ATSC Standard:
Video and Transport Subsystem Characteristics of MVC for 3D-TV Broadcast in the ATSC Digital Television System

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1. SCOPE

This part describes the video coding constraints on Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10 [9] ("MVC") video compression and the transport of the MVC video streams for 3D-TV broadcast in the ATSC Digital Television System.

2. REFERENCES

All referenced documents are subject to revision. Users of this Standard are cautioned that newer editions might or might not be compatible.

2.1 Normative References

The following documents, in whole or in part, as referenced in this document, contain specific provisions that are to be followed strictly in order to implement a provision of this Standard.

[1]   IEEE: "Use of the International Systems of Units (SI): The Modern Metric System," Doc. SI 10-2002, Institute of Electrical and Electronics Engineers, New York, N.Y., 2002.

[2]   ATSC: "ATSC Digital Television Standard, Part 3 – Service Multiplex and Transport Subsystem Characteristics," Doc. A/53, Part 3:2023-02, Advanced Television Systems Committee, Washington, D.C., 15 February 2023.

[3]   ATSC: "ATSC Digital Television Standard, Part 4 – MPEG-2 Video System Characteristics," Doc. A/53 Part 4:2009, Advanced Television Systems Committee, Washington, D.C., 7 August 2009.

[4]   ATSC: "ATSC: "Program and System Information Protocol for Terrestrial Broadcast and Cable," Doc. A/65:2013, Advanced Television Systems Committee, Washington, D.C, 8 July 2013.

[5]   ATSC: "Parameterized Services Standard," Doc A/71:2012, Advanced Television Systems Committee, Washington, D.C., 3 December 2012.

[6]   ATSC: " Video System Characteristics of AVC in the ATSC Digital Television System," Doc. A/72, Part 1:2014, Advanced Television Systems Committee, Washington, D.C., 18 February 2014.

[7]   ISO: "Information technology – Generic coding of moving pictures and associated audio information: Systems," Doc. ISO/IEC 13818-1:2007, International Standards Organization, Geneva, 2007.

[8]   ISO: "Generic Coding of Moving Pictures and Audio: Systems, AMENDMENT 4: Transport of Multiview Video over ITU-T Rec H.222.0 | ISO/IEC 13818-1," Doc. ISO/IEC 13818-1:2007/FDAM 4, International Standards Organization, Geneva, 2007.

[9]   ISO: "Text of ISO/IEC FDIS 14496-10:201X" Doc. MPEG N13916, International Standards Organization, Geneva, 2014 /ITU-T Rec H.264: "Advanced video coding for generic audiovisual services", February 2014.

2.2 Informative References

The following documents contain information that may be helpful in applying this Standard.

[10] ETSI: "Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream," Doc. TS 101 154 v1.11.1, Geneva, November 2012. Aavailable at: www.etsi.org/deliver/etsi_ts/101100_101199/101154/01.11.01_60/ts_101154v011101p.pdf

[11] Blu-ray Disc Association: "White Paper Blu-ray Disc™ Read-Only Format 2.B Audio Visual Application Format Specifications for BD-ROM Version 2.5", July 2011. Available at http://blu-raydisc.com/assets/Downloadablefile/BD-ROM-AV-WhitePaper_110712.pdf)

[12] ATSC: " 3DTV Terrestrial Broadcasting, Part 6 – Independent Coded 3D Using Real-Time Delivery," Doc. A/104, Part 6, Advanced Television Systems Committee, Washington, D.C., Candidate Standard January 2014.

[13] ATSC: "3DTV Terrestrial Broadcasting, Part 3 - Frame Compatible Coding Using Real-Time Delivery", Doc. A/104, Part 3:2014, Advanced Television Systems Committee, Washington, D.C., 27 June 2014.

3. DEFINITION OF TERMS

With respect to definition of terms, abbreviations, and units, the practice of the Institute of Electrical and Electronics Engineers (IEEE) as outlined in the Institute's published standards [1] shall be used. Where an abbreviation is not covered by IEEE practice or industry practice differs from IEEE practice, the abbreviation in question will be described in Section 3.3 of this document.

3.1   Compliance Notation

This section defines compliance terms for use by this document:

shall – This word indicates specific provisions that are to be followed strictly (no deviation is permitted).

shall not – This phrase indicates specific provisions that are absolutely prohibited.

should – This word indicates that a certain course of action is preferred but not necessarily required.

should not – This phrase means a certain possibility or course of action is undesirable but not prohibited.

3.2   Treatment of Syntactic Elements

This document contains symbolic references to syntactic elements used in the audio, video, and transport coding subsystems. These references are typographically distinguished by the use of a different font (e.g., restricted), may contain the underscore character (e.g., sequence_end_code) and may consist of character strings that are not English words (e.g., dynrng).

3.2.1   Reserved Elements

One or more reserved bits, symbols, fields, or ranges of values (i.e., elements) may be present in this document. These are used primarily to enable adding new values to a syntactical structure without altering its syntax or causing a problem with backwards compatibility, but they also can be used for other reasons.

The ATSC default value for reserved bits is '1.' There is no default value for other reserved elements. Use of reserved elements except as defined in ATSC Standards or by an industry standards setting body is not permitted. See individual element semantics for mandatory settings and any additional use constraints. As currently-reserved elements may be assigned values and meanings in future versions of this Standard, receiving devices built to this version are expected

to ignore all values appearing in currently-reserved elements to avoid possible future failure to function as intended.

3.3   Acronyms and Abbreviation

The following acronyms and abbreviations are used within this document.

AFD – Active Format Description

ATSC – Advanced Television Systems Committee

AU – Access Unit

AVC – Advanced Video Coding

DPB – Decoded Picture Buffer

DTS – Decode Time Stamp

MFC – Multi-resolution Frame Compatible Stereo Coding

MVC – Multiview Video Coding

NAL – Network Abstraction Layer

POC – Picture Order Count

PPS – Picture Parameter Set

PES – Packetized Elementary Stream

PSI – Program Specific Information

PTS – Presentation Time Stamp

SEI – Supplemental Enhancement Information

SPS – Sequence Parameter Set

T-STD – Transport System Target Decoder

VCL – Video Coding Layer

VUI – Video Usability Information

3.4   Terms

The following terms are used within this document.

GOP – This term is not defined in the AVC specification (ISO/IEC 14496-10 [9]), but is widely used in the industry, and is defined for the purposes of this standard: A group of pictures spanning two consecutive MVC Access Points including the prior MVC Access Point but not including the subsequent MVC Access Point, where an MVC Access Point is defined in Section 6.1.2 of this standard.

reserved – An element that is set aside for use by a future Standard.

MVC Base Access Point – An access unit of an MVC Base view sub-bitstream and equivalent to an AVC Access Point as defined in Section 6.1.3 of A/72 Part 1 [6].

MVC Base GOP – A collection of access units (AUs) starting at, and including the AU comprising the MVC Base Access Point, and including all the AUs up to, but not including the next MVC Base Access Point.

MVC Base view component – A coded representation of the MVC Base view sub-bitstream in a single access unit.

MVC Base view sub-bitstream – A sub-bitstream of an MVC video stream. The MVC Base view sub-bitstream contains all VCL NAL units associated with the minimum value of view order index present in each AVC video sequence of the AVC video stream as defined in A/72 Part1 [2].

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MVC Dependent Access Point – An access unit of MVC Dependent view sub-bitstream at which a decoder can begin decoding successfully with the corresponding MVC Base Access Point. The access unit must contain one Subset Sequence Parameter Set NAL unit and one Picture Parameter Set NAL unit that are active or being activated when decoding the primary coded picture in this access unit.

MVC Dependent GOP – A collection of access units (AUs) starting at, and including the AU comprising the MVC Dependent Access Point, and including all the AUs up to, but not including the next MVC Dependent Access Point.

MVC Dependent view component – A coded representation of the MVC Dependent view sub-bitstream in a single access unit.

MVC Dependent view sub-bitstream – A sub-bitstream of an MVC video stream. The MVC Dependent view sub-bitstream contains all VCL NAL units and associated non-VCL NAL units associated with the value of view_id corresponding to the Dependent view, of a video stream conforming to the H.264/AVC Stereo High Profile or MFC High Profile Level 4 as defined in ITU-T Rec. H.264 | ISO/IEC 14496-10 [9].

MVC video stream – A video stream composed of an MVC Base view sub-bitstream and an MVC Dependent view sub-bitstream.

4. OVERVIEW

This standard describes the video coding constraints on MVC video compression [9] and the transport of the MVC video streams for 3D-TV broadcast in the ATSC Digital Television System. The real-time delivery of MVC within the ATSC Digital Television System is specified in A/104 Part 6 [12] for H.264/AVC Stereo High Profile or A/104 Part 3 [13] for H.264/AVC MFC High Profile .

5. POSSIBLE VIDEO INPUTS

Please see the A/53 Part 4 Section titled "Possible Video Inputs" [3] for information regarding television production standards. Television production standards supported by this standard include 25 and 50 Hz inputs as well as 29.97 and 59.94 Hz inputs with resolution of 1280 x 720 and 1920 x 1080. Supported frame rates are different for each resolution as specified in Table 5.3 in this document.

6. SOURCE CODING SPECIFICATION FOR MVC

This Section establishes a specific subset of the MVC Annex of the video compression standard [9] MVC is an optional capability for 3D TV broadcasting but, when implemented, shall conform to the requirements specified herein.

The MVC bit stream comprises two views: the term "MVC base view" is used to designate the view that contains all VCL NAL units associated with the minimum value of view order index present in each AVC video sequence of the AVC video stream defined in A/72 Part 1 [6], and the term "MVC dependent view" is used to indicate a view that contains all VCL NAL units with nal_unit_type equal to 20 and associated non-VCL NAL units.

The MVC video compression algorithm shall conform to the Stereo High Profile or MFC High Profile, Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10 [9]. The allowable parameters for the MVC bit stream shall be bounded by the upper limits specified for Stereo High Profile or MFC High Profile at Level 4 defined in Annex H of ITU-T Rec. H.264 | ISO/IEC 14496-10 [9]. Additional constraints with respect to MVC are specified below.

MVC bit streams shall utilize the "Supplemental Enhancement Information (SEI)" defined in Annexes D and H of ISO/IEC 14496-10 [9], and the "Video Usability Information (VUI)" defined in Annex E and Annex H of ISO/IEC 14496-10 [9]. Decoder design should be made under the assumption that any legal structure as permitted by Annex H of ISO/IEC 14496-10 [9] may occur in the broadcast stream even if presently reserved or unused.

6.1 Constraints with Respect to MVC (ISO/IEC 14496-10, Annex H)

6.1.1   Constraints with Respect to Stereo High Profile and MFC High Profile

NAL unit parameters shall be constrained as specified in Section 6.1.3, sequence parameter sets shall be constrained as specified in Section 6.1.4, and picture parameter sets shall be constrained as specified in Section 6.1.5. Additional constraints on VUI parameters and SEI messages are described in Section 6.1.6 and 6.1.7, respectively.

6.1.2   MVC Access Point

An MVC Access Point is defined as an access unit in an MVC video stream at which a decoder can begin decoding video successfully. Each MVC Access Point shall contain all MVC Sequence Parameter Set NAL units (NAL unit type 7 or 15) and all Picture Parameter Set NAL units (NAL unit type 8) that are referenced in the VCL NAL units of the access unit. The access unit shall not contain any Sequence Parameter Set NAL unit (NAL unit type 7) that is not referenced in the VCL NAL units of the access unit. In addition, if both are present in the access unit, the Sequence Parameter Set NAL unit associated with the MVC base view shall precede the Subset Sequence Parameter Set NAL unit associated with the MVC dependent view. The access unit must contain an IDR view component in which non_idr_flag is set equal to 0 for the MVC base view.

6.1.3   NAL Unit Constraints

The following parameters shall be set according to the following constraints.

- svc_extension_flag in the nal_unit() shall be set to 0.
- view_id in the nal_unit_header_mvc_extension() shall be set to a value other than 0.

The following NAL units shall not be present in the MVC Base view sub-bitstream.

- Prefix NAL unit (nal_unit_type=14).
- Coded slice extension NAL unit (nal_unit_type=20).
- Subset sequence parameter set NAL unit (nal_unit_type=15).

In the absence of the Prefix NAL unit, the following constant values shall be inferred for decoding of the MVC Base view sub-bitstream.

- non_idr_flag is inferred to be equal to 0 if the nal_unit_type of the base view component is set equal to 5; otherwise, non_idr_flag is inferred to be equal to 1.
- priority_id is inferred to be equal to 0.
- view_id is inferred to be equal to 0.
- temporal_id is inferred to be equal to the same value as corresponding view component of MVC Dependent view sub-bitstream.
- anchor_pic_flag is inferred to be equal to the same value as corresponding view component of MVC Dependent view sub-bitstream.
- inter_view_flag is inferred to be equal to 1.

The following NAL units shall not be present in the MVC Dependent view sub-bitstream.

- Access unit delimiter NAL unit (nal_unit_type=9).

- Sequence parameter set extension NAL unit (nal_unit_type=13).
- Coded slice of the auxiliary coded picture without partitioning NAL unit (nal_unit_type=19).

Additionally, the structure of the video bit stream shall obey the following constraints.

- When the MVC Dependent view component is a B picture component, then the corresponding view component of MVC Base view video shall also be B picture component.
- When the MVC Dependent view component is a non-reference B picture component, the corresponding view component of MVC Base view video shall also be a non-reference B picture component.
- The structure of MVC Base GOP and the structure of MVC Dependent GOP shall be the same, including: the number of view components; the values of nal_ref_idc of a NAL unit with slice data for MVC Base view component and nal_ref_idc of a NAL unit with slice data for the corresponding MVC Dependent view component; the display order of the pictures; i.e., Picture Order Count (POC); and the decoding delay, defined as the PTS of the first displayed picture in a coded video sequence minus its DTS.

6.1.4   Sequence Parameter Set Constraints

For each MVC Access Point, there shall be one Sequence Parameter Set (SPS) present in the bit stream. Table 6.1 identifies parameters in the Sequence Parameter Set of a bit stream that shall be constrained by the video subsystem and lists the allowed values for each.

Table 6.1 Sequence Parameter Set Constraints

Sequence Parameter Set Syntactic Element	Allowed Value
profile_idc	100 (High Profile)
constraint_set0_flag	0
constraint_set1_flag	0 (Same constraint in A/72 Part 1 [6]
constraint_set2_flag	0
constraint_set3_flag	0
constraint_set4_flag	0
constraint_set5_flag	0
gaps_in_frame_num_value_allowed_flag	0 (gaps not allowed)
vui_parameters_present_flag	1

For each MVC Dependent Access Point, there shall be one Subset SPS present in the MVC Dependent view sub-bitstream. Table 6.2 specified parameters in the Subset SPS.

Table 6.2 Subset Sequence Parameter Set Constraints

Subset Sequence Parameter Set Syntactic Element	Allowed Value
mvc_vui_parameters_present_flag	1
profile_idc	128 (Stereo High Profile) or 134 (MFC High Profile)
num_level_values_signalled_minus1	0
vui_mvc_num_ops_minus1	0
vui_mvc_low_delay_hrd_flag	0 (if present)
vui_mvc_pic_struct_present_flag	0 or 1 (Same value as pic_struct_present_flag in SPS of corresponding MVC base view sub-bitstream.)

Parameters encoded in the SPS of a Subset SPS in the MVC Dependent view sub-bitstream shall be the same as parameters in the SPS of the corresponding MVC Base view sub-bitstream, with the exception of seq_parameter_set_id and profile_idc. Specifically, the value of level_idc in the MVC Base view sub-bitstream and MVC Dependent view sub-bitstream shall have the same value.

Additionally, the values of seq_parameter_set_id in the SPS and Subset SPS shall be set according to the following constraints:

- seq_parameter_set_id in the MVC Base view sub-bitstream shall refer to the SPS in the MVC Base view sub-bitstream.
- seq_parameter_set_id used in the MVC Base view sub-bitstream shall not be used in the Subset SPS in the corresponding MVC Dependent view sub-bitstream.
- seq_parameter_set_id in the MVC Dependent view sub-bitstream shall refer to the Subset SPS in the MVC Dependent view sub-bitstream.
- seq_parameter_set_id in the MVC Dependent view sub-bitstream shall not have the same value as the seq_parameter_set_id in the corresponding MVC Base view sub-bitstream.

For MFC high profile, Table 6.1 specified parameters in the Subset SPS in addition to Table 6.2.

Table 6.1 Additional Subset Sequence Parameter Set Constraints for MFC High Profile

Subset Sequence Parameter Set Syntactic Element	Allowed Value
mfc_format_idc	0 or 1
default_grid_position_flag	0
view0_grid_position_x, view0_grid_position_y	(4,8) if mfc_format_idc equals to 0 (8,4) if mfc_format_idc equals to 1
view1_grid_position_x, view1_grid_position_y	(4,8) if mfc_format_idc equals to 0 (8,4) if mfc_format_idc equals to 1
rpu_filter_enabled_flag	0 or 1
rpu_field_processing_flag	0 or 1

6.1.5   Picture Parameter Set Constraints

More than one Picture Parameter Set (PPS) can be present between two MVC Access Points. Between the two Access Points, the content of a PPS with a particular pic_parameter_set_id shall not change. If more than one PPS is present and these PPSs are different from each other, then each picture parameter set shall have a different pic_parameter_set_id.

Additionally, the values of seq_parameter_set_id in the SPS and Subset SPS shall be set according to the following constraints:

- pic_parameter_set_id used in the MVC Base view sub-bitstream shall refer to PPSs in the MVC Base view sub-bitstream.
- pic_parameter_set_id used in the MVC Base view sub-bitstream shall not be used in PPSs of the corresponding MVC Dependent view sub-bitstream.
- pic_parameter_set_id in the MVC Dependent view sub-bitstream shall refer to PPS in the MVC Dependent view sub-bitstream.
- pic_parameter_set_id in the MVC Dependent view sub-bitstream shall not be used in PPSs of the corresponding MVC Base view sub-bitstream.

6.1.6   MVC Video Usability Information (VUI) Parameter Extension Constraints

All parameters in vui_parameters() encoded in the SPS of the Subset SPS in the MVC Dependent view sub-bitstream shall be the same as parameters in vui_parameters() encoded in the SPS of the corresponding MVC Base view sub-bitstream except for the following parameters:

- hrd_parameters() (if present)
- max_dec_frame_buffering (if present)
- num_reorder_frames (if present)
- max_bytes_per_pic_denom (if present)

All parameters in mvc_vui_parameters_extension() in the MVC Dependent view sub-bitstream shall be the same as parameters in vui_parameters() in the SPS of the corresponding MVC Base view sub-bitstream, with the exception of hrd_parameters().

6.1.7   MVC Supplemental Enhancement Information (SEI) Constraints

The following SEI messages shall not be present in the MVC Base view sub-bitstream.

- Non-required view component SEI message
- View dependency change SEI message
- MVC scalable nesting SEI message

The following SEI messages shall not be present in the MVC Dependent view sub-bitstream.

- Stereo video information SEI message
- Pan-scan rectangle SEI message
- Non-required view component SEI message
- View dependency change SEI message
- Multiview view positioning SEI message

For MFC High Profile, frame packing arrangement SEI message, which shall conform to Section 5.5.2 of ATSC A/104 Part 3 [12], shall be present in the MVC Base view sub-bitstream. Frame packing arrangement SEI message shall not be present in the MVC Dependent view sub-bitstream.

6.1.7.1 Multiview View Position SEI message

When Stereo High Profile is used, the multiview view position SEI message shall be present in every access unit of an MVC Base view sub-bitstream. This SEI message is used to indicate which of MVC Base view and MVC Dependent view corresponds to the left or right eye. num_views_minus1 shall be set equal to 1 in the multiview view position SEI message.

6.1.7.2 Buffering Period SEI and/or Picture Timing SEI

When Buffering Period SEI and/or Picture Timing SEI are encoded in the MVC Base view sub-bitstream, same SEIs shall be encoded in the MVC scalable nesting SEI message of the MVC

Dependent view sub-bitstream with the same values, except for seq_parameter_set_id, which must be different.

6.1.7.3 Decoded reference picture marking

If decoded reference picture marking syntax is coded in a picture in MVC Base view sub-bitstream, the same decoded reference picture marking syntax shall be coded in the corresponding picture in a MVC Dependent view sub-bitstream; i.e. DPB management is done in the same way between the base view and the dependent view.

If decoded reference picture marking syntax is repeated using a decoded reference picture marking repetition SEI message in an MVC Base view component, then the same syntax shall be repeated in the corresponding view component of the MVC Dependent view sub-bitstream by using a decoded reference picture marking repetition SEI.

6.2 Compression Format Constraints

Table 6.2 lists the allowed compression formats. Profiles and Levels for MVC video stream shall be constrained as shown in Table 6.4 (indicated values for profile_idc and level_idc).

Table 6.2 Compression Format Constraints of MVC Base View Sub-Bitstream

Vertical Size	Horizontal Size	Pic_Width in Mbs	PicHeight in Mbs	aspect_ ratio_idc	profile_ idc	level_ idc	Display Aspect Ratio	Allowed Frame rates (Note)	Progressive/ interlaced
1080	1920	120	68	1	100	40	16:9	1,2,3,4	P
1080	1920	120	68	1	100	40	16:9	3,4	I
1080	1440	90	68	14	100	40	16:9	1,2,3,4	P
1080	1440	90	68	14	100	40	16:9	3,4	I
720	1280	80	45	1	100	32, 40	16:9	1,2,3,4,5,6	P
Note: The values for allowed frame-rates in this table are defined as Table 6.2 in A/72 Part 1 [6].									

6.3 Low Delay and Still Picture Modes

Low delay and still picture modes shall not be used.

6.4 Bit Stream Specifications for Closed Captioning, AFD, and Bar Data

Closed Captioning, AFD, and Bar Data shall not be carried in the bit stream of the MVC Dependent view. Receivers decoding bit stream of the MVC Dependent view are expected to use the information that may be present in the bit stream for the MVC Base view.

7. MVC VIDEO TRANSPORT SUBSYSTEM CHARACTERISTICS

7.1 MPEG-2 Systems Standard Usage

The transport subsystem shall comply with the Transport Stream definition of the MPEG-2 Systems standard as specified in ISO/IEC 13818-1 [7] [8] and shall be further constrained as specified in ATSC A/53 Part 3 [2] and herein. Program shall mean the collection of all elements within the emission that have the same value of MPEG-2 program_number.

The stream_type value for MVC Base view sub-bitstream program elements shall be same as the value of stream_type for AVC video program as defined in A/53 Part 3 [2] (0x1B). The stream_type value for MVC Dependent view sub-bitstream program elements shall be equal to 0x20 as defined ISO/IEC 13818-1 [7] [8]. The video T-STD for MVC Dependent view sub-bitstream shall be as

defined in ISO/IEC 13818-1 [7] [8] and shall follow the constraints for the profile and level encoded in the video elementary stream in Annex H of ISO/IEC 14496-10 [9].

An MVC Base Access Point shall occur at least once per second. Additionally, the MVC Dependent Access Point shall occur at the same time and with the same period as the MVC Base Access Point.

Video streams of stream_type 0x20 shall be identified and constrained as described hereinafter.

7.2 Virtual Channels and Parameterized Services

Any virtual channel referencing an MPEG-2 program carrying a video component of stream_type 0x20 shall identify such channel within all transmitted VCTs (TVCT and/or CVCT per A/65 [4]). The service_type value for all such virtual channels shall be set to 0x07. Such virtual channels (including their signaling) shall comply with the ATSC A/71 Parameterized Services Standard [5].

For Virtual Channels signaled as being service_type 0x07, as required by A/71 [5] there is a component_list_descriptor() present in the descriptor loop following the descriptors_length field in the virtual channel descriptor loop of any terrestrial_virtual_channel_table_section() or cable_virtual_channel_table_section(). For each stream_type present in inner loop of the component_list_descriptor(), there shall be a stream_info_details() present.

7.3 Stream Info Details for Stream Type 0x20

The syntax and semantics for stream_info_details() for stream_type 0x20 shall be as given Table 7.1 and the definitions following the table.

Table 7.1 Stream Info Details Syntax for stream_type 0x20

Syntax	No. of Bits	Format
stream_info_details() {		
MVC_dep_ profile	2	uimsbf
MVC_dep_level_idc	6	uimsbf
future_fields()	var	
}		

MVC_dep_profile – This 2-bit unsigned integer field shall indicate the MPEG-4 MVC profile used for the MPEG-4 MVC Dependent view. The coding for MVC_dep_profile shall be as given in Table 7.2.

Table 7.2 Profile of MVC Dependent View Video Stream

MVC_dep_profile	Description
0x00	Stereo High Profile
0x01	MFC High Profile
0x10-0x11	Reserved

7.4 Constraints on PSI

All program elements in the Transport Stream are described in the PSI and shall conform to the requirements of ATSC A/53 Part 3 [2].

When the video elementary stream_type is equal to 0x20 the descriptor loop immediately following ES_info_length in the TS_program_map_section() shall contain the MVC_extension_descriptor() described in ISO/IEC 13818-1 [7] [8] with the following predetermined values.

- no_prefix_nal_unit_present shall be set to 1.
- The syntax of the view_association_not_present and base_view_is_left_eyeview shall be set accordingly to indicate which view, left or right, has been assigned to the Base view component by the content author when Stereo High Profile is used.

7.5 Constraints of System Layer Constraints for MVC Video Streams

The PTS value of the PES packet for the MVC Base view component shall be the same value as the PTS value of the PES packet for the corresponding MVC Dependent view component.

The first transport packet of the PES packet carrying MVC Base Access Point shall precede the first transport packet of the PES packet carrying corresponding MVC Dependent Access Point.

The last transport packet of the PES packet carrying the last MVC Dependent view component in a GOP in decoding order shall precede the first transport packet of the PES packet carrying MVC Base Access Point of the following GOP.

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