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Edition 2.1 2019-01
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

**Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 –
Part 5: Non-linear PCM bitstreams according to the DTS (Digital Theater Systems) format(s)**

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FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61937-5 edition 2.1 contains the second edition (2006-01) [documents 100/974/CDV and 100/1055/RVC] and its amendment 1 (2019-01) [documents 100/3101/CDV and 100/3163/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61937-5 has been prepared by Technical Area 4: Digital system interfaces and protocols, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition.

a) References to the company name Digital Theater Systems have been changed to DTS which is consistent with the official change of the company name.
b) DTS type IV has been added to Table 1 and 5.3.4 describing type IV has been added.
c) Annex A, which provides examples of the use of the repetition period parameter introduced in subclause 5.3.4, has been added.

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 PCM bitstreams according to the AC-3 format

Part 4: Non-linear PCM bistreams 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 ATRAC, ATRAC2/3 and ATRAC-X formats

Part 8: Non-linear PCM bitstreams according to the Windows Media Audio Professional[1]

The committee has decided that the contents of the base publication and its amendment 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.

A bilingual version may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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[1] To be published.

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

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

1   Scope

This part of IEC 61937 describes audio bitstreams encoded according to the Digital Theater Systems (DTS) format data-types I, II, III, and IV.

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 60958-4, *Digital audio interface – Part 4: Professional applications*

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 Information*

3   Terms, definitions, abbreviations and presentation convention

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

3.1   Definitions

3.1.1
latency
delay time of an external audio decoder to decode a DTS data-burst, defined as the sum of two values of the receiving delay time and the decoding delay time

3.2   Abbreviations

IEC	International Electrotechnical Commission
ISO/IEC MPEG	The Moving Pictures Expert Group, a joint committee of ISO and IEC

3.3   Presentation convention

F872h   Value 'F872' in hexadecimal format

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 and 61937-2.

4.1   DTS burst-info

The 16-bit burst-info contains information about the data which will be found in the data-burst.

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 – 10	According to IEC 61937		
	11	DTS type I	bit 0 of Pa	512
	12	DTS type II	bit 0 of Pa	1 024
	13	DTS type III	bit 0 of Pa	2 048
	14 – 16	According to IEC 61937		
	17	DTS type IV		Dependent on bits 8 – 10
	14 – 31	According to IEC 61937	bit 0 of Pa	
5,6		Reserved		
7		According to IEC 61937		
8 – 10		Reserved for DTS Types I, II and III, ~~For the~~ Repetition period for DTS Type IV, see Table 6		
11 – 12	0 – 3	~~Reserved~~ Profile		
13 – 15		According to IEC 61937		

5   Format of DTS data-bursts

This clause specifies the audio data-bursts DTS type I, DTS type II, DTS type III and DTS type IV. Specific properties such as reference points, repetition period, the method of filling stream gaps, and decoding latency are specified for each data-type.

5.1   General

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

Pause data-burst for DTS type I, DTS type II, DTS type III and DTS type IV is given in Table 2.

Table 2 – Repetition period of the pause data-bursts

| Data-type of audio data-burst	Repetition period of pause data-burst	
	Mandatory	Recommended
DTS type I	-	3 IEC 60958 frames
DTS type II	-	3 IEC 60958 frames
DTS type III	-	3 IEC 60958 frames
DTS type IV	-	3 IEC 60958 frames

5.3 Audio data-bursts

5.3.1 DTS type I

The DTS bitstream consists of sequences of DTS frames. The data-type of a DTS data-burst type I is 0Bh. 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 DTS type I data shall contain one complete DTS-frame and represents 512 samples for each encoded channel.

NOTE 1   The length of the DTS type I data-burst depends on the encoded bit rate (which determines the DTS-frame length).

NOTE 2   The reference to the specification for the DTS bitstream, representing 512 samples of encoded audio per frame, is given in the bibliography.
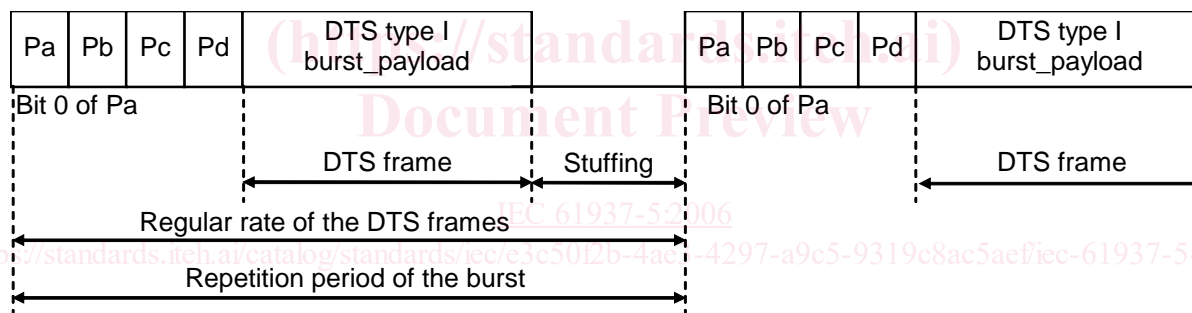
IEC 2671/05

Figure 1 – DTS type I data-burst

The data-type-dependent information for DTS type I is given in Table 3.

Table 3 – Data-type-dependent when DTS type I

| Bits of Pc LSB..MSB	Value	Contents
8-12	00h	Reserved, shall be set to '0'

The reference point of a DTS type I data-burst is bit 0 of Pa and occurs exactly once every 512 sampling periods. The data-burst containing DTS type I frames occurs at a regular rate, with the reference point of each DTS type I data-burst beginning 512 IEC 60958 frames after the reference point of the preceding DTS type I data-burst (of the same bit-stream-number).

It is recommended that pause data-bursts be used to fill stream gaps in the DTS type I bitstream, as described in IEC 61937, and that pause data-bursts be transmitted with a repetition period of 3 IEC 60958 frames, except when other repetition periods are necessary

to fill the precise stream gap length (which may not be a multiple of 3 IEC 60958 frames), or to meet the requirement on burst spacing (see IEC 61937).

When a stream gap in a DTS type I stream is filled by a sequence of pause data-bursts, the Pa of the first pause data-burst shall be located 512 sampling periods following the Pa of the previous DTS type I 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 considering the 3 IEC 60958 frame length of the pause data-burst) the Pa of the first DTS type I data-burst which follows the stream gap.

NOTE 3   The gap-length parameter contained in the pause data-burst is intended to be interpreted by the DTS decoder as an indication of the number of decoded PCM samples which are missing (due to the resulting audio gap).
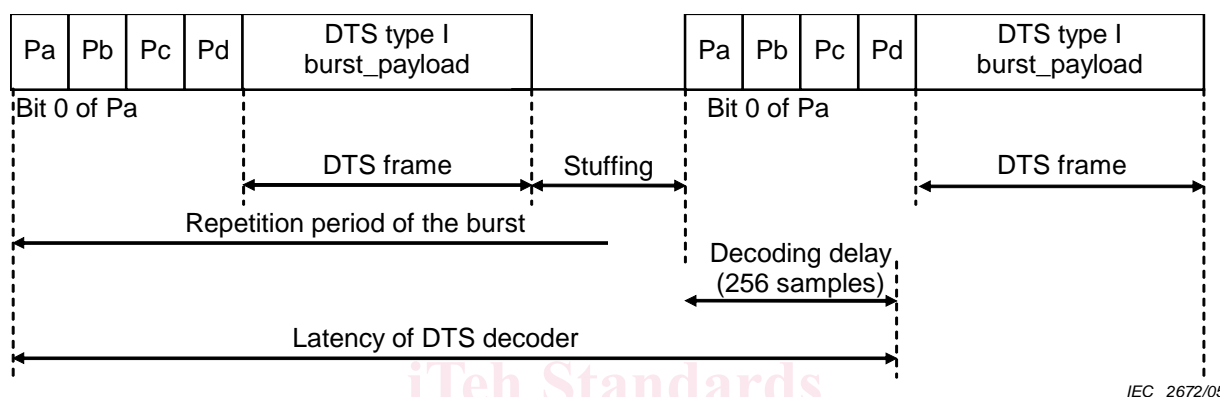
IEC 2672/05

Figure 2 – Latency of DTS type II decoding

NOTE 4   The latency of a DTS decoder is defined as a delay measured from the reference point and equal to one frame (10,67 ms) plus 5,33 ms (equivalent to 256 samples). This is 768 PCM samples or 16 ms at 48 kHz sampling frequency.

5.3.2   DTS type II

The DTS bitstream consists of sequences of DTS frames. The data-type of a DTS data-burst type II is 0Ch. 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 DTS type II data shall contain one complete DTS-frame and represents 1 024 samples for each encoded channel.

NOTE 1   The length of the DTS type II data-burst depends on the encoded bit rate (which determines the DTS-frame length).

NOTE 2   The reference to the specification for the DTS bitstream, representing 1 024 samples of encoded audio per frame, is given in the bibliography.
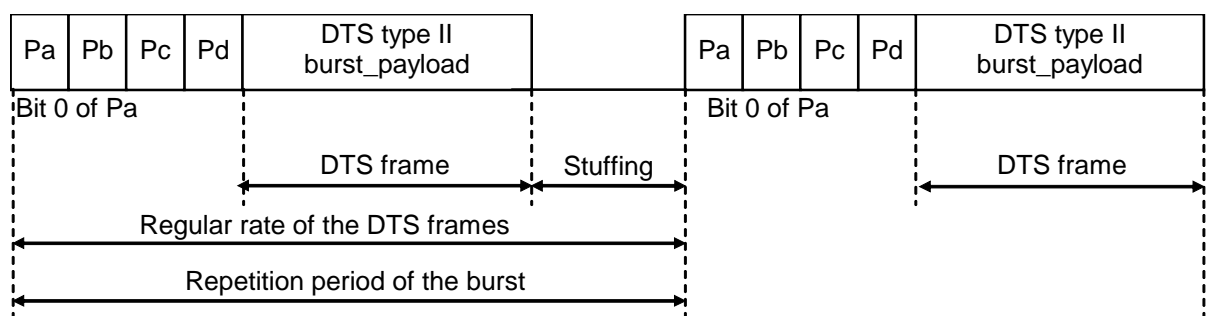
IEC 2673/05

Figure 3 – DTS type II data-burst