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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 –
Part 11: MPEG-4 AAC and its extensions in LATM/LOAS

Audionumérique – Interface pour les flux de bits audio à codage MIC non linéaire conformément à la CEI 60958 –
Partie 11: MPEG-4 AAC et ses extensions en LATM/LOAS

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This bilingual version, published in 2011-02, corresponds to the English version.

The text of this standard is based on the following documents:

CDV	Report on voting
100/1491/CDV	100/1580/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 61937, under the general title *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

Modern digital video broadcasting standards such as DVB include support for the MPEG-4 HE AAC and/or HE AAC v2 audio codecs as specified in ISO/IEC 14496-3. An increasing number of countries are adopting these new codecs for their standard definition and high definition digital video broadcasting services and have started with implementations.

For MPEG-2 AAC audio (ISO/IEC 13818-7) the specified framing format for the audio bit stream is ADTS and its transport over an IEC 60958 interface is specified in IEC 61937-6.

However, the MPEG-4 (ISO/IEC 14496-3) audio codecs introduce new features and capabilities that require a framing format that supports more flexible signaling and delivery mechanisms. Therefore, MPEG-2 Systems (ISO/IEC 13818-1) specifies the MPEG-4 LATM/LOAS framing format for MPEG-4 audio codecs to overcome the limitations of ADTS.

In order to be able to pass the MPEG-4 audio bit stream from a Set Top Box to an A/V receiver connected via the IEC 60958 interface without needing to reframe the audio bit stream within ADTS, the MPEG-4 LATM/LOAS framing format needs to be supported by IEC 61937.

DIGITAL AUDIO – INTERFACE FOR NON-LINEAR PCM ENCODED AUDIO BITSTREAMS APPLYING IEC 60958 –

Part 11: MPEG-4 AAC and its extensions in LATM/LOAS

1 Scope

This part of IEC 61937 describes the method to convey non-linear PCM bitstreams encoded according to the MPEG-4 AAC format and its extensions spectral band replication, parametric stereo and MPEG surround, framed in MPEG-4 LATM/LOAS.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60958 (all parts), *Digital audio interface*

IEC 61937-1, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 1: General*

IEC 61937-2, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 2: Burst-info*

ISO/IEC 14496-3:2009, *Information technology – Coding of audio-visual objects – Part 3: Audio*

3 Terms, definitions and abbreviations

For the purposes of this document the terms, definitions and abbreviations of IEC 61937-1, IEC 61937-2 and the following apply.

3.1 Terms and definitions

3.1.1
access unit
smallest entity to which timing information can be attributed; an access unit is the smallest individually decodable unit; a decoder consumes access units

3.1.2
AudioMuxElement(1)
LATM element that carries payload data for at least one audio elementary stream, related payload length information and multiplex configuration information

NOTE This element carries payload data in form of PayloadMux elements. The number in brackets indicates multiplexing configuration (StreamMuxConfig) is multiplexed into AudioMuxElements, that is in-band transmission.

3.1.3
AudioSpecificConfig
configuration structure used to convey parameters to initialize the MPEG-4 audio decoder

3.1.4
low overhead MPEG-4 audio transport multiplex
LATM
multiplexing layer defined by ISO/IEC 14496-3; used for multiplexing of audio elementary streams

3.1.5
low overhead audio stream
LOAS
synchronisation layer defined by ISO/IEC 14496-3; three different formats of LOAS are defined, each of which is designed to address the specific characteristics of the underlying transmission layer

3.1.6
MPEG-4 AAC profile
contains only the MPEG-4 AAC low complexity audio object type; MPEG-4 AAC low complexity object type is the counterpart to the MPEG-2 AAC low complexity profile; in addition to the MPEG-2 AAC LC profile the MPEG-4 AAC low complexity object type enables the usage of the PNS tool

NOTE The MPEG-4 AAC Low Complexity object type is used when there are restrictions on the usage of RAM and processing complexity.

3.1.7
MPEG-4 high efficiency AAC profile
contains the spectral band replication object type in conjunction with the MPEG-4 AAC low complexity object type

NOTE For further information please refer to ISO/IEC 14496-3. The MPEG-4 high efficiency AAC profile is a superset of the MPEG-4 AAC profile.

3.1.8
MPEG-4 high efficiency AAC profile version 2
contains the parametric stereo object type and the spectral band replication object type in conjunction with the AAC low complexity object type

NOTE The MPEG-4 high efficiency AAC profile version 2 is a superset of the MPEG-4 high efficiency AAC profile.

3.1.9
MPEG surround
technology used for coding of multichannel signals based on a downmixed signal of the original multichannel signal, and associated spatial parameters

NOTE MPEG surround is defined in ISO/IEC 23003-1.

3.1.10
PayloadMux
payload data chunk in an AudioMuxElement that contains potentially multiplexed payload data for multiple audio elementary streams; in general PayloadMux elements can be concatenated inside AudioMuxElements

3.1.11
SpatialSpecificConfig
configuration structure used to initialize the MPEG surround decoder

3.1.12
StreamMuxConfig
configuration structure that describes the structure of the LATM payload multiplex

3.1.13
Sub-data-type
reference to the type of payload of the data-bursts defined for the use with the specified data-type

3.1.14
modified discrete cosine transformation
MDCT
transformation schema used by AAC

3.1.15
transformation length (of the AAC codec or core codec)
AAC can operate in two modes using either a 960 lines or 1 024 lines MDCT transformation for long blocks; an MDCT line is a spectral component described by frequency, amplitude and phase

3.2 Abbreviations

AAC	Advanced Audio Coding
AAC LC	MPEG-4 AAC Low Complexity
HE AAC	MPEG-4 High Efficiency AAC and MPEG-4 High Efficiency AAC Version 2
ADTS	Audio Data Transport Stream
DVB	Digital Video Broadcasting
MDCT	Modified Discrete Cosine Transformation
MPEG	Moving Picture Experts Group
MPS	MPEG Surround
PNS	Perceptual Noise Substitution
PS	Parametric Stereo
SBR	Spectral Band Replication
TL	AAC Transformation Length

4 Mapping of the audio bit stream on to IEC 61937-1

4.1 General

The coding of the bit stream and data-burst is in accordance with IEC 61937-1 and IEC 61937-2.

4.2 Burst-info for MPEG-4 AAC and its extensions in LATM/LOAS

The 16-bit burst-info contains information about the data which will be found in the data-burst (see Table 1).

Table 1 – Values for data-type and sub-data-type

Data-type according to IEC 61937-2 Value of Pc bits 0–4	Sub-data-type Value of Pc bits 5–6	Contents	Reference point R	Repetition period of data-bursts in IEC 60958 frames
0–22	0–3	According to IEC 61937		
23	0	According to IEC 61937-10		Definition specific to IEC 61937-10
	1	AAC LC	Bit 0 of Pa	960 / 1 024
	2	HE AAC	Bit 0 of Pa	1 920 / 2 048
	3	Reserved for future definition of other applications	reserved	Reserved for future definition of other applications
24–31	0–3	According to IEC 61937		
Bits 0–4 of the burst-info (Pc) signal the data-type used for transmission. For MPEG-4 AAC-based audio in LATM/LOAS, the signaled data-type is 23. The Pc bits 5–6 indicate if the transmitted data stream contains audio encoded in AAC LC or HE AAC (including high efficiency AAC version 2). Only values 1 and 2 refer to the transmission of AAC LC or HE AAC based audio. The values 0 and 3 are used for indication of codec types which are described by other or future parts of IEC 61937.				

5 Format of data-burst for MPEG-4 AAC and its extensions in LATM/LOAS

5.1 General

This clause specifies the data-burst for MPEG-4 AAC audio and its extensions in LATM/LOAS. Specific properties such as reference points, repetition period, the method of filling stream gaps and decoding latency are specified.

The decoding latency (or delay), indicated for the sub-data-types, should be taken into account by the transmitter to schedule data-bursts as necessary to establish synchronisation between picture and decoded audio.

5.2 Pause data-bursts for MPEG-4 AAC and its extensions in LATM/LOAS

Pause data-bursts for MPEG-4 AAC and its extensions in LATM/LOAS are defined in Table 2.

Table 2 – Repetition period of pause data-bursts

Data-type of audio data-burst	Repetition period of pause data-burst	
	Mandatory	Recommended
Sub-data-type for MPEG-4 audio in LATM/LOAS based on MPEG-4 AAC core codec	—	64 IEC 60958 frames

If regular audio data-bursts are not being transmitted due to for example a PAUSE condition, it is recommended to use pause data-bursts to fill such stream gaps. The repetition period of the pause data-bursts should be selected according to Table 2. If other repetition periods are necessary to precisely fill the stream gap length, or to meet the requirement on audio data-bursts spacing (see IEC 61937) pause data-bursts may have other lengths which may not be an integer multiple of 64 IEC 60958 frames.

When a stream gap in an audio stream is filled by a sequence of pause data-bursts, the Pa of the first pause data-burst shall occur after exactly that amount of IEC 60958 frames as indicated by the AAC transformation length in conjunction with the codec type information from Table 3. It is recommended that the sequence(s) of pause data-bursts which fill the stream gap should continue from this point up to the Pa of the first audio data-burst which follows the stream gap, or as close as possible considering the specific IEC 60958 frame length of the pause data-burst with respect to the AAC core codec transformation length. The repetition-period-length parameter contained in the pause data-burst is intended to be interpreted by the receiver as an indication of the number of decoded PCM samples that are missing (due to the resulting audio gap).

5.3 Audio data-bursts

5.3.1 MPEG-4 AAC and its extensions in LATM/LOAS

The stream of data-bursts consists of sequences of MPEG-4 AAC and its extensions in LATM/LOAS frames. Each data-burst consists of a preamble followed by the payload and stuffing. The data-type of a data-burst according to this specification is 23.

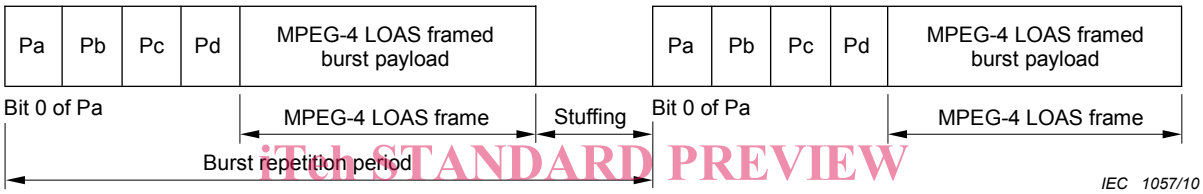

Figure 1 – Data-burst structure

The length of the audio payload data in the data-burst depends on the bit rate and other parameters of the encoded audio. The size of the data-burst payload is indicated by the Pd preamble word and is measured in bits.

P_{AD} = 4 × 16 bit (P_{AD} is the size of the preamble words P_A – P_D measured in bits)

B_S = 4 × 16 bit (B_S is the size of the burst spacing measured in bits)

TL = 1 024 or 960 lines (*TL* is the used MDCT transformation length in MDCT lines)

The maximum data-burst payload size for AAC not utilizing SBR is calculated according to the following equation:

2 × 16 bit × *TL* – (P_{AD} + B_S) = maximum payload size in bits.

If HE AAC is used the maximum data-burst payload size is calculated according to the following equation:

4 × 16 bit × *TL* – (P_{AD} + B_S) = maximum payload size in bits.

The data-type-dependent information for MPEG-4 AAC and its extensions in LATM/LOAS is given in Table 3. Bits 8–12 of Pc contain information about the audio codec used and about the LATM configuration.