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Engineers***

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Stereoscopic 3D Formatting and Coding for Cable

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1.0 SCOPE

This document defines the video-related formatting, and encoding parameters for high-definition frame-compatible stereoscopic 3D content for distribution on cable television systems. Encoding parameters and constraints defined by this specification can be applied to different content types, including broadcast programming, switched digital video (SDV), VOD content, and advertising content to be inserted into broadcast or VOD content.

This document defines only the specific parameters relevant to high-definition frame-compatible S3D content beyond what are already required and specified elsewhere for flat (2D) video content and signaling. Frame-compatible S3D programming will otherwise follow all standardized encoding and signaling practices except where specifically identified in this document. This document does not define a complete distribution method nor does it define all aspects of the cable system infrastructure that content encounters during distribution and playback.

2.0 NORMATIVE REFERENCES

The following documents contain provisions, which, through reference in this text, constitute provisions of this standard. At the time of subcommittee approval, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

2.1 SCTE References

[SCTE 43]	ANSI/SCTE 43 2005, Digital Video Systems Characteristics Standard for Cable Television
[SCTE 54]	ANSI/SCTE 54 2009, Digital Video Service Multiplex and Transport System Standard for Cable Television
[SCTE 128]	ANSI/SCTE 128 2010-a, AVC Video Systems and Transport Constraints for Cable Television
[SCTE 187-2]	SCTE 187-2 2012 Stereoscopic 3D Transport & Signaling

2.2 Standards from other Organizations

[IEC 13818-1]	ISO/IEC 13818-1:2007, International Standard, Information Technology - Generic Coding of Moving Pictures and Associated Audio Information: Systems
[IEC 13818-1/AMD 7]	ISO/IEC 13818-1:2007 / Amendment 7, Signalling of stereoscopic video in MPEG-2 systems

[IEC 13818-2]	ISO/IEC 13818-2:2000 (E), International Standard, Information Technology - Generic Coding of Moving Pictures and Associated Audio Information: Video
[IEC 13818-2/AMD 4]	ISO/IEC 13818-2:2000 (E) / Amendment 4, Frame packing arrangement signalling for 3D content
[ITU H.264]	ITU-T. Recommendation H.264 (03/2010) Advanced video coding for generic audio visual services
[SMPTE 274M]	SMPTE 274M-2008, Standard for Television - 1920 x 1080 Image Sample Structure, Digital Representation and Digital Timing Reference Sequences for Multiple Picture Rates
[SMPTE 296M]	SMPTE 296M-2011, Standard for Television, 1280 x 720 Scanning, Analog and Digital Representation, and Analog Interface

3.0 INFORMATIVE REFERENCES

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

3.1 SCTE References

[SCTE 187-3]	SCTE-187-3 2012 Informative Guidance for Stereoscopic Video
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4.0 COMPLIANCE NOTATION

"SHALL"	This word or the adjective "REQUIRED" means that the item is an absolute requirement of this specification.
"SHALL NOT"	This phrase means that the item is an absolute prohibition of this specification.
"SHOULD"	This word or the adjective "RECOMMENDED" 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.
"SHOULD NOT"	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.
"MAY"	This word or the adjective "OPTIONAL" 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.

5.0 DEFINITIONS AND ACRONYMS

3DTV	Three-Dimensional Television
ASCII	American Standard Code for Information Interchange
AFD	Active Format Descriptor
AVC	Advanced Video Coding
FC-S3D	Frame-Compatible Stereoscopic Three-Dimensional
FC-S3D-ZD	FC-S3D with Zero Disparity
GOP	Group of Pictures
MPEG	Moving Picture Experts Group
NAL	Network Abstraction Layer
PSI	Program-Specific Information
PMT	Program Map Table
S3D	Stereoscopic, three-Dimensional
SbS	Side-by-Side
SEI	Supplemental Enhancement Information
STB	Set Top Box
TaB	Top-and-Bottom
VUI	Video Usability Information
ZPS	Zero Parallax Setting

Frame-Compatible Stereoscopic Three-Dimensional (FC-S3D): Refers to video content composed of left and right eye stereoscopic image pairs assembled into single packed video frames for delivery through legacy video distribution systems. The left and right image pair are typically subject to a filtering, decimation and formatting process to generate a packed frame that has the same pixel count as the original left or right frame. A reverse of this process is performed to reconstruct the full stereoscopic image pair prior to display. Examples of frame-compatible formats include top-bottom and side-by-side.

FC-S3D-Zero Disparity (FC-S3D-ZD): Refers to a subset of FC-S3D content in which the left and right images are identical. Standard 2D content can be pre-processed into FC-

S3D-ZD to match the preceding or succeeding 3D content to facilitate seamless transitions as described in Section 8.4.

6.0 INTRODUCTION

This standard is part one of a three-part standard that describes the use of stereoscopic, three-dimensional (S3D) video programming using a frame-compatible delivery mechanism for cable systems in North America. In many ways the FC-S3D signals can be processed and handled in the same way as flat (2-dimensional) video programming, and hence it is described as *frame-compatible*. The purpose of this three-part standard is to define those parts that are necessarily different from conventional (2-dimensional) video programming.

7.0 DOCUMENT STRUCTURE

Part 1 of this standard (this document) defines the video formatting and constraints as well as specific 3D signaling that is part of the video user data bits as shown below in Figure 1. Part 2 of this standard [SCTE 187-2] defines the program-specific information (PSI) requirements for signaling, which are carried in the program map table (PMT) and also illustrated below in Figure 1. Finally, Part 3 of this standard [SCTE 187-3] is an informative document that provides tutorial and reference information about the implications of certain formatting as it applies to stereoscopic 3D production and content preparation.