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**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 format**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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 format**

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

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

FDIS	Report on voting
100/500/FDIS	100/536/RVD

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

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

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be:

- reconfirmed;
- withdrawn;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 format

1 Scope

This part of IEC 61937 specifies the method for the digital audio interface specified in IEC 60958 to convey non-linear PCM bitstreams encoded in accordance with the MPEG-2 AAC (Advanced Audio Coding) format.

NOTE MPEG-2 AAC is specified in ISO/IEC 13818-7.

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 60958-1, *Digital audio interface – Part 1: General*

IEC 60958-3, *Digital audio interface – Part 3: Consumer applications*

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

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

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

3 Definitions and terminology

3.1 Definitions

For the purposes of this standard, the following definitions apply.

3.1.1

LC profile

low complexity profile identified in ISO/IEC 13818-7: MPEG-2 AAC standard

3.1.2

latency

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

3.2 Abbreviations

AAC Advanced Audio Coding

ADTS Audio Data Transport Stream

¹ To be published.

4 Mapping of the audio bitstream on to IEC 61937-1

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

MPEG-2 AAC burst-info is given Table 1.

Table 1 – Fields of burst-info

Bits of Pc	Value	Contents	Reference point R	Repetition period of data-burst in IEC 60958 frames
0-4		Data-type		
	0-6	In accordance with IEC 61937-2		
	7	MPEG-2 AAC ADTS	bit 0 of Pa	1 024
	8-31	In accordance with IEC 61937-2		
5-15		In accordance with IEC 61937-2		

5 Format of MPEG-2 AAC data-bursts

5.1 General

This clause specifies the audio data-bursts MPEG-2 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 picture and decoded audio.

5.2 Pause data-burst

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

Table 2 – Repetition period of Pause data-bursts

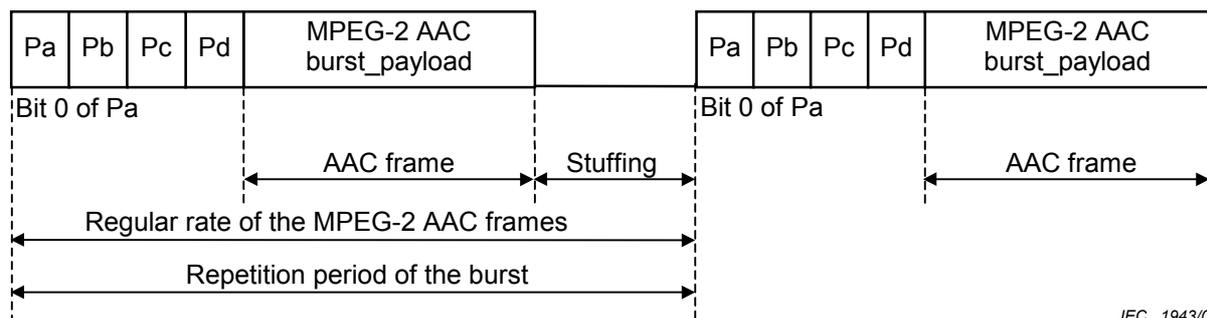
Data-type of Audio data-burst	Repetition period of Pause data-burst	
	Mandatory	Recommended
MPEG-2 AAC	–	32 IEC 60958 frames

5.3 Audio data-bursts

5.3.1 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 a 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).

NOTE The reference to the specification for the MPEG-2 AAC bitstream, representing 1 024 samples of encoded audio per frame, may be found in ISO/IEC 13818-7.



IEC 1943/02

Figure 1 – MPEG-2 AAC data-burst

The data-type-dependent information for MPEG-2 AAC is given in Table 3.

Table 3 – Data-type-dependent information for data-type MPEG-2 AAC

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

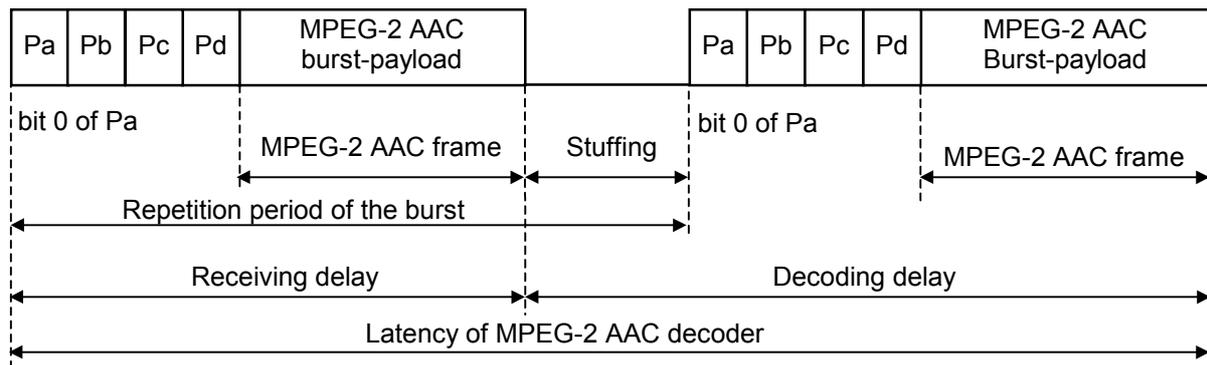
The reference point of a MPEG-2 AAC data-burst is bit 0 of Pa and occurs exactly once every 1 024 sampling periods. The data-burst containing MPEG-2 AAC frames shall occur at a regular rate. The reference point of each MPEG-2 AAC data-burst begins 1 024 IEC 60958 frames after the reference point of the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

It is recommended that Pause data-bursts are used to fill stream gaps in the MPEG-2 AAC bit stream as described in IEC 61937-1, 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 61937-1).

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 the Pa of the first MPEG-2 AAC data-burst which follows the stream gap (as close as possible considering the 32 IEC 60958 frame length of the Pause data-burst). 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).

5.3.2 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.



IEC 1944/02

Figure 2 – Latency of MPEG-2 AAC decoding

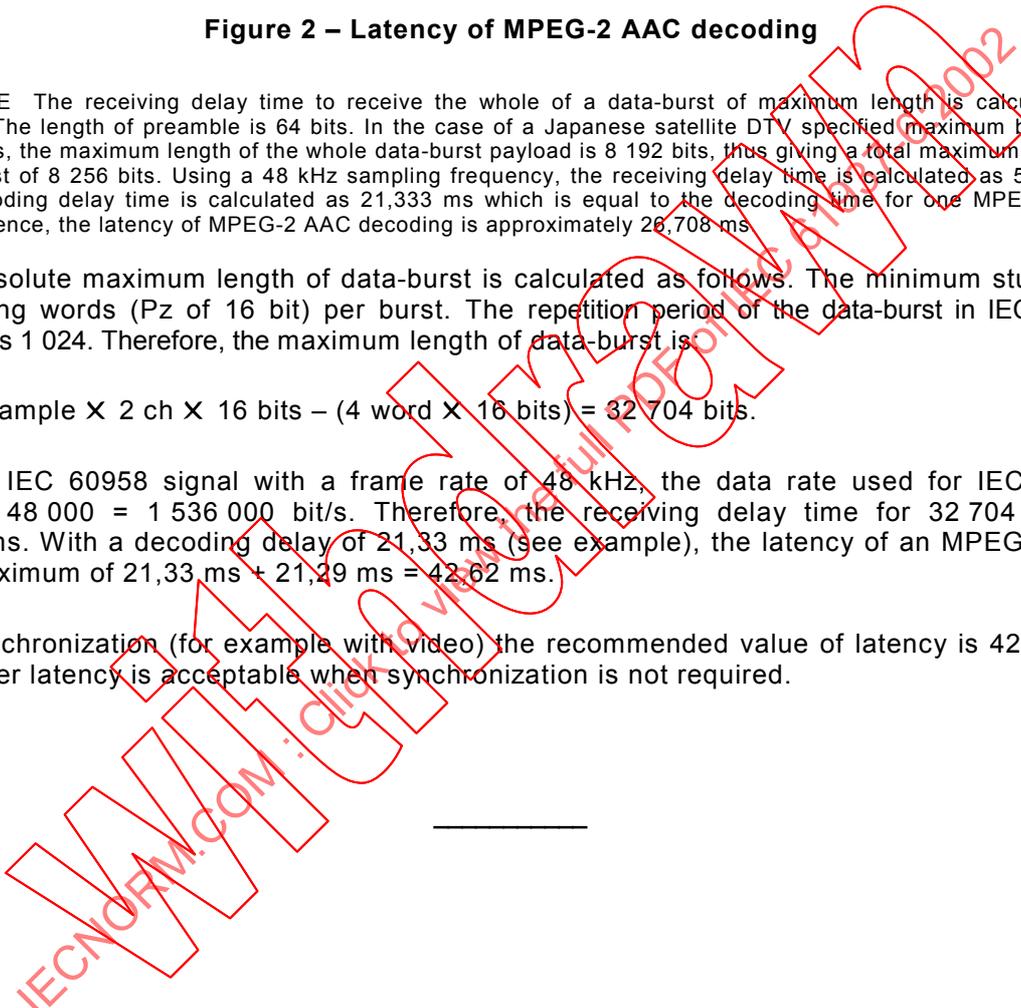
EXAMPLE The receiving delay time to receive the whole of a data-burst of maximum length is calculated as follows. The length of preamble is 64 bits. In the case of a Japanese satellite DTV specified maximum bit rate of 384 kbit/s, the maximum length of the whole data-burst payload is 8 192 bits, thus giving a total maximum length of data-burst of 8 256 bits. Using a 48 kHz sampling frequency, the receiving delay time is calculated as 5,375 ms. The decoding delay time is calculated as 21,333 ms which is equal to the decoding time for one MPEG-2 AAC frame. Hence, the latency of MPEG-2 AAC decoding is approximately 26,708 ms.

The absolute maximum length of data-burst is calculated as follows. The minimum stuffing is 4 stuffing words (Pz of 16 bit) per burst. The repetition period of the data-burst in IEC 60958 frames is 1 024. Therefore, the maximum length of data-burst is:

$$1\ 024\ \text{sample} \times 2\ \text{ch} \times 16\ \text{bits} - (4\ \text{word} \times 16\ \text{bits}) = 32\ 704\ \text{bits}.$$

For an IEC 60958 signal with a frame rate of 48 kHz, the data rate used for IEC 61937 is $32 \times 48\ 000 = 1\ 536\ 000$ bit/s. Therefore, the receiving delay time for 32 704 bits is 21,29 ms. With a decoding delay of 21,33 ms (see example), the latency of an MPEG-2 AAC is a maximum of $21,33\ \text{ms} + 21,29\ \text{ms} = 42,62\ \text{ms}$.

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.



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