SLOVENSKI STANDARD
SIST HD 544 S1:1999

01-julij-1999

Audio recording - PCM encoder/decoder system (IEC 60841:1988)

Audio recording - PCM encoder/decoder system

Tonaufzeichnung. PCM-Coder/Decoder-System

Enregistrement sonore - Système codeur et décodeur à modulation par impulsions codées (MIC)

Ta slovenski standard je istoveten z: **HD 544 S1:1989**

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BODY OF THE HD

The Harmonization Document consists of:

- IEC 841 (1988) ed 1; IEC/SC 60A, not appended.

This Harmonization Document was approved by CENELEC on 1989-11-01 (confirmed by 62 BT).

The English and French versions of this Harmonization Document are provided by the text of the IEC publication and the German version is the official translation of the IEC text.

According to the CENELEC Internal Regulations the CENELEC member National Committees are bound:

to announce the existence of this Harmonization Document at national level by or before 1990-03-01

to publish their new harmonized national standard by or before 1990-09-01

to withdraw all conflicting national standards by or before 1990-09-01.

Harmonized national standards are listed on the HD information sheet, which is available from the CENELEC National Committees or from the CENELEC Central Secretariat.

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Enregistrement sonore – Système codeur et décodeur à modulation par impulsions codées (MIC)

Audio recording – PCM encoder / decoder system

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUDIO RECORDING – PCM ENCODER/DECODER SYSTEM

FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 60A: Sound Recording, of IEC Technical Committee No. 60: Recording.

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

Six Months' Rule	Report on Voting
60A(CO)95	60A(CO)106

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

The following IEC publications are quoted in this standard:

Publications 767 (1983): Helical-scan video tape cassette system using 12.65 mm (0.5 in) magnetic tape on type beta format.

774 (1983): Helical-scan video tape cassette system using 12.65 mm (0.5 in) magnetic tape on type VHS.

AUDIO RECORDING – PCM ENCODER/DECODER SYSTEM

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1. Scope

This standard applies to the reversible process achieved by the PCM encoder/decoder system that transforms two audio signals into one PCM signal for compatibility with either the 60 fields/525 lines or the 50 fields/625 lines television system.

2. Object

This standard has been prepared to establish the signal format and other conditions required for the PCM encoder/decoder system that is intended for recording and reproducing audio signals in the form of a PCM signal through (part of) a domestic videocassette system. The standard seeks to achieve standardized system operation, compatibility of encoder/decoder systems with players and systems, and interchangeability of recorded tapes.

SECTION ONE – GENERAL

3. System description

The encoder of the PCM encoder/decoder transforms two audio signals into a PCM signal with redundant information added to correct occasional errors arising during recording or reproduction. The signal thus encoded is converted to a format that conforms to the relevant television system for recording on to a videocassette (see note).

The PCM signal is retrieved from the video signal by the videocassette system and most of the occasional errors are corrected by using the redundant information.

The decoder of the PCM encoder/decoder transforms the PCM signal into two audio signals.

Note. – Videocassette systems for household use are specified in IEC Publications 767 and 774.

SECTION TWO – FORMAT OF THE RECORDED SIGNAL

4. General

The format of the recorded signal shall be compatible with the signal of the relevant television system, either 60 fields/525 lines or 50 fields/625 lines.

5. Transmission rate

The transmission rate shall be as follows:

2.646 Mbit/s for the 60 fields/525 lines system;

2.625 Mbit/s for the 50 fields/625 lines system.

6. Configuration of the synchronizing signal

6.1 *Horizontal synchronizing signal*

The horizontal period containing the horizontal synchronizing signal shall be composed as shown in Figures 1a and 1b.

6.2 *Vertical synchronizing signal*

The vertical synchronizing signal with equalizing pulses shall be composed as shown in Figures 2a and 2b.

7. Configuration of the horizontal line

7.1 *Data synchronizing signal*

The data synchronizing signal shall consist of 4 bits as follows:

"1 0 1 0"

7.2 *Data block*

The data block shall consist of 128 bits and shall be NRZ (Non Return to Zero) modulated.

7.3 *White reference signal*

The white reference signal shall have a width of 4 bits and peak white level.

7.4 *Assignment in the horizontal period*

One horizontal period shall consist of 168 bits. The data synchronizing signal, the data block and the white reference signal shall be assigned into the horizontal period as shown in Figures 3a and 3b.

Each voltage level shall be measured when terminated by a 75 Ω load.

The tolerance of each level shall be ±10% (see Appendix A).

8. Configuration of the vertical field

8.1 *Audio data block line*

The audio data block line shall occupy the horizontal period containing the audio data block specified in Clause 11.

8.2 *Control data block line*

The control data block line shall occupy the horizontal period containing the control data block specified in Clause 12.

8.3 *Assignment in the vertical field*

Each field shall be headed by the vertical synchronizing signal with the equalizing pulse.

In the case of the 60 fields/525 lines system, as shown in Figure 4a, the control data block line shall be located at the 10th line for an odd field and 10.5th line for an even field.

The 245 audio data block lines shall follow the control data block line.

In the case of the 50 fields/625 lines system, as shown in Figure 4b, the control data block line shall be located at the 6th line for the first (third) field and 6.5th line for the second (fourth) field.

The 294 audio data block lines shall follow the control data block line.

The remaining lines in the field shall be left blank for both systems.

SECTION THREE – SOURCE ENCODING

9. Audio signal

9.1 *Number of audio channels*

The number of recorded audio channels shall be two, and shall be designated as A and B.

Channels A and B correspond to the left and right channels, respectively, for stereophonic use.

9.2 *Emphasis*

Pre-emphasis may be performed on the audio signal.

In that case, the time constants t_1 and t_2 shall be as follows:

$$t_1 = 50\ \mu s \qquad t_2 = 15\ \mu s$$

The characteristics of the pre-emphasis and de-emphasis are shown in Figure 5.

10. Source encoding

10.1 *Sampling*

The sampling rate shall be 44.100 kHz ± 0.01%.

It is recommended that both channels be sampled simultaneously.

It is permissible that the two channels be sampled alternately in the sequence of channel A followed by channel B.

10.2 *Quantization*

The sampled signal shall be recorded with 14-bit or 16-bit lincar encoding.

Note. – The main body of this standard describes 14-bit encoding. Appendix B describes 16-bit encoding.

10.3 *Coding*

Two's complement binary code shall be used.

A positive binary code shall represent a positive audio signal voltage.

SECTION FOUR – DATA BLOCK

11. Configuration of the audio data block

11.1 *General*

The audio data block shall consist of six sampled signal words, two error correcting words and one error detecting word.

11.2 *Sampled signal word*

The sampled signal word shall consist of 14 bits with the MSB (Most Significant Bit) being bit 1 and the LSB (Least Significant Bit) being bit 14 as shown in Figure 6.

The nth sampled signal words for channels A and B are designated A_n and B_n respectively.

11.3 *Error correcting word*

Each of the error correcting words, designated P_n and Q_n, shall consist of 14 bits generated by the following equations (see Appendix B):

$$P_n = A_n + B_n + A_{n+1} + B_{n+1} + A_{n+2} + B_{n+2}$$

$$Q_n = T^6A_n + T^5B_n + T^4A_{n+1} + T^3B_{n+1} + T^2A_{n+2} + TB_{n+2}$$

where: n is 0 or a multiple of 3

T is a generating matrix

Calculations shall be performed modulo 2.

The generating matrix T shall be defined as follows:

$$T = \begin{Bmatrix} 0&0&0&0&0&0&0&0&0&0&0&0&0&1 \\ 1&0&0&0&0&0&0&0&0&0&0&0&0&0 \\ 0&1&0&0&0&0&0&0&0&0&0&0&0&0 \\ 0&0&1&0&0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&1&0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&1&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&1&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&1&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&1&0&0&0&0&0&1 \\ 0&0&0&0&0&0&0&0&1&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&1&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0&1&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0&0&1&0&0 \\ 0&0&0&0&0&0&0&0&0&0&0&0&1&0 \end{Bmatrix}$$