, 0x1.a42d540000000p-7, -0x1.0034a80000000p-7, -0x1.34f5620000000p-11, -0x1.5cf3f20000000p-5, 0x1.c230d20000000p-6, 0x1.5636a40000000p-6, -0x1.0325e80000000p-5, -0x1.51c8ea0000000p-7, -0x1.d6a1360000000p-7,
0x1.6345540000000p-9, -0x1.8006800000000p-8, -0x1.44c6680000000p-4, -0x1.d60c280000000p-5, -0x1.2df8a80000000p-8, 0x1.568fcc0000000p-5, -0x1.3dda180000000p-6, -0x1.35e64c0000000p-4, -0x1.7575180000000p-8, -0x1.2e07820000000p-7, 0x1.fa101e0000000p-3, 0x1.8c251e0000000p-6, 0x1.bba0d40000000p-6, -0x1.1fbcfa0000000p-5, -0x1.1771ba0000000p-6, -0x1.8e2de00000000p-6,
0x1.690a500000000p-9, -0x1.3c17a80000000p-7, -0x1.15fe8c0000000p-4, -0x1.6655140000000p-5, -0x1.678bee0000000p-9, 0x1.21c8a20000000p-7, -0x1.1418200000000p-9, -0x1.3e2fe00000000p-4, -0x1.69db940000000p-7, 0x1.ea940a0000000p-10, -0x1.fa845e0000000p-4, 0x1.2c2a200000000p-5, 0x1.02a29c0000000p-6, -0x1.898c460000000p-5, -0x1.277a6e0000000p-6, -0x1.68fa380000000p-9,
0x1.2a78240000000p-9, -0x1.04caf00000000p-5, -0x1.062bea0000000p-4, -0x1.acc2920000000p-4, -0x1.10bf100000000p-7, 0x1.e11e560000000p-7, -0x1.c01fa20000000p-8, -0x1.1dd91e0000000p-5, 0x1.3360b80000000p-12, -0x1.d0f45a0000000p-9, -0x1.a30c080000000p-4, 0x1.97452e0000000p-6,

0x1.5e585e0000000p-7, -0x1.f4d4420000000p-6, -0x1.39df140000000p-6, -0x1.5b41d00000000p-6,
-0x1.6094880000000p-6, -0x1.b2a0700000000p-6, -0x1.dd05560000000p-4, 0x1.a0f8ac0000000p-3, -0x1.79bf020000000p-8, 0x1.c015e80000000p-5, -0x1.ca39200000000p-7, -0x1.c129180000000p-5, 0x1.6a68420000000p-9, -0x1.09d2e20000000p-8, -0x1.d55a600000000p-5, 0x1.c551900000000p-6, 0x1.8f712c0000000p-11, -0x1.6a69dc0000000p-5, -0x1.2b25ec0000000p-7, -0x1.21ace60000000p-7,
-0x1.459faa0000000p-6, -0x1.22e8ae0000000p-6, -0x1.6095340000000p-5, -0x1.ca95060000000p-5, -0x1.2e1a860000000p-8, 0x1.7f89720000000p-5, -0x1.9d620e0000000p-8, -0x1.0e15980000000p-8, 0x1.62f9740000000p-10, 0x1.0a58d40000000p-11, -0x1.be50d00000000p-6, 0x1.e6052e0000000p-6, -0x1.c33fd20000000p-11, -0x1.f2ca5e0000000p-6, -0x1.ecf48c0000000p-9, -0x1.561ad20000000p-8,
0x1.621eb00000000p-6, -0x1.4af4200000000p-5, -0x1.abe6ec0000000p-6, -0x1.61de920000000p-4, -0x1.5c90480000000p-9, 0x1.56e8ba0000000p-8, -0x1.7ded500000000p-8, 0x1.9dfe3c0000000p-7, -0x1.1a5b520000000p-8, 0x1.8087f20000000p-9, -0x1.8f47160000000p-4, 0x1.0b31860000000p-5, 0x1.188fa40000000p-5, -0x1.bdc5080000000p-5, -0x1.12e67c0000000p-6, -0x1.1dad2a0000000p-6,
-0x1.b4a34c0000000p-6, -0x1.e554cc0000000p-8, -0x1.cdf63a0000000p-4, -0x1.fe23d80000000p-4, -0x1.7ca1dc0000000p-7, 0x1.8fd6660000000p-5, -0x1.537a140000000p-8, -0x1.8021b00000000p-4, 0x1.b5522e0000000p-9, -0x1.7a6d8a0000000p-7, -0x1.539b480000000p-4, 0x1.1905840000000p-6, -0x1.a8027c0000000p-7, -0x1.80b6060000000p-5, -0x1.ce2c720000000p-8, -0x1.a6fee20000000p-9,
-0x1.f5255c0000000p-6, -0x1.36b70c0000000p-7, -0x1.287a9e0000000p-5, -0x1.dc9e920000000p-5, -0x1.b76bc20000000p-8, 0x1.93fd8a0000000p-5, -0x1.70f7600000000p-8, -0x1.fcfa5e0000000p-6, 0x1.2ead9c0000000p-8, 0x1.e467120000000p-10, -0x1.e9c09e0000000p-5, 0x1.aa06620000000p-6, -0x1.2489000000000p-7, -0x1.31ffa00000000p-6, -0x1.1db7480000000p-8, -0x1.40b2fe0000000p-11,
-0x1.25db920000000p-6, -0x1.402a260000000p-5, -0x1.3d69d80000000p-5, -0x1.05d7d20000000p-6, -0x1.0a8fba0000000p-9, 0x1.6519600000000p-5, -0x1.13d6300000000p-7, -0x1.6c9ee00000000p-7, -0x1.f65d760000000p-9, 0x1.dfe9420000000p-11, -0x1.68db6a0000000p-6, 0x1.e870540000000p-7, 0x1.2dd32a0000000p-10, -0x1.33d8e60000000p-5, -0x1.2196500000000p-11, -0x1.0b791c0000000p-8,
0x1.6fc12e0000000p-10, -0x1.2173700000000p-6, -0x1.13c6ce0000000p-6, -0x1.1b88c20000000p-4, -0x1.1f5ff80000000p-8, 0x1.dbbd900000000p-6, -0x1.35f8ce0000000p-7, 0x1.0694be0000000p-5, -0x1.bcf91a0000000p-10, 0x1.1bc4b00000000p-11, -0x1.c030280000000p-5, 0x1.6dd8c20000000p-5, 0x1.769b360000000p-6, -0x1.89f0800000000p-5, -0x1.9817780000000p-7,

	-0x1.a1dff60000000p-7,
	0x1.c040ce0000000p-6, -0x1.1c113c0000000p-6, -0x1.63879e0000000p-4, -0x1.b8a3dc0000000p-4, -0x1.762c2a0000000p-8, 0x1.1061f00000000p-6, -0x1.36b44e0000000p-6, -0x1.1fed9e0000000p-5, -0x1.5647020000000p-7, 0x1.e5067e0000000p-9, -0x1.94f9ba0000000p-4, 0x1.e1e6b20000000p-6, 0x1.6d6a940000000p-5, 0x1.1ea1080000000p-3, -0x1.bb4f4a0000000p-7, -0x1.2eff3a0000000p-6,
	0x1.fa152c0000000p-5, -0x1.564c960000000p-7, -0x1.5dc22c0000000p-4, -0x1.3d4ebc0000000p-4, -0x1.906be20000000p-7, -0x1.25e1880000000p-5, -0x1.a0f35c0000000p-6, 0x1.1371de0000000p-4, -0x1.cf73240000000p-8, 0x1.b08fbc0000000p-8, -0x1.684aca0000000p-4, -0x1.13640c0000000p-6, 0x1.193a080000000p-4, -0x1.09591e0000000p-5, -0x1.7a8a320000000p-6, -0x1.15eb3a0000000p-6,
	-0x1.e6d41a0000000p-9, 0x1.3eba4c0000000p-10, -0x1.7012720000000p-7, -0x1.87d5500000000p-7, -0x1.3138b60000000p-8, 0x1.1ef4580000000p-6, -0x1.7f9c0a0000000p-7, -0x1.eaec200000000p-10, -0x1.c3fbc40000000p-12, -0x1.49fe360000000p-9, -0x1.aed1500000000p-6, 0x1.8067960000000p-6, 0x1.96b6320000000p-8, -0x1.2009220000000p-5, -0x1.065e8a0000000p-7, -0x1.ecea9c0000000p-9,
	-0x1.60def20000000p-7, -0x1.27d12a0000000p-6, -0x1.8fb8060000000p-5, -0x1.197d120000000p-4, -0x1.7d01420000000p-9, 0x1.bbbe540000000p-5, -0x1.a3a28c0000000p-8, -0x1.96f7000000000p-4, -0x1.32d5f80000000p-8, 0x1.a35dca0000000p-10, -0x1.4563ce0000000p-3, 0x1.f6c0ce0000000p-6, 0x1.9086dc0000000p-7, -0x1.1d31260000000p-4, -0x1.c276da0000000p-7, -0x1.9a875a0000000p-8,
	0x1.971ed20000000p-8, -0x1.6cd2080000000p-5, -0x1.6590d80000000p-4, -0x1.8e7f480000000p-4, 0x1.1ecd780000000p-10, 0x1.217d8a0000000p-5, -0x1.b8141e0000000p-8, 0x1.6e57620000000p-4, -0x1.413bde0000000p-7, 0x1.71d7a00000000p-10, -0x1.8adda20000000p-3, 0x1.18eb2a0000000p-5, 0x1.1ba6a40000000p-5, -0x1.001ef00000000p-4, -0x1.6411980000000p-6, -0x1.c9c70c0000000p-8,

Table D.17 Layer 1 CNN (bias parameter bias) of context coding neural network parameter

Parameter value
0x1.f3f7b00000000p-2, 0x1.df46de0000000p-3, -0x1.012fc00000000p-2, 0x1.6736900000000p-7, -0x1.e9370a0000000p-6, 0x1.28ba000000000p-3, -0x1.5de3e20000000p-5, 0x1.0bbf240000000p-2, -0x1.3300f20000000p-5, 0x1.4df4960000000p-7, 0x1.0308060000000p-9, 0x1.f9de120000000p-2, -0x1.2999fa0000000p-3, -0x1.28c7c20000000p-3, -0x1.a76dc40000000p-7, -0x1.8955f20000000p-5,

Table D.18 Layer 2 CNN (convolutional kernel parameter kernel) of context coding neural network parameter

Parameter value
-0x1.be1bc60000000p-5, 0x1.3cecd80000000p-4, -0x1.9f21ec0000000p-2, -0x1.c220f00000000p-5, -0x1.22cf7e0000000p-2, 0x1.58eb760000000p-4, -0x1.8336c40000000p-6, -0x1.059aba0000000p-2, -0x1.8743b20000000p-3, 0x1.aa892c0000000p-9, 0x1.1808de0000000p-5, -0x1.58c7b20000000p-3, 0x1.168df00000000p-3, 0x1.0285c40000000p-5, -0x1.aa26b40000000p-4, 0x1.96d7da0000000p-4,
-0x1.df167c0000000p-5, -0x1.340a500000000p-6, 0x1.3407000000000p-6, -0x1.8c78160000000p-3, -0x1.a307bc0000000p-3, -0x1.8c2cba0000000p-6, -0x1.8d89960000000p-4, 0x1.925f800000000p-3, -0x1.22feae0000000p-3, -0x1.219f6a0000000p-7, -0x1.eb1b380000000p-4, 0x1.5555b40000000p-3, -0x1.34073e0000000p-5, -0x1.57e9080000000p-7, 0x1.0120920000000p-5, -0x1.38da300000000p-7,
-0x1.ed4a7e0000000p-3, -0x1.9b46180000000p-4, 0x1.21a4c20000000p-3, -0x1.fb89a80000000p-4, -0x1.dd40ee0000000p-6, -0x1.e367d20000000p-4, 0x1.78ab620000000p-3, -0x1.786bbc0000000p-4, 0x1.33b6860000000p-3, -0x1.419b380000000p-6, 0x1.1484ce0000000p-1, -0x1.d36e760000000p-3, -0x1.7be8300000000p-3, -0x1.6fef520000000p-5, -0x1.9ca19e0000000p-3, -0x1.a7e6ce0000000p-4,
-0x1.126cc60000000p-2, -0x1.e0c56a0000000p-4, 0x1.07b4120000000p-3, 0x1.a35e1a0000000p-5, 0x1.cb87280000000p-4, -0x1.1b48780000000p-3, 0x1.a71d7c0000000p-2, 0x1.69a3880000000p-4, 0x1.6cefec0000000p-4, -0x1.7dbca20000000p-6, -0x1.0fa1180000000p+1, -0x1.9707c00000000p-3, -0x1.bd459c0000000p-3, -0x1.ade2880000000p-5, 0x1.deebf60000000p-4, -0x1.eebd940000000p-4,
0x1.5cd8ca0000000p-3, 0x1.30288a0000000p-4, -0x1.37ab720000000p-4, -0x1.e38cfe0000000p-9, -0x1.9c21b20000000p-4, 0x1.65ff260000000p-4, -0x1.4a2ab80000000p-2, 0x1.d1330a0000000p-7, -0x1.e1b03c0000000p-3, 0x1.e105b20000000p-7, -0x1.153dba0000000p-1, -0x1.e2d13c0000000p-3, 0x1.1856620000000p-3, 0x1.0b30a80000000p-5, 0x1.fbf7140000000p-2, 0x1.36bc460000000p-4,
0x1.4675920000000p-4, 0x1.1c736e0000000p-4, -0x1.9b6e780000000p-3, 0x1.0bd8580000000p-11, -0x1.5affc20000000p-5, 0x1.47bb540000000p-4, -0x1.09c2f40000000p-3, -0x1.5cfe000000000p-8, -0x1.b98d740000000p-4, 0x1.6ffe380000000p-7, -0x1.224d9e0000000p-2, -0x1.1e8e760000000p-2, 0x1.040c340000000p-3, 0x1.f3617e0000000p-6, 0x1.b091020000000p-6, 0x1.34b07a0000000p-4,
0x1.3ff67c0000000p-3, 0x1.00d86e0000000p-4, -0x1.4c0aa60000000p-4, -0x1.3e27480000000p-5, -0x1.105eca0000000p-3, 0x1.23c2040000000p-4,

-0x1.963bbc0000000p-1, -0x1.91059e0000000p-3, 0x1.45e5bc0000000p-4, 0x1.3c04580000000p-7, -0x1.eb39720000000p-2, 0x1.887fb20000000p-3, 0x1.d12ab20000000p-4, 0x1.bb0e880000000p-6, -0x1.128f3e0000000p-2, 0x1.19d9660000000p-4,
-0x1.2eff920000000p-3, -0x1.ab7bde0000000p-5, 0x1.4044660000000p-3, -0x1.74188e0000000p-7, 0x1.7178020000000p-3, -0x1.dea97a0000000p-5, 0x1.0f09f00000000p-4, 0x1.9796bc0000000p-4, -0x1.0e10580000000p-2, -0x1.a973e00000000p-8, -0x1.dcd1c40000000p-1, -0x1.91ab880000000p-3, -0x1.807d480000000p-4, -0x1.68e7180000000p-6, 0x1.f50a860000000p-4, -0x1.f06d440000000p-5,
0x1.0b00940000000p-3, 0x1.ad8c8a0000000p-5, -0x1.04800a0000000p-4, 0x1.43b4620000000p-5, 0x1.e81d140000000p-6, 0x1.0e55800000000p-4, -0x1.5e9b040000000p-2, -0x1.b1a97e0000000p-4, 0x1.7771e00000000p-5, 0x1.2760ce0000000p-6, -0x1.88f0fe0000000p-2, -0x1.df76c60000000p-3, 0x1.9ec9000000000p-4, 0x1.9e6aa00000000p-6, -0x1.1fd3a00000000p-6, 0x1.5065e20000000p-5,
0x1.568aac0000000p-3, 0x1.14fdb40000000p-4, -0x1.fde6d20000000p-4, 0x1.2944440000000p-3, 0x1.8a00620000000p-3, 0x1.433fb20000000p-4, -0x1.ef94940000000p-2, 0x1.2b0aea0000000p-4, -0x1.02163c0000000p-3, 0x1.b455600000000p-7, -0x1.2a367e0000000p-1, -0x1.b90ea60000000p-3, 0x1.fda4b40000000p-4, 0x1.eba1a80000000p-6, -0x1.283d400000000p-9, 0x1.19f0420000000p-4,
-0x1.13954a0000000p-2, -0x1.d29e980000000p-4, 0x1.cb144c0000000p-4, 0x1.57351e0000000p-3, 0x1.53d7d80000000p-3, -0x1.0797220000000p-3, -0x1.e3d0a20000000p-3, 0x1.3baf300000000p-3, -0x1.adf81a0000000p-6, -0x1.b691ae0000000p-7, -0x1.f13a0e0000000p+0, -0x1.3e31de0000000p-3, -0x1.a315c00000000p-3, -0x1.913f460000000p-5, 0x1.9d7c560000000p-4, -0x1.0dfdd80000000p-3,
-0x1.01fcc60000000p-4, 0x1.5974e40000000p-5, 0x1.84d9e80000000p-2, 0x1.b7040e0000000p-3, -0x1.1e075c0000000p-5, -0x1.0298460000000p-5, 0x1.a74b2a0000000p-3, -0x1.9dc0a40000000p-6, 0x1.7faf580000000p-3, -0x1.2407de0000000p-3, -0x1.bf46f40000000p-2, 0x1.ad69720000000p-3, -0x1.0f83780000000p-8, -0x1.25ffd40000000p-6, 0x1.d155a60000000p-4, 0x1.33ffa40000000p-2,
0x1.97c8dc0000000p-3, 0x1.1217800000000p-7, 0x1.abebbe0000000p-3, -0x1.3786520000000p-3, 0x1.42cb280000000p-5, 0x1.86de420000000p-7, -0x1.81f9c80000000p-2, -0x1.7ea9da0000000p-4, -0x1.33b1440000000p-4, 0x1.6160140000000p-8, -0x1.19a66a0000000p-1, 0x1.10aa9e0000000p-4, 0x1.2174cc0000000p-6, 0x1.3757e40000000p-8, -0x1.34c6440000000p-2, 0x1.2c665e0000000p-9,
-0x1.cb0f220000000p-3, -0x1.bcf2980000000p-4, 0x1.0d6bdc0000000p-2, 0x1.0d08440000000p-3, 0x1.e67cae0000000p-5, -0x1.b03fc00000000p-4, -0x1.91d9ac0000000p-1, 0x1.37cf6e0000000p-6, -0x1.6e9a160000000p-3,

0x1.291f700000000p-6, 0x1.591ef20000000p+0, -0x1.88e0b40000000p-3, -0x1.6ca9840000000p-3, -0x1.30bd660000000p-5, 0x1.01af5e0000000p-3, -0x1.6f0e200000000p-3,
0x1.3329680000000p-4, -0x1.2af6220000000p-4, 0x1.6a2d520000000p-2, 0x1.70f01c0000000p-5, -0x1.7b469e0000000p-4, -0x1.3346e20000000p-4, 0x1.020f8c0000000p-3, -0x1.2b48ea0000000p-4, -0x1.1683f80000000p-5, 0x1.304ca80000000p-8, -0x1.0b54580000000p-5, -0x1.8427060000000p-3, -0x1.fcffda0000000p-4, -0x1.cb3c360000000p-6, -0x1.2c45820000000p-2, -0x1.b77f720000000p-4,
0x1.21c60c0000000p-3, 0x1.b4540c0000000p-5, -0x1.69cf360000000p-4, 0x1.e129840000000p-5, -0x1.64843e0000000p-3, 0x1.ef9d1a0000000p-5, -0x1.52e2dc0000000p-1, 0x1.f573e20000000p-4, -0x1.5ba5b00000000p-5, 0x1.f1c46a0000000p-8, -0x1.b8d2d00000000p-2, -0x1.f647580000000p-4, 0x1.8a5f540000000p-4, 0x1.7853b00000000p-6, -0x1.53b8ce0000000p-3, 0x1.e737940000000p-5,
0x1.7b6ff40000000p-7, 0x1.212c0c0000000p-6, 0x1.c08f000000000p-4, -0x1.f000700000000p-5, -0x1.68b6540000000p-4, 0x1.14f9460000000p-6, -0x1.d4e8840000000p-4, -0x1.21782a0000000p-2, -0x1.9c94cc0000000p-3, -0x1.0385260000000p-8, 0x1.7ce1a20000000p-5, -0x1.97db220000000p-3, 0x1.cc862e0000000p-6, 0x1.7fbc740000000p-8, 0x1.92f2e20000000p-4, 0x1.ee6b060000000p-6,
-0x1.6b59520000000p-2, -0x1.2a58b00000000p-3, 0x1.b3fb6a0000000p-4, -0x1.ca12720000000p-3, -0x1.b72ef40000000p-4, -0x1.64b6f40000000p-3, -0x1.b9e7ae0000000p-7, -0x1.e2b3680000000p-4, -0x1.d29a680000000p-6, -0x1.1ae9cc0000000p-5, -0x1.f21b600000000p-1, 0x1.12b6760000000p-3, -0x1.1709100000000p-2, -0x1.0da0a80000000p-4, -0x1.593a520000000p-3, -0x1.1d7b1c0000000p-3,
-0x1.0e49980000000p-2, -0x1.db5e9e0000000p-4, 0x1.46c4060000000p-4, -0x1.9b3f800000000p-4, 0x1.936a2e0000000p-4, -0x1.07d32a0000000p-3, -0x1.6422880000000p+0, 0x1.4499400000000p-4, 0x1.45a9980000000p-5, -0x1.6588b60000000p-7, -0x1.3329e00000000p+1, 0x1.0491ee0000000p-3, -0x1.a6e5100000000p-3, -0x1.9393740000000p-5, -0x1.ef36ae0000000p-5, -0x1.1a3f8e0000000p-3,
-0x1.000eec0000000p-4, -0x1.16a2a80000000p-5, 0x1.0345d80000000p-6, -0x1.b7c69c0000000p-5, 0x1.5e1f000000000p-4, -0x1.2c69fe0000000p-5, -0x1.243ef00000000p-1, 0x1.63b35c0000000p-3, 0x1.430ecc0000000p-3, 0x1.4c37020000000p-11, -0x1.9330820000000p-3, -0x1.e6c98a0000000p-4, -0x1.dce9aa0000000p-5, -0x1.d3a0c80000000p-7, 0x1.715b760000000p-2, -0x1.7fd7320000000p-5,
0x1.6a1d7e0000000p-3, 0x1.37156e0000000p-4, -0x1.1123820000000p-4, -0x1.9472860000000p-5, 0x1.ec36e80000000p-4, 0x1.5966c20000000p-4, -0x1.cce5c40000000p-1, -0x1.63de540000000p-7, 0x1.4ac0920000000p-4, 0x1.ecb01a0000000p-8, -0x1.23de2c0000000p-1, -0x1.338d960000000p-3,

0x1.142aee0000000p-3, 0x1.02978a0000000p-5, -0x1.4fc06c0000000p-3, 0x1.7252da0000000p-4,
0x1.ada25c0000000p-4, 0x1.92f7b80000000p-5, 0x1.7d53300000000p-6, -0x1.3c28700000000p-5, 0x1.8dc9c80000000p-5, 0x1.b51cbc0000000p-5, -0x1.4aa39a0000000p-2, 0x1.f453b20000000p-6, -0x1.3a2d340000000p-2, 0x1.13c70a0000000p-9, -0x1.4226dc0000000p-3, -0x1.20792a0000000p-4, 0x1.6002cc0000000p-4, 0x1.45672a0000000p-6, 0x1.1b0d860000000p-4, 0x1.01a8960000000p-4,
0x1.aba4260000000p-3, 0x1.55d17a0000000p-4, -0x1.a969200000000p-5, 0x1.5b02200000000p-3, -0x1.bb941a0000000p-4, 0x1.7fc7aa0000000p-4, -0x1.9e6bdc0000000p-1, -0x1.a7facc0000000p-4, -0x1.02da2a0000000p-5, 0x1.2e28d00000000p-7, -0x1.f1cca00000000p-2, 0x1.0217f00000000p-5, 0x1.340b0c0000000p-3, 0x1.22138e0000000p-5, -0x1.3c0ac60000000p-2, 0x1.9316f80000000p-4,
-0x1.8115160000000p-5, -0x1.4071b60000000p-5, 0x1.72eca80000000p-4, -0x1.40d6800000000p-5, 0x1.b0e5500000000p-4, -0x1.7fd9180000000p-5, -0x1.a33da20000000p-4, -0x1.139b280000000p-3, 0x1.1054460000000p-4, -0x1.50616e0000000p-7, -0x1.a2d9100000000p-2, -0x1.617ed20000000p-3, -0x1.280eaa0000000p-4, -0x1.2294280000000p-6, 0x1.9e1d660000000p-8, -0x1.21e9320000000p-5,
0x1.198a320000000p-3, 0x1.dc54800000000p-5, -0x1.31b3660000000p-5, 0x1.92e9600000000p-3, -0x1.0f19aa0000000p-2, 0x1.04da2c0000000p-4, -0x1.42d7640000000p-1, 0x1.0be8c60000000p-4, 0x1.d790ba0000000p-7, 0x1.a1fc220000000p-9, -0x1.98bbe40000000p-2, 0x1.73d4d60000000p-5, 0x1.a739940000000p-4, 0x1.883e5c0000000p-6, 0x1.9597c20000000p-6, 0x1.2e04980000000p-4,
0x1.be469c0000000p-3, 0x1.762ae20000000p-4, -0x1.1a6ea80000000p-4, 0x1.f0c6300000000p-4, -0x1.123f1a0000000p-3, 0x1.8fca0c0000000p-4, -0x1.864ee40000000p-1, -0x1.3fefa60000000p-3, 0x1.9bd24e0000000p-3, 0x1.b546380000000p-10, -0x1.dfdf400000000p-2, -0x1.22a9ac0000000p-4, 0x1.465a620000000p-3, 0x1.2d34660000000p-5, -0x1.e995340000000p-3, 0x1.f1a8500000000p-4,
-0x1.5831c20000000p-4, -0x1.69c1de0000000p-5, 0x1.28b2a00000000p-6, -0x1.2f6ed80000000p-6, -0x1.9a14a80000000p-7, -0x1.6d79920000000p-6, -0x1.945c700000000p-1, -0x1.40b58e0000000p-3, -0x1.81fab00000000p-3, 0x1.6f01520000000p-5, -0x1.f774e60000000p-5, -0x1.4e923e0000000p-3, -0x1.add6d60000000p-5, -0x1.c5e2500000000p-8, 0x1.f654ca0000000p-2, -0x1.156c7e0000000p-3,
0x1.5f1d680000000p-3, 0x1.a920940000000p-5, 0x1.76a7540000000p-3, -0x1.85a6e20000000p-3, -0x1.9ccb760000000p-4, 0x1.48e5ca0000000p-5, 0x1.12d67a0000000p-7, 0x1.7fa6640000000p-4, -0x1.eda2500000000p-6, -0x1.cc404a0000000p-6, 0x1.2269f60000000p-1, 0x1.2dd8820000000p-4, 0x1.2f8c6e0000000p-4, 0x1.d8c8380000000p-7, 0x1.8939560000000p-6,

0x1.e423300000000p-4,
0x1.ed3a3a0000000p-4, 0x1.4952ae0000000p-5, -0x1.4ccc8c0000000p-3, 0x1.0e7dfc0000000p-2, 0x1.40bb2c0000000p-4, 0x1.fb3dca0000000p-5, -0x1.3463520000000p+0, -0x1.0519f40000000p-3, -0x1.34dcc40000000p-2, 0x1.25f21e0000000p-5, -0x1.b0bf5e0000000p-2, 0x1.ceb69c0000000p-4, 0x1.6efa3e0000000p-4, 0x1.97d7980000000p-6, 0x1.8f11980000000p-1, -0x1.970f9c0000000p-8,
0x1.be5d980000000p-10, -0x1.2acc1a0000000p-6, -0x1.bcfebe0000000p-7, -0x1.557fb60000000p-3, -0x1.2a6a280000000p-3, 0x1.e31e1a0000000p-5, -0x1.adb2c40000000p-3, 0x1.6f90f40000000p-5, 0x1.0f6d620000000p-4, 0x1.2d925a0000000p-3, 0x1.63acf20000000p-3, 0x1.5778ce0000000p-3, 0x1.891f220000000p-5, 0x1.uncan22000000000p-6, 0x1.2fc5b80000000p-5, -0x1.1a6e560000000p-2,
0x1.0c54960000000p-5, -0x1.0502180000000p-8, -0x1.79aa560000000p-4, 0x1.1a29040000000p-5, -0x1.2f98560000000p-5, 0x1.417ede0000000p-8, 0x1.7ef1040000000p-2, -0x1.39fc800000000p-3, 0x1.191d3c0000000p-3, 0x1.1c68980000000p-6, 0x1.4ac3680000000p-6, -0x1.8a89a20000000p-4, 0x1.75dbf20000000p-9, 0x1.8af1c40000000p-9, 0x1.108e300000000p-3, -0x1.1b6f280000000p-5,
0x1.5f68a20000000p-3, 0x1.26c0600000000p-4, -0x1.f42e960000000p-5, -0x1.e7f6ee0000000p-6, 0x1.c6ef460000000p-4, 0x1.4f5a6e0000000p-4, -0x1.7c83680000000p-1, 0x1.2b340c0000000p-4, -0x1.0a27dc0000000p-2, 0x1.4085bc0000000p-7, -0x1.b693ec0000000p-2, -0x1.ed6a120000000p-3, 0x1.0b71680000000p-3, 0x1.fd5cd60000000p-6, -0x1.f076620000000p-3, 0x1.4c2bec0000000p-4,
0x1.127dee0000000p-5, -0x1.c30c340000000p-6, 0x1.d228060000000p-3, -0x1.f742860000000p-3, -0x1.b124b80000000p-3, -0x1.248ac40000000p-6, -0x1.1eff5e0000000p-2, -0x1.eb49f20000000p-3, -0x1.a88bf20000000p-6, 0x1.348bcc0000000p-6, 0x1.f464520000000p-3, -0x1.f136120000000p-3, -0x1.2ec4740000000p-5, -0x1.0732540000000p-7, -0x1.7dc5140000000p-1, -0x1.1cf6380000000p-4,
-0x1.8e075a0000000p-3, -0x1.7a28420000000p-4, 0x1.73dbda0000000p-4, 0x1.e76aa80000000p-4, -0x1.2567ec0000000p-3, -0x1.8dd6060000000p-4, -0x1.1e17840000000p-3, 0x1.517f260000000p-4, 0x1.f3e0700000000p-5, 0x1.0ed76a0000000p-9, -0x1.b5e4000000000p-2, 0x1.de30f20000000p-7, -0x1.457ad00000000p-3, -0x1.2abe620000000p-5, -0x1.f2e8da0000000p-2, -0x1.093dc00000000p-3,
-0x1.8e89e60000000p-6, -0x1.7304b40000000p-7, -0x1.3d6e320000000p-7, 0x1.5beae40000000p-4, -0x1.bf515a0000000p-5, -0x1.0d18420000000p-6, -0x1.935c280000000p-1, -0x1.ddca960000000p-4, -0x1.cce85a0000000p-4, -0x1.954e720000000p-8, 0x1.97d78a0000000p-6, -0x1.1e9a7a0000000p-5, -0x1.7d61fc0000000p-6, -0x1.8943060000000p-8, 0x1.1d73820000000p-3, -0x1.210b1c0000000p-8,

-0x1.47da340000000p-5, -0x1.083ec60000000p-6, -0x1.0172600000000p-8, -0x1.c71c980000000p-4, -0x1.57a88c0000000p-3, -0x1.381ff40000000p-6, 0x1.8f009c0000000p-3, 0x1.afd7240000000p-3, 0x1.6f2fde0000000p-4, -0x1.b31be60000000p-9, -0x1.7090720000000p-4, -0x1.59da560000000p-3, -0x1.e4863a0000000p-6, -0x1.f8f0960000000p-8, -0x1.23d4f80000000p-9, -0x1.1a852c0000000p-6,
0x1.2d7d000000000p-6, 0x1.0ef25a0000000p-7, -0x1.149dfe0000000p-6, 0x1.7bb0ae0000000p-6, -0x1.4938be0000000p-4, 0x1.5dff440000000p-6, -0x1.e205000000000p-1, -0x1.4c7e1a0000000p-3, -0x1.7ea91a0000000p-4, 0x1.9234c40000000p-6, -0x1.f94cfe0000000p-3, 0x1.6dcaec0000000p-4, 0x1.b472680000000p-6, 0x1.250a820000000p-7, -0x1.3fb4a60000000p-3, -0x1.0796b80000000p-5,
-0x1.33ae4e0000000p-5, -0x1.b9781e0000000p-6, 0x1.6c3fe60000000p-4, -0x1.54a6ae0000000p-3, -0x1.1966a40000000p-3, -0x1.edb9940000000p-6, -0x1.9102220000000p-2, -0x1.191eb60000000p-2, 0x1.aed68a0000000p-6, -0x1.ccef9c0000000p-9, 0x1.556c840000000p-3, -0x1.037ff20000000p-3, -0x1.8e627c0000000p-5, -0x1.8cda080000000p-7, -0x1.b376740000000p-1, -0x1.f7d1500000000p-6,
-0x1.3144620000000p-6, -0x1.b42fd20000000p-8, 0x1.73f4380000000p-9, -0x1.ac832e0000000p-3, 0x1.65b6980000000p-3, -0x1.4c95340000000p-7, -0x1.2fa9000000000p-2, 0x1.c6d3000000000p-5, -0x1.61c9820000000p-4, -0x1.72ddb00000000p-8, 0x1.f03a640000000p-4, -0x1.a2a4380000000p-6, -0x1.dbd2480000000p-7, -0x1.b9cc720000000p-9, 0x1.864d3c0000000p-3, 0x1.9eee740000000p-11,
-0x1.2ef2c00000000p-4, -0x1.24f5e80000000p-5, -0x1.b49dac0000000p-7, -0x1.e964380000000p-3, -0x1.ee7ba80000000p-3, -0x1.2bcc380000000p-7, 0x1.96cca00000000p-4, 0x1.2851820000000p-3, 0x1.7d7e960000000p-3, 0x1.b497e60000000p-5, -0x1.2474aa0000000p-3, -0x1.431cb20000000p-3, -0x1.11e7640000000p-5, -0x1.881d880000000p-11, -0x1.824e1c0000000p-2, -0x1.1d943a0000000p-3,
-0x1.8195c20000000p-7, -0x1.1e0db80000000p-11, -0x1.2e26160000000p-7, 0x1.1faba80000000p-8, -0x1.e4e1740000000p-5, -0x1.7007e80000000p-10, -0x1.2e25dc0000000p-1, 0x1.94c9340000000p-7, -0x1.3e95860000000p-2, -0x1.bd377e0000000p-10, -0x1.d64f260000000p-5, -0x1.dd50240000000p-7, -0x1.e6d9c80000000p-10, -0x1.be536a0000000p-15, -0x1.9732340000000p-2, 0x1.9481940000000p-10,
-0x1.3b94560000000p-8, 0x1.964b1c0000000p-9, -0x1.b7ed800000000p-7, 0x1.9c5f640000000p-4, -0x1.6687220000000p-3, -0x1.c544900000000p-11, -0x1.e4c7da0000000p-3, -0x1.041d980000000p-5, -0x1.43a4a20000000p-3, -0x1.70d74a0000000p-8, -0x1.c83f6e0000000p-6, -0x1.c1cb1c0000000p-4, 0x1.f1ecf60000000p-10, -0x1.4aff3c0000000p-11, -0x1.aa2cae0000000p-3, 0x1.b2ca200000000p-7,
0x1.6094080000000p-6, 0x1.43e11a0000000p-8, -0x1.208d080000000p-6,

-0x1.1ae7a80000000p-3, 0x1.96359a0000000p-5, 0x1.c54bde0000000p-6, 0x1.bea1c00000000p-3, -0x1.a7d3ca0000000p-3, -0x1.3de3280000000p-5, 0x1.4bad560000000p-5, -0x1.af75fa0000000p-7, -0x1.3cd84e0000000p-4, 0x1.04bb300000000p-5, 0x1.77b5b80000000p-7, 0x1.8150740000000p-4, -0x1.f5e5480000000p-5,
0x1.0f2b9c0000000p-2, 0x1.0d95f20000000p-5, -0x1.3bc8000000000p-4, -0x1.48a3d60000000p-3, -0x1.be65020000000p-3, 0x1.fefafa0000000p-6, 0x1.8610860000000p-3, -0x1.0a93ea0000000p-4, -0x1.4ade8c0000000p-4, -0x1.eff9f60000000p-8, 0x1.638a760000000p-3, 0x1.9900b40000000p-4, 0x1.b1e2400000000p-5, 0x1.6d48620000000p-7, -0x1.123b160000000p-2, 0x1.d660560000000p-5,
-0x1.b48b320000000p-4, -0x1.13cbc20000000p-7, -0x1.787cde0000000p-3, -0x1.04b6780000000p-2, -0x1.20e36e0000000p-4, -0x1.06acea0000000p-10, 0x1.190f860000000p-2, 0x1.0e42100000000p-5, -0x1.a9c9b80000000p-5, 0x1.0ce2760000000p-6, -0x1.408e800000000p-4, 0x1.0c2cbe0000000p-4, -0x1.86e8e00000000p-8, 0x1.4dc4d60000000p-9, -0x1.3acc240000000p-2, -0x1.4044280000000p-5,
0x1.848fce0000000p-6, 0x1.e48f140000000p-8, -0x1.6ee7120000000p-6, 0x1.8abe280000000p-6, -0x1.f0c4c60000000p-4, 0x1.6e83bc0000000p-5, 0x1.73edb40000000p-2, -0x1.9709240000000p-3, 0x1.d274960000000p-4, 0x1.2c14180000000p-4, -0x1.1380c00000000p-3, -0x1.ff261e0000000p-3, 0x1.a344360000000p-5, 0x1.527b420000000p-6, -0x1.7f902a0000000p-3, -0x1.da980e0000000p-4,
-0x1.91dcc20000000p-6, 0x1.d193500000000p-6, -0x1.748a520000000p-3, -0x1.d5338c0000000p-4, -0x1.95d5880000000p-3, 0x1.6ee9160000000p-8, 0x1.e366fc0000000p-2, -0x1.43ae980000000p-5, 0x1.06ba340000000p-3, -0x1.6647a00000000p-5, -0x1.04eb8e0000000p-3, -0x1.7d341e0000000p-3, 0x1.98b6740000000p-6, 0x1.0fa1140000000p-9, -0x1.8752f60000000p-1, 0x1.cf6efa0000000p-4,
-0x1.1ac8860000000p-8, -0x1.21737a0000000p-10, 0x1.a174960000000p-10, -0x1.a6b3fa0000000p-3, 0x1.9d8d720000000p-6, -0x1.5779380000000p-9, -0x1.43b12e0000000p-2, -0x1.89e7520000000p-4, 0x1.5719ce0000000p-5, -0x1.63dec00000000p-9, 0x1.9177a80000000p-5, 0x1.54c06e0000000p-5, -0x1.a7adda0000000p-9, -0x1.1893720000000p-10, -0x1.a9421c0000000p-9, 0x1.73f4140000000p-9,

Table D.19 Layer 2 CNN (bias parameter bias) of context coding neural network parameter

Parameter value
-0x1.e93a5a0000000p-1, 0x1.20d5680000000p-1, 0x1.4360d60000000p+0,

0x1.3302100000000p-6, -0x1.19b6760000000p-5, 0x1.6ef2000000000p-6, 0x1.0e89020000000p-1, -0x1.dae8fa0000000p-5, -0x1.2e19580000000p-3, 0x1.828ea0000000p-1, 0x1.1e9b100000000p-1, -0x1.a1aba40000000p-6, 0x1.e97bb40000000p-3, 0x1.96cef80000000p-1, -0x1.15e39a0000000p-6, 0x1.88d3740000000p-1,

Table D.20 Layer 3 CNN (convolutional kernel parameter kernel) of context coding neural network parameter

Parameter value
0x1.776cdc0000000p-13, 0x1.2d54bc0000000p-14, 0x1.ee43440000000p-15, 0x1.d0f0f20000000p-14, 0x1.029d440000000p+0, -0x1.828bbe0000000p-14, -0x1.3fb09e0000000p-14, 0x1.203b6a0000000p-14, 0x1.a43e940000000p-16, -0x1.1d505c0000000p-14, -0x1.596b880000000p-17, 0x1.72c4de0000000p-15, 0x1.862c3e0000000p-1, 0x1.5399ae0000000p-16, 0x1.10935a0000000p-14, -0x1.6bc7fe0000000p-15,
0x1.a49b9a0000000p-5, -0x1.51880a0000000p-3, 0x1.99b6120000000p-5, 0x1.e9ae800000000p-5, -0x1.09e4560000000p-2, -0x1.6e3a160000000p-4, 0x1.21c6320000000p-4, 0x1.ccee6e0000000p-6, 0x1.ae2d720000000p-4, -0x1.7d4eb20000000p-3, 0x1.faf2880000000p-5, -0x1.c392580000000p-5, -0x1.43d7700000000p-3, -0x1.d0e4e60000000p-6, -0x1.1867f60000000p-5, -0x1.fcb3c40000000p-4,
-0x1.e8158a0000000p-13, -0x1.24c26c0000000p-15, -0x1.f38de80000000p-16, -0x1.5a531a0000000p-14, 0x1.03659e0000000p+0, 0x1.5619d40000000p-14, 0x1.284dd80000000p-13, -0x1.54dcce0000000p-14, 0x1.46049e0000000p-13, 0x1.5b05c00000000p-15, 0x1.1b3bfe0000000p-14, -0x1.7340460000000p-14, 0x1.f859620000000p-1, -0x1.42e9160000000p-14, -0x1.337c220000000p-13, 0x1.2db4760000000p-16,
0x1.5db3a80000000p-3, 0x1.99dcd00000000p-5, -0x1.a0a4560000000p-5, 0x1.10d6a40000000p-3, 0x1.ef17540000000p-3, -0x1.77060e0000000p-5, -0x1.50b30e0000000p-4, 0x1.7e6e600000000p-5, -0x1.2375d60000000p-3, 0x1.caf4f60000000p-4, 0x1.b31f4c0000000p-3, 0x1.f058420000000p-6, -0x1.2f4ec60000000p-3, 0x1.7027740000000p-3, -0x1.b5fa6c0000000p-7, 0x1.c3b51e0000000p-4,
0x1.13c71e0000000p-3, -0x1.42e6ee0000000p-3, 0x1.820c420000000p-3, 0x1.46da540000000p-3, -0x1.25af2c0000000p-1, -0x1.24f1ac0000000p-11, -0x1.f7579e0000000p-4, -0x1.a124dc0000000p-7, 0x1.69b8d80000000p-3, 0x1.d2814c0000000p-7, -0x1.bfb3760000000p-5, 0x1.9ea47e0000000p-5, -0x1.2007640000000p-3, 0x1.6718160000000p-3, -0x1.a25cb40000000p-4, -0x1.4f07a60000000p-4,
0x1.bd90700000000p-6, 0x1.1980580000000p-4, -0x1.d4cdc00000000p-7, -0x1.2862380000000p-3, -0x1.733a780000000p-2, -0x1.fde1080000000p-5, -0x1.4618ea0000000p-5, 0x1.b723100000000p-4, 0x1.185f980000000p-11,

0x1.dec2920000000p-6, -0x1.9e9da40000000p-6, 0x1.7351da0000000p-5, -0x1.e5d3ca0000000p-2, 0x1.a0aab20000000p-5, 0x1.7af3a00000000p-5, -0x1.1c7dbe0000000p-7,
-0x1.4f7ec00000000p-15, -0x1.9e0c540000000p-13, 0x1.1a3d3c0000000p-17, 0x1.cfea120000000p-12, 0x1.ce459a0000000p+0, 0x1.06ef3c0000000p-14, -0x1.0b775e0000000p-12, 0x1.b5fa9e0000000p-13, -0x1.435a460000000p-14, 0x1.823c9a0000000p-17, -0x1.cd4eac0000000p-14, 0x1.e28a4e0000000p-13, 0x1.bbb7a40000000p-2, -0x1.c2a8b60000000p-14, -0x1.f692700000000p-20, -0x1.3ab5740000000p-15,
0x1.44f4e00000000p-4, -0x1.4d32a00000000p-3, 0x1.a3e4ee0000000p-4, -0x1.c5591c0000000p-5, -0x1.34bfbc0000000p-10, -0x1.ca7ff00000000p-5, -0x1.80fdfe0000000p-4, 0x1.0456840000000p-5, -0x1.035dfa0000000p-3, 0x1.e869da0000000p-3, 0x1.60a9da0000000p-5, -0x1.0a3bfc0000000p-5, -0x1.d1dff20000000p-5, -0x1.f343320000000p-5, -0x1.4f46d40000000p-4, -0x1.be75380000000p-3,
0x1.3d87d80000000p-3, -0x1.05d9100000000p-3, -0x1.78eaf00000000p-3, -0x1.3dd8540000000p-3, -0x1.0da3660000000p-1, -0x1.e7ed240000000p-5, 0x1.687ca40000000p-3, -0x1.441d200000000p-3, -0x1.c5df420000000p-5, 0x1.ad379e0000000p-4, -0x1.0e6fe60000000p-5, -0x1.4843e20000000p-4, -0x1.402d1a0000000p-1, -0x1.44df160000000p-5, 0x1.01734a0000000p-4, 0x1.4c4c560000000p-4,
-0x1.3314c20000000p-2, 0x1.23f38e0000000p-7, -0x1.72a6ea0000000p-4, -0x1.ad644a0000000p-3, 0x1.79e03c0000000p-8, 0x1.cf43b40000000p-3, 0x1.95f07c0000000p-3, -0x1.a9966a0000000p-6, 0x1.bd50ec0000000p-4, 0x1.2c4b280000000p-4, 0x1.23b6480000000p-6, -0x1.49c0d20000000p-4, -0x1.0d285a0000000p-1, 0x1.49fb9e0000000p-3, -0x1.2097920000000p-6, -0x1.18e8e00000000p-6,
-0x1.0bac2a0000000p-12, 0x1.e682060000000p-13, -0x1.7e6a340000000p-13, -0x1.134f280000000p-13, 0x1.15e42c0000000p+0, -0x1.287d860000000p-13, 0x1.17d6ce0000000p-13, -0x1.1446540000000p-13, 0x1.6f54440000000p-17, -0x1.2998880000000p-14, -0x1.918a760000000p-16, -0x1.c6dbf80000000p-14, 0x1.ac971c0000000p-1, 0x1.5650d80000000p-15, 0x1.c5d4ce0000000p-14, 0x1.cf77220000000p-16,
0x1.020fc20000000p-3, 0x1.514a9a0000000p-3, -0x1.0eb98a0000000p-4, -0x1.7b3da20000000p-5, -0x1.77790e0000000p-3, -0x1.e5cbf40000000p-3, -0x1.eb18600000000p-4, -0x1.5431d20000000p-3, -0x1.7551260000000p-4, 0x1.ae58960000000p-3, -0x1.d97cbe0000000p-3, -0x1.fb0c280000000p-7, 0x1.e3d4fa0000000p-3, -0x1.cb830a0000000p-3, 0x1.a873000000000p-5, 0x1.d2afca0000000p-6,
0x1.989a060000000p-4, 0x1.06c3140000000p-5, 0x1.604fc40000000p-6, 0x1.86390a0000000p-3, -0x1.06904c0000000p-1, 0x1.d278a80000000p-9, -0x1.fd7b600000000p-4, -0x1.3eb03e0000000p-4, -0x1.73e3b60000000p-4, 0x1.e0e46e0000000p-6, -0x1.f5318e0000000p-6, 0x1.fc42120000000p-6,

-0x1.32195a0000000p-1, -0x1.1811080000000p-4, -0x1.e27b560000000p-6, 0x1.eee9900000000p-5,
-0x1.dec0120000000p-4, -0x1.9a232a0000000p-6, -0x1.8bb8540000000p-8, -0x1.349a980000000p-3, -0x1.2c6e440000000p-1, -0x1.3455a40000000p-7, 0x1.5c8f240000000p-3, 0x1.390aae0000000p-9, 0x1.ada89e0000000p-8, 0x1.17073a0000000p-5, 0x1.83651e0000000p-5, -0x1.b5eb040000000p-6, -0x1.4836a40000000p-2, -0x1.815aae0000000p-5, 0x1.2738060000000p-4, 0x1.0d5aea0000000p-5,
-0x1.edf9340000000p-5, -0x1.0240400000000p-6, -0x1.f664860000000p-6, -0x1.489e4a0000000p-5, 0x1.ef5b0a0000000p-3, 0x1.75b8220000000p-3, -0x1.fbccf40000000p-5, -0x1.b799840000000p-7, -0x1.0c2b8a0000000p-4, -0x1.3e45780000000p-6, 0x1.4388420000000p-9, -0x1.e264820000000p-8, -0x1.1783480000000p-1, 0x1.7f94200000000p-5, 0x1.148da00000000p-4, -0x1.84d3680000000p-7,
-0x1.38099c0000000p-3, 0x1.1470da0000000p-5, -0x1.a4ef4e0000000p-5, -0x1.09f9080000000p-3, -0x1.01b5b80000000p+0, 0x1.cd66880000000p-4, 0x1.6a8bbc0000000p-4, -0x1.7803040000000p-8, 0x1.26ef820000000p-5, 0x1.1167140000000p-4, -0x1.4fd1980000000p-11, -0x1.b6251a0000000p-6, -0x1.2d48860000000p-4, 0x1.500db60000000p-4, 0x1.5e80920000000p-8, 0x1.6f82480000000p-7,
0x1.c28c020000000p-14, 0x1.0c130c0000000p-14, -0x1.5f46aa0000000p-16, 0x1.b49a440000000p-14, 0x1.2a07c20000000p+0, 0x1.5b18aa0000000p-17, -0x1.127c300000000p-12, 0x1.f621ae0000000p-14, 0x1.9df7020000000p-13, 0x1.2d23000000000p-14, -0x1.dd205e0000000p-14, -0x1.ba04200000000p-16, -0x1.9bc80a0000000p-1, -0x1.f744520000000p-14, -0x1.0474d40000000p-19, -0x1.d37cde0000000p-15,
-0x1.e415520000000p-3, 0x1.fd75cc0000000p-4, -0x1.0a47c60000000p-3, -0x1.acd9bc0000000p-4, -0x1.80a6ea0000000p-1, 0x1.0b7b8a0000000p-7, -0x1.e1351c0000000p-6, -0x1.7493980000000p-7, 0x1.54398c0000000p-3, 0x1.f83f160000000p-4, 0x1.286e840000000p-6, 0x1.27e8660000000p-3, 0x1.1384680000000p-2, 0x1.a5fa3c0000000p-5, -0x1.b0650a0000000p-8, -0x1.3ef8c40000000p-4,
-0x1.3c42ec0000000p-12, 0x1.f2c54a0000000p-16, -0x1.4304040000000p-15, -0x1.da34580000000p-13, 0x1.1d2d940000000p+0, 0x1.8f11c60000000p-14, 0x1.49b9da0000000p-13, -0x1.9f56500000000p-15, 0x1.08f82a0000000p-12, -0x1.c230500000000p-17, 0x1.8277da0000000p-14, -0x1.ef67900000000p-15, -0x1.c089bc0000000p-1, 0x1.b2c78a0000000p-15, -0x1.a9076c0000000p-19, -0x1.31c98a0000000p-17,
0x1.9936a20000000p-9, 0x1.b5ab8c0000000p-11, -0x1.bb04d40000000p-12, 0x1.49419e0000000p-9, -0x1.3d1ce60000000p+0, -0x1.ea420a0000000p-13, -0x1.f6256e0000000p-10, -0x1.3253040000000p-10, -0x1.4fa75c0000000p-10, -0x1.e4d5ba0000000p-11, 0x1.0cc3ea0000000p-10, 0x1.10273c0000000p-9, 0x1.b428480000000p-1, 0x1.2d4c560000000p-12, -0x1.4e92460000000p-11,

0x1.7288d80000000p-9,
0x1.9187ee0000000p-11, -0x1.0f908e0000000p-3, 0x1.3f89020000000p-4, 0x1.c533940000000p-3, 0x1.ea923c0000000p-6, 0x1.dc91440000000p-4, 0x1.72e4960000000p-5, -0x1.70c28e0000000p-3, -0x1.2c67c60000000p-3, -0x1.79dfae0000000p-4, 0x1.4ae9820000000p-3, 0x1.9ec0da0000000p-3, -0x1.3982f60000000p-3, -0x1.23c1800000000p-3, 0x1.c890a80000000p-5, 0x1.81ce460000000p-3,
0x1.a458940000000p-4, 0x1.4f44c20000000p-4, 0x1.26ee020000000p-3, 0x1.0baa380000000p-3, -0x1.8602f60000000p-2, -0x1.21f83c0000000p-7, -0x1.e442580000000p-7, -0x1.b4fde40000000p-4, -0x1.6f73780000000p-4, -0x1.4b3bd00000000p-4, -0x1.c1dca80000000p-6, -0x1.0336640000000p-3, 0x1.1810a00000000p-1, 0x1.5f7fc80000000p-5, -0x1.2b34400000000p-5, 0x1.c9a6ac0000000p-4,
-0x1.53c7c00000000p-12, -0x1.f766e40000000p-13, -0x1.1e3c1e0000000p-12, -0x1.80f1ae0000000p-13, 0x1.f03b540000000p-1, 0x1.352c1c0000000p-18, -0x1.28ddca0000000p-13, 0x1.089a300000000p-15, 0x1.87802c0000000p-14, 0x1.b4b7720000000p-16, -0x1.1116120000000p-12, -0x1.417dc80000000p-18, -0x1.94fc060000000p-1, 0x1.103f4c0000000p-16, 0x1.27d0600000000p-14, -0x1.c8bce80000000p-13,
0x1.007f2e0000000p-3, 0x1.8d798c0000000p-4, 0x1.934ea60000000p-3, 0x1.edbe520000000p-4, -0x1.3c1e100000000p-3, 0x1.5a13c00000000p-4, 0x1.16f4fc0000000p-3, 0x1.abd4a60000000p-3, 0x1.394ba40000000p-7, -0x1.1f74bc0000000p-4, 0x1.e26f0c0000000p-4, -0x1.ccd18e0000000p-5, -0x1.87ffac0000000p-3, -0x1.173be80000000p-4, -0x1.0474340000000p-3, -0x1.e4bc3a0000000p-3,
0x1.8cc47a0000000p-4, -0x1.b2bd580000000p-3, -0x1.7d15640000000p-3, 0x1.93e30a0000000p-3, 0x1.04c6800000000p-3, -0x1.75409a0000000p-7, 0x1.3ee17e0000000p-3, -0x1.ab17ee0000000p-4, 0x1.c304660000000p-6, -0x1.0ecba20000000p-5, -0x1.9c9f020000000p-5, 0x1.3b39f80000000p-3, -0x1.07113e0000000p-3, 0x1.014dbe0000000p-3, 0x1.38e1180000000p-3, -0x1.298ebc0000000p-6,
-0x1.d7ec500000000p-5, -0x1.71324c0000000p-4, -0x1.99310c0000000p-3, -0x1.9b746c0000000p-4, -0x1.8432aa0000000p-2, 0x1.2a466c0000000p-6, 0x1.0b087c0000000p-4, -0x1.3ad6660000000p-4, -0x1.9040f40000000p-6, -0x1.b284620000000p-5, -0x1.fa54480000000p-5, 0x1.d6446a0000000p-7, 0x1.0047060000000p-2, -0x1.f804aa0000000p-6, 0x1.5c756a0000000p-4, 0x1.cb99ac0000000p-5,
-0x1.0a26800000000p-12, 0x1.00bc600000000p-15, -0x1.c614ce0000000p-14, -0x1.e22b380000000p-19, 0x1.1653780000000p+0, 0x1.2d3d340000000p-14, 0x1.7edc4a0000000p-13, 0x1.0a2e8c0000000p-16, -0x1.bec9fc0000000p-13, -0x1.6dc5fa0000000p-15, 0x1.0afae60000000p-15, -0x1.2601bc0000000p-13, -0x1.cabb220000000p-1, 0x1.73c6280000000p-14, 0x1.128e6c0000000p-14, 0x1.8e4af00000000p-15,

-0x1.fed4500000000p-3, 0x1.51c8040000000p-5, -0x1.b8b9f00000000p-4, 0x1.c4cd9a0000000p-5, 0x1.a0f5c40000000p-5, 0x1.dc8b500000000p-4, -0x1.67df6a0000000p-4, 0x1.5f8abe0000000p-7, 0x1.4f8b8a0000000p-5, -0x1.c4fd180000000p-4, 0x1.ea2ce80000000p-5, -0x1.0544da0000000p-6, -0x1.2018400000000p-4, 0x1.cd7c8a0000000p-4, 0x1.a19ac00000000p-4, -0x1.b1a2080000000p-3,
0x1.8a2d9a0000000p-5, -0x1.97e10a0000000p-5, 0x1.0c95d00000000p-4, -0x1.e4d72c0000000p-8, -0x1.2e96640000000p-1, 0x1.1be06e0000000p-7, 0x1.1246460000000p-7, 0x1.8759e20000000p-4, -0x1.c328640000000p-7, 0x1.9eb0b60000000p-6, -0x1.78b3140000000p-11, 0x1.e37b820000000p-6, 0x1.2d7fc60000000p-1, -0x1.9657f20000000p-5, 0x1.6245740000000p-9, -0x1.07cdae0000000p-4,
0x1.5032300000000p-5, -0x1.ce7e300000000p-4, -0x1.d923d20000000p-4, 0x1.2906fc0000000p-7, -0x1.8500420000000p-1, -0x1.83c1660000000p-5, -0x1.0207ce0000000p-5, 0x1.594d860000000p-5, 0x1.f5afc60000000p-6, -0x1.9a87460000000p-6, 0x1.fc75e20000000p-4, -0x1.a710600000000p-5, -0x1.6df2be0000000p-9, 0x1.b47d760000000p-6, -0x1.4a76c20000000p-6, 0x1.1da58a0000000p-7,
-0x1.abda9e0000000p-12, 0x1.5aa4140000000p-16, -0x1.2450c00000000p-10, -0x1.34c4cc0000000p-16, -0x1.b0bae20000000p+0, 0x1.4ffcea0000000p-10, -0x1.84679c0000000p-11, 0x1.59f2d40000000p-11, -0x1.422d860000000p-10, -0x1.b96ca60000000p-14, -0x1.3648d60000000p-12, 0x1.6c7e880000000p-11, 0x1.85a63c0000000p-3, 0x1.38500a0000000p-11, 0x1.475f400000000p-11, -0x1.3347780000000p-11,
0x1.4a21d60000000p-6, -0x1.e35e720000000p-5, -0x1.12e4740000000p-4, -0x1.3325aa0000000p-6, -0x1.79cda00000000p-1, 0x1.de5a080000000p-9, 0x1.049ef00000000p-5, -0x1.5a90740000000p-5, -0x1.5ee4fc0000000p-5, -0x1.ab85b20000000p-5, -0x1.ba515c0000000p-6, -0x1.eb079c0000000p-6, 0x1.2ce6360000000p-2, -0x1.09ae860000000p-6, 0x1.28d9fe0000000p-5, 0x1.916fa60000000p-5,
-0x1.adab320000000p-13, 0x1.01ab520000000p-14, -0x1.2a942a0000000p-13, -0x1.dc1f8a0000000p-14, -0x1.737a400000000p-6, 0x1.0486700000000p-13, 0x1.0a0dbc0000000p-15, 0x1.52a1640000000p-14, 0x1.c904f80000000p-15, 0x1.3db2b20000000p-13, 0x1.0eec840000000p-14, -0x1.6a1d980000000p-13, -0x1.34644e0000000p-9, -0x1.9c9d9e0000000p-14, -0x1.680fb40000000p-13, -0x1.bc87080000000p-13,
-0x1.6629440000000p-3, -0x1.8d81e20000000p-4, -0x1.fb5efe0000000p-4, -0x1.8fc7e20000000p-8, -0x1.38387a0000000p-5, -0x1.a0903a0000000p-4, 0x1.3569ec0000000p-4, 0x1.ba10ce0000000p-5, 0x1.219e840000000p-4, 0x1.7d39d40000000p-6, 0x1.e2ca740000000p-5, 0x1.b38c7e0000000p-3, -0x1.7d84860000000p-6, -0x1.6483d60000000p-4, -0x1.7581640000000p-4, 0x1.807f5c0000000p-3,
0x1.12c8200000000p-12, 0x1.0a01a20000000p-14, 0x1.d272c60000000p-13,

0x1.b238ea0000000p-15, 0x1.3b54860000000p-4, 0x1.67e85c0000000p-15, -0x1.9fb3740000000p-15, -0x1.942ad40000000p-14, 0x1.ea9b9e0000000p-14, -0x1.3e88140000000p-13, 0x1.d0887e0000000p-15, -0x1.492f3a0000000p-14, -0x1.1fb5ea0000000p-6, -0x1.57套路d0000000000p-16, 0x1.abd8880000000p-14, -0x1.8317b80000000p-16,
0x1.046b780000000p-5, 0x1.35f2ea0000000p-7, 0x1.716ce80000000p-4, 0x1.cba37c0000000p-3, -0x1.4ea90c0000000p-3, 0x1.a5bce80000000p-3, 0x1.f62ab00000000p-5, -0x1.5f17780000000p-5, 0x1.2dc8d80000000p-4, 0x1.d973200000000p-3, -0x1.38b9e40000000p-3, 0x1.fab0de0000000p-3, -0x1.833a780000000p-3, 0x1.d38ee80000000p-6, 0x1.61edda0000000p-4, 0x1.3640020000000p-5,
0x1.a14d320000000p-4, 0x1.d115960000000p-3, -0x1.8f5d000000000p-3, 0x1.944e1c0000000p-4, 0x1.052fb20000000p-16, -0x1.c0d73c0000000p-4, 0x1.ae2a980000000p-3, 0x1.93e4c00000000p-8, 0x1.97d5040000000p-3, 0x1.3210700000000p-3, -0x1.ac534a0000000p-4, -0x1.8829a20000000p-9, 0x1.5afac00000000p-3, 0x1.887a740000000p-4, 0x1.284cb00000000p-5, 0x1.aae2ec0000000p-3,
-0x1.56dbac0000000p-4, 0x1.b6c3e40000000p-4, -0x1.081bf40000000p-3, -0x1.f52fac0000000p-4, 0x1.f7a9e00000000p-4, 0x1.5296200000000p-6, 0x1.11c1ea0000000p-3, -0x1.44c1760000000p-5, -0x1.4ca4dc0000000p-3, 0x1.283e3e0000000p-4, 0x1.2f24a00000000p-5, -0x1.06edfc0000000p-4, -0x1.39de4e0000000p-3, 0x1.f9610a0000000p-5, 0x1.76c06e0000000p-5, -0x1.5ca87a0000000p-4,
-0x1.f6e0cc0000000p-18, -0x1.9a24ea0000000p-13, 0x1.e45cce0000000p-13, 0x1.4d39740000000p-12, -0x1.3627620000000p-5, -0x1.9552ce0000000p-12, -0x1.fbfa420000000p-13, -0x1.9b47200000000p-15, 0x1.791dfa0000000p-12, 0x1.7a82760000000p-16, -0x1.7674860000000p-15, 0x1.57340c0000000p-13, -0x1.2815240000000p-7, 0x1.32605a0000000p-13, -0x1.1f2b4e0000000p-13, -0x1.ac63860000000p-13,
-0x1.be21240000000p-3, 0x1.c0c0400000000p-4, -0x1.0093780000000p-8, -0x1.0cd1900000000p-3, 0x1.d507e20000000p-4, 0x1.3c03960000000p-3, -0x1.6f38a20000000p-5, 0x1.cc12900000000p-3, -0x1.516a860000000p-3, -0x1.4b4dc40000000p-3, 0x1.4c2fc00000000p-5, 0x1.d1097e0000000p-3, 0x1.fcd2bc0000000p-3, -0x1.e3e4f00000000p-4, 0x1.0e0ccc0000000p-4, -0x1.7d9a0a0000000p-7,
0x1.94e0ba0000000p-3, 0x1.cbac700000000p-4, 0x1.2008380000000p-4, 0x1.bfbfa80000000p-3, 0x1.0053a40000000p-3, -0x1.f4a76e0000000p-4, 0x1.01297a0000000p-3, 0x1.62bb500000000p-3, 0x1.b60ac00000000p-4, -0x1.0e43540000000p-5, -0x1.75ad9e0000000p-3, 0x1.0a5f6a0000000p-3, -0x1.48d9fa0000000p-3, -0x1.5280300000000p-4, -0x1.68eb180000000p-5, -0x1.6891820000000p-6,
-0x1.ae0ea80000000p-7, -0x1.42e21a0000000p-5, 0x1.fe90520000000p-5, -0x1.9eea3c0000000p-5, -0x1.0ad2b20000000p-2, 0x1.d55a400000000p-7,

	-0x1.a32f3c0000000p-4, -0x1.e587be0000000p-8, 0x1.573f4a0000000p-5, -0x1.e69eb00000000p-7, 0x1.fd85800000000p-5, -0x1.967dd60000000p-6, 0x1.23c11c0000000p-4, 0x1.8f86940000000p-5, 0x1.e656c80000000p-6, -0x1.c1efd00000000p-4,
	-0x1.d327d20000000p-14, 0x1.e6b2480000000p-17, 0x1.0336ce0000000p-13, 0x1.36571e0000000p-14, -0x1.4caa1c0000000p-5, 0x1.53ba9c0000000p-16, -0x1.1369360000000p-13, 0x1.e3b7f80000000p-16, -0x1.40c00e0000000p-16, -0x1.a4d1ac0000000p-15, 0x1.750cc60000000p-17, -0x1.1e82880000000p-13, 0x1.0312140000000p-5, 0x1.05a3c20000000p-15, 0x1.11c31c0000000p-14, 0x1.3a6a740000000p-16,
	0x1.f8a0640000000p-4, 0x1.70a21e0000000p-4, -0x1.13e8c40000000p-4, 0x1.984e760000000p-3, 0x1.ab042a0000000p-3, 0x1.702faa0000000p-6, -0x1.f2dcea0000000p-3, 0x1.5172e20000000p-4, -0x1.edc9180000000p-3, -0x1.44fc820000000p-3, 0x1.b868b40000000p-4, -0x1.0d201c0000000p-4, 0x1.c96d4c0000000p-4, -0x1.8f41620000000p-6, -0x1.8e12940000000p-4, -0x1.44f6660000000p-4,
	0x1.e97bef0000000p-4, -0x1.62608e0000000p-5, 0x1.129df60000000p-3, 0x1.7003d00000000p-4, 0x1.e639260000000p-6, 0x1.44df2a0000000p-6, -0x1.eee2160000000p-4, 0x1.4733780000000p-7, 0x1.75ff860000000p-4, -0x1.e82ef00000000p-5, -0x1.7fb0680000000p-5, -0x1.b2b6800000000p-6, 0x1.cb094a0000000p-5, -0x1.dc3e1e0000000p-7, -0x1.e3d82e0000000p-10, -0x1.869b540000000p-9,
	0x1.65aa2a0000000p-4, 0x1.a9ff120000000p-4, -0x1.4742e00000000p-5, 0x1.e3d9c60000000p-5, -0x1.9777c80000000p-3, 0x1.bee9900000000p-6, 0x1.d4845c0000000p-4, -0x1.18d1dc0000000p-6, -0x1.9df9e20000000p-4, 0x1.056ef40000000p-6, -0x1.afbffa0000000p-4, -0x1.0f363c0000000p-4, 0x1.ace6640000000p-4, -0x1.58e6ee0000000p-6, 0x1.3006580000000p-8, 0x1.c944da0000000p-5,
	0x1.53f07c0000000p-5, 0x1.4aaaba0000000p-5, -0x1.7e1e560000000p-7, 0x1.d959b40000000p-4, 0x1.013dd00000000p-4, -0x1.22d3000000000p-3, -0x1.c76bd20000000p-8, 0x1.9bdc6e0000000p-3, -0x1.0b51a80000000p-7, -0x1.09d9180000000p-3, 0x1.7550940000000p-4, 0x1.7ce65a0000000p-6, 0x1.701d280000000p-6, 0x1.70df240000000p-7, -0x1.c81be20000000p-5, -0x1.a3c1920000000p-5,
	0x1.0ba3820000000p-6, 0x1.9259980000000p-7, 0x1.0ba80c0000000p-5, -0x1.ffe6440000000p-6, -0x1.d515840000000p-4, 0x1.a2d04c0000000p-6, -0x1.44b43e0000000p-5, -0x1.087e640000000p-6, -0x1.9056040000000p-7, -0x1.29f58a0000000p-9, 0x1.2acef40000000p-6, -0x1.b341060000000p-5, 0x1.b276180000000p-5, 0x1.4adf040000000p-5, 0x1.06bc0c0000000p-5, -0x1.58b5ee0000000p-4,

Annex E (Informative) Correspondence between Coding Metadata in this document and Metadata in ITU-R BS.2076-2

Table E.1 shows the correspondence between the coding metadata in chapter 9 and the ITUR BS.2076-2.

Table E.1 Metadata correspondence

Metadata element in ITU-R BS.2076-2	Sub-element and attribute in ITU-R BS.2076-2	Coding metadata in chapter 9 in this document	Correspondence to metadata in ITU-R BS.2076-2
audioTrackFormat	All sub-elements and attributes	None	—
audioStreamFormat	All sub-elements and attributes	None	—
audioChannelFormat	audioChannelFormatID	None	In this document, channelFormatIdx has the same meaning as audioChannelFormatID.
	typeLabel	None	In this document, the typeLabel in the audioChannelFormat metadata is consistent with the typeLabel in the audioPackFormat metadata at its upper layer.
	typeDefinition	None	—
	frequency	None	—
audioBlockFormat	audioBlockFormatID	None	—
	rtime	None	—
	duration	None	—
	gain	channelGainUnit, channelGain_QFlag, channelGain	Consistent
	importance	importance	Consistent
	headLocked	b_headLocked	Consistent
	headphoneVirtualise：bypass	None	—
	headphoneVirtualise: DRR	None	—

Table E.1 (continued)

Metadata element in ITU-R	Sub-element and attribute in ITU-R	Coding metadata in chapter 9 in this	Correspondence to metadata in ITU-R BS.2076-2

BS.2076-2	BS.2076-2	document	
audioBlockFormat	speakerLabel (typelabel=directSpeakers)	None	When the value of packFormatID is 0 to 31, the packFormatID metadata is used in the ITU-R BS.2094-1 standard to obtain the speakerLabel described in GY/T 316-2018. When the value of packFormatID is 32 to 63, for a non-standard speaker layout, position metadata (the azimuth and the elevation) is used in GY/T 316-2018 to obtain the corresponding speakerLabel.
	position (typelabel=directSpeakers)	DirectSpeakersPosition	Consistent
	outputChannel FormatIDRef	None	—
	jumpPosition(typelabel=matrix)	None	—
	interpolationLength(typelabel=matrix)	None	—
	coefficient (typelabel=matrix)	None	In this document, matrixCoef metadata is used to adjust the linear gain in coefficient metadata.
	position (typelabel=object polar)	obj_position_azimuth、obj_position_elevation、obj_position_distance、obj_width_horizontal、obj_hight_vertical、obj_depth_distance	Consistent
	position(typelabel=object Cartesian)	obj_position_x、obj_position_y、obj_position_z、obj_width_x、obj_width_y、obj_width_z	Consistent
	cartesian	cartesianDm	Consistent
	diffuse	diffuse	Consistent
	channelLock	channelLock	Consistent
	maxDistance	channelLock_maxDistance	Consistent
	objectDivergence	objectDivergence	Consistent
	azimuthRange	objectDivergence_azimuth Range	Consistent
	positionRange	None.	—

Table E.1 (continued)

Metadata element in ITU-R BS.2076-2	Sub-element and attribute in ITU-R	Coding metadata in chapter 9 in this document	Correspondence to metadata in ITU-R

	BS.2076-2		BS.2076-2
audioBlockFormat	jumpPosition (typelabel=object)	jumpPosition	Consistent
	interpolationLength (typelabel=object)	None	In this document, the dynamic metadata in frames contains the result obtained through interpolationLength interpolation.
	zoneExclusion	None.	—
	screenRef(typelabel=object)	obj_screenRef	Consistent
	equation	None.	—
	order	hoaOrder	Consistent
	degree	None	This document uses the ACN SN3D manner.
	normalization	normalization	Consistent
	nfcRefDist	nfcRefDist	Consistent
	screenRef (typelabel=HOA)	screenRef	Consistent
audioPackFormat	audioPackFormatID	packFormatIdx	In this document, packFormatIdx has the same meaning as audioPackFormatID.
	audioPackFormatName	None	—
	typeLabel	typeLabel	Consistent
	typeDefinition	None	—
	importance	audioPackFormatImportance	Consistent
	audioChannelFormatIDRef	None	In this document, refChannelIdx has the same meaning as audioChannelFormatI Ref.
	audioPackFormatIDRef	None	In this document, audioPackFormat metadata is converted by referencing another audioPackFormat format into two independent audioPackFormat formats.

Table E.1 (continued)

Metadata element in ITU-R BS.2076-2	Sub-element and attribute in ITU-R BS.2076-2	Coding metadata in chapter 9 in this document	Correspondence to metadata in ITU-R BS.2076-2
audioPackFormat	absoluteDistance	absoluteDistance	Consistent
	encodePackFormatIDRef(typelabel=Matrix)	None	—
	decodePackFormatIDRef(typelabel=Matrix)	None	—
	inputPackFormatIDRef (typelabel=Matrix)	None	—
	outputPackFormatIDRef (typelabel=Matrix)	None	—
	normalization	normalization	Consistent
	nfcRefDist	nfcRefDist	Consistent
	screenRef (typelabel=HOA)	screenRef	Consistent
audioObject	audioObjectID	None	In this document, objectIdx has the same meaning as audioObjectID.
	audio Object Name	Object Name	The character coding format is not limited in this document, and can be automatically identified based on coded binary data. However, the GB2312 or GBK character coding format is recommended for Chinese and English characters.
	language	audioObjectLanguage	Consistent
	start	None.	—
	duration	None.	—
	dialogue	Dialogue	Consistent
	importance	audioObjectImportance	Consistent
	interact	b_interact	Consistent
	disableDucking	b_disableDucking	Consistent
	audioPackFormatIDRef	None	In this document, refPackFormatIdx has the same meaning as audioPackFormatIDRef.

Table E.1 (continued)

Metadata element in ITU-R BS.2076-2	Sub-element and attribute in ITU-R BS.2076-2	Coding metadata in chapter 9 in this document	Correspondence to metadata in ITU-R BS.2076-2
audioObject	audioObjectIDRef	None	In this document, audioObject metadata is converted by referencing another audioObject format into two independent audioObject formats.
	audioComplementaryObjectGroup Label	ComplementaryObjectIdx	Consistent
	audioComplementary ObjectIDRef		
	audioTrackUIDRef	None	—
	audioObjectInteraction	audioObjectInteraction	Consistent
	gain	objectGainQFlag, objectGain	Consistent
	gainUnit	objectGainUnit	Consistent
	headLocked	b_headLocked	Consistent
	positionOffset	None	—
	mute	b_mute	Consistent
	alternativeValueSet	None	—
audioContent	audioContentID	None	In this document, contentIdx has the same meaning as audioContentID.
	audioContentName	None	—
	language	audioContentLanguage	Consistent
	audioObjectIDRef	None	In this document, refObjectIdx has the same meaning as audioObjectIDRef.
	loudnessMetadata	loudnessMetadata	Consistent
	dialogue	Dialogue	Consistent
	alternativeValueSetIDRef	None	—
audio Programme	audioProgrammeID	None	—
	audioProgrammeName	None	—
	language	audioProgrammeLanguage	Consistent
	start	None	—
	end	None	—
	maxDuckingDepth	maxDuckingDepth	Consistent
	audioContentIDRef	refContentIdx	In this document, refContentIdx has the same meaning as audioContentIDRef.

Table E.1 (continued)

Metadata element in ITU-R BS.2076-2	**Sub-element and attribute in ITU-R BS.2076-2**	**Coding metadata in chapter 9 in this document**	**Correspondence to metadata in ITU-R BS.2076-2**
audio Programme	loudnessMetadata	loudnessMetadata	Consistent
	audioProgrammeReferenceScreen	b_audioProgrammeReferenceScreen	Consistent
	authoringInformation	None	—
	alternativeValueSetIDRef	None	—
audioTrackUID	All Sub-element and Attribute	None	—
loudnessMetadata	loudnessMethod	None	—
	loudnessRecType	None	—
	loudnessCorrectionType	None	—
	integratedLoudness	integratedLoudness	Consistent
	loudnessRange	loudnessRange	Consistent
	maxTruePeak	maxTruePeak	Consistent
	maxMomentary	maxMomentary	Consistent
	maxShortTerm	maxShortTerm	Consistent
	dialogueLoudness	dialogueLoudness	Consistent

Reference Documents

[1] J. Ballé, V. Laparra, and E. P. Simoncelli, “Density modeling of images using a generalized normalization transformation,” in Proc. Int. Conf. Learn. Represent., 2016, pp. 1–14.
[2] T/AI 125-2023 Information Technology Virtual Reality Content Expression Audio