International Standard

ISO/IEC 14496-26

Information technology — Coding of audio-visual objects —

Part 26:
Audio conformance

Technologies de l'information — Codage des objets audiovisuels —

Partie 26: Conformité audio

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Foreword

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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 or www.iec.ch/members_experts/refdocs).

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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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint 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 14496-26:2010), which has been technically revised. It also incorporates the Amendments ISO/IEC 14496-26:2010/Amd 2:2010, ISO/IEC 14496-26:2010/Amd 3:2014, ISO/IEC 14496-26:2010/Amd 4:2016, ISO/IEC 14496-26:2010/Amd 5:2018 and the Technical Corrigenda ISO/IEC 14496-26:2010/Cor 2:2011, ISO/IEC 14496-26:2010/Cor 3:2011, ISO/IEC 14496-26:2010/Cor 4:2011, ISO/IEC 14496-26:2010/Cor 5:2012, ISO/IEC 14496-26:2010/Cor 6:2013, ISO/IEC 14496-26:2010/Cor 7:2013 and ISO/IEC 14496-26:2010/Cor 8:2015.

The main changes are as follows:

- Introduced additional BSAC conformance bitstreams to assist in implementing Terrestrial-DMB products
- Correction according to bitstreams and wave files for BSAC
- Correction according to channel_pair_element()
- Correction for MPEG-4 ALS floating point bitstreams
- Correction for MPEG-4 SLS test sequences

- Correction for BSAC and HE-AAC V2 profile
- Correction for ER AAC test sequences
- New conformance bitstreams for Low Delay AAC V2 profile
- Correction for AAC block length parameter and test sequences
- Additional multichannel conformance data for AAC and HE-AAC
- Additional levels of ALS simple profile and SBR enhancements
- Additional levels of MPEG-4 ALS simple profile supporting high-resolution audio

A list of all parts in the ISO/IEC 14496 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 and www.iec.ch/national-committees.

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Introduction

ISO/IEC 14496-3 specifies coded representations of audio information. ISO/IEC 14496-3 allows for large flexibility, achieving suitability of ISO/IEC 14496 for many different applications. The flexibility is obtained by including parameters in the bitstream that define the characteristics of coded bitstreams. Examples are the audio sampling frequency bitrate parameters, synchronisation timestamps, the association of bitstreams and synthetic objects within objects.

Characteristics of compressed data and decoders are defined for ISO/IEC 14496-3. The compressed data characteristics define the subset of the standard that is exploited in the compressed data. Examples are the applied values or range of the sampling rate and bitrate parameters. Decoder characteristics define the properties and capabilities of the applied decoding process. An example of a property is the applied arithmetic accuracy. The capabilities of a decoder specify which compressed data the decoder can decode and reconstruct, by defining the subset of the standard that may be exploited in the decodable compressed data. Compressed data can be decoded by a decoder if the characteristics of the compressed data are within the subset of the standard specified by the decoder capabilities.

The tests described in this document 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 14496-3.

- manufacturers of decoders and their customers can use the tests to verify whether the decoder meets the requirements specified in ISO/IEC 14496-3 for the claimed decoder capabilities.

- manufacturers and customers of terminals supporting interactive, broadcast 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 14496-6.

- manufacturers of test equipments, and their customers can use the tests to verify compliance with ISO/IEC 14496-3.

Information technology — Coding of audio-visual objects —

Part 26:
Audio conformance

1 Scope

This document specifies how tests can be designed to verify whether compressed data and decoders meet requirements specified by ISO/IEC 14496-3. Encoders are not addressed specifically. An ISO/IEC 14496 encoder generates compressed data compliant with the syntactic and semantic bitstream payload requirements specified in ISO/IEC 14496-3.

This document summarises the requirements, cross references them to characteristics, and defines how conformance with them can be tested. Guidelines are given on constructing tests to verify decoder conformance. Some examples of compressed data implemented according to these guidelines are provided as an electronic annex to this document usually together with their uncompressed counterparts (reference waveforms).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies..

ISO/IEC 11172-3, *Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s — Part 3: Audio*

ISO/IEC 11172-4, *Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s — Part 4: Compliance testing*

ISO/IEC 13818-3, *Information technology — Generic coding of moving pictures and associated audio information — Part 3: Audio*

ISO/IEC 13818-4, *Information technology — Generic coding of moving pictures and associated audio information — Part 4: Conformance testing*

ISO/IEC 13818-7, *Information technology — Generic coding of moving pictures and associated audio information — Part 7: Advanced Audio Coding (AAC)*

ISO/IEC 14496-1, *Information technology — Coding of audio-visual objects — Part 1: Systems*

ISO/IEC 14496-3, *Information technology — Coding of audio-visual objects — Part 3: Audio*

ISO/IEC 14496-3:2019, *Information technology — Coding of audio-visual objects — Part 3: Audio*

ISO/IEC 14496-11, *Information technology — Coding of audio-visual objects — Part 11: Scene description and application engine*

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

ISO/IEC 23003-2:2018, *Information technology — MPEG audio technologies — Part 2: Spatial Audio Object Coding (SAOC)*

3   Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 14496-1, ISO/IEC 14496-3 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
conformance data
conformance test sequences and conformance tools

3.2
conformance tools
tools which are provided within an electronic annex of this document to check certain conformance criteria

3.3
conformance test sequences
set of compressed data and its reference waveforms

Note 1 to entry: The conformance test sequences are provided as examples at: https://standards.iso.org/iso-iec/14496/-26/ed-2/en/.

3.4
compressed data
encoded data according to ISO/IEC 14496-3

3.5
reference waveforms
decoded counterparts of the compressed data

4   Conformance points

All audio decoders except the LATM-based decoders are part of the MPEG-4 framework. Table 1 gives an overview about the interfaces that have to be provided to test the audio decoders using the MPEG-4 System.

Table 1 — Conformance points

conformance point / interface	data flow direction	description / reference
AudioSpecificConfig	in	audio related decoder specific information, see ISO/IEC 14496-3:2019, (1.6.2.1 AudioSpecificConfig)
audio access units	in	audio related bitstream payload, see ISO/IEC 14496-1:2004 (7.1.2.3 Access Units (AU))
BIFS/AudioSource node	in	see ISO/IEC 14496-11: 2005 (7.2.2.15 Audio Source)
private test info	in	to control some elements which are usually generated by random number generators
audio composition units	out	see ISO/IEC 14496-1: 2004 (7.2.8 Composition Units (CU))

Figure 1 gives an overview about the test bench (MPEG-4 System), the system under test (Audio decoder), and the interfaces between them. Figure 2 gives a more detailed view on the audio decoder, consisting of error protection (EP) decoder and audio core decoder.
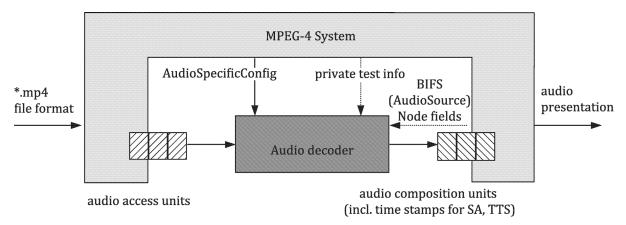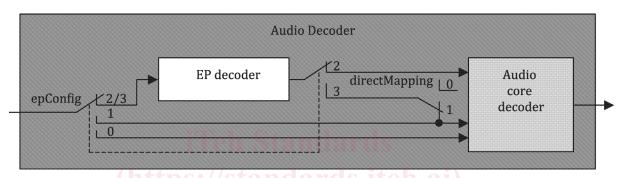
Figure 1 — Audio conformance points

Figure 2 — Audio decoder structure

Clause 7 describes:

The conformance criteria of the audio core decoder.

The conformance criteria of the compressed data not requiring the EP decoder (epConfig == 0 || epConfig == 1).

The properties of the examples of compressed data with (epConfig == 0 || epConfig == 1).

Clause 8 describes:

The conformance criteria of the EP decoder

The conformance criteria of the compressed data requiring the EP decoder (epConfig == 2 || epConfig == 3).

The properties of the examples of compressed data with (epConfig == 2 || epConfig == 3).

Compressed data with different epConfig settings are available referring to the same reference waveforms. Here, the output of a conforming decoder shall be equal, independently of the used epConfig setting.

For some of the compressed data containing scalable configurations, conformance points are defined at the PCM output of the decoder for m layers being decoded from an n-layer input, where m is an integer in the range 0 (base layer conformance) to $n-1$. The reference PCM decoder output signals corresponding to these conformance points are listed in the respective conformance tables.

5 Profiles

ISO/IEC 14496-3 defines several profiles and several levels within each profile. Conformance is always tested against a certain level within a certain profile. Audio profiles always comprise a set of audio object types. Nevertheless the conformance criteria as described within this document are based on audio object types. The assignment of object types to profiles as well as the level definitions can be found in ISO/IEC 14496-3. The conformance of a certain level within a certain profile is fulfilled, if the conformance of each object type belonging to this profile is fulfilled. The assignment of the provided test sequences to profiles and levels can be found in Clause 12.

6 Conformance data

6.1 File name conventions

For all conformance test sequences, the file name convention given in Table 2 is used.

Table 2 — File name conventions

object type name/ tool name	File Name (compressed)	File Name (uncompressed)
AdvancedAudioBIFS - perceptual apporach	aabper<coreSetup>	-- not applicable --
AdvancedAudioBIFS - physical approach	aabphy<coreSetup>	-- not applicable --
AudioBIFS	ab<coreSetup>_<coder>	ab<coreSetup>_<coder>
AudioBIFS v3	ABv3_<nodeAbbrev><coreSetup>	-- not applicable --
AAC scalable	ac<coreSetup>	ac<coreSetup>[_lay<highestLay>]
AAC LC	al<coreSetup>_<fs>	al<coreSetup>_<fs>[_cut<fac>_boost<facr>] [_level<lvl>][_<chan>]
AAC main	am<coreSetup>_<fs>	am<coreSetup>_<fs>[_cut<fac>_boost<facr>] [_level<lvl>][_<chan>]
AAC LTP	ap<coreSetup>_<fs>	ap<coreSetup>_<fs>
AAC SSR	as<coreSetup>_<fs>	as<coreSetup>_<fs>[_<chan>]
CELP	ce<coreSetup>	ce<coreSetup>[_lay<highestLay>]
ER AAC scalable	er_ac<coreSetup>_ep<epConfig> [<epSetup>]	er_ac<coreSetup>[_lay<highestLay>]
ER AAC LD	er_ad<coreSetup>_<fs>_ep<epConfig> [<epSetup>]	er_ad<coreSetup>_<fs>
ER AAC LC	er_al<coreSetup>_<fs>_ep<epConfig> [<epSetup>]	er_al<coreSetup>_<fs>
ER AAC LTP	er_ap<coreSetup>_<fs>_ep<epConfig> [<epSetup>]	er_ap<coreSetup>_<fs>
SBR (+AAC LC)	al_sbr_<tool>_<fs>_<nchan>[_fsaac<fs>][_sig<sig>]	al_sbr_<mode>_<tool>_<fs>_<nchan> [_fsaac<fs>][_sig<sig>][_<chan>]
SBR (+AAC LC with 960 samples per frame)	al960_sbr_<tool>_<fs>_<nchan> [_fsaac<fs>][_sig<sig>]	al960_sbr_<mode>_<tool>_<fs>_<nchan> [_fsaac<fs>][_sig<sig>][_<chan>]
PS (+SBR+AAC LC)	al_sbr_ps_<coreSetup>	al_sbr_ps_<coreSetup>[_<version>]
SSC	ssc_<tool>_<nchan>[_sig<sig>]	ssc_<mode>_<tool>_<nchan>[_sig<sig>][_<chan>]
DST	dst_<tool>_<nchan>[_sig<sig>]	dst_<mode>_<tool>_<nchan>[_sig<sig>][_<chan>]
Layer-3	l3_<coreSetup>	l3_<coreSetup>

object type name/ tool name	File Name (compressed)	File Name (uncompressed)
ER BSAC	er_bs<coreSetup>_<fs>_ep<epConfig> [<epSetup>]	er_bs<coreSetup>_<fs>[_lay<highestLay>]
ER CELP	er_ce<coreSetup>_ep<epConfig> [<epSetup>]	er_ce<coreSetup>[_lay<highestLay>]
ER HILN	er_hi<coreSetup>_ep<epConfig> [<epSetup>]	er_hi<coreSetup>[_lay<highestLay>] [_s<speedFac>][_p<pitchFac]
ER HVXC	er_hv<coreSetup>_ep<epConfig> [<epSetup>]	er_hv<coreSetup>[_lay<highestLay>]_<delay>
ER Parametric	er_pa<coreSetup>_ep<epConfig> [<epSetup>]	er_pa<coreSetup>[_lay<highestLay>]_<delay>
ER Twin VQ	er_tv<coreSetup>_ep<epConfig> [<epSetup>]	er_tv<coreSetup>[_lay<highestLay>]
HVXC	hv<coreSetup>	hv<coreSetup>[_lay<highestLay>]_ref<decCfg>
Algorithmic Synthesis and Audio FX	sy<coreSetup>	sy<coreSetup>
TTSI	tts<coreSetup>	tts<coreSetup>
TwinVQ	tv<coreSetup>	tv<coreSetup>[_lay<highestLay>]
ALS	als_<tool>_<coreSetup>	als_<tool>_<coreSetup>
SLS	sls<coreSetup>_<fs>_<bitres>	sls<coreSetup>_<fs>_<bitres>
Layer-1	l1_<coreSetup>	l1_<coreSetup>
Layer-2	l2_<coreSetup>	l2_<coreSetup>
ER AAC ELD	er_eld<coreSetup>_<fs>_ep<epConfig> [<epSetup>]	er_eld<coreSetup>_<fs>
LD MPEG Surround (+ER AAC LD)	er_ad_ldmps_<coreSetup>	er_ad_ldmps_<coreSetup>
LD MPEG Surround (+ER AAC ELD)	er_eld_ldmps_<coreSetup>	er_eld_ldmps_<coreSetup>

<bitres> can be 16 or 24 and indicates the bit resolution of the coded wavefile

<chan> indicates the channel for multi-channel sequences (f<number> - number of the front channel, b<number>- number of the back channel, s<number> - number of the side channel, l<number> - number of the LSF channel).

<coder> indicates the coder used to encode the content (ce – CELP, sa – Structured Audio, pcm – PCM)

<coreSetup> refers to a certain audio coder setup. It is most likely a number, but may also contain characters.

<delay> refers to the decoder delay, it can become "ld" (low delay) or "nd" (normal delay).

<epConfig> can be 0, 1, 2 or 3, depending on epConfig (defined in AudioSpecificConfig).

<epSetup> is required if (epConfig==2 || epConfig==3). It refers to a certain error protection setup.

<fs> sampling frequency (08, 11, 12, 16, 22, 24, 32, 44, 48, 64, 88 or 96).

_level<lvl> refers to the level with regard to DRC.

_cut<fac>_boost<fac> referes to the cut and boost factors with regard to DRC.

_lay<highestLay> is required for any scalable configuration. It marks the highest layer of the scalable configuration used for decoding (starting with 0 for the core layer).

_p<pitchfac> is a number refering to the decoder configuration with regard to the pitch factor.

_ref<decCfg> is a number refering to the decoder configuration with regard to delay mode, speed and pitch change.

_s<speedfac> is a number refering to the decoder configuration with regard to the speed factor.

<tool> indicates the SBR module mainly targeted by the test sequence. Possible values are "e" for testing the envelope adjuster "s" for testing sine addition, "gh" for testing time-grid transitions in combination with changes of SBR header data, "i" for testing inverse filtering, "qmf" for testing the QMF implementation, "cm" and "gen" for testing various channel modes, "sig" for testing SBR signalling, "twi" for QMF identification, "sr" for testing various combinations of sampling rates, and "esbr" for testing SBR enhancements.

<nodeAbbrev> is the abbreviation of one of the AudioBIFS v3 node names.

<nchan> corresponds to the number of channels present in the conformance test sequence. It is either a single integer, in which case it refers to the number of main audio channels, or two integers separated by a '.', in which case the first integer equals the number of main audio channels, while the second number equals the number of low frequency enhancement channels.

fsaac<fs> corresponds to the sampling rate of the underlying AAC-LC data. If it is omitted, it is half the sampling rate given as output sampling rate.

<sig> is an integer describing the kind of signalling used according to Table 3. If this value is omitted, backwards compatible explicit signalling of SBR is used.

Table 3 – File name conventions for SBR signaling

sig	Signalling method used
0	Implicit signalling of SBR
1	Hierarchical explicit signalling of SBR
2	Backwards compatible explicit signalling of SBR

<mode> is either "hq" or "lp" for the high quality or the low power version of the SBR decoding algorithm respectively.

<version> is either "bl" or "ur" for the baseline or the unrestricted version of the parametric stereo decoding algorithm respectively.

With respect to file extensions, the following rules are applied as shown in Table 4

Table 4 – File extensions

Compressed	MPEG-4 file format	.mp4
Compressed	native MPEG-1/2 Audio storage format	.mpg
Compressed	Audio data interchange format	.adif
Compressed	Audio data transport stream	.adts
Compressed	AudioSyncStream	.ass
Compressed	EPAudioSyncStream	.ess
Compressed	AudioPointerStream	.aps
Uncompressed	HILN Conformance Test Parameters	.ctp
Uncompressed	WAVE format (uncompressed PCM format)	.wav
Uncompressed	TTSI decoded text and control digits	.txt

6.2 Content

The test set includes a set of sine sweeps, a set of musical/speech test sequences and a set of noise-like test sequences. The supplied sine sweeps with an amplitude of -20dB relative to full scale have an absolute amplitude of +/- 0.1.