

ICS 35.040
CCS L 71



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 33475.4-2024

**Information technology - High efficiency multimedia coding -
Part 4: Conformance testing**

信息技术 高效多媒体编码 第4部分:符合性测试

Issued on: May 28, 2024

Implemented on: December 1, 2024

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

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1 Scope

The document lays down the requirements and the methods for carrying out conformance testing on the video bitstreams of GB/T 33475.2-2024 and on the audio bitstreams of GB/T 33475.3-2018.

It applies to the conformance testing of bitstreams and of decoders that are to satisfy the requirements defined in GB/T 33475.2-2024 or in GB/T 33475.3-2018.

The two normative references cited are GB/T 33475.2-2024, Information technology - High efficiency multimedia coding - Part 2: Video, and GB/T 33475.3-2018, Part 3: Audio.

3 Terms and definitions

The terms and definitions of GB/T 33475.2-2024 and GB/T 33475.3-2018 apply, together with six terms defined here.

3.1 video conformance testing: testing used to judge whether the coded bitstream output by a video encoder, a video decoder or another product conforms to GB/T 33475.2-2024.

3.2 video test bitstream: a coded bitstream used to test whether a video decoder conforms

to GB/T 33475.2-2024, that is, a video conformance coded bitstream. A note adds that such a coded bitstream has to conform to GB/T 33475.2-2024 in full.

3.3 video decoder under test: the decoder whose conformance to GB/T 33475.2-2024 is to be judged by video conformance testing.

3.4 reference video decoder: a video decoder already known to conform to GB/T 33475.2-2024, used for comparison with the decoder under test.

3.5 coincident video decoder: a video decoder that has passed video conformance testing and has been judged to conform to GB/T 33475.2-2024.

3.6 video bitstream verifier: software or a tool used to check whether a video bitstream meets the requirements laid down in GB/T 33475.2-2024. A note adds that a verifier is a decoder designed to the newer coding standard which is able to decode all or part of the coded bitstreams of the older one.

4 Abbreviated terms

The abbreviations used in the document are AEC, advanced entropy code; ALF, adaptive levelling filter; BBV, bitstream buffer verifier; CBR, constant bit rate; CB, coding block; CU, coding unit; CUT, coding unit tree; DOI, decoded order index; DPB, decoded picture buffer; GOP, group of pictures.

They continue with LCB, largest coding block; LCU, largest coding unit; LSB, least significant bit; MSB, most significant bit; PB, prediction block; PMVR, progressive motion vector; POI, picture order index; PU, prediction unit; ROI, region of interest; SAO, sample adaptive offset; TB, transform block.

5 Conformance testing of video coded bitstreams and decoders

5.1 General. Throughout the clause, unless stated otherwise, video coded bitstream and video bitstream mean a bitstream generated according to GB/T 33475.2-2024, and video decoder means a GB/T 33475.2-2024 video decoder with display processing excluded. What a decoder is able to decode is set by its own capability, and conformance testing checks whether it decodes a conforming bitstream correctly.

Two kinds of decoder test are defined. A static test compares, bit by bit, the picture files decoded from the video test bitstream; a dynamic test decodes the test bitstream in real time and displays the pictures. Because the inverse transform of GB/T 33475.2-2024 is an integer transform, the decoder under test and the reference decoder have to produce identical reconstructed samples from the same coded picture of the same bitstream; where the samples differ, the decoder under test is not a coincident decoder.

A dynamic test verifies that the decoder buffer neither overflows nor underflows at a suitable bit delivery rate, by checking that all reconstructed samples are output for display

and that the displayed output is judged sound on subjective assessment. The document does not fix the actual output of display processing.

5.2 Definitions of conformance. Bitstream conformance means conformance of the coded bitstream to GB/T 33475.2-2024, including the profile and level limits of its Annex B. Decoder conformance means that the decoder under test processes the coded bitstream as GB/T 33475.2-2024 prescribes and meets its profile and level requirements. GB/T 33475.2-2024 carries a baseline profile with profile_id 0x20 and a baseline 10-bit profile with profile_id 0x22, and testing is carried out under those two profiles at the levels listed in the document, in 4:2:0 format. Conformance testing of the video encoder is expressed through the conformance testing of the bitstream it outputs. A conforming decoder may leave reserved syntax element values unprocessed, and has to ignore reserved bits.

5.3 Conformance testing of video coded bitstreams. Since the parameter values are coded directly or indirectly into the bitstream, the whole bitstream syntax has to be analysed, every parameter extracted and every value checked against GB/T 33475.2-2024. This calls for a video bitstream verifier, for which the reference software of GB/T 33475.2-2024 may serve. A conforming bitstream has to pass the verifier without provoking any error or non-conformance message; a bitstream that passes may be taken to conform to the profile it declares.

5.4 Conformance testing of video decoders. Sub-clause 5.4.1 catalogues the video test bitstreams, each described by the coding conditions it has to traverse, by the object under test and by the purpose of the test. The families are: block structure (BlockStr_1.1 to 1.2), transform technique (Transform_2.1 to 2.5), intra prediction (Intra_3.1 to 3.5), inter prediction (Inter_4.1 to 4.5), derivation of motion information (Motion_5.1 to 5.8), inter-picture interpolation (Interpolation_6.1 to 6.2), quantization technique (Quant_7.1 to 7.6), reference frame management (Ref_8.1 to 8.5), filtering technique (Filter_9.1 to 9.6), field coding (Field_10.1 to 10.2), entropy coding (Entropy_11.1 to 11.13), high level syntax and functional testing (HLS12.1 to 12.10), the bitstream buffer verifier (BBV13.1 to 13.3) and limit testing (Ultra14.1 to 14.6).

The entropy coding bitstreams are the ones that traverse the context models and the binarizations: Tables 2 to 9 pair each syntax element with the combinations of context or of binarized value that the bitstream has to cover, element by element, for split_flag, cu_type_index, transform_split_flag, ctp_uv, ctp_y, cu_qp_delta, the sample adaptive offset elements, the coefficient coding elements and the motion vector difference elements.

5.4.2 Procedure. In the static test the reconstructed samples are checked for correctness and precision at the levels and in the format set out in 5.2.3, and, the transform being an integer transform, the data output by the decoder under test have to match those of the reference decoder exactly. The dynamic test needs display processing, which lies outside the scope of GB/T 33475.2-2024: the reconstructed samples are output for display, and the test is passed where subjective assessment finds nothing abnormal.

6 Audio conformance testing

6.1 General. The clause lays down the standard tests for verifying conformance of the audio bitstreams and audio decoders of GB/T 33475.3-2018. The test criterion for general audio conformance is equivalent quality: the output of the decoder under test has to be of a quality equivalent to that of the reference decoder, the difference staying inside the permitted error. The decoder under test has to decode correctly every sequence listed.

6.2 Definitions. The AASF format is the base data stream; the AATF format adds frame header information to each AASF frame, and that header information is all contained in the AASF file header, so conformance testing may concentrate on the AASF format. The coding options to be covered and their reasonable combinations are three-dimensional and channel-based signal coding, high and low bit rate coding, lossy and lossless coding, and mono, two-channel and multi-channel coding. Because a three-dimensional codec may be configured freely between 128 sound objects and 128 channel signals, typical application scenarios are chosen as the basic test options out of that mass of combinations. For lossless coding the tools to be covered include integer lifting wavelet, LPC, arithmetic entropy coding and Golomb-Rice with arithmetic entropy coding; for general coding they include PCA, MCR in the MDFT domain, MCR in the MDCT domain and BWE.

6.3 Conformance testing of the general audio decoder. The test bitstream sets ts_block_01 to ts_block_15 traverse the sampling frequencies 32 kHz, 44.1 kHz and 48 kHz against the bit rate index tables for mono, two-channel stereo, 5.1, 7.1, 4.0, 5.1.2, 5.1.4, 7.1.2 and 7.1.4 layouts, then three-dimensional audio coding, high frequency parameter decoding, resampling, the fill module and object metadata, and finally second and third order HOA. Each set names bitstream demultiplexing or the module concerned as the object under test.

Further groups follow: ts_transform_01 to ts_transform_03 for the inverse MDCT, the inverse MDFT and the MDCT to MDFT conversion, each traversing all block lengths and window sequences of the block sequence table and the window information table; ts_mcr_01 onwards for the codebooks and codewords of MCR quantization in the MDCT and MDFT domains; and, as listed in the correspondence table, ts_pca, ts_quan, ts_anc and ts_audio_00.

6.5 Procedure of audio decoder conformance testing. The static test checks the correctness and precision of the reconstructed samples: bit exactness is verified for one group of test bitstreams, while the audio file decoded from another group has to meet the indicators of the static test table, which fixes frequency response, noise level, harmonic distortion, intermodulation distortion plus noise, intermodulation distortion plus swept frequency, and crosstalk. The dynamic test outputs the reconstructed samples for listening and is passed where subjective assessment finds nothing abnormal. A final table maps each test bitstream and bitstream set onto the static tests, correct decoding and audio indicator alike,