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**Digital cinema (D-cinema) packaging —  
Part 10:  
Stereoscopic picture track file**

*Emballage du cinéma numérique (cinéma D) —*

*Partie 10: Fichier de trajectoire d'image stéréoscopique*

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Published in Switzerland

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 26429-10 was prepared by the Society of Motion Picture and Television Engineers (as SMPTE 429-10-2008) and was adopted, under a special “fast-track procedure”, by Technical Committee ISO/TC 36, *Cinematography*, in parallel with its approval by the ISO member bodies.

ISO 26429 consists of the following parts, under the general title *Digital cinema (D-cinema) packaging*:

- *Part 3: Sound and picture track file* [equivalent to SMPTE 429-3]
- *Part 4: MXF JPEG 2000 application* [equivalent to SMPTE 429-4]
- *Part 6: MXF track file essence encryption* [equivalent to SMPTE 429-6]
- *Part 7: Composition playlist* [equivalent to SMPTE 429-7]
- *Part 8: Packing list* [equivalent to SMPTE 429-8]
- *Part 9: Asset mapping and file segmentation* [equivalent to SMPTE 429-9]
- *Part 10: Stereoscopic picture track file* [equivalent to SMPTE 429-10]

## Introduction

This part of ISO 26429 comprises SMPTE 429-10-2008 and Annex ZZ (which provides equivalences between ISO standards and SMPTE standards referenced in the text).

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# SMPTE STANDARD

## D-Cinema Packaging — Stereoscopic Picture Track File



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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 Administrative Practices.

SMPTE Standard 429-10 was prepared by Technology Committee DC28.

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## 1 Scope

This document provides the definition of a single MXF file design for Stereoscopic Picture content wrapping. It also defines a new Composition Playlist (CPL) extension element to reference such Stereoscopic Picture Track File.

## 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.

## 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.

ANSI/SMPTE 298M-1997, Television — Universal Labels for Unique Identification of Digital Data

SMPTE 377M-2004, Television — Material Exchange Format (MXF), File Format Specification

SMPTE 429-3-2006, D-Cinema Packaging — Sound and Picture Track File

SMPTE 429-7-2006, D-Cinema Packaging — Composition Playlist

SMPTE RP 210, Metadata Dictionary Registry of Metadata Element Descriptions

World Wide Web Consortium (W3C) (2004, February 4) — Extensible Markup Language (XML) 1.0 (Third Edition), see <http://www.w3.org/TR/2004/REC-xml-20040204/>

World Wide Web Consortium (W3C) (2004, October 28) — XML Schema Part 1: Structures (Second Edition), see <http://www.w3.org/TR/2004/REC-xmlschema-1-20041028/>

World Wide Web Consortium (W3C) (2004, October 28) — XML Schema Part 2: Datatypes (Second Edition), see <http://www.w3.org/TR/2004/REC-xmlschema-2-20041028/>

Internet Engineering Task Force (IETF) (1996, November), RFC 2396 — Uniform Resource Identifiers (URI): Generic Syntax

Internet Engineering Task Force (IETF) (2005, July), RFC 4122 — A Universally Unique Identifier (UUID) URN Namespace

### 4 Glossary of Acronyms and Terms

The general glossary of acronyms, terms and data types used in the MXF specification is given in SMPTE 377M. It is not repeated here to avoid any divergence of meaning.

- CPL            Composition Playlist
- MXF            Material eXchange Format
- URI            Uniform Resource Identifier
- XML            eXtensible Markup Language
- 2D            Non-stereoscopic

### 5 Stereoscopic Picture Track Files Structure

The starting point of this stereoscopic picture packaging method is a single “Stereoscopic Picture Essence Stream” corresponding to the frame based interleaving of the two sequences of frames associated respectively with the left eye and the right eye as presented in Figure 1:

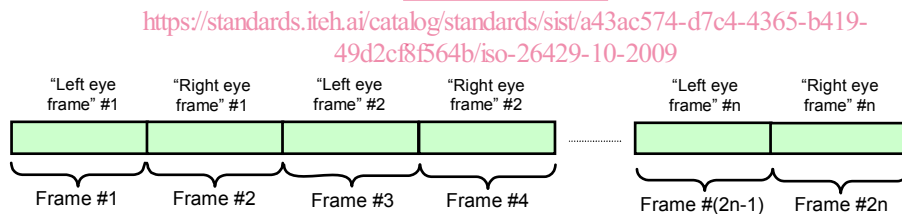


Figure 1 – Stereoscopic Picture Essence Stream Structure

This single Stereoscopic Picture Essence Stream shall contain the same number of left and right frames and shall be wrapped according to SMPTE 429-3, with the constraint that the KLV Fill item shall not be used between the left frame and the right frame of the same frames pair.

The left frame shall be the first frame in the left/right frames pair as presented in the Figure 1 above.

The Picture Essence Descriptor shall have a strong reference to a Stereoscopic Picture Essence Sub-Descriptor, defined in Annex A. This Stereoscopic Picture Essence Sub-Descriptor shall be used to identify a Track File as being a Stereoscopic Picture Track File belonging to this standard.

The Sample Rate property of the Picture Essence Descriptor shall be set to the frame rate of the essence stream. The Edit Rate in the Picture Track of the MXF header Packages shall be half the Sample Rate. The Index Table shall use Edit Units that are defined for the left/right frames pairs and as illustrated in Figure 2. The Index Start Position of the first Index Table Segment shall index the position of the first frame (which is a left eye frame) of the stereoscopic picture track.



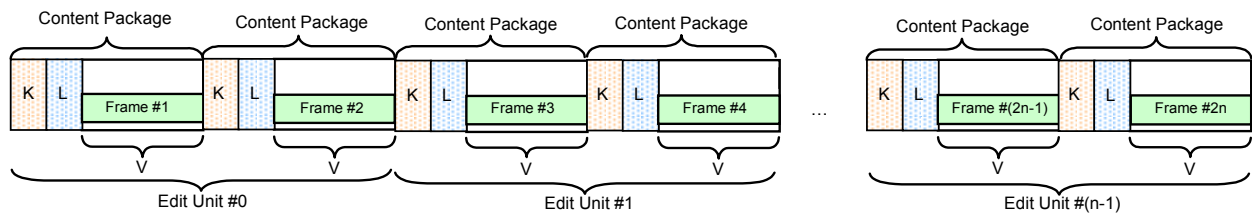


Figure 2 – Stereoscopic Picture Track File Body

Notes:

1 The relationship between Edit Units and Sample Rate is defined in SMPTE 377M and can be summarized as follows:

- Sample Rate is used in descriptors and defines the gross picture rate. This is typically either the rate of fields or frames in the picture.
- Edit Rate is the desired editing rate of the picture data. An edit unit (1/edit rate) is typically 1 picture, but may be larger in some applications.

2 Given a gross picture rate of 48, the Sample Rate property of the Picture Essence Descriptor would be set to 48 – as one sample unit corresponds to one frame in this design, the Sample Rate is the Frame Rate. Since the left/right pictures are grouped as pairs, the Edit Rate in the Picture Track of the MXF header Packages will be half the Sample Rate: 24. In this example, the MXF file will contain the following information:

- Sample Rate (Frame Rate) = 48
- Edit Rate = 24

3 The indexing of left/right frames pairs permits decoders to unambiguously determine the first frame of a stereoscopic frames pair at any point in the essence container.

## 6 MainStereoscopicPicture Element

In order to reference the Stereoscopic Picture Track File in a standard Composition Playlist, a `MainStereoscopicPicture` element is defined and shall be used as an extension element in the Reel element of a Composition Playlist as specified in SMPTE 429-7, Section 7.3.5.

The `MainStereoscopicPicture` element shall indicate stereoscopic picture essence to be projected onto the main screen and shall reference an external Track File as defined in Section 5. The `MainStereoscopicPicture` element shall be an instance of `PictureTrackFileType` and its structure is defined in SMPTE 429-7, Section 8.4.

The `MainStereoscopicPicture` element structure defined in this standard is represented using the Extensible Markup Language (XML) [XML 1.0], and specified using XML Schema [XML Schema Part 1: Structures] and [XML Schema Part 2: Datatypes]. This `MainStereoscopicPicture` element specification shall be associated with a unique XML namespace name that shall be the string value “<http://www.smptra.org/schemas/429-10/2008/Main-Stereo-Picture-CPL>”. This namespace name conveys both structural and semantic version information, and serves the purpose of a traditional version number field.

XML namespace names used in this standard are identified in Table 1. Namespace names are represented as Uniform Resource Identifier (URI) values [RFC 2396]<sup>1</sup>.

<sup>1</sup> Readers unfamiliar with URI values as XML namespace names should be aware that although a URI value begins with a “method” element (“http” in this case), the value is designed primarily to be a unique string and does not necessarily correspond to an actual on-line resource. Applications implementing this standard should not attempt to resolve URI values on-line.