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**Information technology — High  
efficiency coding and media delivery  
in heterogeneous environments —**

**Part 3:  
3D audio**

**AMENDMENT 2: MPEG-H 3D Audio File  
Format Support**

*Technologies de l'information — Codage à haute efficacité et livraison  
des médias dans des environnements hétérogènes —*  
*Partie 3: Audio 3D*

*AMENDEMENT 2: Support de format fichier audio 3D MPEG-H*

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Amendment 2 to ISO/IEC 23008-3:2015 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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# Information technology — High efficiency coding and media delivery in heterogeneous environments —

## Part 3: 3D audio

### AMENDMENT 2: MPEG-H 3D Audio File Format Support

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Add the following as a new Clause 20

#### 20 Carriage of MPEG-H 3D Audio in ISO base media file format

##### 20.1 General

This clause specifies the carriage of MPEG-H 3D Audio in the ISO base media file format. 20.2 describes the signalling of random access points for Immediate Play-out Frames (IPF) and independently decodable frames (IF). 20.7 describes the additional signalling of dynamic range control and loudness information that might be present in the encoded bitstream. 20.9 describes the additional signalling of audio scene information data that might be present in the encoded bitstream.

##### 20.2 Random Access and Stream Access

Frames that use AudioPreRoll() following the restrictions in 5.5.6 are considered to be Immediate Play-out Frames (IPF) and shall be signalled by means of the sync sample box according to ISO/IEC 14496-12:2015, 8.6.2.

Independently decodable Frames (IF) as described in 5.7 shall be signalled by means of the roll sample group according to ISO/IEC 14496-12.

##### 20.3 Overview of new box structures

mha1, mha2, mhm1, mhm2		*	<i>sample entry</i>
	mhaC		<i>configuration</i>
	mhaD		<i>dynamic range and loudness</i>
	maeM		<i>multi-stream</i>
	maeI		<i>audio scene information</i>
	maeG	*	<i>group definition</i>
	maeS		<i>switch group definition</i>
	maeP		<i>preset definition</i>
	maeL		<i>text label definition</i>

## 20.4 MHA decoder configuration record

### 20.4.1 Definition

This clause specifies the decoder configuration information for MPEG-H 3D Audio (MHA) content.

This record contains a version field. This version of the specification defines version 1 of this record. Incompatible changes to the record will be indicated by a change of version number. Readers must not attempt to decode this record or the streams to which it applies if the version number is unrecognised.

### 20.4.2 Syntax

```
aligned(8) class MHADecoderConfigurationRecord {
    unsigned int(8)    configurationVersion = 1;
    unsigned int(8)    mpeg3daProfileLevelIndication;
    unsigned int(8)    referenceChannelLayout;
    unsigned int(16)   mpeg3daConfigLength;
    bit(8*mpeg3daConfigLength) mpeg3daConfig;
}
```

### 20.4.3 Semantics

configurationVersion	shall be set to 1 in this version of the specification.
mpeg3daProfileLevelIndication	defined in 5.2.2.
referenceChannelLayout	ChannelConfiguration value defined in ISO/IEC 23001-8.
mpeg3daConfigLength	length in bytes of mpeg3daConfig.
mpeg3daConfig	the MPEG-H 3DA configuration defined in this part of ISO/IEC 23008.

## 20.5 MPEG-H Audio Sample Entry

[ISO/IEC 23008-3:2015/Amd 2:2016](https://standards.iteh.ai/catalog/standards/sist/60c796b0-6954-44cb-9faa-57a477614463/iso-iec-23008-3-2015-amd-2-2016)

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### 20.5.1 Definition

Box Types: 'mhaC', 'mha1', 'mha2'

Container: Sample Table Box ('stbl')

Mandatory: The mha1 box is mandatory

Quantity: One or more sample entries may be present

The MHASampleEntry shall contain a MHAConfigurationBox, as defined below. This includes the MHADecoderConfigurationRecord as defined in 20.4. If the sample entry type is 'mha1', multiple streams shall not be used. If the sample entry name is 'mha2', multiple streams may be used.

If an 'mha1' or 'mha2' MHASampleEntry is present, each sample of the appropriate Track shall contain exactly one mpeg3daFrame as defined in this part of ISO/IEC 23008. An optional MPEG4BitRateBox may be present in the MHASampleEntry to signal the bit rate information of the MHA stream. Extension descriptors that should be inserted into the Elementary Stream Descriptor, when used in MPEG-4, may also be present. Other boxes may be present in the MHASampleEntry. When multiple streams are used, the MHADecoderConfigurationRecord for each track shall correspond to the appropriate mpeg3daFrame of that track.

The following optional boxes inherited from AudioSampleEntry from ISO/IEC 14496-12/Amd 4:2015 shall not be present

- DownMixInstructions()
- DRCCoefficientsBasic()
- DRCInstructionsBasic()

- DRCCoefficientsUniDRC ()
- DRCInstructionsUniDRC ()

### 20.5.2 Syntax

```

class MHAConfigurationBox() extends Box('mhaC') {
    MHADecoderConfigurationRecord MHAConfig;
}
class MPEG4BitRateBox() extends Box('btrt') {
    unsigned int(32) bufferSizeDB;
    unsigned int(32) maxBitrate;
    unsigned int(32) avgBitrate;
}
class MPEG4ExtensionDescriptorsBox() extends Box('m4ds') {
    Descriptor Descr[0 .. 255];
}
MHASampleEntry() extends AudioSampleEntry('mha1') {
    MHAConfigurationBox config;
    MPEG4BitRateBox(); // optional
    MPEG4ExtensionDescriptorsBox (); // optional
}
MHASampleEntry() extends AudioSampleEntry('mha2') {
    MHAConfigurationBox config;
    MPEG4BitRateBox(); // optional
    MPEG4ExtensionDescriptorsBox (); // optional
}

```

### 20.5.3 Semantics

ChannelCount	inherited from AudioSampleEntry, shall be set to 0 (inapplicable) The MPEG-H 3D Audio decoder is capable of rendering a scene to any given speaker setup. The referenceChannelLayout carried in the MHADecoderConfigurationRecord shall be used to signal the preferred reproduction layout for this stream and replaces the ChannelCount
config	defined in 20.4
Descr	is a descriptor which should be placed in in the ElementaryStreamDescriptor when this stream is used in an MPEG-4 systems context. This does not include SLConfigDescriptor or DecoderConfigDescriptor, but includes the other descriptors in order to be placed after the SLConfigDescriptor
bufferSizeDB	gives the size of the decoding buffer for the elementary stream in bytes
maxBitrate	gives the maximum rate in bits/second over any window of 1 second
minBitrate	gives the average rate in bits/second over any window of 1 second

## 20.6 MPEG-H Audio MHAS Sample Entry

### 20.6.1 Definition

Box Types: 'mhml', 'mhm2'

Container: Sample Table Box ('stbl')

Mandatory: No

Quantity: One or more sample entries may be present

Especially in streaming or broadcast environments based on, e.g. MPEG-DASH or MPEG-H MMT, the MPEG-H 3D Audio configuration may change at arbitrary positions of the stream and not necessarily only on fragment boundaries. To enable this use-case the 'mhml' and 'mhm2' MHASampleEntry provides an in-band configuration mechanism for MPEG-H 3D Audio files.

If an 'mhm1' or 'mhm2' MHASampleEntry is present, each sample of the appropriate Track shall contain exactly one MHAS Packet with the MHASPacketType PACTYP\_MPEGH3DAFRAME as defined in Clause 14.

A sample may contain additional MHAS Packets of other types: if present, an MHAS Packet with MHASPacketType PACTYP\_MPEGH3DACFG, PACTYP\_AUDIOSCENEINFO or PACTYP\_AUDIOTRUNCATION shall directly precede the MHAS Packet of Type PACTYP\_MPEGH3DAFRAME.

MHAS Packets with the MHASPacketType PACTYPE\_CRC16 and PACTYPE\_CRC32 shall not be present in any sample. Other MHAS Packets may be present in a sample.

The first sample of the movie and the first sample of every fragment (when applicable) shall contain a MHAS packet with the type PACTYP\_MPEGH3DACFG followed by an MHAS packet with the Type PACTYP\_AUDIOSCENEINFO if present.

All samples of the movie that contain an MHAS packet of type PACTYP\_MPEGH3DACFG shall be sync samples.

If the movie contains a configuration change, i.e. one of the samples of the movie besides the first sample contains an MHAS packet of type PACTYP\_MPEGH3DACFG, all sync samples of the movie shall contain an MHAS packet of type PACTYP\_MPEGH3DACFG.

If the sample entry type is 'mhm1', multiple streams shall not be used. If the sample entry name is 'mhm2', multiple streams may be used.

Optional boxes may be present in the MHASampleEntry. Optional boxes for the sample entry type 'mhm1' are handled according to the sample entry type is 'mha1', optional boxes for the sample entry type is 'mhm2' are handled according to the sample entry type is 'mha2'.

In contrast to the sample entry types 'mha1' and 'mha2' the MHAConfigurationBox is optional for the sample entry types 'mhm1' and 'mhm2', and not mandatory.

## 20.6.2 Syntax

```
MHASampleEntry() extends AudioSampleEntry('mhm1') {
    MHAConfigurationBox config;          // optional
    MPEG4BitRateBox();                  // optional
    MPEG4ExtensionDescriptorsBox();     // optional
}
MHASampleEntry() extends AudioSampleEntry('mhm2') {
    MHAConfigurationBox config;          // optional
    MPEG4BitRateBox();                  // optional
    MPEG4ExtensionDescriptorsBox();     // optional
}
```

## 20.7 Dynamic Range Control and Loudness

### 20.7.1 MHA Dynamic Range Control and Loudness

#### 20.7.1.1 Definition

Box Type: 'mhaD'

Container: MHA sample entry ('mha1', 'mha2', 'mhm1', 'mhm2')

Mandatory: No

Quantity: Zero or one

This box specifies the dynamic range control and loudness information that may be contained in the MPEG-H 3D Audio (MHA) track. The provided information represents only a subset of the in-stream configuration according to 6.3.



### 20.7.1.2 Syntax

```

aligned(8) class MHADynamicRangeControlAndLoudnessBox()
  extends FullBox('mhaD', version = 0, 0) {
  unsigned int(2)   reserved = 0;
  unsigned int(6)   drcInstructionsUniDrcCount;
  unsigned int(2)   reserved = 0;
  unsigned int(6)   loudnessInfoCount;
  unsigned int(2)   reserved = 0;
  unsigned int(6)   loudnessInfoAlbumCount;
  unsigned int(3)   reserved = 0;
  unsigned int(5)   downmixIdCount;

  for (i=0; i < drcInstructionsUniDrcCount; i++) {
    unsigned int(6)   reserved = 0;
    unsigned int(2)   drcInstructionsType;
    if (drcInstructionsType == 2) {
      unsigned int(1)   reserved = 0;
      unsigned int(7)   mae_groupID;
    }
    if (drcInstructionsType == 3) {
      unsigned int(3)   reserved = 0;
      unsigned int(5)   mae_groupPresetID;
    }
    unsigned int(2)   reserved = 0;
    unsigned int(6)   drcSetId;
    unsigned int(1)   reserved = 0;
    unsigned int(7)   downmixId;
    unsigned int(5)   reserved = 0;
    unsigned int(3)   additionalDownmixIdCount;
    for (j=0; j < additionalDownmixIdCount; j++) {
      unsigned int(1)   reserved = 0;
      unsigned int(7)   additionalDownmixId;
    }
    unsigned int(16)  drcSetEffect;
    unsigned int(7)   reserved = 0;
    unsigned int(1)   limiterPeakTargetPresent;
    if (limiterPeakTargetPresent == 1) {
      unsigned int(8)   bsLimiterPeakTarget;
    }
    unsigned int(7)   reserved = 0;
    unsigned int(1)   drcSetTargetLoudnessPresent;
    if (drcSetTargetLoudnessPresent == 1) {
      unsigned int(2)   reserved = 0;
      unsigned int(6)   bsDrcSetTargetLoudnessValueUpper;
      unsigned int(2)   reserved = 0;
      unsigned int(6)   bsDrcSetTargetLoudnessValueLower;
    }
    unsigned int(1)   reserved = 0;
    unsigned int(6)   dependsOnDrcSet;
    if (dependsOnDrcSet == 0) {
      unsigned int(1)   noIndependentUse;
    } else {
      unsigned int(1)   reserved = 0;
    }
  }

  for (i=0; i < loudnessInfoCount; i++) {
    unsigned int(6)   reserved = 0;
    unsigned int(2)   loudnessInfoType;
    if (loudnessInfoType == 1 || loudnessInfoType == 2) {
      unsigned int(1)   reserved = 0;
      unsigned int(7)   mae_groupID;
    } else if (loudnessInfoType == 3) {
      unsigned int(3)   reserved = 0;
      unsigned int(5)   mae_groupPresetID;
    }
    LoudnessBaseBox();
  }

  for (i=0; i < loudnessInfoAlbumCount; i++) {

```

```

    LoudnessBaseBox();
}

for (i=0; i < downmixIdCount; i++) {
    unsigned int(1)    reserved = 0;
    unsigned int(7)    downmixId;
    unsigned int(2)    downmixType;
    unsigned int(6)    CICPspeakerLayoutIdx;
}
}

```

### 20.7.1.3 Semantics

drcInstructionsUniDrcCount	number of drcInstructions in the MHA track
loudnessInfoCount	number of loudnessInfo blocks in the MHA track
loudnessInfoAlbumCount	number of loudnessInfoAlbum blocks in the MHA track
downmixIdCount	number of downmixId definitions in the MHA track
drcInstructionsType	defined in 6.3 a value of '1' is not defined
mae_groupID	defined in 15.3
mae_groupPresetID	defined in 15.3
drcSetId	defined in ISO/IEC 23003-4:2015, Annex A
downmixId	defined in 5.3.5
additionalDownmixId	defined in ISO/IEC 23003-4:2015, Annex A
drcSetEffect	defined in ISO/IEC 23003-4:2015, Annex A
bsLimiterPeakTarget	defined in ISO/IEC 23003-4:2015, Annex A
bsDrcSetTargetLoudnessValueUpper	defined in ISO/IEC 23003-4:2015, Annex A
bsDrcSetTargetLoudnessValueLower	defined in ISO/IEC 23003-4:2015, Annex A
dependsOnDrcSet	defined in ISO/IEC 23003-4:2015, Annex A
noIndependentUse	defined in ISO/IEC 23003-4:2015, Annex A
downmixType	defined in 5.3.5
CICPspeakerLayoutIdx	defined in 5.3.5
LoudnessBox()	defined in ISO/IEC 14496-12:2012/Amd.4:2015

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## 20.8 MHA Multi-Stream Signalling

### 20.8.1 Definition

Box Type: 'maeM'

Container: MHA sample entry ('mha1', 'mha2', 'mhm1', 'mhm2')

Mandatory: No

Quantity: Zero or one

This box provides information on the location of each `mae_groupID` in case of splitting the audio scene over multiple streams or files. If multiple streams are used, this box shall be present.

## 20.8.2 Syntax

```
aligned(8) class MHAMultiStreamBox()
  extends FullBox('maeM', version=0, 0) {
  unsigned int(1) isMainStream;
  unsigned int(7) thisStreamID;

  if (isMainStream) {
    unsigned int(1) reserved = 0;
    unsigned int(7) mae_numGroups;
    unsigned int(1) reserved = 0;
    unsigned int(7) numAuxiliaryStreams;

    for (i=0; i< mae_numGroups; i++) {
      unsigned int(7) mae_groupID;
      unsigned int(1) isInMainStream;
      if (!isInMainStream) {
        unsigned int(1) reserved = 0;
        unsigned int(7) auxiliaryStreamID;
      }
    }
  }
}
```

## 20.8.3 Semantics

<code>isMainStream</code>	flag indicating if this is the main stream
<code>thisStreamID</code>	unique ID of the audio stream in the scope of all available streams in the MHA scene
<code>mae_numGroups</code>	total number of groups in the MHA scene. This value can have a value between 1 and 127, a minimum number of 1 and a maximum number of 127 groups. This number shall be equal to <code>mae_numGroups</code> in <code>MHA-GroupDefinitionBox()</code>
<code>numAuxiliaryStreams</code>	total number of auxiliary streams available
<code>mae_groupID</code>	<code>mae_groupID</code> (see 15.3) the loop instance refers to
<code>isInMainStream</code>	if this flag is set to 1, the audio data related to the group (indicated by <code>mae_groupID</code> ) is present in the main stream, otherwise the data is transmitted in an auxiliary stream
<code>auxiliaryStreamID</code>	in case the audio data identified by <code>mae_groupID</code> is an auxiliary stream, this integer identifies the respective auxiliary stream

## 20.9 Audio Scene Information

### 20.9.1 MHA Group Definition

#### 20.9.1.1 Definition

Box Type: `'maeG'`

Container: MHA scene information (`'maeI'`)

Mandatory: Yes

Quantity: Zero or one