SMPTE 2036-2-2008

SMPTE STANDARD

Ultra High Definition Television[1] — Audio Characteristics and Audio Channel Mapping for Program Production

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[1] Ultra High Definition Television - UHDTV

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Foreword

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SMPTE Standard 2036-2 was prepared by Technology Committee A29.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. 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.

Introduction

SMPTE 2036 Ultra High Definition Television (UHDTV) suite of documents is in multiple parts:

Part 1: Image Parameter Values for Program Production

Part 2: Audio Characteristics and Audio Channel Mapping for Program Production

This document is Part 2 of SMPTE 2036 and describes the audio characteristics and audio channel mapping for program production.

Part 1 specifies the family of progressive image sample structures for UHDTV program production.

The channel-mapping and labeling scheme described in this document is intended for UHDTV and specifies the channel-mapping and labeling for 24 audio channels. This mapping takes into account historical practice and standards work of both SMPTE and ITU-R.

1 Scope

This document specifies the characteristics of digital audio for UHDTV program production and distribution. This document also defines the mapping and labeling of 22.2 multichannel audio for UHDTV program production.

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 standard contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was 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 standard indicated below.

AES3-2003, AES Standard for Digital Audio Engineering — Digital Input-Output Interfacing — Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data (Revision of AES3-1992)

4 Definition of Terms

UHDTV: Ultra High Definition Television, having an image format (sample structure) of 3840 × 2160 or 7680 × 4320 at a frame rate of 50P, 59.94P or 60P.

UHDTV1: Class of UHDTV having an image format (sample structure) of 3840 × 2160 at a frame rate of 50P, 59.94P or 60P.

UHDTV2: Class of UHDTV having an image format (sample structure) of 7680 × 4320 at a frame rate of 50P, 59.94P or 60P.

22.2 multichannel audio: A multichannel audio system for UHDTV, which has three loudspeaker layers vertically (Top layer, Middle layer and Bottom layer). The 22.2 audio channels consist of 22 full-bandwidth channels and 2 LFE (Low Frequency Effects) channels. (An informative diagram of 22.2 multichannel audio system is shown in section 7.)

Top layer: Top (highest) layer of three loudspeaker-layers located at the top of the screen. (Alternatively at the top of the room.)

Middle layer: Middle layer of three loudspeaker-layers located at the vertical center of the television screen (Alternatively at the same height as the height of viewer's ear.)

Bottom layer: Bottom (lowest) layer of three loudspeaker-layers located at the bottom of the television screen. (Alternatively at floor level of the room.)

Front left: A loudspeaker position located at far left and centered vertically with the middle layer.

Front right: A loudspeaker position located at far right and centered vertically with the middle layer.

Front center: A loudspeaker position located at the middle layer corresponding to the center of the television screen as viewed from the seating area.

LFE-1: A Low Frequency Effects (band-limited low frequency channel) loudspeaker position located at the bottom layer and normally far left front, when LFE-2 is used.

Back left: A loudspeaker position located at far left back of the middle layer.

Back right: A loudspeaker position located at far right back of the middle layer.

Front left center: A loudspeaker position located mid-way between the front center and front left of the middle layer.

Front right center: A loudspeaker position located mid-way between the front center and front right of the middle layer.

Back center: A loudspeaker position located at center back of the middle layer.

LFE-2: A Low Frequency Effects (band-limited low frequency channel) loudspeaker position located at the bottom layer, and is normally at far right front of the bottom layer, when LFE-1 is used.

Side left: A loudspeaker position located at left side of the middle layer.

Side right: A loudspeaker position located at right side of the middle layer.

Top front left: A loudspeaker position located at far left front of the top layer.

Top front right: A loudspeaker position located at far right front of the top layer.

Top front center: A loudspeaker position located at center front of the top layer.

Top center: A loudspeaker position located at the center of the top layer directly above the seating area.

Top back left: A loudspeaker position located at far left back of the top layer.

Top back right: A loudspeaker position located at far right back of the top layer.

Top side left: A loudspeaker position located at left side of the top layer.

Top side right: A loudspeaker position located at right side of the top layer.

Top back center: A loudspeaker position located at center back of the top layer.

Bottom front center: A loudspeaker position located at center front of the bottom layer.

Bottom front left: A loudspeaker position located at far left front of the bottom layer.

Bottom front right: A loudspeaker position located at far right front of the bottom layer.

5 Digital Signal Characteristics

5.1 Sampling Frequency

UHDTV audio shall support a sampling frequency of 48 kHz locked (synchronous) to video. UHDTV audio may additionally support a sampling frequency of 96 kHz locked (synchronous) to video for UHDTV program production. Audio sample rate jitter shall be as specified in AES3.

5.2 Bit Depth

The bit depth shall be one of 16 bits or, 20 bits or, 24 bits per sample.

5.3 Audio Channels

UHDTV audio shall support a channel count of 24 full-bandwidth channels.

Note: The two LFE channels are transported as full-bandwidth channels.

5.4 Emphasis

The audio signals carried by UHDTV shall not use AES-3 frequency pre-emphasis.

5.5 AES3 Channel Status, Validity Bit and User Bits

Channel status data, Validity bit and User data bits specified in AES3 shall be carried through the path from origination to emission.

6 Channel Mapping and Channel Labeling of 22.2 Multichannel Audio

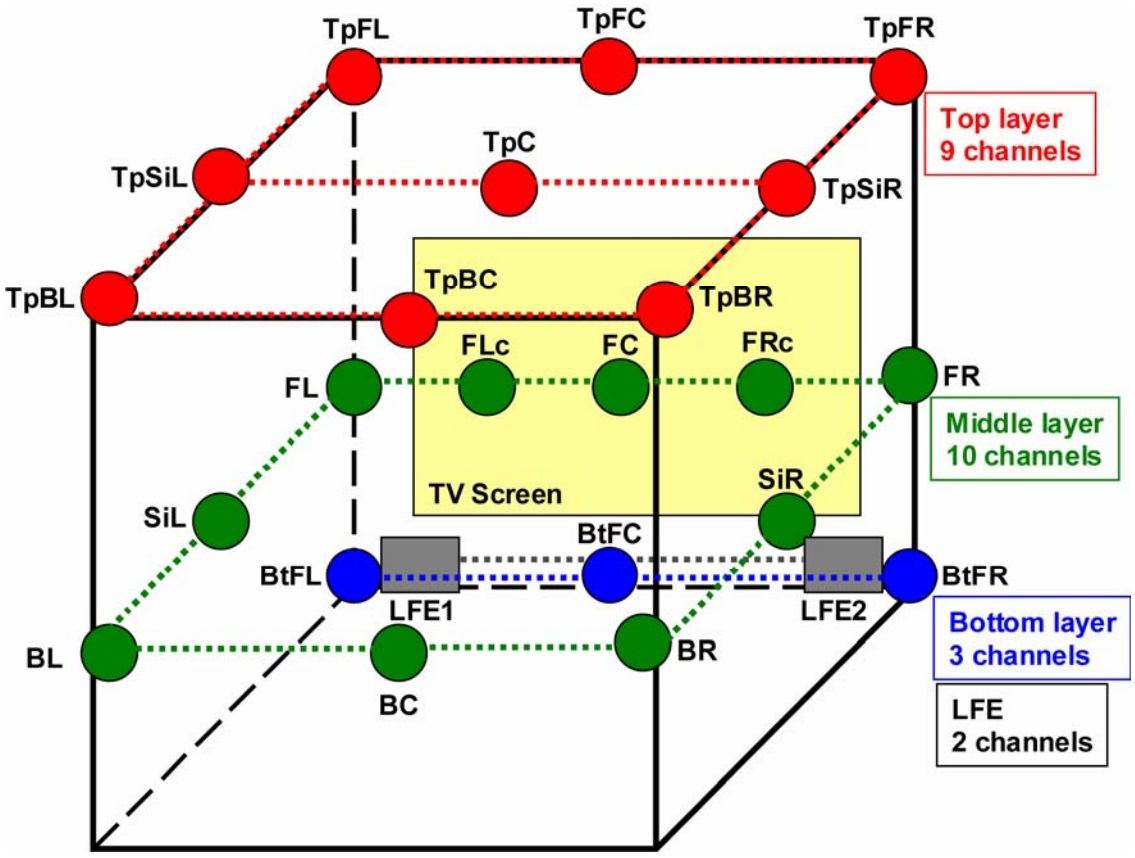
Channel numbers listed refer to the input and output interfaces of a UHDTV audio system. AES3 pairs and channel one or two in the pair shall be mapped in accordance with the table below. Labels shall be retained throughout the audio chain.

Table 1 – Channel maps and labels of 22.2 multichannel audio

AES Pair No./Ch No.	Channel No.	Label	Name
1/1	1	FL	Front left
1/2	2	FR	Front right
2/1	3	FC	Front center
2/2	4	LFE1	LFE-1
3/1	5	BL	Back left
3/2	6	BR	Back right
4/1	7	FLc	Front left center
4/2	8	FRc	Front right center
5/1	9	BC	Back center
5/2	10	LFE2	LFE-2
6/1	11	SiL	Side left
6/2	12	SiR	Side right
7/1	13	TpFL	Top front left
7/2	14	TpFR	Top front right
8/1	15	TpFC	Top front center
8/2	16	TpC	Top center
9/1	17	TpBL	Top back left
9/2	18	TpBR	Top back right
10/1	19	TpSiL	Top side left
10/2	20	TpSiR	Top side right
11/1	21	TpBC	Top back center
11/2	22	BtFC	Bottom front center
12/1	23	BtFL	Bottom front left
12/2	24	BtFR	Bottom front right

7 Loudspeaker Layout (Informative)

The figure below illustrates the loudspeaker layout of a 22.2 multichannel sound system.



Annex A (Informative)
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