STANDARD FOR CODING 25/50 HZ VIDEO

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STANDARD FOR CODING 25/50 Hz VIDEO

(Normative)

VIDEO SYSTEMS CHARACTERISTICS

1. SCOPE

This Annex describes the characteristics of the video subsystem of a digital television system operating at 25 Hz and 50 Hz frame rates. The input formats and bit stream characteristics are described in separate sections.

2. REFERENCES

2.1 Normative references

The following documents 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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

ISO/IEC IS 13818-1, International Standard, *MPEG-2 Systems*.

ISO/IEC IS 13818-2, International Standard, *MPEG-2 Video*.

ISO/IEC IS 11172-2, International Standard, *MPEG-1 Video.*

2.2 Informative references

SMPTE 274M (1995), *Standard for television, 1920 x 1080 Scanning and Interface.*

SMPTE 296M (1995), *Standard for television, 1280 x 720 Scanning and Interface.*

ITU-R BT.601-4 (1994), *Encoding parameters of digital television for studios.*

3. COMPLIANCE NOTATION

As used in this document, *"shall"* or *"will"* denotes a mandatory provision of the standard. *"Should"* denotes a provision that is recommended but not mandatory. *"May"* denotes a feature whose presence does not preclude compliance, that may or may not be present at the option of the implementor.

4. POSSIBLE VIDEO INPUTS

While not required by this standard, there are certain television production standards, shown in Table 1, that define video formats that relate to compression formats specified by this standard.

Table 1 Standardized Video Input Formats

Video standard	Active lines	Active samples/ line
SMPTE 274M	1080	1920
SMPTE 296M	720	1280
ITU-R BT.601-4	576	720

The compression formats may be derived from one or more appropriate video input formats. It may be anticipated that additional video production standards will be developed in the future that extend the number of possible input formats.

5. SOURCE CODING SPECIFICATION

The ATV video compression syntax shall conform to ISO/IEC 11172-2 or to the Main Profile of ISO/IEC 13818-2, with the following additional constraints.

The parameters of bit streams conforming to the ISO/IEC 11172-2 syntax shall be bounded by the upper limits imposed by setting constrained_parameter_flag to '1', with the further constraints that vertical_size = 288, horizontal_size = 352 and picture_rate = 3.

The parameters of bit streams conforming to the ISO/IEC 13818-2 syntax shall be bounded by the upper limits specified for the Main Profile at High Level.[1] Additionally, bit streams conforming to the ISO/IEC 13818-2 syntax shall meet the constraints and specifications described in Sections 5.1 and 5.2.

5.1 Constraints with respect to ISO/IEC 13818-2 Main Profile

The following tables list the allowed values for each of the ISO/IEC 13818-2 syntactic elements which are restricted beyond the limits imposed by MP@HL.

In these tables conventional numbers denote decimal values, numbers preceded by **0x** are to be interpreted as hexadecimal values and numbers within single quotes (e.g., '10010100') are to be interpreted as a string of binary digits.

5.1.1 Sequence header constraints

Table 2 identifies parameters in the sequence header of a bit stream that shall be constrained by the video subsystem and lists the allowed values for each.

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[1] See ISO/IEC 13818-2, Section 8 for more information regarding profiles and levels.

Table 2 Sequence Header Constraints

Sequence header syntactic element	Allowed value
horizontal_size_value	see Table 3
vertical_size_value	see Table 3
aspect_ratio_information	see Table 3
frame_rate_code	see Table 3
bit_rate_value ($\leq$ 38.8 Mbps)	$\leq$ 97000
vbv_buffer_size_value	$\leq$ 488

5.1.2   Compression format constraints

Table 3 lists the allowed compression formats.

Table 3 Compression Format Constraints

vertical_size_ value	horizontal_size_ value	aspect_ratio_ information	frame_rate_ code	progressive_ sequence
1080[2]	1920	1,3	3	0,1
720	1280	1,3	3,6	1
576	720	2,3	3,6	1
			3	0
	544	2,3	3	0,1
	480			
	352			
288	352	2,3	3	1

Legend for MPEG-2 coded values in Table 3		
aspect_ratio_information	1 = square samples 2 = 4:3 display aspect ratio 3 = 16:9 display aspect ratio	
frame_rate_code	3 = 25 Hz 6 = 50 Hz	
progressive_sequence	0 = interlaced scan 1 = progressive scan	

5.1.3   Sequence extension constraints

Table 4 identifies parameters in the sequence extension part of a bit stream that shall be constrained by the video subsystem and lists the allowed values for each. A sequence_extension structure is required to be present after every sequence_header structure.

Table 4 Sequence Extension Constraints

Sequence extension syntactic element	Allowed values
progressive_sequence	see Table 3
profile_and_level_indication	see Note
chroma_format	'01'
horizontal_size_extension	'00'

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[2] Note that 1088 lines are actually coded in order to satisfy the MPEG-2 requirement that the coded vertical size be a multiple of 16 (progressive scan) or 32 (interlaced scan).

Sequence extension syntactic element	Allowed values
vertical_size_extension	'00'
bit_rate_extension	'0000 0000 0000'
vbv_buffer_size_extension	'0000 0000'
frame_rate_extension_n	'00'
frame_rate_extension_d	'0000 0'

Note: The profile_and_level_indication field shall indicate the lowest profile and level defined in ISO/IEC 13818-2, Section 8, that is consistent with the parameters of the video elementary stream.

5.1.4   Sequence display extension constraints

Table 5 identifies parameters in the sequence display extension part of a bit stream that shall be constrained by the video subsystem and lists the allowed values for each.

Table 5 Sequence Display Extension Constraints

Sequence display extension syntactic element	Allowed values
video_format	'000'

The preferred and default values for color_primaries, transfer_characteristics, and matrix_coefficients are defined to be SMPTE 274M[3] (value 0x01 in all three cases). While all values described by MPEG-2 are allowed in the transmitted bit stream, it is noted that ITU-R BT.470-2 System B,G values (0x05 in all three cases) will be the most likely alternate in common use.

5.1.5   Picture header constraints

In all cases other than when vbv_delay has the value 0xFFFF, the value of vbv_delay shall be constrained as follows:

$$vbv\_delay = 45000$$

5.2   Bit stream specifications beyond MPEG-2

This section covers the extension and user data part of the video syntax. These data are inserted at the sequence, GOP, and picture level. When a user_data_start_code is followed by the ATSC_identifier, the syntax of the subsequent data, up to the occurrence of the next start code, shall conform to the specifications below.

5.2.1   Picture extension and user data syntax

Table 6 describes the syntax used for picture extension and user data.

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[3] At some point in the future, the color gamut may be extended by allowing negative values of RGB and defining the transfer characteristics for negative RGB values.

Table 6 Picture Extension and User Data Syntax

	No. of bits	Mnemonic
extension_and_user_data(2) {		
while ((nextbits( ) == extension_start_code) || (nextbits() == user_data_start_code)) {		
if (nextbits()== extension_start_code)		
extension_data(2)		
if (nextbits() == user_data_start_code)		
user_data()		
}		
}		

5.2.2   Picture user data syntax

The syntax used for the insertion of EIA-style captions[4] in picture user data is described below.[5]

Table 7 Picture User Data Syntax[6]

	No. of bits	Mnemonic
user_data( ) {		
user_data_start_code	32	bslbf
ATSC_identifier	32	bslbf
user_data_type_code	8	uimsbf
if (user_data_type_code == '0x03') {		
process_em_data_flag	1	bslbf
process_cc_data_flag	1	bslbf
additional_data_flag	1	bslbf
cc_count	5	uimsbf
em_data	8	bslbf
for (i=0 ; i < cc_count ; i++) {		
marker_bits	5	'1111 1'
cc_valid	1	bslbf
cc_type	2	bslbf
cc_data_1	8	bslbf
cc_data_2	8	bslbf
}		
marker_bits	8	'1111 1111'
if (additional_data_flag) {		
while(nextbits() != '0000 0000 0000 0000 0000 0001') {		
additional_user_data	8	
}		

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[4] EIA, *Recommended Practice for Advanced Television Closed Captioning*, draft, July 1, 1994.

[5] In order to decode the user data, the decoder should properly recognize the 32-bit ATSC registration identifier at the PSI stream level (see ISO/IEC 13818-1).

[6] Shaded cells in this table indicate syntactic and semantic additions to the ISO/IEC 13818-2 standard.

	No. of bits	Mnemonic
}		
} else {		
while(nextbits() != '0000 0000 0000 0000 0000 0001') {		
ATSC_reserved_user_data	8	
}		
}		
next_start_code()		
}		

5.2.3   Picture user data semantics

user_data_start_code — This is set to 0x0000 01B2.

ATSC_identifier — This is a 32 bit code that indicates that the video user data conforms to this specification. The value ATSC_identifier shall be 0x4741 3934.

user_data_type_code — This 8-bit code is set to 0x03 if EIA style captioning is used. Other values are reserved for use by ATSC.

process_em_data_flag — This flag is set to indicate whether it is necessary to process the em_data. If it is set to 1, the em_data has to be parsed and its meaning has to be processed. When it is set to 0, the em_data can be discarded.

process_cc_data_flag — This flag is set to indicate whether it is necessary to process the cc_data. If it is set to 1, the cc_data has to be parsed and its meaning has to be processed. When it is set to 0, the cc_data can be discarded.

additional_data_flag — This flag is set to 1 to indicate the presence of additional user data.

cc_count — This 5-bit integer indicates the number of closed caption constructs following this field. It can have values 0 through 31.

em_data — Eight bits for representing emergency message.[7]

cc_valid — This flag is set to '1' to indicate that the two closed caption data bytes that follow are valid. If set to '0' the two data bytes are invalid.

cc_type — Denotes the type of the two closed caption data bytes that follow.[4]

cc_data_1 — The first byte of a closed caption data pair.

cc_data_2 — The second byte of a closed caption data pair.

additional_user_data — Any further demand for picture user data could be met by defining this part of the bit stream.

ATSC_reserved_user_data — Reserved for future use by ATSC.

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[7] Syntax and semantics to be specified by EIA.