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3D Audio technology specification
Part 3-2: Technical requirements and test methods
– Mobile digital device

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3D Audio technology specification Part 3-2: Technical requirements and test methods - Mobile digital device

1 Scope

This document specifies the technical requirements and testing methods for mobile digital devices using 3D audio technology as specified in T/UWA 009.1.

This document is applicable to the design, production, and inspection of mobile digital devices using 3D audio technology as specified in T/UWA 009.1.

2 Normative references

The content of the following documents is normatively referenced as indispensable clauses in this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 9002-2017 Vocabulary for Audio, Video, and Audiovisual Equipment and Systems

GB/T 9813.2-2016 General Specification for Computers - Part 2: Portable Microcomputers

GB/T 17975.1 Information Technology - General Coding of Moving Images and Associated Sound Information - Part 1: Systems

GB/T 17975.2 Information Technology - General Coding of Moving Images and Associated Sound Signals - Part 2: Video

GB/T 17975.3 Information Technology - General Coding of Moving Images and Associated Sound Signals - Part 3: Audio

GB/T 33475.3 Information Technology - Efficient Multimedia Coding - Part 3: Audio

SJ/T 11324-2006 Terminology of Digital Television Receiving Equipment

T/UWA 009.1 3D audio Technical Specification Part 1: Encoding Distribution and Presentation

3 Terms, definitions, and abbreviations

3.1 Terms and definitions

The terms and definitions defined in GB/T 9002-2017, SJ/T 11324-2006, and T/UWA 009.1, as well as the following, apply to this document.

3.1.1 Mobile digital device

Devices used for audio or video reception, decoding, rendering, transmission, amplification, and playback in handheld mobile application scenarios, including mobile phones, digital mobile phones, tablets, portable microcomputers, etc.

3.1.2 Audio Vivid

The audio encoding and decoding technical specifications and supporting derivative technologies specified in T/UWA 009.1 are synonymous.

3.2 Abbreviations

The following abbreviations apply to this document.

AV Audio and Video
 C Front Center
 dBFS Decibel Full Scale
 FFT Fast Fourier Transform
 HOA High Order Ambisonics Technology
 L Left channel
 LFE Low Frequency Effects Channel
 Lrs Left Rear Surround
 Lss Left Side Surround
 Ltb Left Top Back
 Ltf Left Top Front
 MPEG Moving Picture Experts Group
 PMT Program Map Table
 R Right channel
 Rrs Right Rear Surround
 Rss Right Side Surround
 Rtb Right Top Back
 Rtf Right Top Front
 THD Total Harmonic Distortion
 THD+N Total Harmonic Distortion add Noise

4 Technical requirement

4.1 Decoding function requirements

The Audio Vivid decoding function shall comply with the requirements of Table 1.

Table 1 Decoding Function Requirements of Audio Vivid

NO.	Item	Function requirements	
1	Audio Vivid Recognition	It shall have the function of decoding Audio Vivid streams, which can correctly decode Audio Vivid from multiple audio streams (Audio Vivid, MPEG-1 Layer II audio) multiplexed in a program. Devices with UI shall correctly identify Audio Vivid audio streams, and non Audio Vivid audio streams shall not be labeled as Audio Vivid.	
2	Audio bed decoding	Channel mapping	It shall be able to correctly map all channels of Audio Vivid, including stereo channel and 5.1.4 multi-channel. All normal channel signals shall be reproduced correctly.
3		Input sample rate	It shall be able to decode Audio Vivid with sample rate of 32 kHz, 44.1 kHz, and 48 kHz, and should be able to decode Audio Vivid with sample rate of 96 kHz.
4		Data rate	Shall be able to decode Audio Vivid at 64 kbps to 832 kbps data rates
5		Bit depth	Supports 16 bits, lossless audio decoding shall support 24 bit depth
6	Lossless audio decoding	Should support lossless audio decoding	
7	HOA decoding	It should be able to correctly reproduce the third-order HOA signal and accurately reproduce all directions.	

NO.	Item	Function requirements
8	Object audio decoding	It shall be able to support object audio reproduction, with accurate reproduction in all directions.
9	Output samplerate	Devices with digital audio output shall support 48 kHz samplerate output, should support 96 kHz.
10	Audio rendering	It shall be possible to mix Audio Vivid to the maximum audio playback capacity set of the device itself.

4.2 Electrical performance requirements

The electrical performance of the audio output of the mobile digital devices Audio Vivid decoding shall comply with the requirements of Table 2.

Table 2 Audio Output Performance Requirements of Audio Vivid Decoding

NO.	Item	Unit	performance requirement
1	Audio S/N	dB	≥ 60
2	Channel pairs gain difference	dB	≤ 0.5
3	Channel pairs crosstalk	dB	≤ -60
4	THD+N	%	≤ 0.5 (997Hz)
5	Noise floor	dBv	≤ -100

4.3 Acoustic performance

The acoustic performance of the tablet shall meet the requirements of Table 3-1. The acoustic performance requirements of other equipment are pending.

Table 3-1 Tablet Acoustic Performance Requirements

NO.	Item	Unit	performance requirement
1	Independent reproduction of audio channels	-	Supports independent reproduction of 2.0 channels and above
2	Acoustic frequency response	dB	≤ 20 (non-uniformity of peaks and valleys within the range of 500 Hz to 8000 Hz) Acoustic pressure level values without peak and valley width less than 1/6 oct
3	Maximum acoustic pressure level at rated input	dB (A)	≥ 70
4	THD	%	≤ 5 (500 Hz~8000 Hz)

4.4 Audio video synchronization

The time difference range of audio and video signals decoded by mobile digital devices shall comply with the requirements of Table 4.

Table 4 Time difference of audio and video signals

NO.	Receiving terminal type	Time difference range ms
1	Mobile digital devices	-125-45
Note: -125 ms indicates that the audio signal is 125 ms later than video signal after decoding ; 45 ms indicates that the audio signal is 45 ms earlier than video signal after decoding..		

4.5 Digital media interface output

If mobile digital devices support digital media interface output, they shall support outputting audio and metadata by the way of PCM or passthrough.

4.6 Metadata processing performance

The metadata processing performance of mobile digital devices shall comply with the requirements of Table 5.

Table 5 metadata processing performance

NO.	Item	requirement
1	Gain Control	It shall be able to correctly parse the gain metadata and control the gain, and the trend of the played audio level shall match the preset in the test audio stream, with a deviation of no more than ± 2 dB.
2	Dialogue Gain Control	It shall be able to correctly parse the dialogue gain metadata and control the dialogue gain correctly. The trend of the played audio level shall match the preset in the test audio stream, and the deviation shall not exceed ± 2 dB.

5 General measurement conditions

5.1 Environment condition

Measurements shall be made within the following temperature, humidity, and air pressure conditions:

- Environmental temperature: 15 °C~35 °C
- Relative humidity: 25%~75%
- Air pressure: 86 kPa~106 kPa

5.2 Power supply

The measurement shall be conducted under the rated power supply voltage condition, and the change of power supply voltage during measurement shall not exceed $\pm 2\%$.

When using AC power for power supply, the fluctuation of power frequency shall not exceed $\pm 2\%$, and the harmonic component shall not exceed 5%.

When using battery power, the battery level shall not be less than 50%.

5.3 Adjustment of rated operating state

5.3.1 Sound settings

When testing the electrical and acoustic performance of mobile digital devices, all sound effect settings shall be turned off.

5.3.2 Other settings

Except for the requirements of 5.3.1, all other settings shall be set to be the factory settings.

5.4 Warming-up

Before testing, the DUT shall be operated under rated measurement conditions for 15 minutes to ensure stable performance.

5.5 Measurement input interface

The measurement input interface adopts one type, with priority order as USB and IP.

5.6 Main measuring instruments

The main measuring instruments shall meet the requirements of the table.

Table 6 Main Measurement Instrument Requirements

NO.	Device name	Requirement
1	Audio analyzer	a) Equipped with 600 Ω input impedance option, 22 kHz or 30 kHz low-pass filter, 997 Hz 1/3 oct bandpass filter, A-weighted filter option; b) Equipped with functions of voltage meter, phase meter, and distortion meter; c) Equipped with FFT spectrum analysis function ^a ; d) Equipped with waveform monitoring function ^b ; e) Equipped with digital audio input function.
2	oscilloscope	Equipped with dual input function; Bandwidth not less than 1MHz; Time base range: 100 μ S/div~1s/div
3	spectrum analyzer	Frequency range: 40MHz~1GHz, average noise level: ≤ 150 dBc/Hz
4	Photoelectric converter	Support analog photoelectric conversion, conversion speed ≤ 0.1 ms
5	Acoustic electric converter	Supports analog acoustic electrical conversion, with conversion speed ≤ 0.1 ms
6	Audio video synchronization tester	Support audio and video synchronization testing, with a testing error of ≤ 1 ms
^a If FFT spectrum analysis function is not available, spectrum analyzer in the frequency range of 20 Hz to 20 kHz can be used.		

^b If it does not have waveform monitoring function, an oscilloscope can be used.

6 Test signal

6.1 Packaging

The audio and video test signals of mobile digital devices in this document are packaged in MP4 files or transport stream files in accordance with GB/T 17975.1-2010. The pure audio test signal is packaged in MP4 files.

6.2 Video elementary stream

The digital video elementary stream in this document shall comply with the video encoding technical specifications used, such as H.265, which shall comply with the elementary stream packaging requirements specified in ITU-T Rec. T.35 (02/2000).

6.3 Audio elementary stream

Testing audio elementary streams includes AV streams and independent audio streams. Test mobile digital devices using AV streams and audio streams.

The digital audio elementary stream in this document shall comply with the following regulations.

- a) Audio Vivid elementary stream shall comply with the provisions of GB/T 33475.3.
- b) The MPEG-1 layer II audio elementary stream complies with the provisions of GB/T 17975.3.

6.4 Requirements for audio elementary stream

6.4.1 Audio elementary stream characteristics of audio recognition testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 6.

Table 6 Audio elementary stream characteristics of audio recognition testing

Test signal	Characteristic
Audio_AVivid	1 Audio Vivid audio
Audio_MPEG	1 MPEG-1 layer II audio

6.4.2 Audio elementary stream characteristics of channel mapping testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 7.

Table 7 Audio elementary stream characteristics of channel mapping testing

Test signal	Characteristic		
	Audio encoding	Encoding mode	Channel
Channel_ID_Voice_714_AVivid	Audio Vivid	7.1.4	L, R, C, LFE, Lss, Rss, Lrs, Rrs, Ltf, Rtf, Ltb, Rtb
Channel_ID_Voice_514_AVivid	Audio Vivid	5.1.4	L, R, C, LFE, Lss, Rss, Ltf, Rtf, Ltb, Rtb
Channel_ID_Voice_51_AVivid	Audio Vivid	5.1	L, R, C, LFE, Lss, Rss
Channel_ID_Voice_20_AVivid	Audio Vivid	2.0	L, R

6.4.3 Audio elementary stream characteristics of input samplerate testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 8.

Table 8 Audio elementary stream characteristics of input sample rate testing

Test signal	Characteristic		
	Audio encoding	Encoding mode	Sample rate
Sample rate_ 514_ 32k_ AVivid	Audio Vivid	5.1.4	32 kHz
Sample rate_ 514_ 44.1k_ AVivid	Audio Vivid	5.1.4	44.1 kHz
Sample rate_ 514_ 48k_ AVivid	Audio Vivid	5.1.4	48 kHz
Sample rate_ 514_ 96k_ AVivid	Audio Vivid	5.1.4	96 kHz

6.4.4 Audio elementary stream characteristics of bit depth testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 9.

Table 9 Audio elementary stream characteristics of bit depth testing

Test signal	Characteristic		
	Audio encoding	Encoding mode	Bit depth
Bitdepth_ 16_ AVivid	Audio Vivid	5.1.4	16 bits
Bitdepth_ 24_ AVivid	Audio Vivid (lossless encoding)	5.1.4	24 bits

6.4.5 Audio elementary stream characteristics of bit rate support testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 10.

Table 10 Audio Elementary stream Characteristics of bit rate support testing

Test signal	Characteristic		
	Audio encoding	Encoding mode	Bitrate
Data_ Rate_ 20_ 32_ AVivid	Audio Vivid	2.0	32 kbps
Data_ Rate_ 20_ 320_ AVivid	Audio Vivid	2.0	320 kbps
Data_ Rate_ 51_ 96_ AVivid	Audio Vivid	5.1	96 kbps
Data_ Rate_ 51_ 720_ AVivid	Audio Vivid	5.1	720 kbps
Data_ Rate_ 514_ 176_ AVivid	Audio Vivid	5.1.4	176 kbps
Data_ Rate_ 514_ 704_ AVivid	Audio Vivid	5.1.4	704 kbps
Data_ Rate_ 714_ 240_ AVivid	Audio Vivid	7.1.4	240 kbps
Data_ Rate_ 714_ 832_ AVivid	Audio Vivid	7.1.4	832 kbps

6.4.6 Audio elementary stream characteristics of HOA testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 11.

Table 11 Audio Elementary stream Characteristics of HOA testing

Test signal	Characteristic		
	Audio encoding	Encoding mode	Order
HOA_3order_AVivid	Audio Vivid	HOA	three

6.4.7 Audio elementary stream characteristics of Object Audio Testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 12. The number of objects is 4, divided into three groups, and the characteristics of each object shall comply with the provisions of Table 13.

Table 12 Audio Elementary stream Characteristics of Object Audio Testing

Test signal		Characteristic	
		Audio encoding	Encoding mode
Object_4_ AVivid	Acoustic bed	Audio Vivid	5.1.4
	object	Audio Vivid	object

Table 13 Object Properties

NO.	Type	Content
1	0 (point sound source)	Human voice
2	0 (point sound source)	Human voice
3	1 (surface sound source)	Human voice
4	2 (Diffusion sound source)	Object sound

6.4.8 Audio elementary stream characteristics of Audio S/N testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 14.

Table 14 Audio elementary stream characteristics of Audio S/N testing

Test signal	Characteristic				
	Audio encoding	Encoding mode	Signal Description		
			Channel	Frequency	Amplitude
514_997_0dB_AVivid	Audio Vivid	5.1.4	All channels (LEF silent)	997 Hz	0 dBFS
514_Silent_AVivid	Audio Vivid	5.1.4	All channels	Digital Silent	

6.4.9 Audio elementary stream characteristics of Channel pairs gain difference

The audio elementary stream characteristics of this test shall comply with the provisions of Table 15.

Table 15 Audio Elementary stream Characteristics of Channel pairs gain difference

Test signal	Characteristic		
	Audio	Encoding	Signal Description

	encoding	mode	Channel	Frequency	Amplitude
514_997-20dB_AVivid	Audio Vivid	5.1.4	All channels (LEF mute)	997 Hz	-20 dBFS

6.4.10 Audio elementary stream characteristics of Crosstalk Testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 16.

Table 16 Audio Elementary stream Characteristics of Crosstalk Testing

Test signal	Characteristic				
	Audio encoding	Encoding mode	Signal Description		
			Channel	Frequency	Amplitude
514_997L_0dB_AVivid	Audio Vivid	5.1.4	Left channel	997 Hz	0 dBFS
			Right channel	Digital mute	
514_997R_0dB_AVivid	Audio Vivid	5.1.4	Left channel	Digital mute	
			Right channel	997 Hz	0 dBFS

6.4.11 Audio elementary stream characteristics of Acoustic performance testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 17.

Table 17 Audio Elementary stream Characteristics of Acoustic performance testing

Test signal	Characteristic				
	Audio encoding	Encoding mode	Signal Description		
			Channel	Frequency	Amplitude
2_Fstplr12oct_L-12dB_AVivid	Audio Vivid	two	Left side channel	20 Hz to 20 kHz (1/12 oct)	-12 dBFS
			Right side channel	Digital mute	
2_Fstplr12oct_R-12dB_AVivid	Audio Vivid	two	Right side channel	20 Hz to 20 kHz (1/12 oct)	-12 dBFS
			Left side channel	Digital mute	
2_Pink_L-12dB_AVivid	Audio Vivid	two	Left side channel	20 Hz~20 kHz pink noise	-12 dBFS
			Right side channel	Digital mute	
2_Pink_R-12dB_AVivid	Audio Vivid	two	Right side channel	20 Hz~20 kHz pink noise	-12 dBFS
			Left side channel	Digital mute	

6.4.12 Audio elementary stream characteristics of Gain control testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 18.

Table 18 Audio Elementary stream Characteristics of Gain control testing

Test signal	Characteristic					
	Audio encoding	Encoding mode	Signal Description			Gain (Static metadata)
			Channel	Frequency	Range	
Loudless_0_AVivid	Audio Vivid	two	All channels	997 Hz	-20 dBFS	0 dB
Loudless_10_AVivid	Audio Vivid	two	All channels	997 Hz	-20 dBFS	10 dB
Loudless_-10_AVivid	Audio Vivid	two	All channels	997 Hz	-20 dBFS	-10 dB

6.4.13 Audio elementary stream characteristics of dialogue gain control testing

The audio elementary stream characteristics of this test shall comply with the provisions of Table 19.

Table 19 Audio Elementary stream Characteristics of dialogue gain control testing

Test signal		Characteristic					
		Audio encoding	Encoding mode	Signal Description			
				Channel	Frequency	Range	Duration
Dialogue_AVivid	Acoustic bed	Audio Vivid	two	All channels	Digital mute		30 seconds
	Dialogue object	Audio Vivid	object	-	997 Hz	-20 dBFS	30 seconds

The metadata control of white gain control shall comply with the provisions of Table 20 over time.

Table 20 Meta data variation characteristics of dialogue gain control

Time	Gain (dynamic metadata)
0-10 s	0 dB
10-20 seconds	10 dB
20-30 s	-10 dB

7 Test method

7.1 Decoding function test

7.1.1 summary

Decoding function test verifies the Audio Video decoding function of the tested device. The decoding function test includes: Audio Vivid recognition test, Audio bed decoding test, HOA decoding test, object audio decoding test, and audio rendering test.

7.1.2 Test system Figure

The test connection diagram is shown in Figure 1.

Mobile digital devices are tested with their own speaker. If mobile digital devices do not have their own speaker, accompanying speaker can be used for testing. The accompanying speaker can independently restore no less than 2 channels.

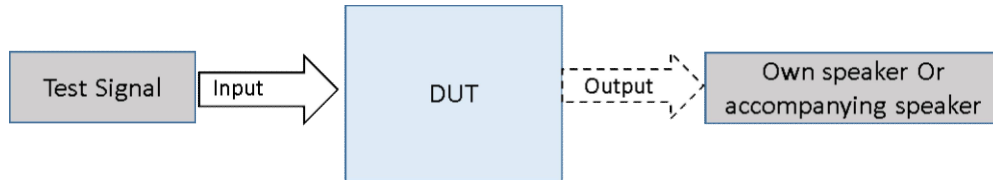


Figure 1 Decoding Function Test system

7.1.3 Audio Vivid Audio Recognition

7.1.3.1 Feature

This clause verifies whether the DUT has the Audio Vivid recognition function listed in Table 1. The functional requirements shall comply with the provisions of Table 21.

Table 21 Audio Vivid Audio Recognition Test Function Judgment Basis

test signal	Functional requirements
Multi_Audio_Audio Vivid	Shall be able to correctly decode Audio Vivid
	Shall be labeled as Audio Vivid audio
Multi_Audio_MPEG	Shall not be labeled as Audio Vivid

7.1.3.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 1;
- b) Play the test streams in Table 6 in sequence to verify whether the DUT meets the functional requirements of Table 21.

7.1.3.3 Report of result

The results are expressed in terms of conformity or non conformity.

7.1.4 Channel mapping test

7.1.4.1 Feature

This section verifies whether the DUT has the channel mapping function shown in Table 1.

The functional requirements shall comply with the provisions of Table 22.

Table 22 Judgment for channel mapping test

Test signal	Functional requirements
Channel_ID_Voice_714_AVivid	All channels are correctly mapped/reproduced, with no misalignment in orientation
Channel_ID_Voice_514_	All channels are correctly mapped/reproduced, with no misalignment in

Test signal	Functional requirements
AVivid	orientation
Channel_ID_Voice_51_AVivid	All channels are correctly mapped/reproduced, with no misalignment in orientation
Channel_ID_Voice_20_AVivid	All channels are correctly mapped/reproduced, with no misalignment in orientation
Example of incorrect mapping/reproduction: such as reversing left and right channel mapping, loss of one or several channels, etc.	

7.1.4.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 1;
- b) Play the test streams in Table 7 in sequence to verify whether the DUT meets the functional requirements of Table 22. During the testing process, after switching between different test signals, the DUT shall be able to automatically recognize and play.

7.1.4.3 Report of result

The results are expressed in terms of conformity or non conformity.

7.1.5 Input samplerate test

7.1.5.1 Feature

This clause verifies whether the DUT meets the samplerate requirements in Table 1.

The functional requirements shall comply with the provisions of Table 23.

Table 23 Sampling Frequency Test Judgment Basis

test signal	Functional requirements
Reference_Level_514_32k_AVivid	Decode and output 997 Hz single tone signal, without popping, clicking, or defects
Reference_Level_514_44.1k_AVivid	Decode and output 997 Hz single tone signal, without popping, clicking, or defects
Reference_Level_514_48k_AVivid	Decode and output 997 Hz single tone signal, without popping, clicking, or defects
Reference_Level_514_96k_AVivid	Decode and output 997 Hz single tone signal, without popping, clicking, or defects

7.1.5.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 1;
- b) Play the test stream files of the test signals in Table 8 in sequence to verify whether the DUT meets the functional requirements of Table 23. During the testing process, after switching between different test signals, the DUT shall be able to automatically recognize and play.

7.1.5.3 Report of result

The results are expressed in terms of conformity or non conformity.

7.1.6 Data rate support testing

7.1.6.1 Feature

This clause verifies whether the DUT meets the code data rate requirements in Table 1.

The functional requirements shall comply with the provisions of Table 24.

Table 24 Code Rate Support Test Judgment Basis

test signal	Functional requirements
Data_Rate_20__32_AVivid	Bit rate support, no popping, clicking, or flaws
Data_Rate_20__320_AVivid	Bit rate support, no popping, clicking, or flaws
Data_Rate_51__96_AVivid	Bit rate support, no popping, clicking, or flaws
Data_Rate_51__720_AVivid	Bit rate support, no popping, clicking, or flaws
Data_Rate_514__176_AVivid	Bit rate support, no popping, clicking, or flaws
Data_Rate_514__704_AVivid	Bit rate support, no popping, clicking, or flaws
Data_Rate_714__240_AVivid	Bit rate support, no popping, clicking, or flaws
Data_Rate_714__832_AVivid	Bit rate support, no popping, clicking, or flaws

7.1.6.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 1;
- b) Play the test stream files in Table 10 in sequence to verify whether the DUT meets the functional requirements of Table 24. During the testing process, after switching between different test signals, the DUT shall be able to automatically recognize and play.

7.1.6.3 Report of result

The results are expressed in terms of conformity or non conformity.

7.1.7 Bit depth

7.1.7.1 Feature

This clause verifies whether the DUT meets the bit depth requirements in Table 1.

The functional requirements shall comply with the provisions of Table 25.

Table 25 Sampling Frequency Test Judgment Basis

test signal	Functional requirements
Bitdepth_16_AVivid	Decode and output 997 Hz single tone signal, without popping, clicking, or defects
Bitdepth_24_AVivid	Decode and output 997 Hz single tone signal, without popping, clicking, or defects

7.1.7.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 1;

b) Play the test stream files of the test signals in Table 9 in sequence to verify whether the DUT meets the functional requirements of Table 25. During the testing process, after switching between different test signals, the DUT shall be able to automatically recognize and play.

7.1.7.3 Report of result

The results are expressed in terms of conformity or non conformity.

7.1.8 HOA decoding test

7.1.8.1 Feature

This clause verifies whether the DUT has HOA decoding capability.

7.1.8.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 1;
- b) Play the test stream file in Table 11 and verify that all normal sound channels of the DUT are reproducing without popping, clicking, or defects.

7.1.8.3 Report of result

The results are expressed in terms of conformity or non conformity.

7.1.9 Object audio decoding test

7.1.9.1 Feature

This clause verifies whether the DUT supports the object's audio decoding ability.

The functional requirements shall comply with the provisions of Table 26.

Table 26 Judgment basis for object audio decoding test

test signal		Functional requirements
Object_4 _AVivid	Audio bed	All channels are correctly mapped/reproduced, without popping, clicking, or defects
	Object 1	The object audio is correctly mapped/reproduced, without popping, clicking, or defects
	Object 2	The object audio is correctly mapped/reproduced, without popping, clicking, or defects
	Object 3	The object audio is correctly mapped/reproduced, without popping, clicking, or defects
	Object 4	The object audio is correctly mapped/reproduced, without popping, clicking, or defects

7.1.9.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 1;
- b) Play the test stream files in Table 12 in sequence to verify whether the DUT meets the functional requirements of Table 26.

7.1.9.3 Report of result

The results are expressed in terms of conformity or non conformity.

7.1.10 Audio rendering test

7.1.10.1 Feature

This section verifies whether the DUT supports down-mixing Audio Vivid to the maximum audio playback capacity set of the device itself.

The functional requirements shall comply with the provisions of Table 27.

Table 27 Code Rate Support Test Judgment Basis

test signal	Functional requirements
Channel_ID_Voice_714_AVivid	All channels are correctly mapped/reproduced, with no misalignment in orientation

7.1.10.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 1;
- b) Play channel_ID_Voice_714_AVivid, verify whether the DUT meets the functional requirements of Table 27.

7.1.10.3 Report of result

The results are expressed in terms of conformity or non conformity.

7.2 Electrical performance testing

7.2.1 summary

Electrical performance testing is used to verify the electrical performance of the audio video decoding audio output of the DUT. Electrical performance testing includes: audio S/N test, Channel pairs gain difference test, Channel pairs crosstalk test, THD+N test, and Noise floor test. If the DUT has a 3.5mm headphone interface, select it as the test interface. If the DUT does not have a 3.5mm headphone interface, select an existing digital media interface (such as USB-C) and test it by connecting the accompanying digital adapter to a 3.5mm headphone adapter.

If the actual output channel is less than 5.1.4 channels, only the performance of the actual channel will be measured. For example, when outputting a 3.5mm headphone, only the left and right channels are measured.

7.2.2 Test system figure

The electrical performance test connection diagram is shown in Figure 2.

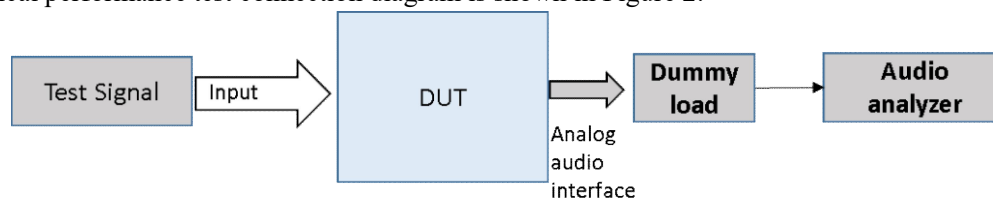


Figure 2 Electrical performance test system figure

The analog audio output shall be terminated with a rated impedance load, such as a 3.5mm interface output terminal with 32 ohms. If the rated impedance is not 32 ohms, the rated impedance shall be used.

7.2.3 Audio S/N

7.2.3.1 Feature

This section measures the ratio of signal level to noise at the audio output end of the DUT.

7.2.3.2 Procedure

The measurement method is carried out as follows:

- a) Connect the testing system according to Figure 2;
- b) 514 in Playlist 14_997_0dB_AVivid test signal file;
- c) Adjust the gain controller to maximize the volume output of the DUT;
- d) Use an audio analyzer to read the output level of the audio output terminal, denoted as U_S ;
- e) 514 in Playlist 14_Silence_AVivid test signal file;
- f) Measure the audio output level of the DUT, noted as U_N , and add an A-weighted filter during measurement;
- g) The audio signal-to-noise ratio is:

$$S/N = 20 \lg \frac{U_S}{U_N} \dots\dots\dots (1)$$

In the equation:

S/N - signal-to-noise ratio;

U_S . Signal voltage;

U_N . Noise voltage.

- h) Repeat steps a) to f) and measure the signal-to-noise ratio of each channel separately.

7.2.3.3 Report of result

The results are expressed in decibels (dB).

7.2.4 Channel pairs gain difference

7.2.4.1 Feature

This section measures the inequality of signal amplitude between the left and right channels of the audio output end of the DUT.

7.2.4.2 Procedure

The measurement method is carried out as follows:

- a) Connect the testing system according to Figure 2;
- b) 514 in Playlist 15_997-20dB_AVivid test signal;
- c) Adjust the gain controller to maximize the volume output of the DUT;
- d) Use an audio analyzer to measure the channel gain difference of the audio output terminals of each left and right channel pair of the DUT;

7.2.4.3 Report of result

The results are expressed in decibels (dB).

7.2.5 Channel pairs crosstalk

7.2.5.1 Feature

This section measures the ratio of the signal amplitude of one channel at the audio output end of the DUT to the signal amplitude of the signal string to another channel.

7.2.5.2 Procedure

The measurement method is carried out as follows:

- a) Connect the testing system according to Figure 2;
- b) Adjust the gain controller to maximize the volume output of the DUT;
- c) Play 514_997L-0dB_AVivid test signal file;
- d) Measure the left to right channel crosstalk of each channel pair of the DUT using an audio analyzer, and add a 997 Hz 1/3 oct bandpass filter during the test;
- e) Play 514_997R-0dB_AVivid test signal file;
- f) Measure the right channel to left channel crosstalk of each channel pair of the DUT using an audio analyzer, and add a 997 Hz 1/3 oct bandpass filter during the test;

7.2.5.3 Report of result

The results are expressed in decibels (dB).

7.2.6 THD+N

7.2.6.1 Feature

This article verifies whether the DUT generates clipping distortion when decoding 0 dBFS signals.

7.2.6.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 2;
- b) Play 514_997_0dB_AVivid file;
- c) Adjust the gain of the volume controller to the maximum gain, and detect the total harmonic distortion and noise (THD+N) of the left and right channel output signals of the DUT through an audio analyzer or oscilloscope

7.2.6.3 Report of result

The results are expressed as percentages.

7.2.7 Noise floor

7.2.7.1 Feature

This measure measures the Noise floor of the signal at the audio output end of the DUT.

7.2.7.2 Procedure

The test is carried out as follows:

- a) Connect the testing system according to Figure 2;
- b) Adjust the gain controller to maximize the volume output of the DUT;
- c) 514 in Playlist 14_Silence_AVivid test signal file;
- d) Measure the audio output level of the DUT, denoted as UN, and add an A-weighted filter during measurement;

7.2.7.3 Result representation

The results are expressed in decibels volts (dBv).

7.3 Acoustic performance testing

7.3.1 summary

Test the sound performance of the DUT with speaker output for decoding audio via playback.

7.3.2 Test set

The test shall be conducted under free sound field conditions.

Similar handheld devices such as mobile phones and tablets, can be tested using hovering clamps. The DUT is recommended to be in a horizontal screen state or the manufacturer's recommended state. The status recommended by the manufacturer shall be recorded in the report. The schematic diagram of the test layout is shown in Figure 3.

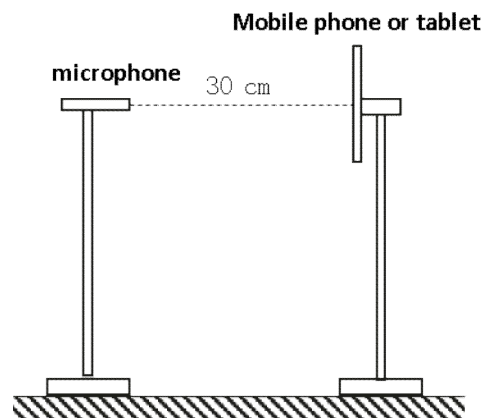


Figure 3 Schematic diagram of handheld device testing set

Laptops and similar desktop devices shall be placed on a rigid surface for testing. The schematic diagram of the test layout is shown in Figure 4. The measuring microphone shall be located in the central plane of the DUT facing the screen.

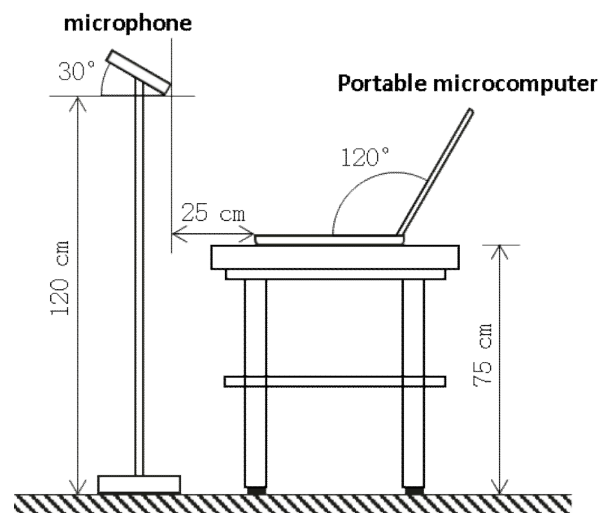


Figure 4 Schematic diagram of desktop equipment testing set

7.3.3 Test system figure

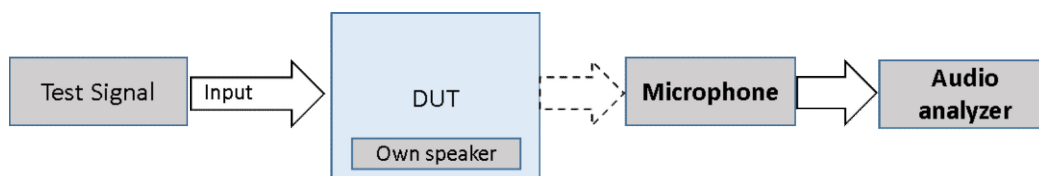


Figure 5 Acoustic Performance Test system figure

7.3.4 Independent reproduction of audio channels

7.3.4.1 Feature

Verify the number of channels that the DUT can independently restore through its own sound generating unit.

7.3.4.2 Procedure

The test is carried out as follows:

- Connect the testing system according to Figure 1;
- Play the test streams in Table 7 in sequence to verify whether the DUT can independently restore each channel through its own sound unit.

7.3.4.3 Result representation

Record the maximum number of channels that can be independently restored.

7.3.5 Acoustic frequency response characteristic test

7.3.5.1 Feature

Measure the acoustic frequency response performance of the DUT within the range of 500 Hz to 8000 Hz.

7.3.5.2 Procedure

The measurement method is carried out as follows:

- Connect the testing system according to Figure 5
- Play 2_Pink_L-12dB_AVivid file;
- In free sound field, place the measuring microphone 30 cm on the reference axis of the DUT;
- Adjust the volume of the DUT until the Acoustic pressure $L=65 \text{ dB (A)} \pm 2 \text{ dB}$;
- If it is not possible to adjust to 65 dB (A), adjust the volume to maximum;
- Play 2_Fstplr12oct_L-12dB_AVivid, measuring the variation curve of Acoustic pressure level with frequency;
- Measure the difference (dB) between the maximum and minimum Acoustic pressure levels in the frequency response curve within the frequency range of 500 Hz to 8000 Hz, excluding Acoustic pressure levels with peak and valley widths less than 1/6 oct;
- Repeat steps b) to g) to change the playback file to 2_Pink_R-12dB_AVivid and 2_Fstplr12oct_R-12dB_AVivid, measure the frequency response characteristics of the right channelsound.

7.3.5.3 Report of result

The results are expressed in decibels (dB).

7.3.6 Maximum Acoustic pressure level test at rated input

7.3.6.1 Feature

Measure the maximum Acoustic pressure level of the DUT at rated input.

7.3.6.2 Procedure

The measurement method is carried out as follows:

- a) Connect the testing system according to Figure 5
- b) Play 2_Pink_L-12dB_AVivid file;
- c) In free sound field, place the measuring microphone 30 cm on the reference axis of the DUT;
- d) Adjust the volume of the DUT to the maximum, and measure the Acoustic pressure L as the maximum Acoustic pressure level of the left channel under rated input;
- e) Repeat steps b) to e) to measure the maximum Acoustic pressure level of the right channel, and change the playback file to 2_Pink_R-12dB_AVivid.

7.3.6.3 Report of result

The results are expressed in decibels (dB).

7.3.7 THD

7.3.7.1 Feature

Measure the total harmonic distortion (THD) of Acoustic pressure at rated input of the DUT within the range of 500 Hz to 8000 Hz.

7.3.7.2 Procedure

The measurement method is carried out as follows:

- a) Connect the testing system according to Figure 5
- b) Play 2_Pink_L-12dB_AVivid file;
- c) In free sound field, Place the measuring microphone 30 cm on the reference axis of the DUT;
- d) Adjust the volume of the DUT until the Acoustic pressure $L=65 \text{ dB (A)} \pm 2 \text{ dB}$;
- e) If it is not possible to adjust to 65 dB (A), adjust the volume to maximum;
- f) Play 2_Fstplr12oct_L-12dB_AVivid, measuring the variation curve of THD with frequency;
- g) Measure the maximum THD within the range of 500 Hz to 8000 Hz as the left channel result;
- h) Repeat steps b) to g) to change the playback file to 2_Pink_R-12dB_AVivid and 2_Fstplr12oct_R-12dB_AVivid, measure the THD of the right channel.

7.3.7.3 Report of result

The results are expressed as percentages.

7.4 Audio video synchronization

7.4.1 Feature

Check the audio and video synchronization time difference of the DUT, in milliseconds (ms).

7.4.2 Test system Figure

The connection diagram for audio and video synchronization testing is shown in Figure 6.

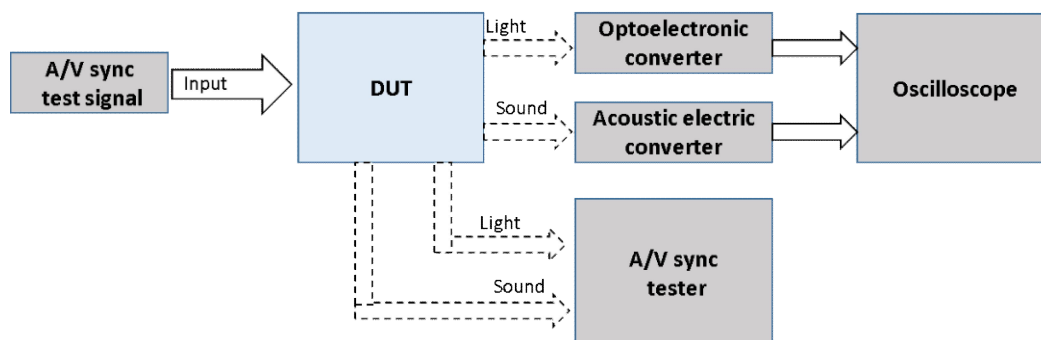


Figure 6 Audio Video Synchronization Test system Figure

7.4.3 Procedure

The audio and video synchronization testing method is as follows:

- a) Connect the testing system according to Figure 6;
- b) Play test files;
- c) Connect an oscilloscope with an optoelectronic converter and an acoustic electric converter, read the time difference of the decoded audio and video signal from the oscilloscope, and record it; Or use an audio and video synchronization tester to directly read the time difference of the audio and video signal and record it;

7.4.4 Report of result

The test results are expressed in milliseconds (ms).

7.5 Digital media interface output

As specified by the manufacturer.

7.6 Meta Data Support

7.6.1 Gain control test

7.6.1.1 Feature

Test whether the DUT can correctly parse and apply metadata related to gain control.

7.6.1.2 Procedure

The measurement method is carried out as follows:

- a) Connect the testing system according to Figure 2;
- b) Play the gain control test audio files in Table 18 in sequence;
- c) The trend of audio level changes played shall matches the preset in the test audio stream;
- d) Use an audio analyzer to test audio level changes and calculate the difference between the measured level of the corresponding signal and the preset level change value.

7.6.1.3 Report of result

The results are expressed in decibels (dB).

7.6.2 Dialogue gain control test

7.6.2.1 Feature

Test whether the DUT can correctly parse and apply metadata related to white gain control.

7.6.2.2 Procedure

The measurement method is carried out as follows:

- a) Connect the testing system according to Figure 2;
- b) Play the dialogue gain control test audio files in Table 19 in sequence;
- c) The trend of audio level changes played matches the preset in the test audio stream;
- d) Use an audio analyzer to test audio level changes, and measure the difference between the corresponding signal level and the preset level change value.

7.6.2.3 Report of result

The results are expressed in decibels (dB).
