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S T A N D A R D S

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HEVC Video Constraints for Cable Television
Part 1- Coding

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HEVC Video Constraints for Cable Television Part 1- Coding

1.0 SCOPE

This document defines the coding constraints on ITU-T Rec. H.265 | ISO/IEC 23008-2 [4] video compression (hereafter called "HEVC") for Cable Television. In particular, this document describes the coding of a single HEVC coded video elementary stream carried in MPEG-2 transport (ISO/IEC 13818-1) [4] for linear delivery systems supporting ad insertion services [3]. Beyond linear delivery with DPI, signaling is provided for segmentation of content for xDVR applications.

1.1 Background (Informative)

This document specifies the creation of an HEVC coded video elementary stream and is intended for cable video services applications such as broadcast, time-shifting (e.g., PVR/DVR service), Video-on-Demand services, and splicing (e.g., Ad-insertion) that could employ the specifications in this document. However, constraints specific to those applications are outside of the scope of this document at this time.

2.0 NORMATIVE REFERENCES

The following documents contain provisions, which, through reference in this text, constitute provisions of this document. At the time of Subcommittee approval, the editions indicated were valid. All documents are subject to revision; and while parties to any agreement based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents might not be compatible with the referenced version.

2.1 SCTE References

- [1] ANSI/SCTE 54 2015, Digital Video Service Multiplex and Transport System Standard for Cable Television.
- [2] ANSI/SCTE 128-1 2013, AVC Video Constraints for Cable Television: Part 1 – Coding
- [3] ANSI/SCTE 35 2017, Digital Program Insertion Cueing Message for Cable

2.2 Standards from other Organizations

- [4] ISO/IEC 13818-1:2018, "Information Technology – Generic coding of moving pictures and associated audio – Part 1: Systems.
- [5] ITU-T Rec. H.265 | ISO/IEC 23008-2:2018 – MPEG-H Part 2: High Efficiency Video Coding
- [6] CTA-608-E 2008, Line 21 Data Services.
- [7] ANSI/CTA-708-E 2013, Digital Television (DTV) Closed Captioning.
- [8] ATSC A/53 Part 4:2009, Digital Television Standard, MPEG-2 Video System Characteristics.
- [9] SMPTE ST 2016-1-2009: Standard for Television – Format for Active Format Description and Bar Data.
- [10] ISO/IEC 13818-2:2013, Information Technology – Generic coding of moving pictures and associated audio - Part 2: Video
- [11] ITU-R BT.2100-1:2017 Image parameter values for high dynamic range television for use in production and international programme exchange.
- [12] CTA-861-G "A DTV Profile for Uncompressed High Speed Digital Interfaces"

3.0 INFORMATIVE REFERENCES

The following documents *may* provide valuable information to the reader but are not required when complying with this standard.

3.1 SCTE References

- [13] ANSI/SCTE 215-2, HEVC Video Constraints for Cable Television Part 2- Transport.
- [14] ANSI/SCTE 43, Digital Video Systems Characteristics Standard for Cable Television.
- [15] ANSI/SCTE 07, Digital Transmission Standard for Cable Television.
- [16] ANSI/SCTE 172, Constraints on AVC and HEVC Structured Video Coding for Digital Program Insertion.
- [17] ANSI/SCTE 128-2, AVC Transport Constraints for Cable Television Part 2: Transport
- [18] ANSI/SCTE 54, Digital Video Service Multiplex and Transport System Standard for Cable Television.
- [19] ANSI/SCTE 187-2, Stereoscopic 3D PSI Signaling.
- [20] ANSI/SCTE 67, Recommended Practice for SCTE 35 Digital Program Insertion Cueing Message for Cable
- [21] ANSI/SCTE 215-1-1 2018, HEVC Video Constraints for Cable Television Part 1-1 HDR10 Coding

3.2 Standards from other Organizations

- [22] ETSI TS 101 154 V2.4.1 Digital Video Broadcasting (DVB): Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream.
- [23] SMPTE ST 170, Television – Composite Analog Video Signal – NTSC for Studio Applications.
- [24] SMPTE ST 274, Standard for television, 1920 x 1080 Scanning and Interface.
- [25] SMPTE ST 296, Standard for television, 1280 x 720 Scanning, Analog and Digital Representation, and Analog Interface.
- [26] ITU-R BT.601-6, Encoding parameters of digital television for studios.
- [27] ITU-R BT.709-6, Parameter values for the HDTV standards for production and international programme exchange.
- [28] ITU-R BT.2020-2, Parameter values for ultra-high definition television systems for production and international programme exchange.
- [29] ITU-T J.83 Digital Video Transmission Standard for Cable Television.
- [30] CEA-CEB16: Active Format Description (AFD) & Bar Data Recommended Practice.
- [31] SMPTE ST 125, Standard for television, Component Video Signal 4:2:2, Bit Parallel Digital Interface.
- [32] SMPTE ST 293, Standard for television, 720x483 Active Line at 59.95 Hz Progressive Scan Production, Digital Representation.
- [33] SMPTE ST 267, Standard for television, Bit Parallel Digital Interface- Component Video Signal 4:2:2 16x9 Aspect Ratios.
- [34] ITU-T Rec. T.35, “Procedure for the allocation of ITU-T defined codes for non-standard facilities.”
- [35] ATSC A/53, Part 3, “Service Multiplex and Transport Subsystem Characteristics”
- [36] SMPTE ST 2036-1, Ultra High Definition Television- Image Parameter Values for Program Production.
- [37] SMPTE ST 2046-1, Specifications for Safe Action and Safe Title Areas for Television.
- [38] ITU: Report ITU-R BT.2390, “High dynamic range television for production and international programme exchange,” International Telecommunications Union, Geneva.

4.0 COMPLIANCE NOTATION

Throughout this document, there are words that are used to define the significance of particular requirements. These words are:

<i>shall</i>	This word or the adjective “ <i>required</i> ” means that the item is an absolute requirement of this specification.
<i>shall not</i>	This phrase means that the item is an absolute prohibition of this specification.
<i>forbidden</i>	This word means the value specified shall never be used.
<i>should</i>	This word or the adjective “ <i>recommended</i> ” means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
<i>should not</i>	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
<i>may</i>	This word or the adjective “ <i>optional</i> ” means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.
<i>deprecated</i>	Use is permissible for legacy purposes only. Deprecated features may be removed from future versions of the standard. Implementations should avoid use of deprecated features.

This document contains symbolic references to syntactic elements used in the video and transport coding subsystems. These references are typographically distinguished by the use of a different font (e.g., *reserved*), *may* contain the underscore character (e.g., *constraint_set0_flag*) and *may* consist of character strings that are not English words (e.g., *pic_width_in_mbs_minus1*).

5.0 DEFINITIONS AND ACRONYMS

5.1 Acronyms

The following definitions and acronyms are used in this document:

AFD	Active Format Description
ATSC	Advanced Television Systems Committee
AU	Access Unit
AVC	Advanced Video Coding
BLA	Broken Link Access
CPB	Coded Picture Buffer
CRA	Clean Random Access
CVS	Coded Video Sequence
DPB	Decoded Picture Buffer
DPI	Digital Program Insertion
DTS	Decoding Time Stamp
DTV	Digital Television
DVB	Digital Video Broadcasting

DVS	Digital Video Subcommittee
ETSI	European Telecommunications Standards Institute
FPP	Forward Predicted Picture
FPS	Frames Per Second
HDR	High Dynamic Range
HDTV	High Definition Television
HRD	Hypothetical Reference Decoder
IDR	Instantaneous Decoding Refresh
IEC	International Electrotechnical Commission
IRAP	Intra Random Access Point [see definitions in 5.2]
ISO	International Organization for Standardization
MPEG	Moving Picture Experts Group
NAL	Network Abstraction Layer
NCG	Narrow Color Gamut
nPVR	Network based Personal Video Recorder
PES	Packetized Elementary Stream
POC	Picture Order Count
PPS	Picture Parameter Set
PTS	Presentation Time Stamp
PVR	Personal Video Recorder
RADL	Random Access Decodable Leading (Picture)
RASL	Random Access Skipped Leading (Picture)
SDR	Standard Dynamic Range
SDTV	Standard Definition Television
SEI	Supplemental Enhancement Information
SGOP	SCTE Group of Pictures [see definitions in 5.2]
SHRAP	SCTE HEVC Random Access Point [see definitions in 5.2]
SPS	Sequence Parameter Set
SRAP	SCTE (AVC) Random Access Point
T-STD	Transport Stream System Target Decoder
VCL	Video Coding Layer
VOD	Video on Demand
VPS	Video Parameter Set
VUI	Video Usability Information
WCG	Wide Color Gamut
xDVR	Generic Digital Video Recorder [see definitions in 5.2]