Doc. CS/TSG-674r1
29 November 2007

Candidate Standard: Draft Amendment to ATSC Digital Television Standard, Doc. A/53D Annex A

Advanced Television Systems Committee
1750 K Street, N.W.
Suite 1200
Washington, D.C. 20006
www.atsc.org

The Advanced Television Systems Committee, Inc., is an international, non-profit organization developing voluntary standards for digital television. The ATSC member organizations represent the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.

Specifically, ATSC is working to coordinate television standards among different communications media focusing on digital television, interactive systems, and broadband multimedia communications. ATSC is also developing digital television implementation strategies and presenting educational seminars on the ATSC standards.

ATSC was formed in 1982 by the member organizations of the Joint Committee on InterSociety Coordination (JCIC): the Electronic Industries Association (EIA), the Institute of Electrical and Electronic Engineers (IEEE), the National Association of Broadcasters (NAB), the National Cable Television Association (NCTA), and the Society of Motion Picture and Television Engineers (SMPTE). Currently, there are approximately 140 members representing the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.

ATSC Digital TV Standards include digital high definition television (HDTV), standard definition television (SDTV), data broadcasting, multichannel surround-sound audio, and satellite direct-to-home broadcasting.

About the Candidate Standard

This specification is being put forth as a Candidate Standard by the TSG/S6 Specialist Group on Audio and Video Coding. ATSC members and non-members are encouraged to review and implement this specification and return comments to cs_amend_editor@atsc.org. ATSC Members can also send comments directly to the TSG/S6 Specialist Group. The ATSC believes this specification is stable. It is expected to progress to Proposed Standard within a period of time ending 31 December 2008.

Replace Annex A of A/53D with the following:

Annex A:
Video System Characteristics (Normative)

1. SCOPE

This Annex describes the characteristics of the video subsystem of the Digital Television Standard. 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.

[A1] CEA-708-B: "Digital Television (DTV) Closed Captioning," Consumer Electronics Association.

[A2] ISO/IEC IS 13818-1:2000 (E), International Standard, Information technology – Generic coding of moving pictures and associated audio information: Systems.

[A3] ISO/IEC IS 13818-2:2000 (E), International Standard, Information technology – Generic coding of moving pictures and associated audio information: Video.

[A4] SMPTE 125M (1995): Standard for Television—Component Video Signal 4:2:2, Bit-Parallel Digital Interface, Society of Motion Picture and Television Engineers, White Plains, N.Y.

[A5] SMPTE 170M (2004): Standard for Television—Composite Analog Video Signal, NTSC for Studio Applications, Society of Motion Picture and Television Engineers, White Plains, N.Y.

[A6] SMPTE 267M (1995): Standard for Television—Bit-Parallel Digital Interface, Component Video Signal 4:2:2 16 x 9 Aspect Ratio, Society of Motion Picture and Television Engineers, White Plains, N.Y.

[A7] SMPTE 274M (2005): Standard for Television—1920 x 1080 Scanning and Analog and Parallel Digital Interfaces for Multiple Picture Rates, Society of Motion Picture and Television Engineers, White Plains, N.Y.

[A8] SMPTE 293M (2003): Standard for Television—720 x 483 Active Line at 59.94-Hz Progressive Scan Production, Digital Representation, Society of Motion Picture and Television Engineers, White Plains, N.Y.

[A9] SMPTE 296M (2001): Standard for Television—1280 x 720 Progressive Image Sample Structure, Analog and Digital Representation and Analog Interface, Society of Motion Picture and Television Engineers, White Plains, N.Y.

2.2 Informative References

[A10] Removed editorially

[A11] CEA-CEB-10-A: "CEA-708-B Implementation Guidance," December 2002, Consumer Electronics Association

[A12] Digital Receiver Implementation Guidelines and Recommended Receiver Reaction to Aspect Ratio Signaling in Digital Video Broadcasting, Issue 1.2.1, February 2001, Digital TV Group.

[A13] ETSI TS 101 154 V1.7.1, Digital Video Broadcasting (DVB): Implementation Guidelines for the use of MPEG-2 Systems, Video and Audio in Satellite, Cable and Terrestrial Broadcasting Applications, Annex B, June 2005.

[A14] ITU-R BT.601-5 (1994): Encoding Parameters of Digital Television for Studios.

[A15] ITU-R BT.709-5 (2002): Parameter values for the HDTV Standards for Production and International Programme Exchange.

[A16] ANSI/SCTE 21 2001 (formerly DVS 053): Standard for Carriage of NTSC VBI Data in Cable Digital Transport Streams, Society of Cable Telecommunications Engineers.

[A17] ANSI/SCTE 43 2005: Digital Video Systems Characteristics Standard for Cable Television, Society of Cable Telecommunications Engineers.

3. COMPLIANCE NOTATION

As used in this document, "shall" 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 implementer.

4. POSSIBLE VIDEO INPUTS

While not required by this standard, there are certain television production standards, shown in Table A1, that define video formats that relate to compression formats specified by this standard.

Table A1 Standardized Video Input Formats

Video Standard	Active Lines	Active Samples/ Line
SMPTE 274M [A7]	1080	1920
SMPTE 296M [A9]	720	1280
ITU-R BT.601-5 [A14]	483	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 DTV video compression algorithm shall conform to the Main Profile syntax of ISO/IEC 13818-2 [A3]. The allowable parameters shall be bounded by the upper limits specified for the Main Profile at High Level.[1] Additionally, all bit streams shall meet the constraints and specifications described in Sections 5.1 and 5.2.

[1] See ISO/IEC 13818-2 [A3], Section 8 for more information regarding profiles and levels.

For 352x240 and 176x120 resolution services, the DTV video compression algorithm shall conform to the Main Profile constraints of ISO/IEC 13818-2 [A3]. Use of these formats shall be permitted only as explicitly described by other parts of this Standard or other ATSC standards.

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 [A3] 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 A2 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.

Table A2 Sequence Header Constraints

Sequence Header Syntactic Element	Allowed Value
horizontal_size_value	see Table A3
vertical_size_value	see Table A3
aspect_ratio_information	see Table A3
frame_rate_code	see Table A3
bit_rate_value (≤ 19.4 Mbps)	≤ 48500
bit_rate_value (≤ 38.8 Mbps)	≤ 97000
vbv_buffer_size_value	≤ 488

The allowable values for the field bit_rate_value are application-dependent. In the primary application of terrestrial broadcast, this field shall correspond to a bit rate which is less than or equal to 19.4 Mbps. In the high data rate mode, the corresponding bit rate is less than or equal to 38.8 Mbps.

5.1.2 Compression Format Constraints

Table A3 lists the allowed compression formats. Usage of these formats may be constrained by other parts of this Standard or other ATSC Standards.

Table A3 Compression Format Constraints

vertical_ size_value	horizontal_ size_value	aspect_ratio_ information	frame_rate_code	progressive_sequence	Cat.
1080[2]	1920	1,3	1,2,4,5	1	A
			4,5	0	A
1080[3]	1440	1,3	1,2,4,5	1	C
			4,5	0	C
720	1280	1,3	1,2,4,5,7,8	1	A
480	720	2,3	1,2,4,5,7,8	1	B
	720	2,3	4,5	0	B
480	704	2,3	1,2,4,5,7,8	1	A
			4,5	0	A
480	640	1,2	1,2,4,5,7,8	1	A
			4,5	0	A
480	544	2,3	1,2,4,5,7,8	1	C
	544	1,2	4,5	0	C
480	528	2,3	1,2,4,5,7,8	1	C
	528	1,2	4,5	0	C
240	352	2,3	1,2,4,5,7,8	1	D
	352	1,2	4,5	0	D
120[4]	176	2,3	1,2,4,5,7,8	1	D
	176	1,2	4,5	0	D

Legend for MPEG-2 coded values:
aspect_ratio_information: 1 = square samples, 2 = 4:3 display aspect ratio, 3 = 16:9 display aspect ratio
frame_rate_code: 1 = 23.976 Hz, 2 = 24 Hz, 4 = 29.97 Hz, 5 = 30 Hz, 7 = 59.94 Hz, 8 = 60 Hz
progressive_sequence: 0 = interlaced scan, 1 = progressive scan

Categories:
A: Only these formats were included in the original Table 3 of Annex A of A/53.
B: These formats were not included in the original Table 3 of Annex A of A/53, but have been in use by broadcasters for several years without reported complaint. These formats are included in Table 3 of ANSI/SCTE 43 2005 [A17].
C: These formats were not included in the original Table 3 of Annex A of A/53, but are included in Table 3 of ANSI/SCTE 43 2005 [A17]. They are required to be properly displayed on any receiver in the US designated as "digital cable-ready," but receivers not so designated may not make usable pictures from video transmitted in these formats.
D: These formats were added to this table in January 2006 to establish standard low resolution raster formats.

[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). The bottom 8 lines are black, per MPEG rules.

[3] See Footnote 2.

[4] Note that 128 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). The bottom 8 lines are black, per MPEG rules.

5.1.3 Sequence Extension Constraints

Table A4 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 A4 Sequence Extension Constraints

Sequence Extension Syntactic Element	Allowed Values
progressive_sequence	see Table A3
profile_and_level_indication	see Note
chroma_format	'01'
horizontal_size_extension	'00'
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 [A3], Section 8, that is consistent with the parameters of the video elementary stream.

5.1.4 Sequence Display Extension Constraints

Table A5 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 A5 Sequence Display Extension Constraints

Sequence Display Extension Syntactic Element	Allowed Values
video_format	'000'

The values for color_primaries, transfer_characteristics, and matrix_coefficients shall be explicitly indicated in the sequence_display_extension. While all values for color_primaries, transfer_characteristics, and matrix_coefficients defined in Tables 6-7, 6-8, and 6-9 of ISO/IEC 13818-2 [A3] are allowed in the transmitted bit stream, those of ITU-R BT.709 [A15] and SMPTE 170M [A5] are the most likely to be in common use.

Note: Some previously-encoded legacy material may not have the colorimetry (i.e., color_primaries, transfer_characteristics, and matrix_coefficients) explicitly indicated in the sequence_display_extension, in which case the colorimetry is most likely ITU-R BT.709 [A15] for all formats except those formats with vertical_size_value = 480, which are most likely to have colorimetry according to SMPTE 170M [A5].

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:

$vbv\_delay \leq 45000$

5.1.6 Picture Coding Constraints

frame_pred_frame_dct shall be '1' if progressive_frame is '1'

5.2 Bit Stream Specifications Beyond MPEG-2

This section covers the extension and user data part of the video syntax. These data are all inserted at the picture level as shown in Table A6.

5.2.1 Picture Extension and User Data Syntax

Table A6 is provided to show the syntax that is required for picture extension and user data as defined by MPEG-2 video (ISO/IEC 13818-2 [A3]).

Table A6 Picture Extension and User Data Syntax (Informative)

Value	No. of Bits	Format

extension_and_user_data(2) {
  while ((nextbits( ) == extension_start_code) ll
  (nextbits() == user_data_start_code)) {
  if (nextbits()== extension_start_code)
  extension_data(2)
  if (nextbits() == user_data_start_code)
  user_data()
  }
}		

5.2.2 User Data Syntax

Table A7 describes the user data syntax which shall be used.

Table A7 User Data Syntax[5]

Syntax	No. of Bits	Format
user_data() {		
user_data_start_code	32	bslbf
user_identifier	32	bslbf
user_structure()		
}		

In accordance with the bit stream syntax in Table A6, more than one picture user data construct may follow any given picture header. However, no more than one picture user data construct using the same user_identifier or user_data_type_code shall follow any given picture header.

Receiving devices are expected to silently discard any unrecognized video user data encountered in the video bit stream. For example, if an unrecognized 32-bit identifier is seen following the user_data_start_code, or an unrecognized 8-bit user_data_type_code is seen following the ATSC_identifier, data should be discarded until another start code is seen.

[5] Shaded cells in this table indicate syntactic and semantic additions to the ISO/IEC 13818-2 Standard [A3].

5.2.3 ATSC User Data Semantics

user_data_start_code – This is set to 0x0000 01B2 per ISO/IEC 13818-2 [A3].

user_identifier – This is a 32 bit code that indicates the contents of the user_structure() as indicated in Table A8.

user_structure()– This is a variable length data structure defined by the value of user_identifier and Table A8.

Table A8 user_identifier

user_identifier	user_structure()
0x47413934 (“GA94”)	ATSC1_data()
0x44544731 (“DTG1”)	afd_data()
all other values	ATSC Reserved

Table A9 ATSC1_data() Syntax

Syntax	No. of Bits	Format
ATSC1_data( ) {		
user_data_type_code	8	uimsbf
user_data_type_structure()	var	
marker_bits	8	'11111111'
}		

user_data_type_code – An 8-bit value that identifies the type of user data to follow in the user_data_type_structure(). The values are defined in Table A10.

Table A10 user_data_type_code

user_data_type_code	user_data_type_structure()
0x00 – 0x02	ATSC Reserved
0x03	cc_data()[6]
0x04	ATSC Reserved[7]
0x05	ATSC Reserved[8]
0x06	bar_data()
0x07 – 0xFF	ATSC Reserved

user_data_type_structure – This is a variable length set of data defined by the value of user_data_type_code and Table A10.

[6] To be replaced with a reference to cc_data() in CEA-708-C when published.

[7] See ANSI/SCTE 21 [A13].

[8] See ANSI/SCTE 21 [A13].

5.2.3.1 Captioning Data[9]

Table A11 describes the syntax and the semantics of captioning data.

Table A11 Captioning Data Syntax

Syntax	No. of Bits	Format
cc_data() {		
reserved	1	'1'
process_cc_data_flag	1	bslbf
zero_bit	1	'0'[10]
cc_count	5	uimsbf
reserved	8	'1111 1111'
for (i=0 ; i < cc_count ; i++) {		
one_bit	1	'1'
reserved	4	'1111'
cc_valid	1	bslbf
cc_type	2	bslbf
cc_data_1	8	bslbf
cc_data_2	8	bslbf
}		
}		

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 shall be parsed and its meaning processed. When it is set to '0', the cc_data shall be discarded.

zero_bit – This bit shall be '0' to maintain backwards compatibility with previous versions of this document.

cc_count – This 5-bit integer indicates the number of closed caption constructs following this field. It can have values 0 through 31. The value of cc_count shall be set according to the frame rate and coded picture structure (field or frame) such that a fixed bandwidth of 9600 bits per second is maintained for the closed caption payload data. Sixteen (16) bits of closed caption payload data are carried in each pair of the fields cc_data_1 and cc_data_2.

one_bit – This bit shall be '1' to maintain backwards compatibility with previous versions of this document.

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, as defined in [A9].

cc_type – Denotes the type of the two closed caption data bytes that follow, as defined in [A9].

cc_data_1 – The first byte of a closed caption data pair as defined in [A9].

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[9] The syntax and semantics of cc_data() may be moved to a future revision of CEA-708. At that point this entire section should be deleted in deference to the CEA-708 definition. This syntax is bit-compatible with the existing syntax defined by previous versions of this document.

[10] For backwards compatibility, this bit must be zero, not one.

cc_data_2 – The second byte of a closed caption data pair as defined in [A9].

5.2.3.2 Bar Data

Note: this section is subject to revision due to ongoing standards work.

Table A12 describes the syntax of bar data. Bar data should be included in video user data whenever the rectangular picture area containing useful information does not extend to the full height or width of the coded frame[11].

Bar data shall be carried in the picture user data of the video Elementary Stream. After each sequence start (and repeat sequence start), the bar data shall be signalled. After introduction, bar data shall remain in effect until the next sequence start. Within a sequence, bar data shall remain in effect until a picture contains new bar data or a picture contains AFD data without bar data. At the start of a sequence, the absence of bar data, unless accompanied by AFD data specifying otherwise, shall indicate that the rectangular picture area containing useful information extends to the full height and width of the coded frame.

Table A12 Bar Data Syntax

Syntax	No. of Bits	Format
bar_data() {		
top_bar_flag	1	bslbf
bottom_bar_flag	1	bslbf
left_bar_flag	1	bslbf
right_bar_flag	1	bslbf
reserved	4	'1111'
if (top_bar_flag == '1') {		
marker_bits	2	'11'
line_number_end_of_top_bar	14	uimsbf
}		
if (bottom_bar_flag == '1') {		
marker_bits	2	'11'
line_number_start_of_bottom_bar	14	uimsbf
}		
if (left_bar_flag == '1') {		
marker_bits	2	'11'
pixel_number_end_of_left_bar	14	uimsbf
}		
if (right_bar_flag == '1') {		
marker_bits	2	'11'
pixel_number_start_of_right_bar	14	uimsbf
}		
}		

[11] In other words, the video is letterboxed (bars above and/or below video) or pillarboxed (bars left and/or right of video).

Designation of line numbers for line_number_end_of_top_bar and line_number_start_of_bottom_bar is video format-dependent and shall conform to the applicable standard indicated in Table A13.

Table A13 Line Number Designation

Video Format	Applicable Standard
480 Interlaced (analog)	SMPTE 170M [A5]
480 Interlaced 4:3 (digital)	SMPTE 125M [A4]
480 Interlaced 16:9 (digital)	SMPTE 267M [A6]
480 Progressive	SMPTE 293M [A8]
720 Progressive	SMPTE 296M [A9]
1080 Interlaced	SMPTE 274M [A7]
1080 Progressive	SMPTE 274M [A7]

top_bar_flag – This flag shall indicate, when set, that the top bar data is present.

bottom_bar_flag – This flag shall indicate, when set, that the bottom bar data is present.

left_bar_flag – This flag shall indicate, when set, that the left bar data is present.

right_bar_flag – This flag shall indicate, when set, that the right bar data is present.

line_number_end_of_top_bar – A 14-bit unsigned integer value representing the last line of a horizontal letterbox bar area at the top of the reconstructed frame. Designation of line numbers shall be as defined in Table A13.

line_number_start_of_bottom_bar – A 14-bit unsigned integer value representing the first line of a horizontal letterbox bar area at the bottom of the reconstructed frame. Designation of line numbers shall be as defined in Table A13.

pixel_number_end_of_left_bar – A 14-bit unsigned integer value representing the last horizontal luminance sample of a vertical pillarbar area at the left side of the reconstructed frame. Pixels shall be numbered from zero, starting with the leftmost pixel.

pixel_number_start_of_right_bar – A 14-bit unsigned integer value representing the first horizontal luminance sample of a vertical pillarbar area at the right side of the reconstructed frame. Pixels shall be numbered from zero, starting with the leftmost pixel.

5.2.3.3 Active Format Description Data

Active Format Description (AFD) should be included in video user data whenever the rectangular picture area containing useful information does not extend to the full height or width of the coded frame. AFD data may also be included in user data when the rectangular picture area containing useful information extends to the full height and width of the coded frame.

When present the AFD shall be carried, using the syntax and semantics defined in [A13], in the user data of the video Elementary Stream. After each sequence start (and repeat sequence start) the default aspect ratio of the area of interest shall be that signalled by the sequence header and sequence display extension parameters. After introduction, an AFD shall remain in effect until the next sequence start or until another AFD is introduced. Receivers should interpret the absence of AFD in a sequence start to mean the active format is the same as the coded frame, corresponding to AFD value ‘1000’ (see Table A15).

Note: The AFD syntax as shown here, starting with the MPEG-2 video user_data of Table A7 is syntactically identical to that specified in ETSI TS 101 154 V1.7.1 [A13], and is reprinted here with permission.

5.2.3.3.1 AFD Syntax

Table A14 describes the syntax of the Active Format Description.

Table A14 Active Format Description Syntax

Syntax	No. of Bits	Format
afd_data() {		
zero_bit	1	'0'
active_format_flag	1	bslbf
flag_bits	6	'00 0001'
if (active_format_flag == '1') {		
reserved	4	'1111'
active_format	4	bslbf
}		
}		

5.2.3.3.2 AFD Semantics

zero_bit – This bit shall be '0'.

active_format_flag – A 1 bit flag. A value of '1' indicates that an active format is described in this data structure.

flag_bits – A 6 bit field with a defined value of '00 0001'.

active_format – A 4 bit field describing the "area of interest" in terms of its aspect ratio within the coded frame as defined in ISO/IEC 13818-2 [A3].

The active_format is used by the decoder in conjunction with the "source aspect ratio." The source aspect ratio is derived from the "display aspect ratio" (DAR) signaled in the aspect_ratio_information, the horizontal_size, vertical_size, and display_horizontal_size and display_vertical_size if present (see ISO/IEC 13818-2 [A3]):

- If sequence_display_extension() is not present, source aspect ratio = DAR
- If sequence_display_extension() is present, source aspect ratio = $\mathrm{DAR} \times \frac{\mathrm{display\_horizontal\_size}}{\mathrm{display\_vertical\_size}} \times \frac{\mathrm{vertical\_size}}{\mathrm{horizontal\_size}}$

The combination of source aspect ratio and active_format allows the decoder to identify whether the "area of interest" is the whole of the frame (e.g., source aspect ratio 16:9, active_format 16:9 center), a letterbox within the frame (e.g. source aspect ratio 4:3, active_format 16:9 center), or a "pillarbox" within the frame (e.g. source aspect ratio 16:9, active_format 4:3 center).

Table A15 defines the coding of the active_format field that shall be used.

Table A15 Active Format

active_format	Description	
	4:3 coded frames	**16:9 coded frames**
'0000' – '0001'	Reserved	Reserved
'0010' – '0100'	Reserved	Reserved
'0101' – '0111'	Reserved	Reserved
'1000'	4:3 full frame image	16:9 full frame image
'1001'	4:3 full frame image	4:3 pillarbox image
'1010'	16:9 letterbox image	16:9 full frame image
'1011'	14:9 letterbox image	14:9 pillarbox image
'1100'	Reserved	Reserved
'1101'	4:3 full frame image, alternative 14:9 center	4:3 pillarbox image, alternative 14:9 center
'1110'	16:9 letterbox image, alternative 14:9 center	16:9 full frame image, alternative 14:9 center
'1111'	16:9 letterbox image, alternative 4:3 center	16:9 full frame image, alternative 4:3 center

Note: This section is subject to revision due to ongoing standards work.

Illustrations of the various values of active_format may be found in ETSI-TS 101 154 Table B.3 [A13]. Users are strongly encouraged to consult this reference.

5.2.3.3.3 Recommended Receiver Response to AFD

Receiving device designers are strongly encouraged to study the suite of Consumer Electronics Association (CEA) bulletins which contain the most recent recommendations regarding the processing of AFD. In several instances, a variety of design choices are possible when processing a given AFD value for display and the recommendation identifies one preferred method.

5.2.4 Relationship Between Bar Data and AFD (Informative)

Note: This section is subject to revision due to ongoing standards work.

Any combination of Active Format Description and bar data may be present in video user data (either, neither, or both). Note that AFD data may not always exactly match bar data because AFD only deals with 4:3, 14:9, and 16:9 aspect ratios while bar data can accurately represent nearly any aspect ratio.