UHD World Association
世界超高清视频产业联盟

Coding of UHD video and audio broadcasting system for “Bai Cheng Qian Ping”：video

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Contents

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1 Scope

This document specifies the requirements for 4K/8K UHD video coding used in the UHD video and audio broadcasting system for "Bai Cheng Qian Ping".
This document is applicable to the video encoding and compression for broadcast by UHD video and audio broadcasting system for "Bai Cheng Qian Ping".

2 Normative References

The contents in the following documents, through normative references in the text, constitute indispensable provisions of this document. Among them, the dated reference documents are only applicable to the version corresponding to that date; For undated references, the latest version (including all amendments) is applicable to this document.
ITU-R BT.2020-2 Parameter values for ultra-high definition television systems for production and international programme exchange, MOD
ITU-R BT.2100-1 Image parameter values for high dynamic range television for use in production and international programme exchange, MOD
GB/T 33475.2-2016 Information technology—High efficiency media coding Part 2: Video
GY/T 323-2019 Technical requirements and measurement methods of AVS2 4K UHDTV
GY/T 340-2020 Subjective evaluation method for image quality of ultra high-definition television—Dual stimulus continuous quality scale method
T/UWA005.1-2022 High Dynamic Range (HDR) Video Technology Part 1 Metadata and Adaptation
T/AI 109.2-2021 Information technology—Intelligent media coding - Part 2: Video

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 Ultra high definition video

UHD video include 4K UHD video and 8K UHD video.

3.2 4K ultra high definition video

The signal format conforms to HDR UHD video specified in GY/T 307-2017 or GY/T 315-2018, and the image resolution is 3840 × 2160.

3.3 8K ultra high definition video

The signal format conforms to HDR UHD video specified in GY/T 307-2017 or GY/T 315-2018, and the image resolution is 7680 × 4320.

3.4 Bai Cheng Qian Ping

'Bai Cheng Qian Ping' means 'a hundred cities and a thousand large screens', which is a public promotion project, refers to the 8K UHD HDR image and 3D audio played on over a thousand large screens at commercial streets in more than hundred major cities.

4 Abbreviations

The following abbreviations are applicable to this document.

AVS2 Information technology—High efficiency media coding Part 2: Video

AVS3 Information technology—Intelligent media coding Part 2: Video

HDR High Dynamic Range

CBR Constant Bitrate

GOP Group of Pictures

5 Technical requirements

5.1 AVS2 encoding requirements for 4K UHD video

The syntax and semantics of 4K UHD video AVS2 encoding shall meet the requirements of GB/T 33475.2-2016.

5.1.1 Requirements for AVS2 coding mode class and level

The class and level of AVS2 coding mode shall meet the requirements of Table 1.

Table 1 **Requirements for AVS2 coding mode class and level**

Class	Level	Maximum bit rate Mbps	Mandatory/Optional
Main Profile 10 bit class (The value of profile_id is 0x22)	8.0.60	40	Mandatory
	8.2.60	160	Optional
	8.0.120	60	Optional
	8.2.120	240	Optional

5.1.2 Format requirements of AVS2 4K UHD encoded video

The format of AVS2 4K UHD encoded video shall meet the requirements of Table 2.

Table 2 **Format requirements for 4K UHD bitstream video after AVS2 encoding**

No.	Parameter	Parameter value	Mandatory/Optional
1	Pixel count Horizontal × vertical	3840×2160	Mandatory
2	Picture aspect ratio	16:9	Mandatory
3	Frame frequency	50Hz	Mandatory
		100Hz	Optional
4	Scan mode	Progressive	Mandatory
5	Sampling	4:2:0	Mandatory
6	Quantization levels	10bit	Mandatory
		12bit	Optional
7	Color gamut	Comply with ITU-R BT.2020-2	Mandatory
8	Nonlinear transformation curve	Comply with ITU-R BT.2100-1	Mandatory
9	GOP length	8-96 adjustable (step size is 8 frames), typical length is 24 frames	Mandatory
10	Bitrate control mode	Support CBR bitrate mode	Mandatory
11	Bitrate range	25Mbps-40Mbps continuously adjustable	Mandatory

5.1.3 Bitrate fluctuation and image quality requirements

AVS2 transport stream bitrate fluctuation and encoded image quality shall comply with GY/T 323-2019.

5.1.4 HDR metadata requirements

The syntax, semantics and metadata encapsulation of AVS2 encoded HDR metadata shall comply with T/UWA005.1-2022.

5.2 AVS3 encoding requirements for 8K UHD video

The syntax and semantics of AVS3 encoding of 8K UHD video shall meet the requirements of T/AI 109.2-2021.

5.2.1 Requirements for AVS3 coding mode class and level

The class and level of AVS3 coding mode shall meet the requirements of Table 3.

Table 3 **Requirements for AVS3 coding mode class and level**

Class	Level	Maximum bit rate Mbps	Mandatory/Optional
Benchmark 10 bit class (The value of profile_id is 0x22)	10.0.60	120	Mandatory
	10.2.60	480	Optional
	10.0.120	240	Optional
	10.2.120	800	Optional

5.2.2 Format requirements of AVS3 8K UHD encoded video

The video format of 8K UHD encoded video shall meet the requirements of Table 4.

Table 4 **Format requirements for 8K UHD bitstream video after AVS3 encoding**

No.	Parameter	Parameter value	Mandatory/Optional
1	Pixel count Horizontal × vertical	7680×4320	Mandatory
2	Picture aspect ratio	16:9	Mandatory
3	Frame frequency	50Hz	Mandatory
		100Hz	Optional
4	Scan mode	Progressive	Mandatory
5	Sampling	4:2:0	Mandatory
6	Quantization levels	10bit	Mandatory
		12bit	Optional
7	Color gamut	Comply with ITU-R BT.2020-2	Mandatory
8	Nonlinear transformation curve	Comply with ITU-R BT.2100-1	Mandatory
9	GOP length	8-96 adjustable (step size is 8 frames), typical length is 24 frames	Mandatory
10	Bitrate control mode	Support CBR bitrate mode	Mandatory
11	Bitrate range	80Mbps-120Mbps continuously adjustable	Mandatory

5.2.3 Video and audio bitrate fluctuation

In the transport stream with CBR mode, the maximum bitrate value of the video and audio coding rate shall not be greater than 101% of the target value, and the minimum bitrate value of the effective video and audio coding rate shall not be less than 97% of the target value.

5.2.4 **Coding image quality requirements**

The bitrate is set to 100Mbps, adopt the double stimulus continuous quality scale method which is specified in GY/T 340-2020 to subjective assessment. In 8 different characteristics 8K UHD test image sequences which should includes 4 high motion image sequences, There are at least 6 compressed sequences with a quality loss of no more than 12% compared to the raw image, the image quality loss of other compressed sequences should not be greater than 20%. compared to the raw image.

5.2.5 **HDR metadata requirements**

The syntax, semantics and metadata encapsulation of AVS3 encoded HDR metadata shall comply with T/UWA 005.1-2022.

References

[1] GY/T 307-2017 Parameter values for ultra high definition television system for production and programme exchange

[2]GY/T 315-2018 Image parameter values for high dynamic range television for use in production and programme exchange

[3] Technical requirements for production and broadcasting of 8K ultra high definition television programme of China Media Group (Provisional) (RTZ [2021] 1)