

---

---

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

**Part 9:  
3D Audio conformance testing**

*Technologies de l'information — Codage à haut rendement et  
fourniture de supports dans les environnements hétérogènes —*

*Partie 9: Essais de conformité 3D Audio*





**COPYRIGHT PROTECTED DOCUMENT**

© ISO/IEC 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
Foreword.....	vii
Introduction.....	viii
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>1</b>
<b>3 Terms, definitions and abbreviated terms.....</b>	<b>1</b>
3.1 Terms and definitions.....	1
3.2 Abbreviated terms.....	2
<b>4 MPEG-H 3D audio conformance testing.....</b>	<b>3</b>
4.1 General.....	3
4.2 Profiles.....	3
4.3 Test procedure.....	3
4.3.1 General.....	3
4.3.2 Naming convention.....	4
4.3.3 Conformance test tools.....	6
<b>5 MPEG-H 3D audio bitstreams.....</b>	<b>6</b>
5.1 Characteristics, test procedure.....	6
5.2 MPEG-H 3D audio general configuration.....	7
5.2.1 mpegH3daConfig().....	7
5.2.2 FrameworkConfig3d().....	7
5.2.3 Signals3d().....	7
5.2.4 SpeakerConfig3d().....	7
5.2.5 mpegH3daFlexibleSpeakerConfig().....	7
5.2.6 mpegH3daSpeakerDescription().....	8
5.3 MPEG-H 3D core audio configuration.....	8
5.3.1 mpegH3daDecoderConfig().....	8
5.3.2 mpegH3daSingleChannelElementConfig().....	8
5.3.3 mpegH3daChannelPairElementConfig().....	8
5.3.4 mpegH3daCoreConfig().....	9
5.3.5 mpegH3daLfeElementConfig().....	9
5.3.6 mpegH3daExtElementConfig().....	9
5.3.7 mpegH3daConfigExtension().....	10
5.3.8 SbrConfig().....	10
5.3.9 Mps212Config().....	10
5.4 MPEG-H 3D core audio frame.....	10
5.4.1 mpegH3daFrame().....	10
5.4.2 mpegH3daSingleChannelElement().....	10
5.4.3 mpegH3daChannelPairElement().....	11
5.4.4 mpegH3daLfeElement().....	11
5.4.5 mpegH3daExtElement().....	11
5.4.6 ics_info().....	11
5.4.7 mpegH3daCoreCoderData().....	12
5.4.8 StereoCoreToolInfo().....	12
5.4.9 fd_channel_stream().....	12
5.4.10 lpd_channel_stream().....	13
5.4.11 acelp_coding().....	14
5.4.12 tcx_coding().....	14
5.4.13 lpd_stereo_stream().....	14
5.4.14 igf_stereo_pred_data().....	15
5.4.15 igf_data().....	15
5.4.16 tbe_data().....	15
5.4.17 tw_data().....	16
5.4.18 scale_factor_data().....	16

5.4.19	tns_data()	16
5.4.20	ac_spectral_data()	16
5.4.21	arith_data()	16
5.4.22	fac_data()	16
5.4.23	code_book_indices()	16
5.4.24	UsacSbrData()	16
5.4.25	Mps212Data()	16
5.5	Fill element	16
5.6	MPEG surround configuration, SpatialSpecificConfig()	16
5.7	MPEG surround frame, SpatialFrame()	17
5.8	SAOC configuration, SAOCSpecificConfig()	17
5.9	SAOC frame, SAOCFrame()	17
5.10	AudioPreRoll	17
5.10.1	Recursive presence of AudioPreRoll extension payload	17
5.10.2	AudioPreRoll()	17
5.11	Dynamic range control configuration	17
5.11.1	mpegh3daUniDrcConfig()	17
5.11.2	mpegh3daUniDrcChannelLayout()	17
5.11.3	drcCoefficientsUniDrc()	18
5.11.4	drcInstructionsUniDrc()	18
5.11.5	uniDrcConfigExtension()	18
5.12	Dynamic range control frame, uniDrcGain()	18
5.13	Object metadata configuration, ObjectMetadataConfig()	18
5.14	Object metadata frame	18
5.14.1	object_metadata_efficient()	18
5.14.2	object_metadata()	18
5.14.3	object_metadata_efficient()	18
5.14.4	intracoded_object_metadata_efficient()	18
5.14.5	differential_object_metadata()	19
5.14.6	offset_data()	21
5.14.7	object_metadata_low_delay()	21
5.14.8	intracoded_object_metadata_low_delay()	21
5.14.9	dynamic_object_metadata()	22
5.14.10	single_dynamic_object_metadata()	22
5.15	EnhancedObjectMetadataConfig()	23
5.16	EnhancedObjectMetadataFrame()	23
5.17	SAOC 3D Config	24
5.17.1	SAOC3DSpecificConfig()	24
5.17.2	SAOC3DgetNumChannels()	25
5.17.3	SAOC3DExtensionConfig()	25
5.17.4	SAOC3DExtensionConfigData()	25
5.17.5	SAOCExtensionConfig()	25
5.18	SAOC 3D frame	25
5.18.1	Saoc3DFrame()	25
5.18.2	SAOC3DFramingInfo()	26
5.18.3	EcDataSaoc()	26
5.18.4	ByteAlign()	26
5.18.5	SAOC3DExtensionFrame()	26
5.18.6	SAOC3DExtensionFrameData()	26
5.18.7	SAOCExtensionFrame()	26
5.18.8	HOAConfig()	26
5.18.9	HOADecoderConfig()	26
5.18.10	HOAEnhConfig()	27
5.18.11	HOADecoderEnhConfig()	27
5.18.12	getSubbandWidths()	27
5.19	HOA frame	27
5.19.1	HOAFrame()	27
5.19.2	HOAEnhFrame()	27

5.19.3	ChannelSideInfoData()	28
5.19.4	AddAmbHoaInfoChannel()	28
5.19.5	HOAGainCorrectionData()	28
5.19.6	VVectorData()	28
5.19.7	HOAPredictionInfo()	29
5.19.8	HOADirectionalPredictionInfo()	29
5.19.9	readDirPredDiffValues()	29
5.19.10	HOAParInfo()	29
5.19.11	readParDiffValues()	30
5.20	FMT converter frame, FormatConverterFrame()	30
5.21	Multi-channel coding tool config, MCTConfig()	30
5.22	Multi-channel coding tool frame	30
5.22.1	MultichannelCodingBoxRotation()	30
5.22.2	MultichannelCodingBoxPrediction()	31
5.22.3	MultichannelCodingFrame()	31
5.23	Tonal component coding configuration, TccConfig()	31
5.24	Tonal component coding frame	31
5.24.1	General	31
5.24.2	TccGroupOfSegments()	31
5.25	HREP config, HREPConfig()	32
5.26	HREP frame, HREPFrame()	32
5.27	ICG config, ICGConfig()	33
5.28	SignalGroupInformation Config, SignalGroupInformation()	33
5.29	DownmixMatrix	33
5.29.1	downmixConfig()	33
5.29.2	DownmixMatrixSet()	33
5.29.3	DownmixMatrix()	33
5.29.4	DecoderGainValue()	34
5.29.5	ReadRange()	34
5.29.6	EqualizerConfig()	34
5.30	Loudness info	35
5.30.1	mpegh3daLoudnessInfoSet()	35
5.30.2	loudnessInfo()	35
5.30.3	loudnessInfoSetExtension()	35
5.31	Audioscene info	35
5.31.1	mae_AudioSceneInfo	35
5.31.2	mae_Data()	35
5.31.3	mae_GroupDefinition()	36
5.31.4	mae_SwitchGroupDefinition()	36
5.31.5	mae_Description()	37
5.31.6	mae_ContentData()	37
5.31.7	mae_CompositePair()	37
5.31.8	mae_GroupPresetDefinition()	37
5.31.9	mae_ProductionScreenSizeData()	38
5.31.10	mae_LoudnessCompensationData()	38
5.31.11	mae_ProductionScreenSizeDataExtension()	39
5.31.12	mae_GroupPresetDefinitionExtension()	39
5.31.13	mae_DrcUserInterfaceInfo()	40
5.32	HOA matrix	40
5.32.1	HoaRenderingMatrixSet()	40
5.32.2	HoaRenderingMatrix()	41
5.32.3	DecoderHoaMatrixData()	41
5.32.4	DecoderHoaGainValue()	41
5.33	CompatibleProfileLevelSet()	41
5.34	Restrictions depending on profiles and levels	42
5.34.1	General	42
5.34.2	Low complexity profile	42
<b>6</b>	<b>MPEG-H 3D audio interfaces to the MPEG-H 3D audio decoder</b>	<b>46</b>

6.1	Characteristics and test procedure .....	46
6.2	Interface for local setup information .....	46
6.2.1	mpegh3daLocalSetupInformation() .....	46
6.2.2	LoudspeakerRendering() .....	46
6.2.3	BinauralRendering() .....	47
6.2.4	LocalScreenSizeInformation() .....	47
6.3	Interface for user interaction .....	47
6.3.1	mpegh3daElementInteraction() .....	47
6.3.2	ElementInteractionData () .....	47
6.3.3	ei_GroupInteractivityStatus () .....	47
6.3.4	LocalZoomAreaSize() .....	48
6.4	Interface for loudness normalization and dynamic range control .....	48
6.5	Interface for scene displacement data, mpegh3daSceneDisplacementData() .....	48
6.6	Interface for positional scene displacement data, mpegh3daPositionalSceneDisplacementData() .....	48
<b>7</b>	<b>MPEG-H 3D audio decoders .....</b>	<b>48</b>
7.1	General .....	48
7.2	Basic conformance test conditions .....	49
7.2.1	Element configuration test condition .....	49
7.2.2	Sampling rate .....	51
7.2.3	Core mode tests [Fd Lpd Cct] .....	52
7.3	Additional test conditions .....	52
7.3.1	3D audio core (FD) .....	52
7.3.2	3D audio core (LPD) .....	60
7.3.3	3D audio core (FD and LPD) .....	64
7.3.4	Object rendering .....	71
7.3.5	Higher order ambisonics (HOA) .....	74
7.3.6	Signalling of HOA rendering matrix [Hmx] .....	78
7.3.7	Downmix matrix test condition (dwx) .....	78
7.3.8	Dynamic range and loudness control .....	80
7.3.9	AudioPreRoll() condition, immediate playout frame (IPF) .....	84
7.4	Decoder settings .....	85
7.4.1	Target layout (Lay-<x>) .....	85
7.4.2	Target loudness (Lou-<x>) .....	86
7.4.3	DRC effect type request (Eff-<x>) .....	87
7.4.4	Group preset request (Pr-<x>) .....	87
7.4.5	Conformance point (Cpo-<x>) .....	88
	<b>Bibliography .....</b>	<b>89</b>

## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)) or the IEC list of patent declarations received (see [patents.iec.ch](http://patents.iec.ch)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). In the IEC, see [www.iec.ch/understanding-standards](http://www.iec.ch/understanding-standards).

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This second edition cancels and replaces the first edition (ISO/IEC 23008-9:2019), which has been technically revised.

The main changes are as follows:

- conformance testing of Baseline Profile support.

A list of all parts in the ISO 23008 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html) and [www.iec.ch/national-committees](http://www.iec.ch/national-committees).

## Introduction

This document specifies how tests can be designed to verify whether bitstreams and decoders meet the requirements as specified in ISO/IEC 23008-3 and allow interoperability with remote terminals in interactive, broadcast, streaming and local (with stored contents) sessions. These tests can be used for various purposes, such as:

- manufacturers of encoders, and their customers, can use the tests to verify whether the encoder produces bitstreams compliant with ISO/IEC 23008-3,
- manufacturers of decoders and their customers can use the tests to verify whether the decoder meets the requirements specified in ISO/IEC 23008-3 for the claimed decoder capabilities,
- manufacturers and customers of terminals supporting interactive, broadcast, streaming, and local sessions over a multitude of transport protocols and networks, can use the tests to verify whether the claimed functionalities are compliant with ISO/IEC 23008-3,
- manufacturers of test equipment, and their customers can use the tests to verify compliance with ISO/IEC 23008-3.



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

## Part 9: 3D Audio conformance testing

### 1 Scope

This document specifies conformance criteria for both bitstreams and decoders compliant with the MPEG-H 3D audio standard as defined in ISO/IEC 23008-3. This is done to assist implementers and to ensure interoperability.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 23003-1, *Information technology — MPEG audio technologies — Part 1: MPEG Surround/ — Amendment 1: Conformance testing*

ISO/IEC 23003-2, *Information technology — MPEG audio technologies — Part 2: Spatial Audio Object Coding (SAOC) — Amendment 4: SAOC Conformance*

ISO/IEC 23003-3:2020, *Information technology — MPEG audio technologies — Part 3: Unified speech and audio coding*

ISO/IEC 23003-4:2020, *Information technology — MPEG audio technologies — Part 4: Dynamic range control*

ISO/IEC 23008-3:2019/Amd 2:2020, *Information technology — High efficiency coding and media delivery in heterogeneous environments — Part 3: 3D audio/ — Amendment 2: 3D Audio baseline profile, corrections and improvements*

ISO/IEC 23091-3, *Information technology — Coding-independent code points — Part 3: Audio*