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S T A N D A R D S

Digital Video Subcommittee

SCTE STANDARD

SCTE 215-1-1 2018

**HEVC Video Constraints for Cable Television
Part 1-1 HDR10 Coding**

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HEVC Video Constraints for Cable Television Part 1- Coding

1.0 SCOPE

This document defines the additional coding constraints on SCTE 215-1 HDR video streams using an HDR10 format.

1.1 Background (Informative)

This document in combination with SCTE 215-1 specifies the creation of an HDR10 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 215-1, HEVC Video Constraints for Cable Television Part 1- Coding.

2.2 Standards from other Organizations

- [2] ITU-R BT.2100-1:2017 Image parameter values for high dynamic range television for use in production and international programme exchange.
- [3] 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

[4] ANSI/SCTE 215-2, HEVC Video Constraints for Cable Television Part 2- Transport.

3.2 Standards from other Organizations

- [5] ITU-R BT.2020-2, Parameter values for ultra-high definition television systems for production and international programme exchange.
- [6] SMPTE ST 2036-1, Ultra High Definition Television- Image Parameter Values for Program Production.
- [7] 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:

CLL	Content Light Level
DVB	Digital Video Broadcasting
DVS	Digital Video Subcommittee
ETSI	European Telecommunications Standards Institute
FALL	Frame Average Light Level
HDR10	High Dynamic Range (PQ) 10 bit Format [see definitions in 5.2]
HDTV	High Definition Television
MDCV	Mastering Display Color Volume
MPEG	Moving Picture Experts Group
PALL	Picture Average Light Level

- SEI Supplemental Enhancement Information
- VUI Video Usability Information
- WCG Wide Color Gamut

5.2 Definitions

- HDR10 High Dynamic Range with a PQ EOTF, BT.2100 WCG container, 10 bit pixel values which may include MaxCLL, MaxFALL, and Mastering Display Color Volume information
- HEVC ITU-T Rec. H. 265 | ISO/IEC 23008-2:2014 High Efficiency Video Coding [1]

Numerical formats are defined in the following Table 1:

Table 1- Numerical Format Definitions

Example Values	Description
12345	Example of a decimal value format
0x2A	Example of a hexadecimal value format
'10010100'	Example of a string of binary digits

6.0 POSSIBLE VIDEO INPUTS - HDR10

Video streams can also be in the form of high dynamic range (HDR) which consists of streams of dynamic range types identified in Table 2.

Table 2- HDR Dynamic Range Types of Video

HDR Type	EOTF	Color Gamut	Bits Per Pixel	Additional Info
HDR10	PQ	BT.2100-1 using BT.2020 Containers.	10	Optional: MaxCLL, MaxPALL, MDCV

NOTE 1: Resolution of video can be considered orthogonal to the dynamic range properties of video. For example, HDR10 streams may be either HDTV or UHD TV1 resolution.

7.0 ADDITIONAL CONSTRAINTS ON HEVC CODING FOR HDR10 STREAMS

7.1.1 Additional VUI Constraints

Additional VUI constraints sets for colorimetry information for HDR10 are listed below in Table 3:

Table 3- Video Usability Information Constraints

VUI Header Syntactic Element	Allowed Value
	HDR10
colour primaries	9
transfer characteristics	16
matrix coefficients	9
VideoFullRangeFlag	0

It is required that the colorimetry information be sent for Level 5 and Level 5.1 (UHDTV1) bitstreams and for all HDR10 type bitstreams.

7.1.2 Additional Supplemental Enhancement Information (SEI) Constraints

HDR10 usage constraints on types of SEI messages are listed in Table 4.

Table 4- Additional Supplementary Enhancement Information Constraints for Carriage of HDR10 Metadata

SEI Header Syntactic Element	Usage Constraints
Mastering Display Colour Volume SEI message	Optionally used at Sequence Level
Content Light Level Information SEI message	Optionally used at Sequence Level

NOTE 2: The MaxCLL and MaxPALL information are conveyed respectively in max_content_light_level and max_pic_average_light_level parameters of the Content Light Level Information SEI message. MaxPALL is also more commonly known as MaxFALL.

NOTE 3: The use of the SEI messages listed in Table 4 are optional.

