

SCTE | **STANDARDS**

Digital Video Subcommittee

SCTE STANDARD

ANSI/SCTE 215-1 2024

**HEVC Video Constraints for Cable Television
Part 1- Coding**

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Document Tags

☒ Specification	☐ Checklist	☐ Facility
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☐ Architecture or Framework	☒ Cloud	☒ Customer Premises
☐ Procedure, Process or Method		

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1. Introduction

1.1. Executive Summary

This document specifies the creation of a HEVC coded video elementary stream for SDR and HDR formats (specifically HDR10) 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.

A single type of HDR transfer function is mandated for delivery in a cable network. Dynamic metadata applications backwards compatible to the specified HDR format can be used to adapt HDR imagery to a multiplicity of displays that have different characteristics than the underlying content.

The means to carry SCTE dynamic metadata Application #1 (DM App #1) and Application #4 (DM App #4) in an HEVC bitstream is described in Section 6 and in Appendix B and C. SCTE DM Apps describe parametric data sets to be used to adapt the imagery for viewers' displays and environment.

1.2. Scope

This document defines the coding constraints on ITU-T Rec. H.265 | ISO/IEC 230008-2 [MPEG-HEVC] video compression (hereafter called "HEVC") for Cable Television. In particular, this document describes the coding of a single HEVC coded video elementary stream in an SDR or HDR format carried in MPEG-2 transport (ISO/IEC 13818-1) [MPEG-2 TS] for linear delivery systems supporting ad insertion services [SCTE 35] or for adaptive bitrate streaming delivery technologies [SCTE 214-1]. Beyond linear delivery with DPI, signaling is provided for segmentation of content for xDVR applications.

1.3. Benefits

The benefit of following this specification is an MPEG-HEVC stream can be created that can be smoothly played across multiple types of MPEG-HEVC decoders that are used in cable applications.

1.4. Intended Audience

This document specifies the creation of a 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. Normative References

The following documents contain provisions which, through reference in this text, constitute provisions of this document. The editions indicated were valid at the time of subcommittee approval. 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

[SCTE 54] ANSI/SCTE 54 2020, Digital Video Service Multiplex and Transport System Standard for Cable Television.

- [SCTE 128-1] ANSI/SCTE 128-1 2020, AVC Video Constraints for Cable Television: Part 1 – Coding
- [SCTE 35] ANSI/SCTE 35 202x, Digital Program Insertion Cueing Message for Cable
- [SCTE 214-1] ANSI/SCTE 214-1 202x, MPEG DASH for IP-Based Cable Services Part 1:MPD Constraints and Extensions

2.2. Standards from Other Organizations

- [MPEG-2 TS] ISO/IEC 13818-1:2022, “Information Technology – Generic coding of moving pictures and associated audio – Part 1: Systems.
- [HEVC] ITU-T Rec. H.265 | ISO/IEC 23008-2:2021 – MPEG-H Part 2: High Efficiency Video Coding
- [CTA 608-E] ANSI/CTA-608-E S-2019, Line 21 Data Services.
- [CTA 708-E] ANSI/CTA-708-E S-2023, Digital Television (DTV) Closed Captioning.
- [ATSC A/53] ATSC A/53 Part 4:2009, Digital Television Standard, MPEG-2 Video System Characteristics.
- [SMPTE ST 2016-1] SMPTE ST 2016-1-2009: Standard for Television – Format for Active Format Description and Bar Data.
- [MPEG-2 Video] ISO/IEC 13818-2:2013, Information Technology – Generic coding of moving pictures and associated audio -Part 2: Video
- [ITU-R 2100] ITU-R BT.2100-2:2018 Image parameter values for high dynamic range television for use in production and international programme exchange.
- [CTA 861-H] ANSI/CTA-861-H:2021 “A DTV Profile for Uncompressed High Speed Digital Interfaces”
- [SMPTE ST 2086] SMPTE ST 2086:2018: SMPTE Standard – Mastering Display Color Volume Metadata Supporting High Luminance and Wide Color Gamut Images.
- [ETSI TS 103 572] ETSI TS 103 572 V1.2.1 (2020-10): HDR Signalling and Carriage of Dynamic Metadata for Colour Volume Transform: Application #1.
- [ETSI TS 103 433-1] ETSI TS 103 433-1 V1.4.1 High-Performance Single Layer High Dynamic Range (HDR) System for use in Consumer Electronics devices; Part 1: Directly Standard Dynamic Range (SDR) Compatible HDR System (SL-HDR1).
- [SMPTE ST 2094-10] SMPTE ST 2094-10: 2021: SMPTE Standard – Dynamic Metadata for Color Volume Transform – Application #1.
- [SMPTE ST 2094-40] SMPTE ST 2094-40: 2020: SMPTE Standard – Dynamic Metadata for Color Volume Transform – Application #4.

2.3. Other Published Materials

No normative references are applicable.

3. Informative References

The following documents might provide valuable information to the reader but are not required when complying with this document.

3.1. SCTE References

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

3.2. Standards from Other Organizations

- [ETSI TS 101 154] 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.
- [SMPTE ST 170] SMPTE ST 170, Television – Composite Analog Video Signal – NTSC for Studio Applications.
- [SMPTE ST 274] SMPTE ST 274, Standard for television, 1920 x 1080 Scanning and Interface.
- [SMPTE ST 296] SMPTE ST 296, Standard for television, 1280 x 720 Scanning, Analog and Digital Representation, and Analog Interface.
- [ITU-R BT.601-6] ITU-R BT.601-6, Encoding parameters of digital television for studios.
- [ITU-R BT.709-6] ITU-R BT.709-6, Parameter values for the HDTV standards for production and international programme exchange.
- [ITU-R BT.2020-2] ITU-R BT.2020-2, Parameter values for ultra-high definition television systems for production and international programme exchange.

- [ITU-T J.83] ITU-T J.83 Digital Video Transmission Standard for Cable Television.
- [CEA-CEB16] CEA-CEB16: Active Format Description (AFD) & Bar Data Recommended Practice.
- [SMPTE ST 125] SMPTE ST 125, Standard for television, Component Video Signal 4:2:2, Bit Parallel Digital Interface.
- [SMPTE ST 293] SMPTE ST 293, Standard for television, 720x483 Active Line at 59.95 Hz Progressive Scan Production, Digital Representation.
- [SMPTE ST 267] SMPTE ST 267, Standard for television, Bit Parallel Digital Interface- Component Video Signal 4:2:2 16x9 Aspect Ratios.
- [ITU-T T.35] ITU-T Rec. T.35, “Procedure for the allocation of ITU-T defined codes for non-standard facilities.”
- [ATSC A/53] ATSC A/53, Part 3, “Service Multiplex and Transport Subsystem Characteristics”
- [SMPTE ST 2036-1] SMPTE ST 2036-1, Ultra High Definition Television- Image Parameter Values for Program Production.
- [SMPTE ST 2046-1] SMPTE ST 2046-1, Specifications for Safe Action and Safe Title Areas for Television.
- [ITU-R BT.2390] ITU: Report ITU-R BT.2390, “High dynamic range television for production and international programme exchange,” International Telecommunications Union, Geneva.
- [CICP 23091-2] ITU-T H.273| ISO/IEC 23091-2:2022, Information technology-Coding independent code points – Part 2:Video.
- [CICP 23091-4] ITU-T H. Supplemental 19| ISO/IEC TR 23091-4:2021, Information technology-Coding independent code points – Part 4: Usage of video signal type code points

3.3. Other Published Materials

No informative references are applicable.

4. Compliance Notation

<i>shall</i>	This word or the adjective “ <i>required</i> ” means that the item is an absolute requirement of this document.
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5. Abbreviations and Definitions

5.1. Abbreviations

AFD	Active Format Description
ATSC	Advanced Television Systems Committee
AU	Access Unit
AVC	Advanced Video Coding
BLA	Broken Link Access
cDVR	Cloud DVR
CPB	Coded Picture Buffer
CRA	Clean Random Access
CVS	Coded Video Sequence
DM	Dynamic Metadata
DPB	Decoded Picture Buffer
DPI	Digital Program Insertion
DTS	Decoding Time Stamp
DTV	Digital Television
DVB	Digital Video Broadcasting
DVR	Digital Video Recorder
DVS	Digital Video Subcommittee
ETSI	European Telecommunications Standards Institute
FPP	Forward Predicted Picture
FPS	Frames Per Second
HEVC	High Efficiency Video Coding
HDR	High Dynamic Range
HDTV	High Definition Television
HRD	Hypothetical Reference Decoder
IDR	Instantaneous Decoding Refresh