SMPTE STANDARD

Interoperable Master Format — Audio with Frame-based S-ADM Metadata Plug-in

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Approved September 27, 2023

Foreword

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SMPTE Engineering Documents are drafted in accordance with the rules given in its Standards Operations Manual. This SMPTE Engineering Document was prepared by Technology Committee TC 35PM.

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 clause 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.

Introduction

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

MGA Signals with S-ADM metadata are created by file-based and real-time production tools. The objective of this standard is to define a method for adding such signals as a Virtual Track to an IMF Composition.

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 a plug-in mechanism to add Metadata Guided Audio (MGA) Signals with Serialized Audio Definition Model (S-ADM) metadata essence to IMF Compositions. S-ADM is specified in ITU-R BS.2125. The MGA Signal and its mapping into MXF is specified in SMPTE ST 2127-1. The mapping of MGA Signals with S-ADM audio metadata is specified in SMPTE ST 2127-10.

2 Normative references

The following standard contains provisions that, through reference in this text, constitute provisions of this standard. Dated references require that the specific edition cited shall be used as the reference. Undated citations refer to the edition of the referenced document (including any amendments) current at the date of publication of this document. All standards are subject to revision, and users of this engineering document are encouraged to investigate the possibility of applying the most recent edition of any undated reference.

Recommendation ITU-R BS.2076, Audio Definition Model

Recommendation ITU-R BS.2125, A serial representation of the Audio Definition Model

SMPTE ST 377-1:2019, Material Exchange Format (MXF) — File Format Specification

SMPTE ST 377-42:2021, MCA Label Controlled Vocabulary

SMPTE ST 2067-2:2020, Interoperable Master Format — Core Constraints

SMPTE ST 2067-3:2020, Interoperable Master Format — Composition Playlist

SMPTE ST 2127-1:2022, Mapping Metadata Guided Audio (MGA) signals into the MXF Constrained Generic Container

SMPTE ST 2127-10:2022, Mapping Metadata Guided Audio (MGA) signals with S-ADM Metadata into the MXF Constrained Generic Container

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in SMPTE ST 2127-1 apply.

4 MGA S-ADM Signal

4.1 General

The MGA S-ADM Signal shall be a sequence of Metadata Guided Audio (MGA) Frames. The MGA Frame is defined in SMPTE ST 2127-1.

For IMF applications, the MGA S-ADM Signal shall be as constrained by the provisions of Clause 4.

NOTE Annex A lists examples of MGA S-ADM applications.

4.2 MGA S-ADM Signal constraints

The MGA S-ADM Signal shall be constrained as follows:

- The MGA S-ADM Signal shall contain exactly one MGA Audio Metadata section carrying S-ADM metadata. The MGA Audio Metadata section carrying S-ADM metadata shall follow the MGA Audio Essence section. The index value of the S-ADM metadata section will therefore be equal to 1. The MGA Audio Metadata section carrying S-ADM metadata shall use Identifier Value 0x02 (Audio Metadata Payload) as defined in Table 2 of SMPTE ST 2127-1:2022. The MGA Audio Metadata section carrying S-ADM metadata shall only contain S-ADM frames of type ‘full’ and type ‘header’, as defined in ITU-R BS.2125.

- The MGA S-ADM Signal may contain additional Audio Metadata sections for supplemental informative metadata (with index values 2 and higher).

- MGA Audio Metadata sections shall not use Identifier Value 0x01 (Audio Metadata Pack) as defined in Table 2 of SMPTE ST 2127-1:2022.

4.3 Homogeneous essence

The following parameters shall remain constant in the Essence Container:

- Number of MGA Audio Metadata sections

- Number of MGA Soundfield Groups

5 MGA S-ADM Track File

5.1 General

An MGA S-ADM Track File is a Track File, as specified in Subclause 5.1 of SMPTE ST 2067-2:2020, which contains Metadata Guided Audio (MGA) with S-ADM metadata according to SMPTE ST 2127-10.

The MGA S-ADM Track File shall be as constrained by the provisions of Clause 5.

5.2 Index Table usage

The Index Table shall be present and the Random Access flag bit of the Index Entry Array structure, as defined in SMPTE ST 377-1, shall have a value of 1 for all Edit Units.

5.3 Single MGA S-ADM Signal

The Essence Track of the MGA S-ADM Track File shall reference an Essence Container, as defined in SMPTE ST 377-1, that shall contain a single MGA Signal with S-ADM metadata (MGA S-ADM Signal) as specified and constrained in Clause 4.

5.4 Wrapping

The MGA S-ADM Signal shall be clip-wrapped, as specified in SMPTE ST 2127-1.

5.5 Essence descriptor constraints

5.5.1 MGA Sound Essence Descriptor constraints

The MGA Sound Essence Descriptor is defined in SMPTE ST 2127-1.

Within a given MGA S-ADM Track File, the constraints of Table 1 shall apply.

Table 1 — MGA Sound Essence Descriptor constraints

Item (Symbol)	MGA Sound Essence Descriptor constraints
AudioSampleRate	Shall be set to the sampling rate of the audio samples in the MGA Audio Essence section and shall be set either to 48000 or 96000.
Locked	Shall be ignored.
AudioReferenceLevel	Shall be ignored.
AudioFormulation	If present, the Electro-Spatial Formulation item of the MGA Sound Essence Descriptor shall be set to a value of 15 (multi-channel mode default).
ChannelCount	Shall be set to the number of sound channels in the MGA Audio Essence section.
QuantizationBits	Shall be set to 24.
DialNorm	Shall be ignored.
SoundCompression	See Subclause 6.2 of SMPTE ST 2127-1:2022.
ReferenceAudioAlignmentLevel	The Reference Audio Alignment Level item, as defined in Subclause E.3 of SMPTE ST 2067-2:2020, should be present.
ReferenceImageEditRate	The Reference Image Edit Rate item, as defined in Subclause E.2 of SMPTE ST 2067-2:2020, should be present.

5.5.2 S-ADM Audio Metadata SubDescriptor

The S-ADM Audio Metadata SubDescriptor is defined in SMPTE ST 2127-10.

Within a given MGA S-ADM Track File, the constraints of Table 2 shall apply.

Table 2 — S-ADM Audio Metadata SubDescriptor constraints

Item (Symbol)	S-ADM Audio Metadata SubDescriptor constraints
SADMProfileLevelULBatch	Should be present and identify the Profile and Level to which the S-ADM metadata stream complies.

5.6 Audio labeling

5.6.1 General

An MGA S-ADM Track File shall contain one instance of the MGA Soundfield Group Label SubDescriptor (Symbol: `MGASoundfieldGroupLabelSubDescriptor`) for each of the soundfield groups described by the MGA Audio Metadata section carrying S-ADM metadata (see Clause 7 for additional constraints). The MGA Soundfield Group Label SubDescriptor is defined in SMPTE ST 2127-1 and further extended in SMPTE ST 2127-10.

An MGA S-ADM Track File shall not contain instances of the MGA Soundfield Group Label SubDescriptor for soundfield groups described in MGA Audio Metadata sections with an index value of 2 or higher.

NOTE 1 Subclause 4.2 constrains the structure of the Audio Metadata sections in an MGA frame for the purposes of this document.

An MGA S-ADM Track File shall not contain instances of AudioChannelLabelSubDescriptor, SoundfieldGroupLabelSubDescriptor, or GroupOfSoundfieldGroupsLabelSubDescriptor.

NOTE 2 The SoundfieldGroupLabelSubDescriptor is not allowed according to SMPTE ST 2127-1.

5.6.2 MGA Soundfield Group Label SubDescriptor constraints

The MGA Soundfield Group Label SubDescriptor is defined in SMPTE ST 2127-1.

Within a given MGA S-ADM Track File, the constraints of Table 3 shall apply.

Table 3 — MGA Soundfield Group Label SubDescriptor constraints

Item (Symbol)	MGA Soundfield Group Label SubDescriptor Constraints
MCALabelDictionaryID	UL for an MGA Soundfield as defined in Table 13 of SMPTE ST 2127-1:2022. For a channel-based S-ADM configuration, the values defined in SMPTE ST 377-42 may be used instead.
MCATagSymbol	‘MGASf’ as defined in SMPTE ST 2127-1. For a channel-based S-ADM configuration, the values defined in SMPTE ST 377-42 may be used instead. If a value from SMPTE ST 377-42 is used, it shall be prepended with the string ‘sg’.
MCATagName	Shall be present. ‘MGA Soundfield’ as defined in SMPTE ST 2127-1. For a channel-based S-ADM configuration, the values defined in SMPTE ST 377-42 may be used instead.
RFC5646SpokenLanguage	Shall be equal to the primary spoken language associated with the MGA Soundfield. It shall be absent if and only if the MGA Soundfield is not associated with a primary spoken language.
MCAContent	Should be present.
MCAUseClass	
MCATitle	
MCATitleVersion	
MCAChannelID	Shall not be present.
ADMAudioProgrammeID	May be present (see Clause 7 for additional constraints).
ADMAudioContentID	May be present (see Clause 7 for additional constraints).
ADMAudioObjectID	May be present (see Clause 7 for additional constraints).

In the absence of additional provisions, other items defined for the MGA Soundfield Group Label SubDescriptor may be present and shall be ignored by implementations. Related application standards may specify such additional provisions.

NOTE MCA Content, MCA Use Class, MCA Title and MCA Title Version contain human-readable descriptive text intended for display to the user. SMPTE ST 2127-1 defines normative requirements regarding the use of values from the MCA Controlled Vocabulary (SMPTE ST 377-41).

6 Composition

6.1 General

A Composition, as defined in SMPTE ST 2067-3, shall contain zero or more MGA S-ADM Virtual Tracks.

6.2 Overview (informative)

Clause 6 defines the MGA S-ADM Virtual Track and its components. An MGA S-ADM Virtual Track consists of one or more Sequences, with each Sequence containing one or more consecutive Resources.

Each Resource references one MGA S-ADM Track File.

Because MGA S-ADM Track Files can carry more than one soundfield group, one or more specific soundfield groups from each MGA S-ADM Track File can be selected from a Resource by using the MGASADMVirtualTrackParameterSet element in the ExtensionProperties element of a CPL.

Clause 7 defines Operational Modes constraining the MGA S-ADM Virtual Track.

Annex A illustrates example Use Cases.

6.3 MGA S-ADM Virtual Track

6.3.1 XML schema and namespace

The XML schema defined in this document shall conform to W3C XML Schema Part 1: Structures.

XML elements defined by this document shall conform to the XML schema definition found in the prose element and element “a” (see Annex B for a list of elements).

In the event of a conflict between element “a” and the prose element, the prose element shall take precedence.

The XML schema root element shall be as defined in Table 4.

Table 4 — XML schema root element definition

```
<xs:schema targetNamespace="http://www.smpte-ra.org/ns/2067-203/2022"
  xmlns:imfsadm="http://www.smpte-ra.org/ns/2067-203/2022"
  xmlns:cpl="http://www.smpte-ra.org/schemas/2067-3/2016"
  xmlns:dcml="http://www.smpte-ra.org/schemas/433/2008/dcmlTypes/"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified" attributeFormDefault="unqualified">
<xs:import namespace="http://www.smpte-ra.org/schemas/2067-3/2016"/>
<xs:import namespace="http://www.smpte-ra.org/schemas/433/2008/dcmlTypes/"/>

<!-- schema definitions found in this document -->

</xs:schema>
```


6.3.2 MGA S-ADM Signal Sequence element

An MGA S-ADM Virtual Track shall consist of one or more MGASADMSignalSequence elements as specified in Table 5. The MGASADMSignalSequence element shall be based on the SequenceType as defined in SMPTE ST 2067-3.

Table 5 — MGASADMSignalSequence element schema definition

```
<!-- MGASADMSignalSequence definition -->
<xs:element name="MGASADMSignalSequence" type="cpl:SequenceType"/>
```

Each MGASADMSignalSequence element shall contain one or more Resource elements of type TrackFileResourceType, as defined in SMPTE ST 2067-3, with each Resource element referencing an MGA S-ADM Track File.

The EditRate of each Resource, as defined in Subclause 6.11.3 of SMPTE ST 2067-3:2020, shall be set to a value equal to the Edit Rate of the Essence Track in the referenced MXF file, as defined in SMPTE ST 377-1.

The Edit Rate shall be an integer multiple of the Edit Rate of the Main Image Virtual Track.

6.3.3 Homogeneous Essence

Within a given MGA S-ADM Virtual Track, the following characteristics of the MGA S-ADM Signal shall remain constant:

- Audio sampling rate
- EditRate

NOTE 1 No specific homogeneousness requirements for the MGA Soundfield Group Label SubDescriptor are defined. S-ADM processors can deal with varying soundfield group configurations within an MGA S-ADM Virtual Track.

NOTE 2 The Profile to which the S-ADM metadata complies can vary between MGA S-ADM Track Files of Resources belonging to a specific Virtual Track. Consuming applications need to verify that all Profiles, to which the S-ADM metadata complies, can be processed.

6.3.4 MGA S-ADM Virtual Track Parameter Set

6.3.4.1 MGASADMVirtualTrackParameterSet element

The ExtensionProperties element of the Composition Playlist shall include exactly one instance of the MGASADMVirtualTrackParameterSet element for each MGA S-ADM Virtual Track in the Composition. The MGASADMVirtualTrackParameterSet element shall be as defined in Table 6.

Table 6 — MGASADMVirtualTrackParameterSet element schema definition

```
<!-- MGASADMVirtualTrackParameterSet definition -->
<xs:element name="MGASADMVirtualTrackParameterSet">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Id" type="dcml:UUIDType"/>
      <xs:element name="TrackId" type="dcml:UUIDType"/>
      <xs:element name="MGASADMOperationalMode" type="xs:anyURI" />
      <xs:element name="MGASADMSoundfieldGroupSelector"
      type="imfsadm:MGASADMSoundfieldGroupSelectorType" minOccurs="0" maxOccurs="unbounded" />
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

The values of the elements of the MGASADMVirtualTrackParameterSet element shall be as defined in Subclauses 6.3.4.2 to 6.3.4.6.

6.3.4.2 Id

The Id element shall identify the MGASADMVirtualTrackParameterSet instance. No two MGASADMVirtualTrackParameterSet instances shall have the same Id values.

6.3.4.3 TrackId

The value of the TrackId element shall be the TrackId (as defined in SMPTE ST 2067-3) of the MGA S-ADM Virtual Track described by the MGASADMVirtualTrackParameterSet instance.

6.3.4.4 MGASADMOperationalMode

The value of the MGASADMOperationalMode element shall be the URI of the Operational Mode to which the MGA S-ADM Virtual Track conforms (see Clause 7).

6.3.4.5 MGASADMSoundfieldGroupSelector

The MGASADMSoundfieldGroupSelector element can be used to select specific soundfield groups from an MGA S-ADM Track File referenced by a Resource.

The MGASADMSoundfieldGroupSelector element shall be of type MGASADMSoundfieldGroupSelectorType. The MGASADMSoundfieldGroupSelectorType type is defined in Subclause 6.3.5.

There shall be zero or one MGASADMSoundfieldGroupSelector elements for each Resource in the MGA S-ADM Virtual Track.

Each MGASADMSoundfieldGroupSelector element shall use the ResourceId child element (defined in Subclause 6.3.5.2) to identify which of these Resources it describes.

Each MGASoundfieldGroupLinkID child element (defined in Subclause 6.3.5.3) shall reference the MCALinkID of one MGA Soundfield Group Label SubDescriptor present in the MGA S-ADM Track File referenced by this Resource.

Within each MGASADMSoundfieldGroupSelector element, no MGA Soundfield Group Label SubDescriptor instance shall be referenced more than once.

If there is no MGASADMSoundfieldGroupSelector element for a Resource then all soundfield groups present in the MGA S-ADM Track File referenced by this Resource shall be selected from the Resource.

If there is an MGASADMSoundfieldGroupSelector element for a Resource then only those soundfield groups referenced by an MGASoundfieldGroupLinkID child element shall be selected from the Resource.

Annex A illustrates the soundfield group selection mechanism.

6.3.4.6 xs:any (informative)

The xs:any element is a placeholder for future or application-specific extensions.

6.3.5 MGASADMSoundfieldGroupSelectorType type

6.3.5.1 General

The MGASADMSoundfieldGroupSelectorType shall be as defined in Table 7.

The values of the elements in instances of MGASADMSoundfieldGroupSelectorType shall be as defined in Subclauses 6.3.5.2 and 6.3.5.3.

Table 7 — MGASADMSoundfieldGroupSelectorType type schema definition

```
<!-- MGASADMSoundfieldGroupSelectorType definition -->
<xs:complexType name="MGASADMSoundfieldGroupSelectorType">
  <xs:sequence>
    <xs:element name="ResourceId" type="dcml:UUIDType" />
    <xs:element name="MGASoundfieldGroupLinkID" type="dcml:UUIDType" maxOccurs="unbounded" />
  </xs:sequence>
</xs:complexType>
```

6.3.5.2 ResourceId

The value of the ResourceId element shall be the Id (as defined in SMPTE ST 2067-3) of the Resource from which soundfield groups are being selected.

6.3.5.3 MGASoundfieldGroupLinkID

The value of each MGASoundfieldGroupLinkID element shall be the MCALinkID of one MGA Soundfield Group Label SubDescriptor present in the MGA S-ADM Track File referenced by the Resource identified by the value of the ResourceId element.

7 Operational Modes

7.1 General

An MGA S-ADM Virtual Track shall conform to an Operational Mode defined in this document or elsewhere.

Each Operational Mode shall be uniquely identified by a predefined URI.

NOTE Each Operational Mode defines a set of constraints that reflect a specific MGA S-ADM workflow configuration selected during authoring. The constraints can apply to the properties of the MGA S-ADM Virtual Track and/or its underlying Track Files.

7.2 Operational Mode A

7.2.1 General

Operational Mode A represents the simplest form of an MGA S-ADM workflow where each MGA S-ADM Track File contains all the audio essence and all S-ADM metadata required for processing.

7.2.2 MGA S-ADM Track File constraints

The S-ADM metadata contained in each MGA S-ADM Track File shall define at least one ADM audioProgramme element.

Each MGA S-ADM Track File shall contain all of the audio samples required for all the ADM entities defined by the S-ADM metadata it contains.

Each MGA S-ADM Track File shall contain exactly one instance of the MGA Soundfield Group Label SubDescriptor for each ADM audioProgramme element defined by the S-ADM metadata contained in the Track File.

The MGA Soundfield Group Label SubDescriptor shall be further constrained according to Table 8.

Table 8 — MGA Soundfield Group Label SubDescriptor constraints for Operational Mode A

Item (Symbol)	MGA Soundfield Group Label SubDescriptor Constraints
MCATitle	Shall be equal to the first audioProgrammeLabel sub-element of the associated audioProgramme, as defined in ITU-R BS.2076. If no audioProgrammeLabel sub-element is present, the audioProgrammeName attribute should be used.
ADMAudioProgrammeID	Shall be present.
ADMAudioContentID	Shall not be present.
ADMAudioObjectID	Shall not be present.

NOTE In Operational Mode A, each MGA Soundfield Group Label SubDescriptor represents the entire soundfield defined by the ADM audioProgramme element identified by the ADMAudioProgrammeID item. In Operational Mode A, the MGA Soundfield Group Label SubDescriptor does not provide a way of referencing sub-elements of the soundfield of an ADM audioProgramme element.

7.2.3 Operational Mode identification

Operational Mode A shall be identified by the following URI:

http://www.smpte-ra.org/ns/2067-203/2022#Operational-Mode-A

Annex A
(informative)

Illustrated examples for MGA S-ADM Plug-in Use Cases

Figure A.1 and Figure A.2 illustrate example use cases for the MGA S-ADM plug-in in IMF Compositions.

Figure A.1 depicts an example for a Composition Playlist (CPL) with MGA S-ADM Virtual Tracks, as defined in Subclause 6.3, and constrained by Operational Mode A, as defined in Subclause 7.2.

Figure A.1 illustrates the soundfield group selection mechanism, and does not contain all mandatory SMPTE ST 2127-1 and SMPTE ST 2127-10 SubDescriptors.

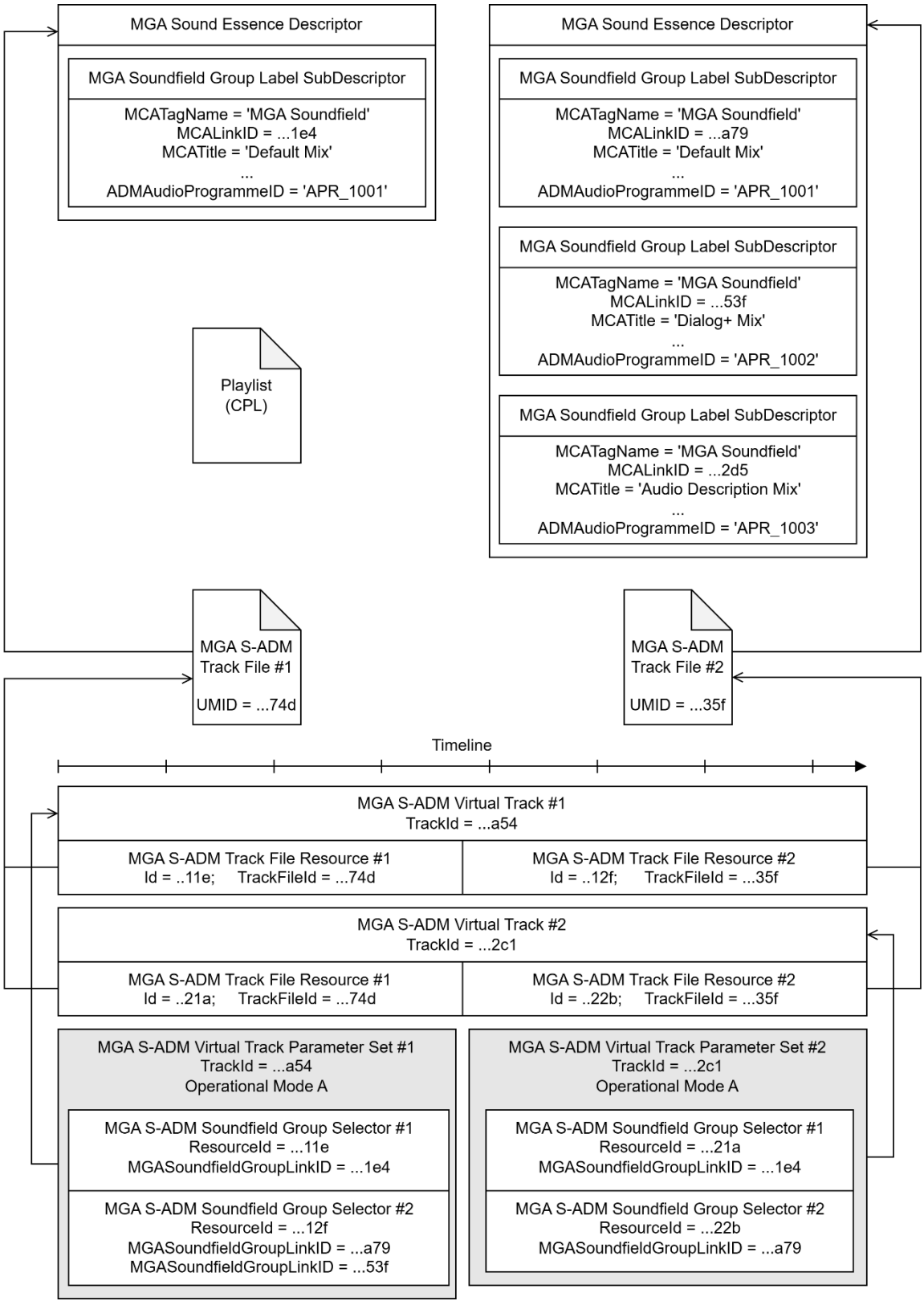

Figure A.1 — Example of CPL with MGA S-ADM Virtual Tracks (Operational Mode A)

As shown in Figure A.1, the MGA Sound Essence Descriptor of the first MGA S-ADM Track File (UMID = ..74d) contains one MGA Soundfield Group Label SubDescriptor, which corresponds to the soundfield group with MCATitle “Default Mix” defined by the ADM audioProgramme element with audioProgrammeID “APR_1001”.

The MGA Sound Essence Descriptor of the second MGA S-ADM Track File (UMID = ..35f) contains three MGA Soundfield Group Label SubDescriptors, which correspond to the soundfield groups with MCATitle “Default Mix”, “Dialog+ Mix”, and “Audio Description Mix” defined by the ADM audioProgramme elements with audioProgrammeID “APR_1001”, “APR_1002” and “APR_1003”.

Both the first and second MGA S-ADM Virtual Track are constrained by Operational Mode A and contain two Resource elements, which reference the first and second MGA S-ADM Track File along the Composition timeline. Within the first MGA S-ADM Virtual Track (TrackId = …a54), two soundfield groups of the second MGA S-ADM Track File are selected via the MGASoundfieldGroupLinkID element. Within the second MGA S-ADM Virtual Track (TrackId = …2c1) just one soundfield group of the second MGA S-ADM Track File is selected.

The MGASADMVirtualTrackParameterSet elements corresponding to MGA S-ADM Virtual Track #1 and MGA S-ADM Virtual Track #2, as depicted in Figure A.1, are given as EXAMPLE 1 and EXAMPLE 2, respectively.

EXAMPLE 1: MGASADMVirtualTrackParameterSet for Virtual Track #1

```
<MGASADMVirtualTrackParameterSet>
   <Id>urn:uuid:85f19d9d-b454-47b6-bbae-b1d22dff649f</Id>
   <TrackId>urn:uuid:...a54</TrackId><!-- Virtual Track #1-->
   <MGASADMOperationalMode>http://www.smpte-ra.org/ns/2067-203/2022#Operational-Mode-A</MGASADMOperationalMode>
   <MGASADMSoundfieldGroupSelector>
      <ResourceId>urn:uuid:...11e</ResourceId><!-- Resource #1-->
      <MGASoundfieldGroupLinkID>urn:uuid:...1e4</MGASoundfieldGroupLinkID><!-- Default Mix -->
   </MGASADMSoundfieldGroupSelector>
   <MGASADMSoundfieldGroupSelector>
      <ResourceId>urn:uuid:...12f</ResourceId><!-- Resource #2-->
      <MGASoundfieldGroupLinkID>urn:uuid:...a79</MGASoundfieldGroupLinkID><!-- Default Mix -->
      <MGASoundfieldGroupLinkID>urn:uuid:...53f</MGASoundfieldGroupLinkID><!-- Dialog+ Mix -->
   </MGASADMSoundfieldGroupSelector>
</MGASADMVirtualTrackParameterSet>
```

EXAMPLE 2: MGASADMVirtualTrackParameterSet for Virtual Track #2

```
<MGASADMVirtualTrackParameterSet>
   <Id>urn:uuid:459ce0fc-342f-4b31-ad8e-61cee4511ad1</Id>
   <TrackId>urn:uuid:...2c1</TrackId><!-- Virtual Track #2-->
   <MGASADMOperationalMode>http://www.smpte-ra.org/ns/2067-203/2022#Operational-Mode-A</MGASADMOperationalMode>
   <MGASADMSoundfieldGroupSelector>
      <ResourceId>urn:uuid:...21a</ResourceId><!-- Resource #1-->
      <MGASoundfieldGroupLinkID>urn:uuid:...1e4</MGASoundfieldGroupLinkID><!-- Default Mix -->
   </MGASADMSoundfieldGroupSelector>
   <MGASADMSoundfieldGroupSelector>
      <ResourceId>urn:uuid:...22b</ResourceId><!-- Resource #2-->
      <MGASoundfieldGroupLinkID>urn:uuid:...a79</MGASoundfieldGroupLinkID><!-- Default Mix -->
   </MGASADMSoundfieldGroupSelector>
</MGASADMVirtualTrackParameterSet>
```

Figure A.2 depicts examples of applications consuming MGA S-ADM Virtual Tracks. In the first example, the MGA S-ADM Virtual Track is encoded by an Audio Encoder for MGA S-ADM, which supports multiple simultaneous soundfield groups and varying soundfield group configurations. In the second example, the MGA S-ADM Virtual Track is converted into a single MGA S-ADM Track File according to SMPTE ST 2127-10, which can be later used for real-time content playout of MGA S-ADM over IP. In this example, the associated audio essence is transported according to SMPTE ST 2110-30, and the S-ADM metadata is transported synchronously by a separate IP stream. In the third example, an MGA S-ADM PCM Renderer is used to generate an Audio Track File according to SMPTE ST 2067-2 and SMPTE ST 382. The definition of detailed processing blocks and their requirements for MGA S-ADM Conversion and MGA S-ADM PCM Rendering can be further studied in the context of the IMF Output Profile List (OPL) framework described in SMPTE ST 2067-100.

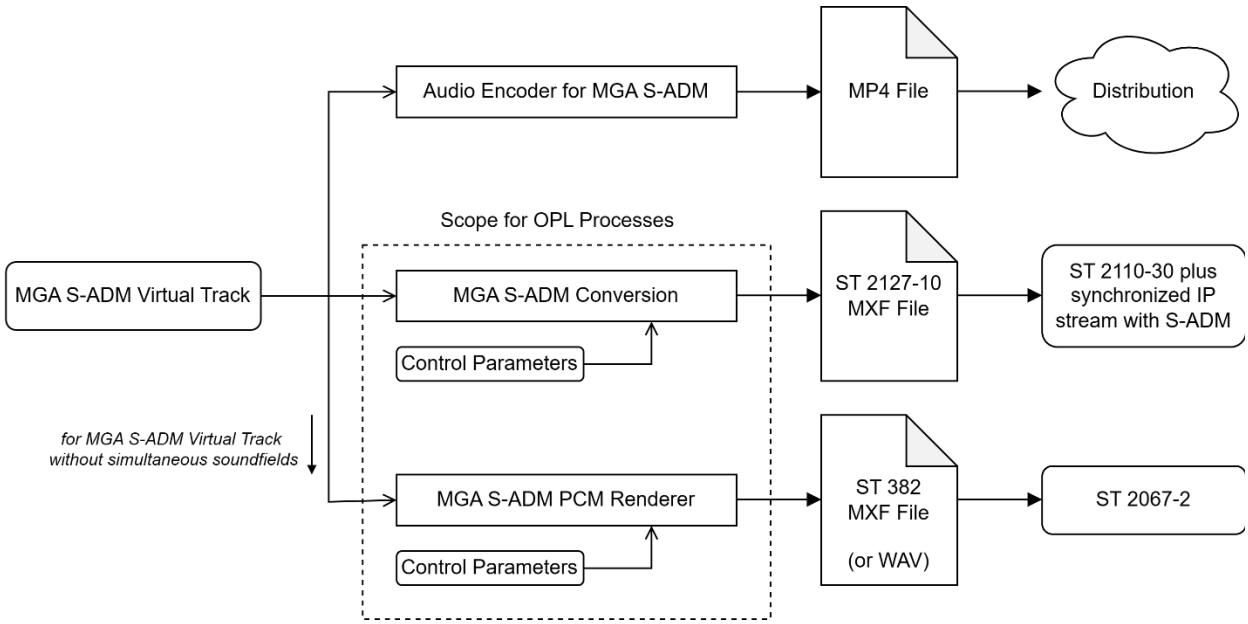

Figure A.2 — Examples of applications consuming MGA S-ADM Virtual Tracks

Annex B
(informative)

Additional elements

Table B.1 lists non-prose elements of this document.

Table B.1 — Additional Elements

Non-prose element	File name	Description
a	st2067-203a-2023.xsd	XML schema document (normative)

The XML Schema to SMPTE ST 2067-203 is provided as a companion element to this document in a public GitHub repository at the following URL:

https://github.com/SMPTE/st2067-203a

Bibliography (informative)

ISO/IEC 14496-14 Information technology — Coding of audio-visual objects — Part 14: MP4 file format

Recommendation ITU-R BS.2088 Long-form file format for the international exchange of audio programme materials with metadata

SMPTE ST 330 Unique Material Identifier (UMID)

SMPTE ST 377-41 MXF Multichannel Audio Controlled Vocabulary

SMPTE ST 382 Material Exchange Format - Mapping AES3 and Broadcast Wave Audio into the MXF Generic Container

SMPTE ST 2067-100, Interoperable Master Format - Output Profile List

SMPTE ST 2110-30 Professional Media Over Managed IP Networks: PCM Digital Audio