

SMPTE STANDARD



Immersive Audio Bitstream Level 0 Plug-in

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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.

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Intellectual Property

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Introduction

This section is entirely informative and does not form an integral part of this Engineering Document.

SMPTE ST 2098-2 has proven (i) effective in representing cinematic immersive sound essence, and (ii) straightforward to wrap in MXF. The objective of this standard is to define a baseline method for the carriage of such sound essence for use with feature and episodic content in IMF compositions (Level 0).

1 Scope

This document specifies requirements for a plug-in mechanism to add Immersive Audio Bitstream (IAB) essence, as specified in ST 2098-2, to IMF compositions.

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; then 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 engineering document. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this engineering document 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

SMPTE ST 377-4:2012, MXF Multichannel Audio Labeling Framework

SMPTE ST 429-18:2019, D-Cinema Packaging — Immersive Audio Track File

SMPTE ST 2067-2:2016, Interoperable Master Format — Core Constraints

SMPTE ST 2067-3:2016, Interoperable Master Format — Composition Playlist

SMPTE ST 2067-5:2013, Interoperable Master Format — Essence Component

SMPTE ST 2098-2:2019, Immersive Audio Bitstream Specification

4 Terms and Definitions

No terms and definitions are listed in this document.

5 IAB Track File

5.1 General

An IAB Track File is a Track File, as specified in Section 5.1 of SMPTE ST 2067-2, which contains ST 2098-2 Immersive Audio Bitstream essence, and is further constrained by the provisions of this Section.

5.2 Identification

The ConformsToSpecifications element specified in Annex B shall be present and contain a single instance of the Universal Label (UL) specified in Table 4.1.

Table 4.1. IMF IAB Track File Level 0 Label.

Kind	Leaf
Name	IMF IAB Track File Level 0
Symbol	IMF_IABTrackFileLevel0
UL	urn:smpte:ul:060E2B34.0401010D.01010201.02000000

5.3 Single Immersive Audio Bitstream

The Essence Track of the IAB Track File shall reference an Essence Container, as defined in SMPTE ST 377-1, that contains a single Immersive Audio Bitstream specified in ST 2098-2.

5.4 Single Sound Essence Track

The following shall apply to the Essence Track referencing the Immersive Audio Bitstream essence:

- It shall be a Sound Essence Track.
- Its Edit Rate, as specified at Annex B.12 of SMPTE ST 377-1, shall be equal to the Sample Rate Property of the IAB Essence Descriptor, as defined in Section 5.9.
- In accordance with Section 4.1 of SMPTE ST 377-1, an Edit Unit shall correspond to a single complete frame of the Immersive Audio Bitstream, as defined in Section 8 of SMPTE ST 2098-2.

NOTE The first requirement above determines the value of the Data Definition item of the Sequence referenced by the Sound Essence Track.

5.5 Single Sound Element

The Immersive Audio Bitstream shall be contained in a single Sound Element, as defined in SMPTE ST 377-1, whose Essence Element Key shall be as specified in Table 4.2.

Table 4.2. Essence Element Key.

Kind	Leaf
Name	IMF IAB Essence Clip-Wrapped Element
Symbol	IMF_IABEssenceClipWrappedElement
UL	urn:smpte:ul:060E2B34.01020101.0D010301.16cc0Dnn

NOTE As audio essence, the Immersive Audio Bitstream is clip-wrapped as specified in SMPTE ST 2067-5.

5.6 Bitstream Characteristics

The following characteristics of the Immersive Audio Bitstream shall remain constant in the Essence Container:

- BitDepth
- FrameRate
- SampleRate

5.6.1 Bitstream Constraints

- The Bit Depth of the Immersive Audio Bitstream shall be 24 bits.
- All AudioData elements contained within the Immersive Audio Bitstream shall be AudioDataPCM elements.
- AudioDataDLC elements shall not be present in the Immersive Audio Bitstream.

5.6.2 Bitstream Element Constraints

The following sections describe IAB bed related elements that shall remain fixed in configuration, and fields within these elements that shall remain fixed.

5.6.2.1 BedDefinition

All IAFrames in a given Immersive Audio Bitstream shall have the same number of BedDefinition elements. For each BedDefinition element in a given IAFrame, there shall be exactly one BedDefinition element in each additional IAFrame that has the same MetaID value. BedDefinition elements with the same MetaID shall have the same value(s) for ConditionalBed, BedUseCase (if present), ChannelCount, and ChannelID. No element which is a child of an ObjectDefinition or BedDefinition shall be used.

5.6.2.2 BedRemap

BedRemap elements shall not be present in the Immersive Audio Bitstream.

5.6.2.3 Conditional Elements

No conditional elements (i.e. BedDefinition elements that have ConditionalBed set to 1 or ObjectDefinition elements that have ConditionalObject set to 1) shall be used unless their UseCase is set to 0xFF (Always Use).