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INTERNATIONAL STANDARD

AMENDMENT 1

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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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)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

This amendment has been prepared by technical area 4: Digital system interfaces and protocols, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

CDV	Report on voting
100/3101/CDV	100/3163/RVC

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website 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- withdrawn,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.

Table 1 – Fields of burst-info

Replace Table 1 with the following new table:

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, Repetition period for DTS Type IV, see Table 6		
11 – 12	0 – 3	Profile		
13 – 15		According to IEC 61937		

5.3.4 DTS type IV

Replace 5.3.4 with the following new subclause:

5.3.4 DTS type IV

The DTS bitstream consists of sequences of DTS frames. The data-type of a DTS data-burst type IV is 11h. The data-burst is headed with a burst-preamble, followed by the burst-payload, and stuffed with stuffing bits. The data-type-dependent information for DTS type IV is given in Table 6.

The burst repetition period is set in bits 8 – 10 of Pc (see Table 6). The IEC 60958 frame rate has an integer relationship to the base sample rate of the compressed audio being delivered. Any supported base sample rate may be applied. The nominal base sample rate for DTS type IV is 48 kHz.

Bits 11 and 12 are used to indicate a profile of DTS type IV.

The units of **burst_length** shall be in bytes. This means the maximum size of a burst is 65 535 bytes.

The reference point of a DTS type IV data-burst is bit 0 of Pa. The data-burst containing DTS type IV frames shall occur at a regular rate, with the reference point of each DTS type IV data-burst beginning one audio frame period after the reference point of the preceding DTS type IV data-burst.

It is recommended that pause data-bursts be used to fill stream gaps in the DTS type IV 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 IV stream is filled by a sequence of pause data-bursts, the Pa of the first pause data-burst shall be located one audio frame period following the Pa of the previous DTS type IV frame. It is recommended that the sequence(s) of pause data-bursts that fill the stream gap be continued 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 IV data-burst that follows the stream gap.

NOTE 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 that are missing (due to the resulting audio gap).

Table 6 – Data-type-dependent when DTS type IV

Replace Table 6 with the following new table:

Table 6 – Data-type-dependent information for DTS type IV

Bits of Pc	Value	Meaning	
0 – 4	17	DTS type IV	
5,6		Reserved	
7		According to IEC 61937	
8 – 10	0	Repetition period of data burst in IEC 60958 frames	512
	1		1 024
	2		2 048
	3		4 096
	4		8 192
	5		16 384
	6		Reserved
	7		Reserved
11 – 12	0	Type IV profile	Single Burst Mode
	1		Multi-Burst Mode
	2		Profile 2
	3		Profile 3
13 – 15		According to IEC 61937	

Add, after 5.3.4, the following new Subclause 5.3.5:

5.3.5 DTS type IV profile definitions

5.3.5.1 Type IV profile = 0: single burst mode

DTS type IV profile 0 shall deliver a DTS audio frame in a each burst. The burst repetition period, indicated with bits 8 – 10 of Pc, is relative to the period of the IEC 60958 frame. Figure 7 provides a representation of the repetition period of the burst.

NOTE 1 The length of the DTS type IV data-burst depends on the encoded bit rate and duration of the burst.

Figure 7 – DTS type IV data-burst

Move Figure 7 from 5.3.4 to this position in 5.3.5.1, and replace the existing Figure 7 with the following new Figure 7:

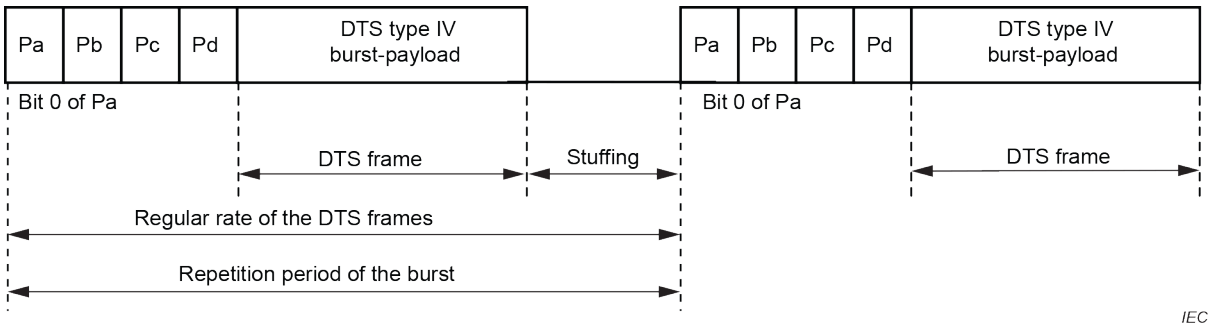

Figure 7 – DTS type IV single burst mode

The decoder latency of a DTS stream delivered using DTS type IV single burst mode is shown in Figure 8.

Figure 8 – Latency of DTS type IV decoding

Move Figure 8 from 5.3.4 to this position in 5.3.5.1, and replace the existing Figure 8 with the following new Figure 8:

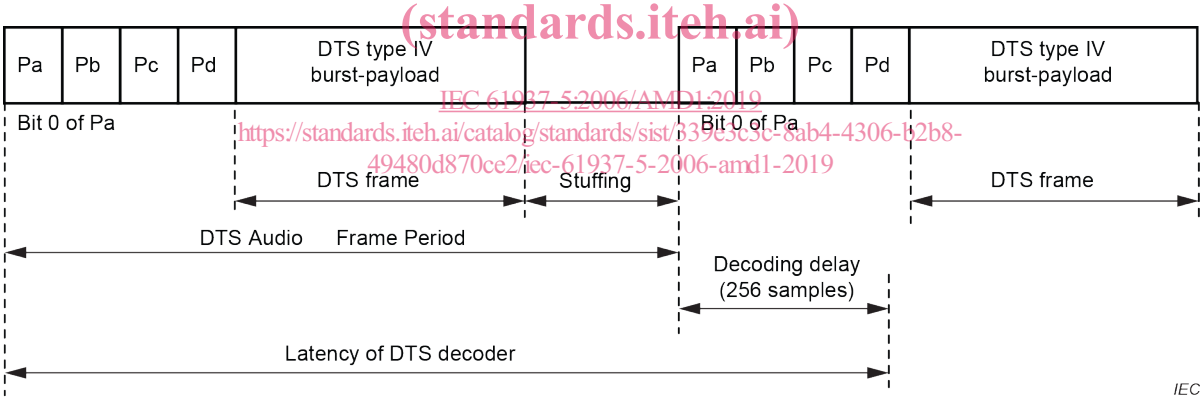

Figure 8 – Decoder latency of DTS type IV single burst mode

NOTE 2 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 one subframe (256 samples at 48 kHz, or 5,33 ms), equivalent to 16 ms.

5.3.5.2 Type IV profile = 1: multi-burst mode

DTS type IV profile 1 delivers a DTS audio frame in a multi-burst sequence, which consists of 1, 2, 4, or 8 bursts. The burst repetition period, indicated with bits 8 – 10 of Pc, is relative to the period of the IEC 60958 frame. The repetition period of the multi-burst sequence shall be equal to the DTS audio-frame period.

The first byte of each burst-payload is the multi-burst control byte (MBControl). The multi-burst control byte is defined in Table 7.

Add the following new Table 7:

Table 7 – Bits of multi-burst control byte

Bits of ControlByte	Coded value	Interpretation	Parameter name
7 (MSB)	0	0	Reserved
6, 5	0	1	MaxBursts
	1	2	
	2	4	
	3	8	
4, 3, 2	0	0	BurstIndex
	1	1	
	2	2	
	3	3	
	4	4	
	5	5	
	6	6	
	7	7	
1, 0	0	8	DelayFactor
	1	4	
	2	2	
	3	1	

A representation of a multi-burst sequence is shown in Figure 9. This representation assumes the case of 2 or more data-bursts per multi-burst sequence, and any data-bursts between the first and last data-burst are represented as data-burst *n*.

Add the following new Figure 9:

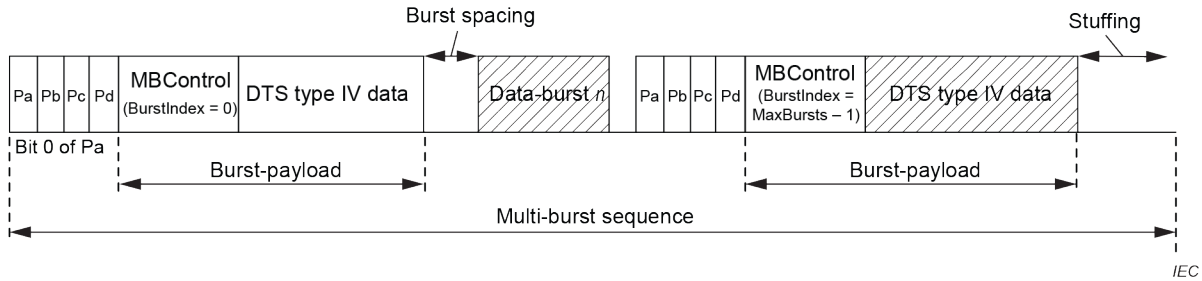

Figure 9 – DTS type IV multi-burst mode

MaxBursts – indicates the number of data-bursts in a multi-burst sequence. The valid values of MaxBursts are 1, 2, 4 or 8 data-bursts per multi-burst sequence. Note that

$$P_{dts} = P_{burst} * MaxBursts$$

where:

P_{dts} is the period of the DTS audio frame, and

P_{burst} is the period of the data burst according to bits 8 – 10 of Pc (see Table 6).

To convert P_{dts} into units of seconds, divide this value by the IEC 60958 frame rate in Hz.

BurstIndex – indicates the index of current burst within the multi-burst sequence. The first data-burst in a multi-burst sequence shall have $BurstIndex$ = 0. A multi-burst sequence shall align the DTS audio frame to begin in the first data-burst of the multi-burst sequence. Subsequent bursts in the multi-burst sequence shall have $BurstIndex$ increment monotonically, with the multi-burst sequence terminating when $BurstIndex$ = ($MaxBursts$ − 1).

DelayFactor – This parameter is used to determine the total decoder latency of the transmitted elementary bitstream. Decoder delay is defined as follows:

$$D_{decoder} = \frac{P_{dts}}{DelayFactor}$$

and

$$L_{total} = P_{dts} + D_{decoder}$$

where

$D_{decoder}$ is the delay of the decoder, and

L_{total} is the total latency of the DTS decoder expressed in IEC 60958 frame periods. To convert latency into units of seconds, divide this value by the IEC 60958 frame rate in Hz.

Decoder latency for audio delivered using multi-burst mode is illustrated in Figure 10.

Add the following new Figure 10:

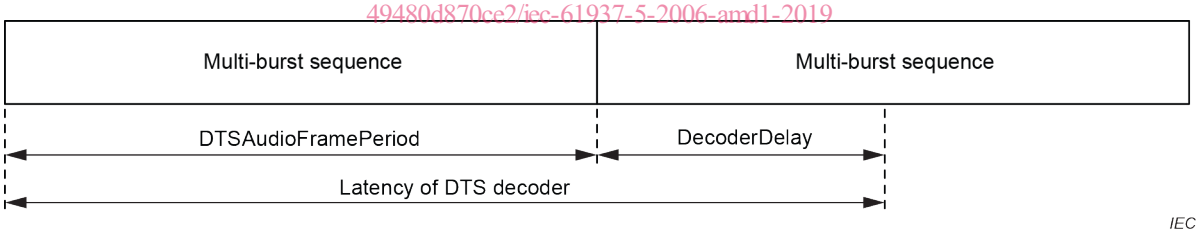

Figure 10 – Decoder latency for DTS type IV multi-burst mode

5.3.5.3 Type IV profile = 2

DTS type IV profile 2 is reserved for future definition.

5.3.5.4 Type IV profile = 3

DTS type IV profile 3 is reserved for future definition.

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