

SMPTE STANDARD

Interoperable Master Format — Application #2



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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Operations Manual.

SMPTE ST 2067-20 was prepared by Technology Committee 35PM.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Engineering Document. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

1 Scope

This document specifies Compositions for IMF Application #2. It is a specialization of the IMF Framework.

Application #2 is meant for studio applications where a TV or movie title is transformed into multiple content versions (airline edits, special edition, languages...) that are made available to multiple consumer distribution channels (Internet, optical media, broadcast...) across multiple territories and over the span of many months to over a year. It uses HD image essence coded as a JPEG 2000 codestream and audio essence coded as linear PCM.

The transformation of Application #2 Compositions to the output formats appropriate for each distribution channel is specified in other documents.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword "reserved" indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

3 Normative References

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

SMPTE ST 377-1:2011, Material Exchange Format (MXF) — File Format Specification

Amendment 1:2012 to SMPTE ST 377-1:2011

Amendment 2:2012 to SMPTE ST 377-1:2011

SMPTE ST 422:2013, MXF — Mapping JPEG 2000 Codestreams into the MXF Generic Container

SMPTE ST 2067-2:2013, Interoperable Master Format — Core Constraints

SMPTE RP 224, SMPTE Labels Register

ISO/IEC 15444-1:2004/Amendment 3:2010, Information Technology — JPEG 2000 Image Coding System

Recommendation ITU-R BT.601-5, Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide-Screen 16:9 Aspect Ratios

Recommendation ITU-R BT.709-5, Parameter Values for the HDTV Standards for Production and International Programme Exchange

World Wide Web Consortium (W3C) (2004, October 28). XML Schema Part 1: Structures (Second Edition).

4 Overall

4.1 General

All provisions of SMPTE ST 2067-2 shall apply.

4.2 Format

Track Files shall conform to SMPTE ST 379-1.

4.3 Shim Parameters

Track Files shall be associated with the shim parameter values specified in Table 1.

Table 1 – Shim Parameter Values Definitions

Shim Parameter	Value
shim_id	http://www.smpte-ra.org/schemas/2067-20/2013
gc_type	379-1-gc
picture_family	JPEG2000
picture_bitrate	ST 2067-20
picture_format	ST 2067-20
picture_custom_ANC	false
picture_render_ANC	false

5 Essence

5.1 Image Essence

5.1.1 General

Image essence shall consist of image frames, each a rectangular pixel array.

5.1.2 Constraints

Image frames shall conform to the combinations of characteristics allowed in Table 2

Table 2 – Image Characteristics

Image Frame Width	Section 5.1.3	1..1920			
Image Frame Height	Section 5.1.3	1..1080			
Pixel Bit Depth	Section 5.1.3.6	8 10			
Frame Structure	Section 5.1.3.2	Progressive		Interlaced	
Stereoscopy	Section 5.1.3.10	Stereoscopic Monoscopic		Monoscopic	
Frame Rate	Section 5.1.3.4	24 24000/1001 25 30 30000/1001 50 60 60000/1001		25 30 30000/1001	
Sampling	Section 5.1.3.9	4:4:4		4:2:2	4:2:2
Quantization	Section 5.1.3.8	QE.1	QE.2	QE.1	QE.1
Color Components	Section 5.1.3.5	R'G'B' Y'C _B C _R	R'G'B'	Y'C _B C _R	Y'C _B C _R
Colorimetry	Section 5.1.3.7	COLOR.1 COLOR.2 COLOR.3	COLOR.3	COLOR.1 COLOR.2 COLOR.3	COLOR.1 COLOR.2 COLOR.3

5.1.3 Characteristics

5.1.3.1 Frame Dimensions

The width and height of the frame are defined as the number of horizontal and vertical pixel elements, respectively.

5.1.3.2 Frame Structure

5.1.3.2.1 General

Implementations shall support image frames with either a progressive or interlaced structure.

5.1.3.2.2 Progressive Structure

An image frame with progressive structure shall consist of a complete image frame, scanned progressively left to right and from top to bottom.

5.1.3.2.3 Interlaced Structure

An image frame with interlaced structure shall consist of a pair of fields, a first field then a second field. The lines of each field shall have twice the vertical spatial sampling pitch of the frame. Lines in the second field shall be displaced vertically by the vertical sampling pitch and the line timing shall be delayed temporally by half the frame time from the lines in the first field.

The temporal order and relative line positions of the two fields are indicated by the Field Dominance and DisplayF2Offset items described in Section 6.1.2.1.

5.1.3.3 Frame Size

The height and width of the image frame shall be an integer.

Image frames with an interlaced image structure shall have an even number of vertical pixels.

5.1.3.4 Frame Rate

When interlaced frame structure is used, the field rate, i.e. the number of image fields per second, shall be twice the frame rate.

5.1.3.5 Color Components

Implementations shall support image frames sampled using either R'G'B' or Y'C_BC_R color component triplets.

5.1.3.6 Pixel Bit Depth

Implementations shall support the color component of each pixel being represented by an integer in the set $\{0..2^n - 1\}$, with n being the pixel bit depth.

5.1.3.7 Colorimetry

Implementations shall support values of the R'G'B' or Y'C_BC_R component signals being mapped to red, green and blue tristimulus values according to one of the systems specified in Table 3.

Table 3 – Colorimetry Systems

System	Description
COLOR.1	Mapped as specified for 625-line systems in Section 2.6 of Recommendation ITU-R BT.601
COLOR.2	Mapped as specified for 525-line systems in Section 2.6 of Recommendation ITU-R BT.601
COLOR.3	Mapped as specified in Section 1 of Part 2 of Recommendation ITU-R BT.709

Note : In Recommendation ITU-R BT.601 and Recommendation ITU-R BT.709, the signals R', G', B', Y', C_B and C_R are referred to as signals E'_R, E'_G, E'_B, E'_Y, E'_{CB} and E'_{CR} respectively, i.e. they correspond to gamma pre-corrected signals.