SMPTE ST 125:2013
Revision of SMPTE 125M-1995
Replacement of SMPTE 267M-1995
Replacement of SMPTE RP 175-1995

SMPTE STANDARD

SDTV Component Video Signal Coding 4:4:4 and 4:2:2 for 13.5 MHz and 18 MHz Systems

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Approved
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Foreword

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SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Operations Manual.

SMPTE ST 125 was prepared by Technology Committee 10E.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Engineering Document. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

Introduction

This section is entirely informative and does not form an integral part of this Engineering Document.

This standard replaces previous versions of SMPTE ST 125, SMPTE ST 267 and SMPTE RP 175. In addition, 625-line values have been included. The parallel representation of the digital signal has been made an informative Annex, reflecting past implementation practice.

This standard is backwards compatible with the previous version of SMPTE ST 125 and SMPTE ST 267. The 625-line characteristics for 13.5 MHz sampling is backwards compatible with Recommendation ITU-R BT.601 625-line values are often included in brackets.

1 Scope

This standard defines the digital video coding for 4:4:4 and 4:2:2 color spaces and a virtual parallel interface for 525/625-line interlaced systems. Two luma sampling rates are defined: 13.5 MHz and 18 MHz. The virtual parallel signal interface format is required as the source for the 10 bit serial interface defined in SMPTE ST 259.

Annex D covers video coding for the 4:4:4:4 member of the family, including multiplexing details for “dual channel” operation.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:”

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

3 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations indicated below.

Recommendation ITU-R BT.601-7, Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide Screen 16:9 Aspect Ratios

Recommendation ITU-R BT.1700, Characteristics of Composite Video Signals for Conventional Analogue Television Systems

4 Video Data Signal Format — Encoding/Analog Timing Parameters

Spectral characteristics of signals to be encoded shall be bandwidth-constrained to minimize aliasing. Suggested filter characteristics are described in Annex B, Figures B.1 through B.4.

4.1 4:4:4 Encoding Characteristics for 13.5 MHz and 18 MHz Systems

Table 1a – 4:4:4 Encoding Parameters 13.5 MHz and 18 MHz Systems

Parameters	525-line, 60/1.001 field/s systems		625-line, 50 field/s systems	
Sampling frequency for each signal	13.5 MHz	18 MHz	13.5 MHz	18 MHz
Coded signals	These values are obtained from the gamma pre-corrected signals Y' = 0.299R' + 0.587G' + 0.114B' C'_R = 0.713 (R'--Y') = 0.500R' -- 0.419G' -- 0.081B' C'_B = 0.564 (B'--Y') = 0.500B' -- 0.169R' -- 0.331G'			
Number of samples per total line for Y',C'_B,C'_R,R',G',B'	858 (Active 720)	1144 (Active 960)	864 (Active 720)	1152 (Active 960)
Sampling structure	Orthogonal, line, field and frame repetitive. The three sampling structures to be coincident, and also coincident with the luma sampling structure of the 4:2:2 member.			
Form of coding	Uniformly quantized PCM, 10 bits per sample			
Correspondence between video signal levels and the quantization levels for each sample –Y', R', G', B',	$877_{(10)}$ quantization levels with the black level corresponding to level $64_{(10)}$ and the peak white level corresponding to level $940_{(10)}$			
Each color-difference signal	$897_{(10)}$ quantization levels with zero signal corresponding to level $512_{(10)}$			