



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.264.1

Corrigendum 1
(09/2005)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS
Infrastructure of audiovisual services – Coding of moving
video

Conformance specification for H.264 advanced
video coding

Corrigendum 1

CAUTION !

PREPUBLISHED RECOMMENDATION

This prepublication is an unedited version of a recently approved Recommendation. It will be replaced by the published version after editing. Therefore, there will be differences between this prepublication and the published version.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU [had/had not] received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Corrigendum 1 to ITU-T Recommendation H.264.1

Conformance specification for H.264 Advanced Video Coding

Summary

This Recommendation specifies tests designed to verify whether bitstreams and decoders meet the normative requirements specified in ITU-T Rec. H.264 | ISO/IEC 14496-10:

- An encoder can claim conformance to ITU-T Rec. H.264 | ISO/IEC 14496-10 if the bitstreams that it generates are conforming bitstreams.
- A decoder can claim conformance to a specified profile and level of ITU-T Rec. H.264 if it can properly decode all bitstreams obeying constraints specified in ITU-T Rec. H.264 | ISO/IEC 14496-10.

The tests specified in this Recommendation provide methods for (non-exhaustive) testing of whether encoders and decoders meet these requirements.

This twin text with ISO/IEC has been jointly developed in the context of JVT and has been submitted to the ISO/IEC JTC 1/SC 29/WG 11 (MPEG) as ISO/IEC 14496-4:2002 / Amendment 6 (2005 E) and ISO/IEC 14496-4:2004 / Amendment 9.

Corrigendum 1 to H.264.1 provides improved synchronization with the technically-aligned twin text in ISO/IEC, removes some errors, and adds tests for some required features that were not tested in the previous version.

For the pre-published version of H.264.1, the bitstreams associated to this Recommendation can be found at

http://ftp3.itu.int/av-arch/jvt-site/draft_conformance

Source

ITU-T Recommendation H.264.1 was approved on 1 March 2005 by ITU-T Study Group 16 (2005-2008) under the ITU-T Recommendation A.8 procedure.

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Introduction

This Recommendation | International Standard has been jointly developed by ITU-T Video Coding Experts Group (VCEG) and the ISO/IEC Moving Picture Experts Group. It is published as technically-aligned twin text in both organizations ITU-T and ISO/IEC.

This Recommendation | International Standard specifies conformance test of ITU-T Rec. H.264 | ISO/IEC 14496-10 video bitstreams and decoders, and it specifically applies to ITU-T Rec. H.264 | ISO/IEC 14496-10, Advanced Video Coding.

The following subclauses specify the normative tests for verifying conformance of ITU-T Rec. H.264 | ISO/IEC 14496-10 video bitstreams and video decoders. These normative tests make use of test data (bitstream test suites) provided as an electronic annex to this Recommendation | International Standard, and the reference software decoder specified in ITU-T Rec. H.264.2 | ISO/IEC 14496-5 with source code available in electronic format.

As the bitstreams files accompanying this specification require a substantial amount of disk space, they are only available in physical medium (DVD), for purchase directly from the ITU-T bookshop.

Corrigendum 1 to ITU-T Recommendation H.264.1

Conformance specification for H.264 advanced video coding

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2 Normative references

2.1 General

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.2 Identical Recommendations | International Standards

- None.

2.3 Paired Recommendations | International Standards equivalent in technical content

- ITU-T Recommendation H.264 (2005), *Advanced video coding for generic audiovisual services*.
ISO/IEC 14496-10:2005⁴, *Information technology – Coding of audio-visual objects – Part 10: Advanced video coding*.
- ITU-T Recommendation H.264.2 (2005), *Reference software for H.264 advanced video coding*.
ISO/IEC 14496-5:2001, *Information technology – Coding of audio-visual objects – Part 5: Reference software*.

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6.5 Procedure to test decoder conformance

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6.5.2 Contents of bitstream file

The conformance bitstreams are included in this Recommendation | International Standard as an electronic attachment. The following information is included in a single zipped file for each such bitstream.

- ITU-T Rec. H.264 | ISO/IEC 14496-10 video bitstream;
- Reconstructed pictures or hashes of decoded pictures (may not be present);
- Short description of the bitstream;
- Trace file (the bitstream in ASCII format).

In cases where the reconstructed pictures or hashes of decoded pictures are not available, the reference software of ITU-T Rec. H.264.2 | ISO/IEC 14496-5 shall be used to generate the necessary reference reconstructed pictures from the bitstream.

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6.5.5 Static tests for output order conformance

Static tests of a video decoder require testing of the reconstructed samples. This subclause will explain how this test can be accomplished when the reconstructed samples at the output of the decoding process are available. It may not be possible to perform this type of test with a production decoder (due to the lack of an appropriate accessible interface in

the design at which to perform the test). In that case this test should be performed by the manufacturer during the design and development phase. Static tests are used for testing the decoding process. The test will check that the values of the samples reconstructed by the decoder under test shall be identical to the values of the ~~reference samples attached to the bitstream file, or shall be identical to the values of the samples reconstructed by the reference decoder in cases where the values of the samples are not attached to the bitstream file.~~ When a hash of the values of the samples of the decoded pictures is attached to the bitstream file, a corresponding hash operation performed on the values of the samples of the decoded pictures produced by the decoder under test shall produce the same results.

6.5.6 Dynamic tests for output timing conformance

Dynamic tests are applied to check that all the reconstructed samples are output and that the timing of the output of the decoder's reconstructed samples conforms to the specification of clause 8 and Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10, and to verify that the HRD models (as defined by the CPB and DPB specification in Annex C of ITU-T Rec. H.264 | ISO/IEC 14496-10) are not violated when the bits are delivered at the proper rate.

The dynamic test is often easier to perform on a complete decoder system, which may include a systems decoder, a video decoder and a display process. It may be possible to record the output of the display process and to check that display order and timing of fields or frames are correct at the output of the display process. However, since the display process is not within the normative scope of ITU-T Rec. H.264 | ISO/IEC 14496-10, there may be cases where the output of the display process differs in timing or value even though the video decoder is conforming. In this case, the output of the video decoder itself (before the display process) would need to be captured in order to perform the dynamic tests on the video decoder. In particular the field or frame order and timing shall be correct.

If buffering period SEI and picture timing SEI are included in the test bitstream, HRD conformance shall be verified using the values of `initial_cpb_removal_delay`, `initial_cpb_removal_delay_offset`, `cpb_removal_delay` and `dpb_removal_delay` that are included in the bitstream.

If buffering period SEI and picture timing SEI are not included in the bitstream, the following inferences shall be made to generate the missing parameters:

- `fixed_frame_rate_flag` shall be inferred to be 1.
- `low_delay_hrd_flag` shall be inferred to be 0.
- `cbr_flag` shall be inferred to be 0.
- The frame rate of the stream shall be inferred to be the frame rate value specified in Table 1. If this is missing, then a frame rate of either 25 or $30000 \div 1001$ can be inferred.
- `time_scale` shall be set to 90,000 and the value of `num_units_in_tick` shall be computed based on field rate (twice the frame rate).
- The bit rate of the bitstream shall be inferred to be the maximum value for the level defined in Table A.1 in ITU-T Rec. H.264 | ISO/IEC 14496-10.
- CPB and DPB sizes shall be inferred to be the maximum value for the level defined in Table A.1 in ITU-T Rec. H.264 | ISO/IEC 14496-10.

With the above inferences, the HRD shall be operated as follows.

- The CPB is filled starting at time $t = 0$, until it is full, before removal of the first access unit. This means that the `initial_cpb_removal_delay` shall be inferred to be equal to the total CPB buffer size divided by the bit rate divided by 90000 (rounded downwards) and `initial_cpb_removal_delay_offset` shall be inferred to be equal to zero.
- The first access unit is removed at time $t = \text{initial_cpb_removal_delay} \div 90000$ and subsequent access units are removed at intervals based on the frame distance, i.e., ~~$\text{cpb_removal_delay} = 2 * (90000 \div \text{num_units_in_tick})$~~ or the field distance i.e., ~~$\text{cpb_removal_delay} = (90000 / \text{num_units_in_tick})$~~ , depending whether the access unit is coded as a frame picture or field picture.
- Using these inferences, the CPB will not overflow or underflow and the DPB will not overflow.

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6.6.3.10 Test bitstream #AVCMR-11, #AVCMR-12

Specification: All slices are coded as I or P slices. Each picture contains more than one slice. entropy coding mode flag is equal to 0, specifying the CAVLC parsing process. pic_order_cnt_type is equal to 0. Reference picture list reordering and memory management control operations are used. Each slice is a coded frame. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Reference picture list reordering and memory management control operations.

Purpose: Check that decoder handles reference picture list reordering and memory management control operations.

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6.6.7.7 Test bitstream #AVCMA-7

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. `disable_deblocking_filter_idc` is equal to 1, specifying disabling of the deblocking filter process. `entropy_coding_mode_flag` is equal to 0, specifying the CAVLC parsing process. `pic_order_cnt_type` is equal to 0. Temporal direct prediction is used for direct prediction. `direct_8x8_inference_flag` is equal to 1. Some slices are coded as a coded field. `mb_adaptive_frame_field_coding` is equal to 1 in the rest of the frames. `mb_qp_delta` is equal to a non-zero value to change the quantizer scale at some MBs. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Macroblock adaptive frame field decoding and slices of a coded field.

Purpose: Check that decoder can properly decode both slices of a coded frame with `mb_adaptive_frame_field_flag=1` and slices of a coded field.

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6.6.16.1 Test bitstream #AVCCAMR-1

Specification: All slices are coded as I, P or B slices. Each picture contains more than one slice. `entropy_coding_mode_flag` is equal to 1, specifying the CABAC parsing process. `pic_order_cnt_type` is equal to 1. Reference picture list reordering and memory management control operations are used. Temporal direct prediction is used for direct prediction. `direct_8x8_inference_flag` is equal to 1. Each slice is a coded frame. `mb_adaptive_frame_field_coding` is equal to 1. VUI is included in the bitstream. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Reference picture list reordering and memory management control operations.

Purpose: Check that decoder handles reference picture list reordering and memory management control operations.

6.6.16.2 Test bitstream #AVCCAMR-2

Specification: All slices are coded as I, P or B slices. Each picture contains more than one slice. `entropy_coding_mode_flag` is equal to 1, specifying the CABAC parsing process. `pic_order_cnt_type` is equal to 0. Reference picture list reordering and memory management control operations are used. Spatial direct prediction is used for direct prediction. `direct_8x8_inference_flag` is equal to 1. Each slice is a coded frame. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Reference picture list reordering and memory management control operations.

Purpose: Check that decoder handles reference picture list reordering and memory management control operations.

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6.6.21.5 Test bitstream #FREH-5, #FREH-32

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. `entropy_coding_mode_flag` is equal to 1, specifying the CABAC parsing process. The value of `cabac_init_idc` is adaptively changed in slice header. `pic_order_cnt_type` is equal to 0. Spatial direct prediction is used for direct prediction. `direct_8x8_inference_flag` is set equal to 1. Both 4x4 and 8x8 block size transform modes are used. `seq_scaling_matrix_present_flag` is set to 1 and default scaling lists are used. Each slice is a coded frame. `mb_adaptive_frame_field_coding` is equal to 1. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Macroblock adaptive frame field decoding and slices of a coded frame with both 4x4 and 8x8 block size transform modes in CABAC entropy coding.

Purpose: Check that a decoder can properly decode slices of coded frames with `mb_adaptive_frame_field_flag=1` and with both 4x4 and 8x8 block size transform modes.

6.6.21.6 Test bitstream #FREH-6, #FREH-33

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. `entropy_coding_mode_flag` is equal to 0, specifying the CAVLC parsing process. `pic_order_cnt_type` is equal to 0. Temporal direct prediction is used for direct prediction. `direct_8x8_inference_flag` is equal to 1. Transform mode is set to 8x8 block size only. `seq_scaling_matrix_present_flag` and `pic_scaling_matrix_flag` are set to 1. Scaling lists are included in the sequence parameter set and the picture parameter set. Each slice is either a coded frame or a coded field. `mb_adaptive_frame_field_coding` is equal to 1 in coded frames. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Tests loading of scaling list in the sequence parameter set and the picture parameter set. Tests 8x8 block size transform mode. Tests decoding of level prefix more than 16 bits in CAVLC entropy coding. Tests deblocking for 8x8 transform.

Purpose: Check that a decoder can properly decode slices of coded frames with 8x8 block size transform for CAVLC and check that scaling list is implemented correctly for both slices of a coded frame with `mb_adaptive_frame_field_flag=1` and slices of a coded field.

6.6.21.7 Test bitstream #FREH-7, #FREH-34

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. `entropy_coding_mode_flag` is equal to 1, specifying the CABAC parsing process. `pic_order_cnt_type` is equal to 0. Temporal direct prediction is used for direct prediction. `direct_8x8_inference_flag` is set equal to 1. Both 4x4 and 8x8 block size transform modes are used. `seq_scaling_matrix_present_flag` and `pic_scaling_matrix_flag` are set to 1. Scaling lists are included in the sequence parameter set and the picture parameter set. Each slice is either a coded frame or a coded field. `mb_adaptive_frame_field_coding` is equal to 1 in coded frames. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Tests 4x4 and 8x8 block size transform modes in CABAC entropy coding. Tests loading of scaling list in the sequence parameter set and the picture parameter set. Tests deblocking for 4x4 and 8x8 transform.

Purpose: Check that a decoder can properly decode slices of coded frames with both 4x4 and 8x8 block size transform modes and check that scaling list is implemented correctly for CABAC entropy coding for both slices of a coded frame with `mb_adaptive_frame_field_flag=1` and slices of a coded field.

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6.6.21.15 Test bitstream #FREH-17

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. `entropy_coding_mode_flag` is equal to 1, specifying the CABAC parsing process. `pic_order_cnt_type` is equal to 0. Temporal direct prediction is used for direct prediction. `direct_8x8_inference_flag` is equal to 1. Both 4x4 and 8x8 block size transform modes are used. `seq_scaling_matrix_present_flag` is set to 1. Scaling lists are included in the sequence parameter set. Each slice is either a coded frame or a coded field. `mb_adaptive_frame_field_coding` is equal to 1 in coded frames. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Tests loading of scaling list in the sequence parameter set. Tests 8x8 block size transform mode.

Purpose: Check that a decoder can properly decode slices of a coded frame with 8x8 block size transform for CABAC. Check that scaling list is implemented correctly for field coding and MBAFF. Check that a decoder can handle temporal direct mode with `direct_inference_flag=1` for coded frames with 8x8 block size transform.

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6.6.21.22 Test bitstream #FREH-24

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. `entropy_coding_mode_flag` is equal to 0, specifying the CAVLC parsing process. `pic_order_cnt_type` is equal to 0. Spatial direct prediction is used for direct prediction. `direct_8x8_inference_flag` is set equal to 1. Both 4x4 and 8x8 block size transform modes are used. `seq_scaling_matrix_present_flag` is set to 1 and default scaling lists are used. `mb_adaptive_frame_field_coding` is equal to 1. Each slice is a coded frame. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Tests 4x4 and 8x8 block size transform modes in CAVLC entropy coding.

Purpose: Check that a decoder can properly decode slices of coded fields with both 4x4 and 8x8 block size transform modes.

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6.6.21.30 Test bitstream #FREH-40, #FREH-41

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. entropy coding mode flag is equal to 1, specifying the CABAC parsing process. pic_order_cnt_type is equal to 0. Spatial direct prediction is used for direct prediction. direct_8x8_inference_flag is set equal to 1. Both 4x4 and 8x8 block size transform modes are used. Both seq_scaling_matrix_present_flag and pic_scaling_matrix_flag are set to 0. Reference picture list reordering and memory management control operations are used. Each slice is a coded frame. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Reference picture list reordering and memory management control operations.

Purpose: Check that decoder handles reference picture list reordering and memory management control operations.

6.6.21.31 Test bitstream #FREH-42

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. entropy coding mode flag is equal to 1, specifying the CABAC parsing process. pic_order_cnt_type is equal to 0. Spatial direct prediction is used for direct prediction. direct_8x8_inference_flag is set equal to 1. Both 4x4 and 8x8 block size transform modes are used. Both seq_scaling_matrix_present_flag and pic_scaling_matrix_flag are set to 0. Reference picture list reordering and memory management control operations are used. mb_adaptive_frame_field_coding is equal to 1. Each slice is a coded frame. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Reference picture list reordering and memory management control operations.

Purpose: Check that decoder handles reference picture list reordering and memory management control operations.

6.6.21.32 Test bitstream #FREH-43

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. entropy coding mode flag is equal to 1, specifying the CABAC parsing process. pic_order_cnt_type is equal to 0. Spatial direct prediction is used for direct prediction. direct_8x8_inference_flag is set equal to 1. Both 4x4 and 8x8 block size transform modes are used. Both seq_scaling_matrix_present_flag and pic_scaling_matrix_flag are set to 0. mb_adaptive_frame_field_coding is equal to 1. Each slice is a coded frame. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Tests 4x4 and 8x8 block size transform modes in CABAC entropy coding.

Purpose: Check that a decoder can properly decode slices of coded frames with both 4x4 and 8x8 block size transform modes.

6.6.21.33 Test bitstream #FREH-44

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. entropy coding mode flag is equal to 0, specifying the CAVLC parsing process. pic_order_cnt_type is equal to 0. Spatial direct prediction is used for direct prediction. direct_8x8_inference_flag is set equal to 1. Both 4x4 and 8x8 block size transform modes are used. Both seq_scaling_matrix_present_flag and pic_scaling_matrix_flag are set to 0. mb_adaptive_frame_field_coding is equal to 1. Each slice is a coded frame. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Tests 4x4 and 8x8 block size transform modes in CAVLC entropy coding.

Purpose: Check that a decoder can properly decode slices of coded frames with both 4x4 and 8x8 block size transform modes.

6.6.21.34 Test bitstream #FREH-45

Specification: All slices are coded as I, P or B slices. Each picture contains only one slice. entropy coding mode flag is equal to 1, specifying the CABAC parsing process. pic_order_cnt_type is equal to 0. Spatial direct prediction is used for direct prediction. direct_8x8_inference_flag is set equal to 1. Both 4x4 and 8x8 block size transform modes are used. seq_scaling_matrix_present_flag is set to 1 and pic_scaling_matrix_flag is set to

0. Memory management control operations are used. Each slice is a coded frame. All NAL units are encapsulated into the byte stream format specified in Annex B in ITU-T Rec. H.264 | ISO/IEC 14496-10.

Functional stage: Reference picture list reordering and memory management control operations.

Purpose: Check that decoder handles reference picture list reordering and memory management control operations.

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6.7 Normative Test Suites for ITU-T Rec. H.264 | ISO/IEC 14496-10

Legend:

X – Bitstream is for static and dynamic test

Table 1 – Bitstreams for Baseline, Extended and Main profile

Categories	Bitstream	Donated by	File name	Baseline	Extended	Main	Level	Frame rate (Frames/sec)
...
MMCO	AVCMR-1	British Telecom	MR1_BT_A	X	X	X	1.1 and higher	20
...
	AVCMR-10	British Telecom	MR8_BT_B		X	X	2.1 and higher	25
	<u>AVCMR-11</u>	<u>HHI</u>	<u>HCBP1_HHI_A</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>3.1 and higher</u>	<u>29.97</u>
	<u>AVCMR-12</u>	<u>HHI</u>	<u>HCBP2_HHI_A</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>3.1 and higher</u>	<u>29.97</u>
WP	AVCWP-1	Toshiba	CVWP5_TOSHIBA_E		X	X	2.0 and higher	7.5
...
CABAC: MMCO	AVCCAMR-1	British Telecom	MR9_BT_B			X	2.1 and higher	25
	<u>AVCCAMR-2</u>	<u>HHI</u>	<u>HCMP1_HHI_A</u>			<u>X</u>	<u>3.0 and higher</u>	<u>29.97</u>
CABAC: WP	AVCCAUP-1	Toshiba	CAWP1_TOSHIBA_E			X	2.0 and higher	7.5
...

Table 2 – Bitstreams for High, High 10, High 4:2:2, and High 4:4:4 profile

Categories	Bitstream	Donated by	File name	High	High 10	High 4:2:2	High 4:4:4	Level	Frame rate (Frames/sec)
4:2:0 8 bit	FREH-1	Panasonic Singapore Lab.	FRExt1_Panasonic_C	X	X	X	X	2.1 and higher	29.97
...

Categories	Bitstream	Donated by	File name	High	High 10	High 4:2:2	High 4:4:4	Level	Frame rate (Frames/sec)
	FREH-21	Broadcom	HPCVFLNL_BRCM_A	X	X	X	X	4.0 and higher	29.97
	FREH-22	Sony	HVLCFI0_Sony_BA	X	X	X	X	3.1 and higher	29.97
	FREH-23	Sony	HVLCPPF0_Sony_BA	X	X	X	X	3.1 and higher	29.97
	FREH-24	Sony	HVLCMFF0_Sony_A	X	X	X	X	3.1 and higher	29.97
...
	FREH-39	Broadcom	brcm_freh12_B	X	X	X	X	3.0 and higher	29.97
	<u>FREH-40</u>	<u>HHI</u>	<u>HCHP1_HHI_B</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>2.1 and higher</u>	<u>29.97</u>
	<u>FREH-41</u>	<u>HHI</u>	<u>HCHP2_HHI_A</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>3.1 and higher</u>	<u>29.97</u>
	<u>FREH-42</u>	<u>HHI</u>	<u>HCHP3_HHI_A</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>4.1 and higher</u>	<u>29.97</u>
	<u>FREH-43</u>	<u>JVC</u>	<u>FREXT01_JVC_D</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>3.1 and higher</u>	<u>29.97</u>
	<u>FREH-44</u>	<u>JVC</u>	<u>FREXT01_JVC_C</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>3.1 and higher</u>	<u>29.97</u>
	<u>FREH-45</u>	<u>Sony</u>	<u>FREXT_MMCO4_Sony_B</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>3.1 and higher</u>	<u>29.97</u>
4:2:0 10 bit	FREH10-1	Dolby	FREH10-1		X	X	X	4 and higher	24
	FREH10-2	Dolby	FREH10-2		X	X	X	4 and higher	24
4:2:2 10 bit	FREH422-1	Tandberg	FREXT13_TANDBERG_A			X	X	2.1 and higher	29.97
	FREH422-2	Tandberg	FREXT25_TANDBERG_A			X	X	2.1 and higher	29.97
	FREH422-3	Tandberg	FREXT36_TANDBERG_A			X	X	2.1 and higher	29.97
	FREH422-4	Sony	Hi422FREXT1_Sony_A			X	X	3.1 and higher	29.97
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