IEC 61937-6

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 6: Non-linear PCM bitstreams according to the MPEG-2 AAC and MPEG-4 AAC formats

Audionumérique – Interface pour les flux de bits audio à codage MIC non linéaire conformément à la CEI 60958 – Partie 6: Flux de bits MIC non linéaire selon les formats MPEG-2 AAC et MPEG-4 AAC

IEC 61937-6:2006

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International Standard IEC 61937-6 has been prepared by technical area 4: Digital systems interfaces, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition of IEC 61937-6 cancels and replaces the first edition published in 2002. This edition contains the following significant technical changes with respect to the previous edition:

a) addition of data-type for MPEG2 AAC low sampling frequency;
b) addition of data-type for MPEG-4 AAC.

This bilingual version (2012-12) corresponds to the monolingual English version, published in 2006-01.

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

CDV	Report on voting
100/942/CDV	100/1043A/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.

IEC 61937 consists of the following parts under the general title *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958*:

Part 1: General

Part 2: Burst-info

Part 3: Non-linear bitstreams according to the AC-3 format

Part 4: Non-linear PCM bitstreams according to the MPEG audio formats

Part 5: Non-linear PCM bitstreams according to the DTS (Digital Theater Systems) format(s)

Part 6: Non-linear PCM bitstreams according to the MPEG-2 AAC and MPEG-4 AAC formats

Part 7: Non-linear PCM bitstreams according to the ATRAC, ATRAC2/3 and ATRAC-X formats

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

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- withdrawn;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

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

Part 6: Non-linear PCM bitstreams according to the MPEG-2 AAC and MPEG-4 AAC formats

1 Scope

This part of IEC 61937 specifies the method for IEC 60958 to convey non-linear PCM bitstreams encoded in accordance with the MPEG-2 AAC (Advanced Audio Coding) and MPEG-4 AAC formats.

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 (all parts), *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958*

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 13818-7:2004, *Information technology – Generic coding of moving pictures and associated audio information – Part 7: Advanced Audio Coding (AAC)*

ISO/IEC 14496-3:2001, *Information technology – Coding of audio-visual objects – Part 3: Audio*
Amendment 1 (2003)

3 Terms, definitions, abbreviations and presentation convention

For the purposes of this document, the following terms, definitions, abbreviations and presentation convention apply.

3.1 Terms and definitions

3.1.1
subdata-type
reference to the type of payload of the data-burst defined for use with the specified data-type

3.1.2
LC profile
low complexity profile identified in ISO/IEC 13818-7

3.1.3
LC profile with SBR
low complexity profile with spectral band replication identified in ISO/IEC 13818-7

3.1.4
latency
delay time of an external audio decoder to decode a MPEG-2 AAC or MPEG-4 AAC data-burst defined as the sum of two values of the receiving delay time and the decoding delay time

3.1.5
AAC profile
AAC profile identified in ISO/IEC 14496-3

3.1.6
HE-AAC profile
HE-AAC profile identified in ISO/IEC 14496-3

3.2 Abbreviations

AAC	Advanced Audio Coding
ADTS	Audio Data Transport Stream
SBR	Spectral Band Replication
HE-AAC	High Efficiency AAC

3.3 Presentation convention

01_2 Value “01” in binary format

4 Mapping of the audio bitstream on to IEC 61937

The coding of the bitstream and data-burst is in accordance with IEC 61937.

4.1 MPEG-2 AAC burst-info

MPEG-2 AAC burst-info (data-type=7) is given in Table 1.

Table 1 – Fields of burst-info (data-type=7)

Bits of Pc	Value	Contents	Reference point R	Repetition period of data-burst in IEC 60958 frames
0-4		Data-type		
	7	MPEG-2 AAC ADTS	Bit 0 of Pa	1 024
5,6	00_2	Reserved		
7-15		In accordance with IEC 61937-1 and IEC 61937-2		

MPEG-2 AAC burst-info (data-type=19) is given in Table 2.

Table 2 – Fields of burst-info (data-type=19)

Bits of Pc	Value	Contents	Reference point R	Repetition period of data-burst in IEC 60958 frames
0-4		Data-type		
	19	MPEG-2 AAC ADTS low sampling frequency		Depends on subdata-type
5,6		Subdata-type		
	00_2	Subdata-type for MPEG-2 AAC ADTS half-rate low sampling frequency	Bit 0 of Pa	2 048
	01_2	Subdata-type for MPEG-2 AAC ADTS quarter-rate low sampling frequency	Bit 0 of Pa	4 096
	10_2, 11_2	Reserved		
7-15		In accordance with IEC 61937-1 and IEC 61937-2		

4.2 MPEG-4 AAC burst-info

MPEG-4 AAC burst-info (data-type=20) is given in Table 3.

Table 3 – Fields of burst-info (data-type=20)

Bits of Pc	Value	Contents	Reference point R	Repetition period of data-burst in IEC 60958 frames
0-4		Data-type		
	20	MPEG-4 AAC		Depends on subdata-type
5,6		Subdata-type		
	00_2	Subdata-type for MPEG4 AAC	Bit 0 of Pa	1024
	01_2	Subdata-type for MPEG4 AAC half-rate low sampling frequency	Bit 0 of Pa	2 048
	10_2	Subdata-type for MPEG4 AAC quarter-rate low sampling frequency	Bit 0 of Pa	4 096
	11_2	Subdata-type for MPEG4 AAC double-rate high sampling frequency	Bit 0 of Pa	512
7-15		In accordance with IEC 61937-1 and IEC 61937-2		

5 Format of MPEG-2 AAC and MPEG-4 AAC data-bursts

This clause specifies the audio data-bursts MPEG-2 AAC and MPEG-4 AAC. Specific properties such as reference points, repetition period, the method of filling stream gaps, and decoding latency are specified for each data-type.

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

5.1 Pause data-burst

5.1.1 The data MPEG-2 AAC

The pause data-burst for MPEG-2 AAC is given in Table 4.

Table 4 – Repetition period of pause data-bursts

Data-type of audio data-burst	Repetition period of pause data-burst	
	Mandatory	Recommended
MPEG-2 AAC	-	32 IEC 60958 frames
MPEG-2 AAC and half-rate low sampling frequency	-	64 IEC 60958 frames
MPEG-2 AAC and quarter-rate low sampling frequency	-	128 IEC 60958 frames

5.1.2 The data MPEG-4 AAC

The pause data-burst for MPEG-4 AAC is given in Table 5.

Table 5 – Repetition period of pause data-bursts

Data-type of audio data-burst	Repetition period of pause data-burst	
	Mandatory	Recommended
MPEG-4 AAC	-	32 IEC 60958 frames
MPEG-4 AAC and half-rate low sampling frequency	-	64 IEC 60958 frames
MPEG-4 AAC and quarter-rate low sampling frequency	-	128 IEC 60958 frames
MPEG-4 AAC double-rate high sampling frequency	-	16 IEC 60958 frames

5.2 Audio data-bursts

5.2.1 The data MPEG-2 AAC

The stream of the data-bursts for MPEG-2 AAC consists of sequences of MPEG-2 AAC ADTS frames. The data-type of an MPEG-2 AAC data-burst is 7. The data-burst is headed with a burst-preamble, followed by the burst-payload, and stuffed with stuffing bits. The burst-payload of each data-burst of MPEG-2 AAC data shall contain one complete MPEG-2 AAC ADTS frame and represents 1 024 samples for each encoded channel. The length of the MPEG-2 AAC data-burst depends on the encoded bit rate (which determines the MPEG-2 AAC ADTS frame length). The reference to the specification for the MPEG-2 AAC bitstream, representing 1 024 samples of encoded audio per frame is found in ISO/IEC 13818-7.

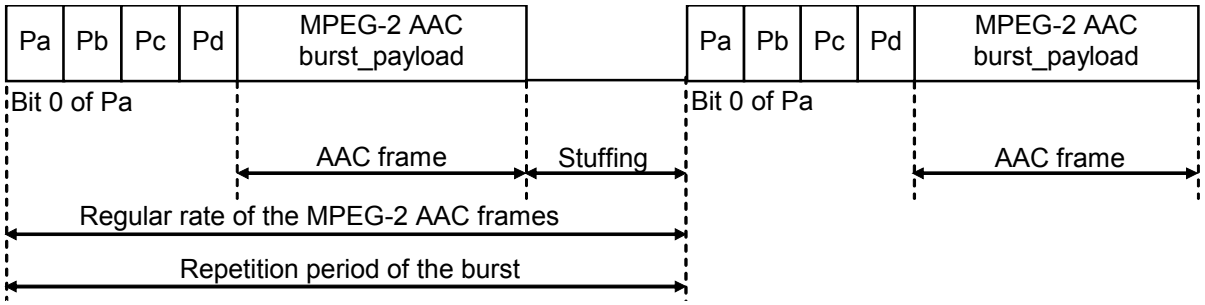

Figure 1 – MPEG-2 AAC data-burst

The data-type-dependent information for MPEG-2 AAC is given in Table 6.

Table 6 – Data-type-dependent information for data-type MPEG-2 AAC

Bits of Pc LSB..MSB	Value	Contents
8-12	00	No indication
	01	LC profile
	02, 03	Reserved for future profile
	04-31	Reserved

The reference point of an MPEG-2 AAC data-burst is bit 0 of Pa and occurs exactly once every 1 024 sampling periods. The data-burst containing MPEG-2 AAC frames shall occur at a regular rate, with the reference point of each MPEG-2 AAC data-burst beginning 1 024 IEC 60958 frames after the reference point of the preceding MPEG-2 AAC data-burst (of the same bitstream number).

It is recommended that pause data-bursts are used to fill stream gaps in the MPEG-2 AAC bitstream as described in IEC 61937, and that pause data-bursts be transmitted with a repetition period of 32 IEC 60958 frames, except when other repetition periods are necessary to fill the precise stream-gap length (which may not be a multiple of 32 IEC 60958 frames), or to meet the requirement on burst spacing (see IEC 61937).

When a stream gap in an MPEG-2 AAC stream is filled by a sequence of pause data-bursts, the Pa of the first pause data-burst shall be located 1 024 sampling periods following the Pa of the previous MPEG-2 AAC frame. It is recommended that the sequence(s) of pause data-bursts which fill the stream gap should continue from this point up to (as close as possible to, considering the 32 IEC 60958 frame length of the pause data-burst) the Pa of the first MPEG-2 AAC data-burst which follows the stream gap. The gap-length parameter contained in the pause data-burst is intended to be interpreted by the MPEG-2 AAC decoder as an indication of the number of decoded PCM samples which are missing (due to the resulting audio gap).

5.2.2 Latency of MPEG-2 AAC decoding

The latency of an external audio decoder to decode MPEG-2 AAC is defined as the sum of the receiving delay time and the decoding delay time.

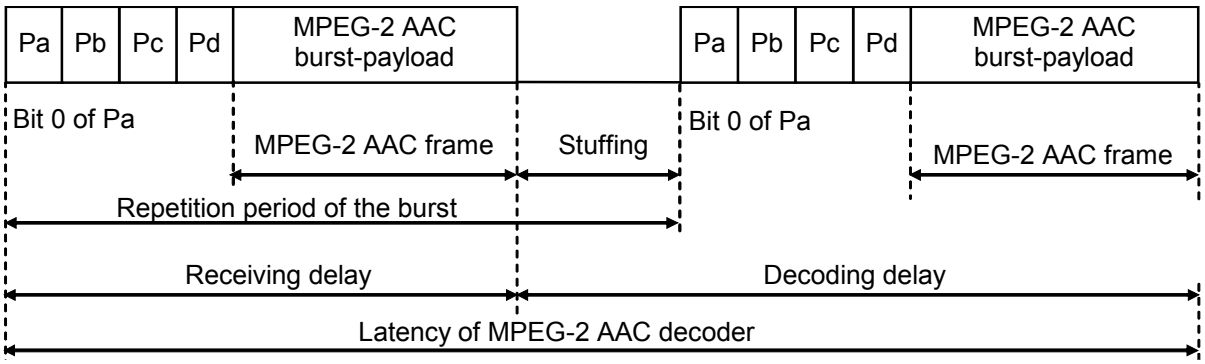

Figure 2 – Latency of MPEG-2 AAC decoding

EXAMPLE The receiving delay time to receive a whole data-burst with maximum length is calculated as follows. The length of preamble is 64 bits. The maximum length of whole data-burst payload is 8 192 bit in the Japanese satellite DTV specified maximum bit rate of 384 kbit/s. In this case, the maximum length of data-bursts is 8 256 bit. The receiving delay time is calculated as 5,375 ms in the case of the 48 kHz sampling frequency. The decoding

delay time is calculated as 21,333 ms. It is of equal value to the decoding time for one MPEG-2 AAC frame data. Hence, the latency of MPEG-2 AAC decoding is approximately 26,708 ms.

The absolute maximum length of the data-burst is calculated as follows. In order to make a burst, a minimum stuffing consists of 4 stuffing words (Pz of 16 bits) per burst. The repetition period of data-burst in IEC 60958 frames is 1 024. Therefore, the maximum length of data-burst leads to 1 024 sample * 2 ch * 16 bits – 4 word * 16 bits = 32 704 bits. The receiving delay time is calculated as 21,29 ms in the case of the 48 kHz sampling frequency (32 704/1 536 000 = 0,021 29). The decoding delay time is 21,333 ms as above. Hence, the latency of MPEG-2 AAC decoding is a maximum of 42,62 ms.

For synchronization (for example, with video), the recommended value of latency is 42,62 ms. A shorter latency is acceptable when synchronization is not required.

5.2.3 The data MPEG-2 AAC half-rate low sampling frequency

The stream of the data-bursts for MPEG-2 AAC half-rate low sampling frequency consists of sequences of MPEG-2 AAC low sampling frequency ADTS frames. The data-type of an MPEG-2 AAC low sampling frequency data-burst is 19; and the subdata type of an MPEG-2 AAC half-rate low sampling frequency is 0. The data-burst is headed with a burst-preamble, followed by the burst-payload, and stuffed with stuffing bits. The burst-payload of each data-burst of the MPEG-2 AAC half-rate low sampling frequency data shall contain one complete MPEG-2 AAC half-rate low sampling frequency ADTS frame, and represents 2 048 samples for each encoded channel. The length of the MPEG-2 AAC half-rate low sampling frequency data-burst depends on the encoded bit rate (which determines the MPEG-2 AAC half-rate low sampling frequency ADTS frame length). The reference to the specification for the MPEG-2 AAC half-rate low sampling frequency bitstream, representing 2 048 samples of encoded audio per frame may be found in ISO/IEC 13818-7.

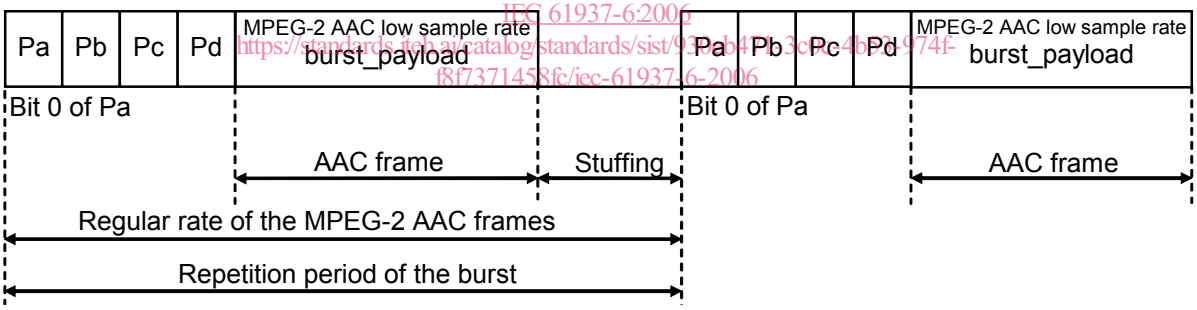

Figure 3 – MPEG-2 AAC half-rate low sampling frequency data-burst

The data-type-dependent information for the MPEG-2 AAC half-rate low sampling frequency is given in Table 7.

Table 7 – Data-type-dependent information for data-type MPEG-2 AAC half-rate low sampling frequency

Bits of Pc LSB..MSB	Value	Contents
8-12	0	No indication
	1	LC profile
	2, 3	Reserved for future profile
	4	LC profile with SBR
	5-31	Reserved

The reference point of an MPEG-2 AAC half-rate low sampling frequency data-burst is bit 0 of Pa and occurs exactly once every 2 048 sampling periods. The data-burst containing the