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Information technology — Generic coding of moving pictures and associated audio information —

Part 4: Conformance testing

AMENDMENT 1: Advanced Audio Coding (AAC) conformance testing

*Technologies de l'information — Codage générique des images animées et
des informations sonores associées —*

Partie 4: Essais de conformité

AMENDEMENT 1: Essai de conformité de codage audio avancé



Foreword

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Amendment 1 to ISO/IEC 13818-4:1998 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 — Generic coding of moving pictures and associated audio information — Part 4: Conformance testing

AMENDMENT 1

Advanced Audio Coding (AAC) conformance testing

1) Add the following reference to subclause 1.2 Normative References:

ITU-R Document TG10-2/3- E only, " Basic Audio Quality Requirements for Digital Audio Bit-Rate Reduction Systems for Broadcast Emission and Primary Distribution", 28 October 1991.

2) Replace the following definitions in subclause 2.1 with the following:

2.1.142 low frequency enhancement (LFE) channel: A limited bandwidth channel for low frequency audio effects in a multichannel system.

2.1.151 modified discrete cosine transform (MDCT): A transform which has the property of time domain aliasing cancellation. An analytical expression for the MDCT can be found in B 2.3.1.2.

2.1.258 variable length code (VLC): A code word assigned by variable length encoder (see variable length coding).

2.1.259 variable length decoder (VLD): A procedure to obtain the symbols encoded with a variable length coding technique.

3) Add the following definitions in subclause 2.1 as indicated:

2.1.145.1 main audio channels: All single_channel_elements (see 3.2.1) or channel_pair_elements (see 3.2.1) in one program.

2.1.193.1 program [AAC]: A set of main audio channels, coupling_channel_elements (see 3.2.1), lfe_channel_elements (see 3.2.1), and associated data streams intended to be decoded and played back simultaneously. A program may be defined by default (see 3.5.1) or specifically by a program_configuration_element (see 3.2.1). A given single_channel_element (see 3.2.1), channel_pair_element (see 3.2.1), coupling_channel_element, lfe_channel_element or data channel may accompany one or more programs in any given bitstream.

2.1.214.1 Sampling Frequency (Fs): Defines the rate in Hertz which is used to digitize an audio signal during the sampling process.

2.1.230.1 spectral coefficients: Discrete frequency domain data output from the analysis filterbank.

2.1.259.1 variable length encoder: A procedure to assign variable length codewords to symbols.

4) Add the following Arithmetic Operator in subclause 2.2.1 following the operator

$Sign(x) = -1$ when $x < 0$:

$INT()$ Truncation to integer operator. Returns the integer part of the real-valued argument.

5) Add the following as subclause 2.6 for conformance testing of ISO/IEC 13818-7:1997, Information technology — Generic coding of moving pictures and associated audio information — Part 7: Advanced Audio Coding (AAC):

2.6 Advanced Audio Coding (AAC)

2.6.1 Introduction

ISO/IEC 13818-7 describes the Advanced Audio Coding (AAC) system for multichannel audio. This part of ISO/IEC 13818 includes much flexibility to enable its use in many different applications. The flexibility is obtained by specifying a toolset that contains several required and optional tools, as well as several parameterized elements in the bitstream.

This subclause of the specification specifies how tests can be designed to verify whether bitstreams and decoders meet the requirements as specified in ISO/IEC 13818-7. 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 valid bitstreams for a particular AAC profile.
- manufacturers of decoders and their customers can use the tests to verify whether the decoder meets the requirements specified in ISO/IEC 13818-4 for the claimed decoder capabilities.

2.6.2 Scope

This subclause of this part of ISO/IEC 13818 specifies how tests can be designed to verify whether bitstreams and decoders meet requirements specified in ISO/IEC 13818-7. In this part of ISO/IEC 13818, encoders are not addressed specifically. An encoder may be said to be an ISO/IEC 13818-7 encoder if it generates bitstreams compliant with the syntactic and semantic bitstream requirements specified in ISO/IEC 13818-7.

Characteristics of coded bitstreams and decoders are defined for ISO/IEC 13818-7. The characteristics of a bitstream define the subset of the standard that is exploited in the bitstream. 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 coded bitstreams the decoder can decode and reconstruct, by defining the subset of the standard that may be exploited in decodable bitstreams. A bitstream can be decoded by a decoder if the characteristics of the coded bitstream are within the subset of the standard specified by the decoder capabilities.

Procedures are described for testing conformance of bitstreams and decoders to the requirements defined in ISO/IEC 13818-7. Given the set of characteristics claimed, the requirements that must be met are fully determined by ISO/IEC 13818-7. This subclause summarizes the requirements, cross references them to characteristics, and defines how conformance with them can be tested. Guidelines are given on constructing tests to verify bitstream and decoder conformance. This part of ISO/IEC 13818 gives guidelines on how to construct bitstream test suites to check or verify decoder conformance. In addition, some test bitstreams implemented according to those guidelines are provided as an electronic annex.

2.6.3 AAC Bitstream Characteristics

Bitstream characteristics specify the constraints that are applied by the encoder in generating the bitstream. These syntactic and semantic constraints may, for example, restrict the range or the values of parameters that are encoded directly or indirectly in the bitstream. The constraints applied to a given bitstream may or may not be known *a priori*.

Encoders may apply restrictions to the following parameters of the bitstream:

- a) sampling frequency
- b) mono_mixdown_element
- c) stereo_mixdown_element
- d) use of prediction in main profile
- e) pulse_data
- f) window_shape
- g) program_config_element
- h) M/S stereo
- i) intensity stereo
- j) TNS
- k) data_stream_element
- l) dependently switched coupling channel

- m) independently switched coupling channel
- n) LFE channel
- o) matrix-downmix

2.6.4 Decoder Characteristics

2.6.4.1 Profile Specification

The naming convention for ISO/IEC 13818-7 AAC decoders dictates that a decoder be specified as an A.L.I.D Channel <Profile Name> Profile ISO/IEC 13818-7 AAC Decoder, where A is replaced by the number of main audio channels, L by the number of LFE channels, I by the number of independent coupling channels, D by the number of dependently switched coupling channels, and Profile Name by the actual profile name (Main, Low-Complexity, or Scaleable Sampling Rate). An example would be a 5.1.1.1 Channel Main Profile ISO/IEC 13818-7 AAC Decoder, indicating a decoder capable of decoding 5 main audio channels, one LFE channel, one independent coupling channel, and one dependent coupling channel, with each of the channels using the profile specified. This can be abbreviated as M.5.1.1.1. Similarly, a Low Complexity decoder can be specified by a leading "L", and an SSR profile by an "S".

A conforming decoder must support a minimum capability in terms of the number of main audio channels, LFE channels, independent coupling channels, and dependent coupling channels as specified below:

Table 2-8 Minimum Decoder Capability for 1, 2, 3, 4, 5, and 7 Main Audio Channels vs. Profile

Number of Main Audio Channels	Main Profile Capability	Low Complexity Profile Capability	SSR Profile Capability
1	1.0.0.0	1.0.0.0	1.0.0.0
2	2.0.0.0	2.0.0.0	2.0.0.0
3	3.0.1.0	3.0.0.1	3.0.0.0
4	4.0.1.0	4.0.0.1	4.0.0.0
5	5.1.1.1	5.1.0.1	5.1.0.0
7	7.1.1.2	7.1.0.2	7.1.0.0

Note that a decoder may support more than the number of channel elements specified in the table above and still be a conformant decoder. Thus, M.5.1.1.1, M.5.1.1.2, L.5.1.1.1, and S.5.1.0.0 are all conformant 5 channel configurations. However, M.5.1.0.0, L.5.1.0.0, and S.5.0.0.0 are not conformant 5 channel configurations.

2.6.4.2 Decoder Modifications

A conforming decoder may also support any of the following modifications of some parameters in audio bitstreams:

Bitstream Characteristic	Normative Clause	Variation
sampling rate	3	a decoder may support only a subset of possible sampling rates, decoder manufacturers must specify the rates which are supported
profile	2.1	a decoder may support additional channel elements beyond the minimums listed for its profile
program configuration	3.5	a decoder is only required to decode one program of a multi-program bitstream
data_stream_element	3.6	a decoder is not required to store or present data recovered from data_stream_elements
mono-mixdown element	3.3.8	a decoder is not required to present audio from the mono-mixdown element