UWA
UHD World Association
世界超高清视频产业联盟

Measuring method of UHD encoder for

"Bai Cheng Qian Ping"

（Version NO. 1.0）

Contents

Measuring method of UHD encoder for "Bai Cheng Qian Ping"

1 Scope

This document specifies the measuring method of UHD encoder for "Bai Cheng Qian Ping".

This document is applicable to the development, production, application, measuring, operation and maintenance of real-time 4K/8K UHD video encoder used in the UHD video and audio transmission 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.

GY/T 307-2017 Ultra High Definition Television System Program Production and Exchange Image Parameter Values

GY/T 315-2018 High dynamic range TV program production and image exchange parameter values

GY/T 340-2020 Subjective evaluation method for image quality of ultra-high definition television Dual stimulus continuous quality scale method

T/UWA 012.3-2022 Coding of UHD video and audio broadcasting system for "Bai Cheng Qian Ping": video

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 Ultra high definition video

UHD video includes 4K UHD video and 8K UHD video.

3.2 4K ultra high definition video

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

3.4 AVS2

The second generation video coding standard formulated by China AVS Working Group is a coding method that meets the requirements of GY/T 299.1-2016 standard.

3.5 AVS3

The third generation video coding standard formulated by China AVS Working Group.

4 Abbreviations

The following abbreviations are applicable to this document.

CBR Constant Bitrate

GOP Group of Pictures

HDR High Dynamic Range

5 Measurements method

5.1 Environment conditions

Ambient temperature: 15 ℃~35 ℃.

Relative humidity: 20%~80%.

Air pressure: 86kPa~106kPa.

AC voltage: 209V~231V.

AC frequency: 49Hz~51Hz.

5.2 Instrument

5.2.1 Video and audio signal source

The video and audio signal source shall be able to send HDR UHD video signals conforming to GY/T 307-2017 or GY/T 315-2018 through SDI or IP.

5.2.2 Stream analyzer

The stream analyzer shall be able to analyze and record the ASI or IP stream, and the recorded files shall be able to be extracted to the external memory.

The analysis function shall at least have the analysis of the code rate of the code stream.

5.2.3 Basic flow analyzer

The basic stream analyzer shall be able to analyze AVS2 and AVS3 encoded code streams, and shall at least be able to analyze image resolution, amplitude ratio, frame rate, scanning mode, chroma format, sampling accuracy, and read metadata carried by the code stream.

5.3 Measuring method of 4K UHD AVS2 encoder

5.3.1 Testing Method for Syntax and Semantics of 4K Ultra HD AVS2 Coding

5.3.1.1 Measuring block diagram

The measuring block diagram refers to Figure 1.

Figure 1 Measuring Block Diagram of 4K Ultra HD AVS2 Encoder

5.3.1.2 Measuring procedure

The measuring steps are as follows:

a. The video and audio signal source outputs 4K UHD test image sequence;

b. Record the output code stream of the encoder to be measured with the code stream analyzer;

c. Analyze the syntax and semantics of the recorded code stream with the basic stream analyzer.

5.3.2 Measuring Methods for 4K Ultra HD AVS2 Coding Mode Classes and Levels

5.3.2.1 Measuring block diagram

The measuring block diagram refers to Figure 1.

5.3.2.2 Measuring procedure

The measuring steps are as follows:

a. The video and audio signal source outputs 4K UHD test image sequence;

b. Record the output code stream of the encoder to be measured with the code stream analyzer;

c. Analyze the class and level of the recorded code stream with the basic stream analyzer.

5.3.3 Measuring Method of 4K Ultra HD Stream Video Format after AVS2 Encoding

5.3.3.1 measuring block diagram
The measuring block diagram refers to Figure 1.

5.3.3.2 Measuring procedure

The measuring steps are as follows:
a.   The video and audio signal source outputs 4K UHD test image sequence;
b.   Record the output code stream of the encoder to be measured with the code stream analyzer;
c.   Analyze the resolution, amplitude ratio, frame rate, scanning mode, chroma format, sampling accuracy of the recorded code stream with the basic stream analyzer, and analyze the color gamut and nonlinear conversion curve by reading metadata;
d.   Adjust the GOP length setting of the tested encoder, and verify whether it supports 24 frames, and whether it supports 8-96 frame adjustable (step size is 8 frames);
e.   Adjust the bit rate setting of the encoder to be tested, take 5Mbps as a step, and sample at least 3 bit rate points within the range of 25Mbps~40Mbps.

5.3.4 Measuring Method for Rate Fluctuation of 4K Ultra HD AVS2 Coding

5.3.4.1 Measuring block diagram
The measuring block diagram refers to Figure 1.

5.3.4.2 Measuring procedure
The measuring steps are as follows:
a.   The video and audio signal source outputs 4K UHD test image sequence;
b.   Use the code stream analyzer to measure the video and audio code rate for 5min, and check the code rate output by the measured encoder.

5.3.5 Subjectively evaluate method of 4K UHD AVS2 Coding Image Quality
Subjectively evaluate the quality of codec image under the coding parameters specified in 5.1.3 of T/UWA 012.3-2022.
The subjective evaluation method shall adopt the double stimulus continuous quality scale specified in GY/T 340-2021. The viewing environment, evaluators and data statistics of the subjective evaluation shall meet the requirements of GY/T 340-2021.

5.3.6 HDR metadata measuring method

5.3.6.1 Measuring block diagram
The measuring block diagram refers to Figure 2.

Figure 2 **HDR Metadata Measuring block Diagram of 4K Ultra HD AVS2 Encoder**

Signal source	SDI/IP →	Measured encoder	ASI#IP →	Stream analyzer	TS file →	HDR metadata analysis software
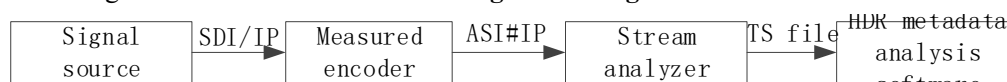
5.3.6.2 Measuring procedure
The measuring steps are as follows:
a.   The video and audio signal source outputs 4K UHD test image sequence;
b.   Set the tested encoder to work in HDR mode;
c.   Record the output code stream of the encoder to be measured with the code stream analyzer;

d.   Use HDR metadata analysis software to analyze the HDR metadata encapsulation of the recorded stream.

5.4   Measuring method of 8K UHD AVS3 encoder

5.4.1   Measuring Method of 8K Ultra HD AVS3 Encoding Syntax and Semantics

5.4.1.1   Measuring block diagram

The measuring block diagram refers to Figure 2.

Figure 3 **8K Ultra HD AVS3 Coding Measuring block Diagram**

Signal source → SDI/IP → Measured encoder → ASI/IP → Stream analyzer → TS file → Base stream analyzer
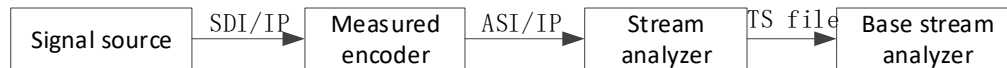
5.4.1.2   Measuring procedure

The measuring steps are as follows:

a.   The video and audio signal source outputs 8K UHD test image sequence;

b.   Record the output code stream of the encoder to be measured with the code stream analyzer;

c.   Analyze the syntax and semantics of the recorded code stream with the basic stream analyzer.

5.4.2   Measuring methods for 8K Ultra HD AVS3 Coding Mode Classes and Levels

5.4.2.1   Measuring block diagram

The measuring block diagram refers to Figure 3.

5.4.2.2   measuring procedure

The measuring steps are as follows:

a.   The video and audio signal source outputs 8K UHD test image sequence;

b.   Record the output code stream of the encoder to be measured with the code stream analyzer;

c.   Analyze the class and level of the recorded code stream with the basic stream analyzer.

5.4.3   Measuring method of 8K Ultra HD Stream Video Format after AVS3 Encoding

5.4.3.1   Measuring block diagram

The measuring block diagram refers to Figure 3.

5.4.3.2   Measuring procedure

The measuring steps are as follows:

a.   The video and audio signal source outputs 8K UHD test image sequence;

b.   Record the output code stream of the encoder to be measured with the code stream analyzer;

c.   Analyze the resolution, amplitude ratio, frame rate, scanning mode, chroma format, sampling accuracy of the recorded code stream with the basic stream analyzer, and analyze the color gamut and nonlinear conversion curve by reading metadata;

d.   Adjust the GOP length setting of the tested encoder, and verify whether it supports 24 frames, and whether it supports 8-96 frame adjustable (step size is 8 frames);

e.   Adjust the bit rate setting of the encoder to be tested, take 5Mbps as a step, and sample at least 3 bit rate points within the range of 80Mbps~120Mbps.

5.4.4   Measuring method for Rate Fluctuation of 8K Ultra HD AVS3 Coding

5.4.4.1   Measuring block diagram

The measuring block diagram refers to Figure 3.

5.4.4.2 Measuring procedure

The measuring steps are as follows:

a. The video and audio signal source outputs 8K UHD test image sequence;
b. Use the code stream analyzer to measure the video and audio code rate for 5min, and check the code rate output by the measured encoder.

5.4.5 8K Ultra HD AVS3 Encoding Image Quality Measuring method

Subjectively evaluate the quality of codec image under the coding parameters specified in 5.2.4 of T/UWA 012.3-2022.

The subjective evaluation method shall adopt the double stimulus continuous quality scale specified in GY/T 340-2021. The viewing environment, evaluators and data statistics of the subjective evaluation shall meet the requirements of GY/T 340-2021.

5.4.6 HDR metadata measuring method

5.4.6.1 Measuring block diagram

The measuring block diagram refers to Figure 4.

Figure 4 HDR Metadata Measuring block Diagram of 8K Ultra HD AVS3 Encoder

| Signal source | SDI/IP → | Measured encoder | ASI#IP → | Stream analyzer | TS file → | HDR metadata analysis software |

5.4.6.2 Measuring procedure

The measuring steps are as follows:

a. The video and audio signal source outputs 8K UHD test image sequence;
b. Set the tested encoder to work in HDR mode;
c. Record the output code stream of the encoder to be measured with the code stream analyzer;
d. Use HDR metadata analysis software to analyze the HDR metadata encapsulation of the recorded stream.

References

[1] GB/T 33475.2-2016 Information Technology High Efficiency Audio and Video Coding Part 2: Video

[2] GY/T 323-2019 AVS2 4K Ultra HD Encoder Technical Requirements and Measurement Methods

[3] T/UWA 005.1-2022 High Dynamic Range (HDR) Video Technology Part 1 Metadata and Adaptation

[4] T/AI 109.2-2021 Information technology - Intelligent media coding - Part 2: Video

[5] ITU-R BT.2100-1 Image parameter values for high dynamic range television for use in production and international program exchange, MOD