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**Information technology — Coding of  
audio-visual objects —**

**Part 4:  
Conformance testing**

**AMENDMENT 38: Conformance testing for  
Multiview Video Coding**

*Technologies de l'information — Codage des objets audiovisuels —*

*Partie 4: Essai de conformité*

*AMENDEMENT 38: Essais de conformité pour codage vidéo multivues*

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Published in Switzerland

## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Amendment 38 to ISO/IEC 14496-4:2004 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This Amendment establishes conformance test requirements for conformance to ITU-T Rec. H.264 | ISO/IEC 14496-10.

In this Amendment, additional text to ITU-T Rec. H.264 | ISO/IEC 14496-10 is specified for testing the conformance of ITU-T Rec. H.264 | ISO/IEC 14496-10 video decoders including in particular the MVC Profiles, which consist of the Multiview High and Stereo High profiles.

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



# Information technology — Coding of audio-visual objects —

## Part 4: Conformance testing

### AMENDMENT 38: Conformance testing for Multiview Video Coding

*In 10.6.5.7, add the following text at the end of the subclause:*

A decoder that conforms to the Multiview High profile at a specific level shall be capable of decoding all bitstreams in which all active MVC sequence parameter sets have any of the following.

- profile\_idc equal to 118
- profile\_idc equal to 100 or 77 and constraint\_set4\_flag is equal to 1
- profile\_idc equal to 88 and constraint\_set1\_flag equal to 1 and constraint\_set4\_flag is equal to 1
- profile\_idc equal to 66 and constraint\_set1\_flag equal to 1

and in which level\_idc or the combination of level\_idc and constraint\_set3\_flag for all active MVC sequence parameter sets represent a level less than or equal to the specific level. In addition to the bitstreams defined in Table AMD38-1, a decoder that conforms to the Multiview High profile shall be capable of decoding the Main profile bitstreams specified in Table AMD6-1, and the High profile bitstreams specified in Table AMD9-2.

A decoder that conforms to the Stereo High profile at a specific level shall be capable of decoding all bitstreams in which all active MVC sequence parameter sets have any of the following.

- profile\_idc equal to 118 and constraint\_set5\_flag is equal to 1
- profile\_idc equal to 128
- profile\_idc equal to 100 or 77
- profile\_idc equal to 88 and constraint\_set1\_flag equal to 1
- profile\_idc equal to 66 and constraint\_set1\_flag equal to 1

and in which level\_idc or the combination of level\_idc and constraint\_set3\_flag for all active MVC sequence parameter sets represent a level less than or equal to the specific level. In addition to the bitstreams defined in Table AMD38-1, a decoder that conforms to the Stereo High profile shall be capable of decoding the Main profile bitstreams specified in Table AMD6-1, and the High profile bitstreams specified in Table AMD9-2.

*After 10.6.6.32.3, add the following text:*

### 10.6.6.33 Test bitstreams – Multiview High Profile

#### 10.6.6.33.1 Test bitstream #MVCDS-1

**Specification:** All slices are coded as I slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. num\_anchor\_refs\_IX and num\_non\_anchor\_refs\_IX are equal to 0. 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:** Decoding of two views without inter-prediction or inter-view prediction.

**Purpose:** Check that the decoder can properly decode multiple view components.

#### 10.6.6.33.2 Test bitstream #MVCDS-2

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. num\_anchor\_refs\_IX and num\_non\_anchor\_refs\_IX are equal to 0. 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:** Decoding of two views with inter-prediction, but without inter-view prediction.

**Purpose:** Check that the decoder can properly decode multiple view components with inter-prediction.

#### 10.6.6.33.3 Test bitstream #MVCDS-3

**Specification:** All slices are coded as I or P slices. Only the first picture is coded as an IDR access unit with all subsequent pictures coded as anchor access units. Each view component contains only one slice. num\_views\_minus1 is equal to 1. num\_anchor\_refs\_I0 is equal to 1, num\_anchor\_refs\_I1 is equal to 0, and num\_non\_anchor\_refs\_IX are equal to 0. 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:** Decoding of two views with inter-view prediction in anchor pictures, but without inter-prediction within views.

**Purpose:** Check that the decoder can properly decode multiple view components with inter-view prediction in anchor pictures.

#### 10.6.6.33.4 Test bitstream #MVCDS-4

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. num\_anchor\_refs\_I0 is equal to 1, and num\_non\_anchor\_refs\_I0 is equal to 0. 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:** Decoding of two views with inter-prediction, and inter-view prediction in anchor pictures.

**Purpose:** Check that the decoder can properly decode multiple view components with inter-prediction, as well as inter-view prediction in anchor pictures.

**10.6.6.33.5 Test bitstream #MVCDS-5**

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. num\_anchor\_refs\_I0 and num\_non\_anchor\_refs\_I0 are 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:** Decoding of two views with inter-prediction, and inter-view prediction in both anchor pictures and non-anchor pictures.

**Purpose:** Check that the decoder can properly decode multiple view components with inter-prediction, as well as inter-view prediction in both anchor and non-anchor access units.

**10.6.6.33.6 Test bitstream #MVCDS-6**

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. num\_anchor\_refs\_I0 and num\_non\_anchor\_refs\_I0 are equal to 1. inter\_view\_flag is equal to 0 for a subset of non-anchor view components of the base view. 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:** Decoding of two views with inter-prediction, and inter-view prediction in both anchor pictures and non-anchor pictures.

**Purpose:** Check that the decoder can properly decode multiple view components with inter-prediction, as well as inter-view prediction in both anchor and non-anchor access units, with different settings of inter\_view\_flag in different view components.

**10.6.6.33.7 Test bitstream #MVCNV-1**

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 2, and the views are denoted as A, B, and C, where view A is the base view, and view B and C are non-base views. View B refers to view A, and view C refers to view B. num\_anchor\_refs\_I0 and num\_non\_anchor\_refs\_I0 for view B and C are equal to 1, respectively. 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:** Decoding of three views with inter-prediction and inter-view prediction in anchor access units and non-anchor pictures.

**Purpose:** Check that the decoder can properly decode three views with inter-prediction, as well as inter-view prediction in anchor access units.

**10.6.6.33.8 Test bitstream #MVCNV-2**

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 7, and the views are denoted as A, B, C, D, E, F, G, H, where view A is the base view, and other views are non-base views. View C refers to view A, view B refers to view A and view C, view E refers to view C, view D refers to view C and view E, view G refers to view E, view F refers to view E and view G, and view H refers to view G. num\_anchor\_refs\_I0 and num\_non\_anchor\_refs\_I0 for view C, E, G, and H are equal to 1, respectively, and num\_anchor\_refs\_IX (X=0,1) and num\_non\_anchor\_refs\_IX (X=0,1) for view B, D, and F are equal to 1, respectively. 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:** Decoding of eight views with inter-prediction and inter-view prediction in anchor access units and non-anchor pictures.

**Purpose:** Check that the decoder can properly decode eight views with inter-prediction, as well as inter-view prediction in anchor access units.

#### 10.6.6.33.9 Test bitstream #MVCNV-3

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 2, and the views are denoted as A, B, and C, where view A is the base view, and views B and C are non-base views. View B refers to view A, and view C does not refer to either view A or B, i.e., it is an independently coded non-base view. num\_anchor\_refs\_I0 and num\_non\_anchor\_refs\_I0 for view C 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:** Decoding of three views including a base view with inter-prediction, a non-base view with inter-prediction but no inter-view prediction, and a non-base view with inter-view prediction from the base view and non-base view without inter-view prediction.

**Purpose:** Check that the decoder can properly decode a bitstream including a mix of non-base views with and without inter-view prediction.

#### 10.6.6.33.10 Test bitstream #MVCNV-4

**Specification:** All slices are coded as I or P slices. Only the first picture is coded as an IDR access unit with all subsequent pictures coded as anchor access units. Each view component contains only one slice. num\_views\_minus1 is equal to 3, and the views are denoted as A, B, C, and D, where view A is the base view, and views B, C and D are non-base views. View B refers to view A, view C refers to view B, and view D refers to view C. num\_anchor\_refs\_I0 is equal to 1, num\_anchor\_refs\_I1 is equal to 0, and num\_non\_anchor\_refs\_IX are equal to 0. 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:** Decoding of four views with inter-view prediction in anchor pictures and subsequent predictions over the views, but without inter-prediction within views.

**Purpose:** Check that the decoder can properly decode multiple view components with inter-view prediction in anchor pictures for a higher number of views.

#### 10.6.6.33.11 Test bitstream #MVCRP-1

**Specification** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. pic\_order\_cnt\_type is equal to 0. Reference picture list reordering is used without reordering\_of\_pic\_nums\_idc equal to 4 or 5. 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 of reference pictures used for inter-prediction.

**Purpose:** Check that decoder handles reference picture list reordering of reference pictures used for inter-prediction.

#### 10.6.6.33.12 Test bitstream #MVCRP-2

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. pic\_order\_cnt\_type is equal to 0. Memory management control operations are used. 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:** Memory management control operations in context of decoding multiple view components.



**Purpose:** Check that decoder handles memory management control operations.

#### 10.6.6.33.13 Test bitstream #MVCRP-3

**Specification** All slices are coded as I or P slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. pic\_order\_cnt\_type is equal to 0. Reference picture list reordering is used including reordering\_of\_pic\_nums\_idc equal to 4 and 5. 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 of reference pictures used for both inter-prediction and inter-view prediction.

**Purpose:** Check that decoder handles reference picture list reordering of reference pictures used for both inter-prediction and inter-view prediction.

#### 10.6.6.33.14 Test bitstream #MVCRP-4

**Specification** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. pic\_order\_cnt\_type is equal to 2. Reference picture list reordering including reordering\_of\_pic\_nums\_idc equal to 4 and 5, and memory management control operations, are used. 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 for both inter-prediction and inter-view prediction, and memory management control operations.

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

#### 10.6.6.33.15 Test bitstream #MVCRP-5

**Specification** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. pic\_order\_cnt\_type is equal to 2. gaps\_in\_frame\_num\_value\_allowed\_flag is equal to 1. Reference picture list reordering including reordering\_of\_pic\_nums\_idc equal to 4 and 5, and memory management control operations, are used. 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 gaps in frame\_num, reference picture list reordering and memory management control operations.

#### 10.6.6.33.16 Test bitstream #MVCRP-6

**Specification:** All slices are coded as I or P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. pic\_order\_cnt\_type is equal to 0. gaps\_in\_frame\_num\_value\_allowed\_flag is equal to 1. Reference picture list reordering including reordering\_of\_pic\_nums\_idc equal to 4 and 5, and memory management control operations, are used. The decoding order is different from the output order. 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, memory management control operations and non-increasing PicOrderCnt values.

**Purpose:** Check that decoder handles reference picture list reordering and memory management control operations. Test output order conformance for non-increasing PicOrderCnt values.

#### 10.6.6.33.17 Test bitstream #MVCSPS-1

**Specification:** All slices are coded as I or P slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. Value of syntax elements in sequence parameter sets for each view vary. 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:** Decoding of multiple views with different values of syntax elements in sequence parameter sets.

**Purpose:** Check that decoder handles variation in sequence parameter sets for each view.

#### 10.6.6.33.18 Test bitstream #MVCSPS-2

**Specification:** All slices are coded as I or P slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 7, but only two views 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:** Decoding of sub-bitstream where num\_views\_minus1 does not correspond to actual number of views in bitstream.

**Purpose:** Check that decoder handles bitstreams that have undergone sub-bitstream extraction process.

#### 10.6.6.34 Test bitstreams – Stereo High Profile

##### 10.6.6.34.1 Test bitstream #MVCICT-1

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. num\_anchor\_refs\_I0 and num\_non\_anchor\_refs\_I0 are equal to 1. field\_pic\_flag is equal to 1 for each picture. Reference picture list reordering is used with reordering\_of\_pic\_nums\_idc equal to 4 or 5. 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:** Decoding of two views with inter-prediction, and each view component is coded as a field picture.

**Purpose:** Check that the decoder handles reference picture list reordering for field pictures.

##### 10.6.6.34.2 Test bitstream #MVCICT-2

**Specification:** All slices are coded as I, P or B slices. Only the first picture is coded as an IDR access unit. Each view component contains only one slice. num\_views\_minus1 is equal to 1. num\_anchor\_refs\_I0 and num\_non\_anchor\_refs\_I0 are equal to 1. mb\_adaptive\_frame\_field\_flag is equal to 1. field\_pic\_flag is equal to 0 for each picture. Reference picture list reordering is used with reordering\_of\_pic\_nums\_idc equal to 4 or 5. 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:** Decoding of two views with inter-prediction, and each view component is coded as a mbaff frame picture.

**Purpose:** Check that the decoder handles reference picture list reordering for mbaff frame pictures.

Table AMD38-1 – Bitstreams for Multiview High and Stereo High profiles

Categories	Bitstream	Donated by	File Name	Multiview High	Stereo High	Level	Frame Rate (Frame/Sec)
Dependency Structure	MVCDS-1	NTT	MVCDS-1	X	X	3 and higher	29,7
	MVCDS-2	NTT	MVCDS-2	X	X	3 and higher	29,7
	MVCDS-3	NTT	MVCDS-3	X	X	3 and higher	29,7
	MVCDS-4	Mitsubishi	MVCDS-4	X	X	3,1 and higher	25
	MVCDS-5	Mitsubishi	MVCDS-5	X	X	3,1 and higher	25
	MVCDS-6	Mitsubishi	MVCDS-6	X	X	3,1 and higher	25
Number of Views	MVCNV-1	NTT	MVCNV-1	X		3 and higher	29,7
	MVCNV-2	Mitsubishi	MVCNV-2	X		4 and higher	25
	MVCNV-3	Mitsubishi	MVCNV-3	X		3,1 and higher	25
	MVCNV-4	NTT	MVCNV-4	X		3 and higher	29,7
Reference Picture List Construction	MVCRP-1	Qualcomm	MVCRP-1	X	X	3 and higher	25
	MVCRP-2	Qualcomm	MVCRP-2	X	X	3 and higher	25
	MVCRP-3	Qualcomm	MVCRP-3	X	X	3 and higher	25
	MVCRP-4	Qualcomm	MVCRP-4	X	X	3 and higher	25
	MVCRP-5	Qualcomm	MVCRP-5	X	X	3 and higher	25
	MVCRP-6	Qualcomm	MVCRP-6	X	X	3 and higher	25
Subset SPS	MVCSPS-1	Mitsubishi	MVCSPS-1	X	X	3,1 and higher	25
	MVCSPS-2	Mitsubishi	MVCSPS-2	X	X	3,1 and higher	25
Interlaced Coding Tools	MVCICT-1	Panasonic	MVCICT-1		X	3,1 and higher	29,7
	MVCICT-2	Panasonic	MVCICT-2		X	3,1 and higher	29,7

