SMPTE ST 2036-3:2018
Revision of SMPTE ST 2036-3:2015

SMPTE STANDARD

Ultra High Definition Television — Mapping into Single-link or Multi-link 10 Gb/s Serial Signal/Data Interface

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Foreword

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SMPTE ST 2036-3 was prepared by Technology Committee 32NF.

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Introduction

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

SMPTE ST 2036 Ultra High Definition Television suite of documents is in multiple parts.

This document is Part 3 of SMPTE ST 2036 and describes UHDTV1, 2 image mapping and High Dynamic Range (HDR) UHDTV1, 2 image mapping of signals into a Single-link or a Multi-link 10 Gb/s Serial Signal/Data Interface (10G-SDI) Mode D defined in SMPTE ST 435-2.

1 Scope

This document defines UHDTV and HDR UHDTV video payload mapping into Single-link, Dual-link, Quad-link or Octa-link 10G-SDI Mode D defined in SMPTE ST 435-2. This document also defines mapping of ANC, Audio Data, payload ID and other ancillary data formatted as defined in SMPTE ST 291-1. The “Basic Stream” complies with the interleaved data stream defined in SMPTE ST 292-1 and is utilized as the input source stream for the 10G-SDI.

When transporting UHDTV1,2 signals through a single single-mode fiber, WDM (Wavelength Division Multiplexing) or DWDM (Dense Wavelength Division Multiplexing) as defined in Section 6.4 and Section 7.4 can be used.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or text that contains the conformance language keywords: "shall," "should," or "may." Informative text is text that is potentially helpful to the user, but not indispensable, and that 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 standards indicated below.

SMPTE ST 291-1:2011, Ancillary Data Packet and Space Formatting

SMPTE ST 292-1:2012, 1.5 Gb/s Signal/Data Serial Interface

SMPTE ST 299-1:2009, 24-Bit Digital Audio Format for SMPTE 292 Bit-Serial Interface

SMPTE ST 352:2013, Payload Identification Codes for Serial Digital Interfaces

SMPTE ST 372:2011, Dual Link 1.5 Gb/s Digital Interface for 1920 × 1080 and 2048 × 1080 Picture Formats

SMPTE ST 435-1:2012, 10 Gb/s Serial Signal/Data Interface — Part 1: Basic Stream Derivation

SMPTE ST 435-2:2012, 10 Gb/s Serial Signal/Data Interface — Part 2: 10.692 Gb/s Stream — Basic Stream Data Mapping

SMPTE ST 435-3:2012, 10 Gb/s Serial Signal/Data Interface — Part 3: 10.692 Gb/s Optical Fiber Interface

SMPTE ST 2036-1:2014, Ultra High Definition Television — Image Parameter Values for Program Production

SMPTE RP 291-2:2013, Ancillary Data Space Use — 4:2:2 SDTV and HDTV Component Systems and 4:2:2 2048 × 1080 Production Image Formats

SMPTE RP 2077:2013, Full Range Image Mapping

Recommendation ITU-R BT.2100-1 (06/2017), Image parameter values for high dynamic range television for use in production and international programme exchange

4 Definition of Terms

4.1 UHDTV
Ultra High Definition Television, having an image format (sample structure) of 3840 × 2160 or 7680 × 4320

4.2 UHDTV1
Class of UHDTV having an image format (sample structure) of 3840 × 2160

4.3 UHDTV2
Class of UHDTV having an image format (sample structure) of 7680 × 4320

4.4 Basic Stream
10-bit parallel interleaved data stream which has the same structure as the source data stream defined in SMPTE ST 292-1 and carries the image structure defined in the source format data defined in SMPTE ST 292-1

4.5 HANC
Horizontal Ancillary Data Space as defined in SMPTE RP 291-2

4.6 VANC
Vertical Ancillary Data Space as defined in SMPTE RP 291-2

5 System Overview

The source UHDTV (Ultra High Definition Television) image sample structures for the interface are listed in Table 1. UHDTV has an image format (sample structure) of 3840 × 2160 (UHDTV1) or 7680 × 4320 (UHDTV2). The source image formats listed in Table 1 shall be as defined in SMPTE ST 2036-1 or Recommendation ITU-R BT.2100.

Table 1 – Image sample structures and frame rates of UHDTV systems

System category	System nomenclature	Luma or R’G’B’ samples per line	Lines per frame	Frame rate (Hz)
UHDTV 1	3840 × 2160/23.98/P	3840	2160	24/1.001
	3840 × 2160/24/P	3840	2160	24
	3840 × 2160/25/P	3840	2160	25
	3840 × 2160/29.97/P	3840	2160	30/1.001
	3840 × 2160/30/P	3840	2160	30
	3840 × 2160/50/P	3840	2160	50
	3840 × 2160/59.94/P	3840	2160	60/1.001
	3840 × 2160/60/P	3840	2160	60
UHDTV 2	7680 × 4320/23.98/P	7680	4320	24/1.001
	7680 × 4320/24/P	7680	4320	24
	7680 × 4320/25/P	7680	4320	25
	7680 × 4320/29.97/P	7680	4320	30/1.001
	7680 × 4320/30/P	7680	4320	30
	7680 × 4320/50/P	7680	4320	50
	7680 × 4320/59.94/P	7680	4320	60/1.001
	7680 × 4320/60/P	7680	4320	60

UHDTV1, 2 images shall be mapped into 4 or 16 Sub images through 2-sample interleave division and shall be mapped into Single-link, Dual-link, Quad-link or Octa-link 10G-SDI Mode D defined in SMPTE ST 435-2 through Basic Streams that comply with 1.5 Gb/s Serial Digital Interface defined in SMPTE ST 292-1 as shown in Figure 1.

When embedding optional ancillary data, the ancillary data packet format shall be in conformance with SMPTE ST 291-1. Ancillary audio data shall be as defined in SMPTE ST 299-1 and shall be mapped in the following order:

(1st) CH1 Basic Stream of 10G-SDI Link 1, up to a maximum of 16 channels at a sampling frequency of 48 kHz or up to a maximum of 8 channels at a sampling frequency of 96 kHz

(2nd) CH1 Basic Stream of 10G-SDI Link 2, up to a maximum of 16 channels at a sampling frequency of 48 kHz or up to a maximum of 8 channels at a sampling frequency of 96 kHz

The multiple numbers of Basic Streams conveying the source data of UHDTV images shall be multiplexed and serialized into the Single-link or Multiple-link 10G-SDI as defined in the following sections.

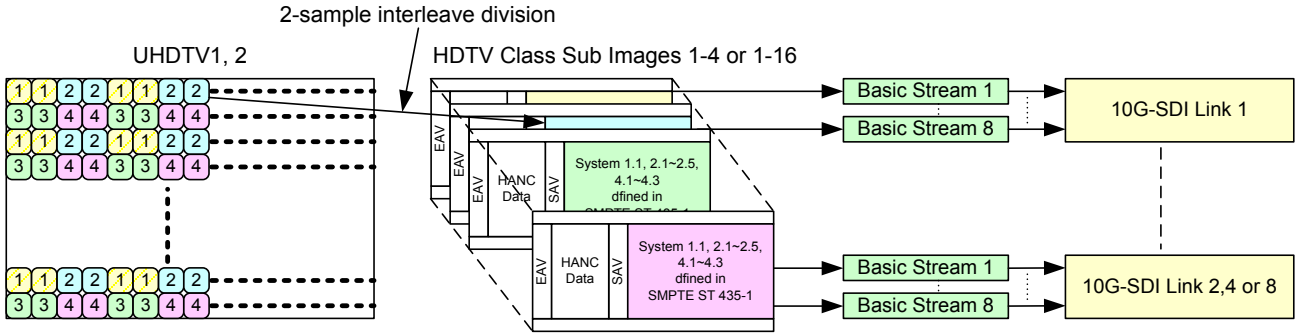

Figure 1 – UHDTV1, 2 mapping overview

6 UHDTV1 Mapping into Single-link or Dual-link 10G-SDI

6.1 Video Payload Mapping

Table 2 shows the UHDTV1 image formats which shall be divided into four Sub images by 2-sample interleave division and shall be mapped into the Single-link or the Dual-link 10G-SDI Mode D defined by SMPTE ST 435-2. Each Sub image shall have the 1920 × 1080 picture format defined as System 1.1, 2.1, 2.2, 2.3, 2.4, 2.5, 4.1, 4.2 or 4.3 in SMPTE ST 435-1.

The mappings for $Y'C'_BC'_R$ signal formats defined in SMTE ST 435-1 and SMPTE ST 435-2 may be applied to the mappings for IC_TC_P signal formats as defined in Recommendation ITU-R BT.2100. For IC_TC_P signal formats the mappings for $Y'C'_BC'_R$ signal formats shall be used with Y' replaced by I, C'_B replaced by C_T and C'_R replaced by C_P.

Table 2 – Source image formats of UHDTV1 Class

System Number	System nomenclature	Sampling Structure/Pixel Depth	Frame Rate/sec	Sub-image format defined in SMPTE ST 435-1
U1.1	3840 x 2160/24/P 3840 x 2160/25/P 3840 x 2160/30/P	4:2:0($Y'C'_BC'_R$)/10-bit 4:2:2($Y'C'_BC'_R$)/10-bit 4:2:0(IC_TC_P)/10-bit 4:2:2(IC_TC_P)/10-bit	24, 25 and 30 Frames Progressive	System 1.1
	3840 x 2160/23.98/P 3840 x 2160/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U1.2	3840 x 2160/24/P 3840 x 2160/25/P 3840 x 2160/30/P	4:4:4(R'G'B')/10-bit	24, 25 and 30 Frames Progressive	System 2.2
	3840 x 2160/23.98/P 3840 x 2160/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U1.3	3840 x 2160/24/P 3840 x 2160/25/P 3840 x 2160/30/P	4:4:4(R'G'B')/12-bit	24, 25 and 30 Frames Progressive	System 2.3
	3840 x 2160/23.98/P 3840 x 2160/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U1.4	3840 x 2160/24/P 3840 x 2160/25/P 3840 x 2160/30/P	4:4:4($Y'C'_BC'_R$)/10-bit 4:4:4(IC_TC_P)/10-bit	24, 25 and 30 Frames Progressive	System 2.4
	3840 x 2160/23.98/P 3840 x 2160/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U1.5	3840 x 2160/24/P 3840 x 2160/25/P 3840 x 2160/30/P	4:2:0($Y'C'_BC'_R$)/12-bit 4:2:2($Y'C'_BC'_R$)/12-bit 4:4:4($Y'C'_BC'_R$)/12-bit 4:2:0(IC_TC_P)/12-bit 4:2:2(IC_TC_P)/12-bit 4:4:4(IC_TC_P)/12-bit	24, 25 and 30 Frames Progressive	System 2.5
	3840 x 2160/23.98/P 3840 x 2160/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U1.6	3840 x 2160/50/P 3840 x 2160/60/P	4:2:0($Y'C'_BC'_R$)/10-bit 4:2:2($Y'C'_BC'_R$)/10-bit 4:2:0(IC_TC_P)/10-bit 4:2:2(IC_TC_P)/10-bit	50 and 60 Frames Progressive	System 2.1
	3840 x 2160/59.94/P		60/1.001 Frames Progressive	
U1.7	3840 x 2160/50/P 3840 x 2160/60/P	4:2:0($Y'C'_BC'_R$)/12-bit 4:2:2($Y'C'_BC'_R$)/12-bit 4:2:0(IC_TC_P)/12-bit 4:2:2(IC_TC_P)/12-bit	50 and 60 Frames Progressive	System 4.1
	3840 x 2160/59.94/P		60/1.001 Frames Progressive	
U1.8	3840 x 2160/50/P 3840 x 2160/60/P	4:4:4(R'G'B')/10-bit 4:4:4($Y'C'_BC'_R$)/10-bit 4:4:4(IC_TC_P)/10-bit	50 and 60 Frames Progressive	System 4.2
	3840 x 2160/59.94/P		60/1.001 Frames Progressive	
U1.9	3840 x 2160/50/P 3840 x 2160/60/P	4:4:4(R'G'B')/12-bit 4:4:4($Y'C'_BC'_R$)/12-bit 4:4:4(IC_TC_P)/12-bit	50 and 60 Frames Progressive	System 4.3
	3840 x 2160/59.94/P		60/1.001 Frames Progressive	
NOTE: IC_TC_P sampling is only applied to High Dynamic Range (HDR) image formats defined in Recommendation ITU-R BT.2100				

System U1.1 through U1.9 images shall be divided and mapped into the active area of Sub images 1 through 4 by 2-sample interleave division as defined by Figure 4 in SMPTE ST 435-1:2012. Sub images of System U1.1 through U1.9 shall be System 1.1, 2.2 through 2.5, 2.1 or 4.1 through 4.3 as shown in Table 2 and shall have the digital sample structure as defined in Section 6 through Section 9 of SMPTE ST 274.

The 0 components of the 4:2:0 (even-numbered samples on odd-numbered lines of unassigned $C'_BC'_R$ or C_TC_P) system image data shall be assigned 200_h ($512_{(10)}$) in case of a 10-bit system and 800_h ($2048_{(12)}$) in case of a 12-bit system.

Table 5 in SMPTE ST 435-1:2012 specifies the relation between the horizontal/vertical pixel number of the original 3840×2160 image and the sample/line number of the mapped 1920×1080 Sub images 1, 2, 3 and 4 by the 2-sample interleave division.

6.2 Single-link 10G-SDI for System U1.1 to U1.5

In the case of System from U1.1 to U1.5 images (3840×2160/23.98/P, 24/P, 25/P, 29.97/P and 30/P), each of Sub image 1 to 4 created by the 2-sample interleave division shall be divided into the single-link or the dual-link 1.5 Gb/s Basic Stream defined in Section 6.1 and Section 6.2 of SMPTE ST 435-1:2012. Four single- or dual-link Basic Streams from four Sub images shall be mapped into the Single-link 10G-SDI as defined in Section 6.4 of SMPTE ST 435-2:2012.

6.3 Dual-link 10G-SDI for System U1.6 to U1.9

In the case of Systems U1.6 through U1.9 images (3840x2160/50/P, 59.94/P and 60/P), each of Sub image data created by the 2-sample interleave division shall be divided into the dual-link Basic Stream or the quad-link Basic Stream with the same structure as the dual link 1.5 Gb/s class or the quad link 1.5 Gb/s class Basic Stream defined in Section 6.2 and Section 6.3 of SMPTE ST 435-1:2012.

Sub images 1 to 4 generated from System U1.6 images are equivalent to System 2.1 as defined by SMPTE ST 435-1 and shall be divided into 8 Basic Streams as shown in Figure 2.

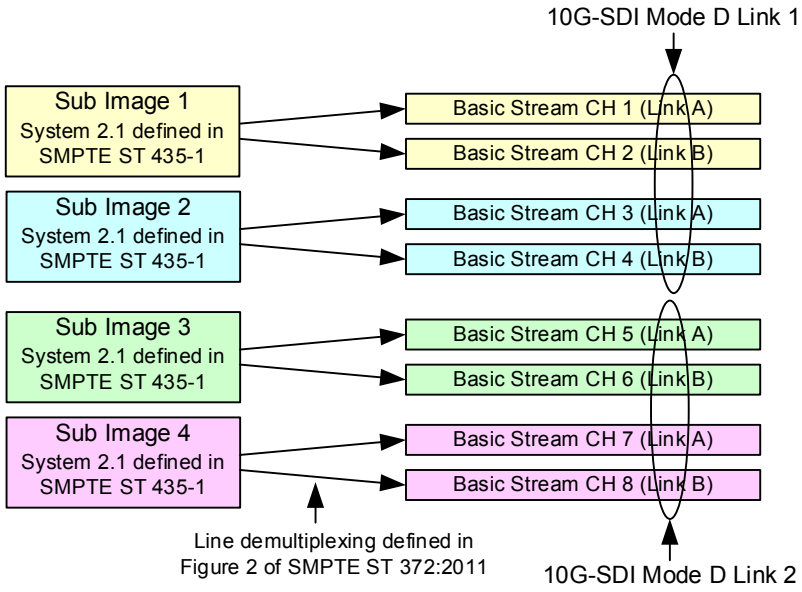

Figure 2 – 8 way division for System U1.6

Eight Basic Streams of a virtual interface for System U1.6 shall be mapped into Dual-link 10G-SDI.

— Basic Streams CH1, CH2, CH3 and CH4 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 1;

— Basic Streams CH5, CH6, CH7 and CH8 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 2.

NOTE: Link B is not used in this mapping.

In the case of System U1.7, U1.8 and U1.9 images, Sub images 1 to 4 shall be divided into 16 Basic Streams as shown in Figure 3.

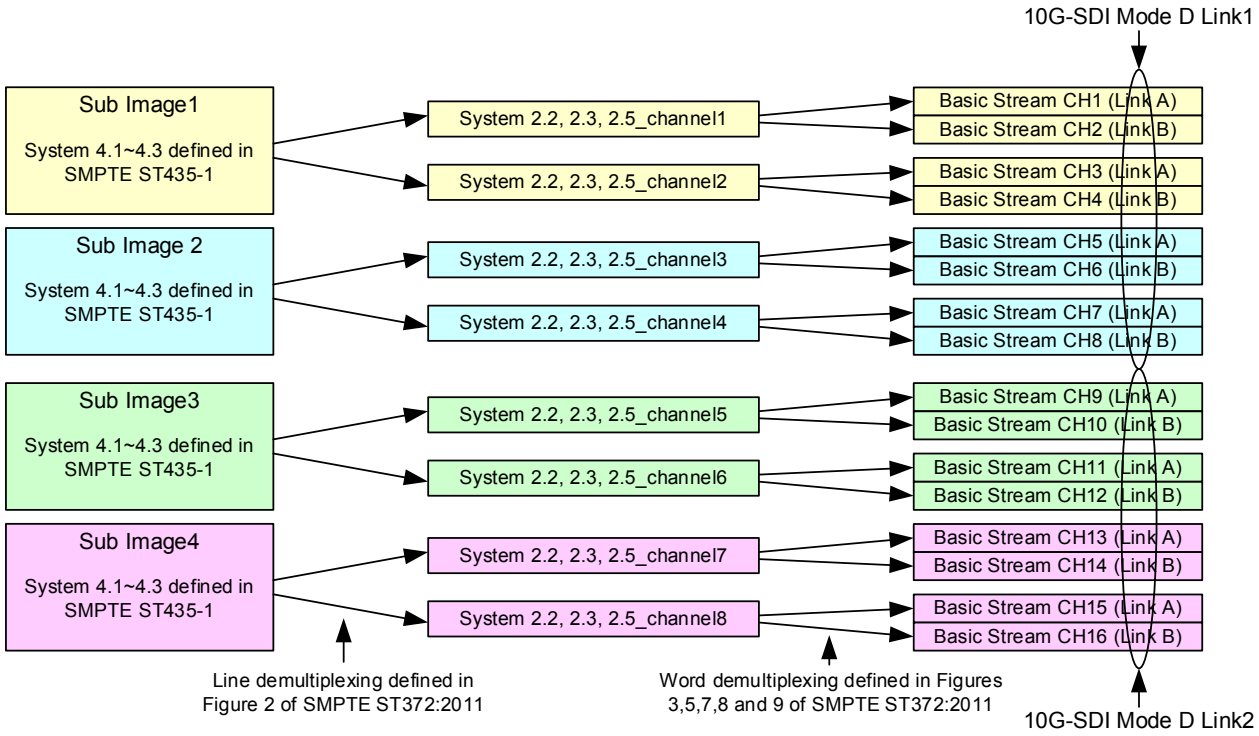

Figure 3 – 16 way division for System U1.7, U1.8 and U1.9

UHDTV1 class images of System U1.6, U1.7 U1.8 and U1.9 shall be transmitted using a Dual-link 10G-SDI Mode D.

NOTE: 10G-SDI Mode D defined by SMPTE ST 435-2 can transmit up to four pairs of the dual link 1.5 Gb/s System 2.2, 2.3, 2.4 or 2.5 or up to two pairs of the quad link 1.5 Gb/s System 4.1, 4.2 or 4.3 as defined in SMPTE ST 435-2.

Sixteen Basic Streams of a virtual interface for Systems U1.7, U1.8 and U1.9 shall be mapped into Dual-link 10G-SDI. Groups of Basic Streams CH(8*k*-7), CH(8*k*-6), CH(8*k*-5), CH(8*k*-4), CH(8*k*-3), CH(8*k*-2), CH(8*k*-1) and CH(8*k*), where *k* is a number from 1 to 2, shall be mapped into CH1, CH2, CH3, CH4, CH5, CH6, CH7 and CH8 of 10G-SDI Link (*k*); i.e.:

— Basic Streams CH1 through CH8 shall be mapped into CH1 through CH8 of 10G-SDI Link 1;
— Basic Streams CH9 through CH16 shall be mapped into CH1 through CH8 of 10G-SDI Link 2.

6.4 Optical Interface Characteristics

The optical interface characteristics of the Single-link and the Dual-link 10G-SDI shall be in conformance with SMPTE ST 435-3.

When transporting the Dual-link 10G-SDI signal through a single single-mode fiber, the WDM (Wavelength Division Multiplexing) or the DWDM (Dense Wavelength Division Multiplexing) technology may be used. The nominal wavelengths of 1310 nm and 1550 nm shall be assigned to the Link 1 and 2 for the WDM transport in conformance with SMPTE ST 435-3. When using DWDM technology, the approximate nominal central wavelengths of 1557.36 nm and 1556.55 nm shall be assigned to the Link 1 and 2 as listed in Table 3.

Table 3 – Nominal central wavelengths of 2ch DWDM interface for UHDTV1

Link No.	Approximate nominal central wavelengths for 2ch DWDM
1	1557.36 nm
2	1556.55 nm

6.5 ANC/Audio Data Mapping

6.5.1 ANC Data Mapping

Ancillary data if present shall be mapped into the blanking area of CH1 Basic Stream of 10G-SDI. The data format shall be in conformance with SMPTE ST 291-1.

In the case of the Dual-link 10G-SDI, the ancillary data shall be mapped into CH1 Basic Stream of 10G-SDI Link 1 first, and any remaining data shall be mapped into CH1 Basic Stream of 10G-SDI Link 2.

6.5.2 Audio Data Mapping

When present, audio data shall be mapped into the C'_B/C'_R data stream of the HANC data space of CH1 Basic Stream of 10G-SDI Link in conformance with SMPTE 299-1 and shall be transmitted in groups of four up to a maximum of 16 channels at a sampling frequency of 48 kHz or up to a maximum of 8 channels at a sampling frequency of 96 kHz.

In the case of the Dual-link 10G-SDI, CH1 Basic Stream of 10G-SDI Link 1 shall be used first for audio data transmission in groups of four up to a maximum of 16 channels at a sampling frequency of 48 kHz or up to a maximum of 8 channels at a sampling frequency of 96 kHz in conformance with SMPTE ST 299-1. If more than 16 channels of audio (8 channels at a sampling frequency of 96 kHz) is required, CH1 Basic Stream of 10G-SDI Link 2 shall be used in conformance with SMPTE ST 299-1.

The maximum channel number carried by Dual-link 10G-SDI Mode D is 32 channels at a sampling frequency of 48 kHz or 16 channels at a sampling frequency of 96 kHz.

NOTE: Mode D as defined in SMPTE ST 435-2 can carry the HANC Data included in CH1,3,5,7 Basic Streams at frame rates from 23.98 Hz through 25 Hz. In this document the audio data is only mapped into the HANC Data area of CH1 Basic Stream irrespective of frame rates.

Audio control packets shall be mapped into the Y' data stream of the HANC data space of CH1 Basic Stream of 10G-SDI Link 1 and Link 2 (if necessary), and shall be in conformance with SMPTE ST 299-1.

6.5.3 Payload ID Mapping

The payload identifier shall be mapped into the blanking area of each Basic Stream of 10G-SDIs. Table 4 defines the payload identifier for the UHDTV1 video payload.

This payload identifier shall be in conformance with the payload identifier format defined in SMPTE ST 352. The byte 1 value of $A1_h$ is mandatory and identifies the video payload format as UHDTV1. The remaining 3 bytes values specify the other features of the video payload for UHDTV1.

The specification and carriage of this payload identifier shall be in conformance with SMPTE ST 352.

NOTE: Designers need to be aware that the first eleven samples after SAV of Line 10 and Line 572 on each Basic Stream channel are reserved for payload identifier usage.

Table 4 – Payload identifier definitions for UHDTV1 video payloads on a Single-link or a Dual-link 10 Gb/s (nominal) serial digital interface

<table>
<tr><th>Bits</th><th>Byte 1</th><th>Byte 2</th><th>Byte 3</th><th>Byte 4</th></tr>
<tr><td>Bit 7</td><td>1</td><td>Interlaced (0) or progressive (1) transport</td><td>Reserved (0)</td><td rowspan="3">Channel assignment within 10G link
Ch1 (0h), Ch2 (1h),
Ch3 (2h), Ch4 (3h),
Ch5 (4h), Ch6 (5h),
Ch7 (6h) or Ch8 (7h)</td></tr>
<tr><td>Bit 6</td><td>0</td><td>progressive (1) picture</td><td>Reserved (0)</td></tr>
<tr><td>Bit 5</td><td>1</td><td rowspan="2">Transfer characteristics
SDR-TV (0h),
HLG (1h),
PQ (2h),
unspecified (3h)</td><td>Reserved (0)</td></tr>
<tr><td>Bit 4</td><td>0</td><td>10G link assignment of Single/Dual link
Link 1 (0) or Link 2(1)</td><td>Colorimetry
ITU-R Rec 709[a] (0h)
ITU-R Rec 2020[b] (1h)</td></tr>
<tr><td>Bit 3</td><td>0</td><td rowspan="4">Picture rate
(see Table 2
SMPTE ST 352:2013)</td><td rowspan="4">Sampling structure
4:2:2 ($Y'C'_BC'_R$ or IC_TC_P) = (0h),
4:4:4 ($Y'C'_BC'_R$ or IC_TC_P) = (1h),
4:4:4 ($G'B'R'$) = (2h),
4:2:0 ($Y'C'_BC'_R$ or IC_TC_P) = (3h),
Other values reserved</td><td>Reserved (0)</td></tr>
<tr><td>Bit 2</td><td>0</td><td>Luminance and color difference signal
$Y'C'_BC'_R$ (0),
IC_TC_P (1)</td></tr>
<tr><td>Bit 1</td><td>0</td><td rowspan="2">Bit depth
10-bit full range (0h),
10-bit narrow range (1h),
12-bit narrow range (2h),
12-bit full range (3h)</td></tr>
<tr><td>Bit 0</td><td>1</td></tr>
<tr><td colspan="5">NOTE: The usage of bytes 2, 3 and 4 is consistent for all modes except bits b6 to b4 of byte 3 in this document but the definitions are repeated for the convenience of the reader.
[a] ITU-R Rec 709 indicates Conventional reference primaries as defined in SMPTE ST 2036-1:2014 Table 3 and is equivalent to ITU-R recommendation BT.709 colorimetry.
[b] ITU-R Rec 2020 indicates UHDTV color primaries and reference white as defined in SMPTE ST 2036-1:2014 Table 2 or Recommendation ITU-R BT.2100 and is equivalent to ITU-R recommendation BT.2020.</td></tr>
</table>

When identifying UHDTV1 video payloads mapped onto a Single-link or a Dual-link 10 Gb/s serial digital interface, the following limitations shall apply:

The interlace/progressive transport shall be identified by Byte 2, bit b7 having the following values:

– (0) identifies an interlaced transport;

– (1) identifies a progressive transport;

Byte 2, bit b6 shall be set to 1 to signify the progressive picture;

The transfer characteristics shall be identified by Byte 2, bits b5 and b4 having the following values:

– (0h) identifies SDR-TV in accordance with SMPTE ST 2036-1;

– (1h) identifies HLG HDR-TV in accordance with Recommendation ITU-R BT.2100;

– (2h) identifies PQ HDR-TV in accordance with Recommendation ITU-R BT.2100;

– (3h) identifies Transfer Characteristic is not specified;

NOTE: The Reference EOTF as defined in SMPTE ST 2084 is the same as the Reference PQ EOTF defined in Recommendation ITU-R BT.2100.

The picture rate shall be identified by Byte 2, bits b3 to b0 in accordance with SMPTE ST 352:2013, Table 2;

The sampling structure shall be identified by Byte 3, bits b3 to b0 having the following values:

– (0h) identifies 4:2:2 ($Y'C'_BC'_R$ or IC_TC_P);

– (1h) identifies 4:4:4 ($Y'C'_BC'_R$ or IC_TC_P);

– (2h) identifies 4:4:4 (G′B′R′);

– (3h) identifies 4:2:0 ($Y'C'_BC'_R$ or IC_TC_P);

The assignment order of the Basic Stream channels and the 10G links for the payload IDs shall correspond to the numeric order of the 10 Gb/s SDI input channel and link numbers as defined in Section 6.2 and Section 6.3;

The 10G (SMPTE ST 435-1) link assignment in Byte 3, bit b4 shall be set to the following values:

– (0) identifies a Single-link or the first link of a Dual-link;

– (1) identifies the second link of a Dual-link;

The Basic Stream (SMPTE ST 292-1) channel number in Byte 4, bits b7 to b5 shall be set to the following values:

– (0h) identifies CH1;

– (1h) identifies CH2;

– (2h) identifies CH3;

– (3h) identifies CH4;

– (4h) identifies CH5;

– (5h) identifies CH6;

– (6h) identifies CH7;

– (7h) identifies CH8;

The colorimetry shall be identified in Byte 4, bit b4 having the following values:

– (0h) identifies conventional color primaries as defined by SMPTE ST 2036-1:2014 Table 3;

– (1h) identifies UHDTV color primaries and reference white as defined by SMPTE ST 2036-1:2014 Table 2 or Recommendation ITU-R BT.2100;

The luminance and color difference signal shall be identified in Byte 4, bit b2 having the following values:

– (0) indicates $Y'C'_BC'_R$ in accordance with SMPTE ST 2036-1 or Recommendation ITU-R BT.2100;

– (1) indicates IC_TC_P in accordance with Recommendation ITU-R BT.2100;

NOTE: In the case where Byte 3 bits b3:b0 indicate G'B'R', this bit can be ignored.

See informative Annex B – Further Guidance on luminance and color difference signal Identification.

The bit depth of the sample quantization shall be identified in Byte 4, bits b1 and b0 having the following values:

– (0h) identifies quantization using 10 bits per sample with the full range coding in accordance with Recommendation ITU-R BT.2100;

– (1h) identifies quantization using 10 bits per sample with the narrow range coding in accordance with Recommendation ITU-R BT.2100;

– (2h) identifies quantization using 12 bits per sample with the narrow range coding in accordance with Recommendation ITU-R BT.2100;

– (3h) identifies quantization using 12 bits per sample with the full range coding in accordance with Recommendation ITU-R BT.2100;

Code values falling within the protected range shall be clipped in accordance with SMPTE RP 2077

6.6 Blanking Data (Informative)

As defined in the Sub image source format document SMPTE ST 274, HANC and VANC spaces with no ancillary data packets or audio data packets contain data words that represent video black level for the video structure being carried.

64 for 10-bit RGBYI signals
512 for 10-bit $C'_BC'_RC_TC_P$ signals.

256 for 12-bit RGBYI signals
2048 for 12-bit $C'_BC'_RC_TC_P$ signals.

4 for 10-bit Full Range RGBYI signals
512 for 10-bit Full Range $C'_BC'_RC_TC_P$ signals.

16 for 12-bit Full Range RGBYI signals
2048 for 12-bit Full Range $C'_BC'_RC_TC_P$ signals.

7 UHDTV2 Mapping into Quad-link or Octa-link 10G-SDI

7.1 Video Payload Mapping

Table 5 shows the UHDTV2 image formats which shall be divided into four UHDTV1 class images and then shall be further divided into 16 Sub images which have been defined in SMPTE ST 435-1 as System 1.1, 2.1, 2.2, 2.3, 2.4, 2.5, 4.1, 4.2 or 4.3 by 2-sample interleave division. Therefore this division of a UHDTV2 image generates 16 Sub images which have the 1920 × 1080 picture formats and shall be mapped into Quad-link or Octa-link of 10G-SDI Mode D defined in SMPTE ST 435-2.

The mappings for $Y'C'_BC'_R$ signal formats defined in SMTE ST 435-1 and SMPTE ST 435-2 may be applied to the mappings for IC_TC_P signal formats as defined in Recommendation ITU-R BT.2100. For IC_TC_P signal formats the mappings for $Y'C'_BC'_R$ signal formats shall be used with Y' replaced by I, C'_B replaced by C_T and C'_R replaced by C_P.

Figure 4 shows 2-sample interleave division of UHDTV2 class image into four UHDTV1 class images by 2-sample interleave division. Even lines of System U2.1 through U2.9 images shall be divided into Sub UHDTV1 Class images 1 and 2 as per two consecutive horizontal samples, and odd lines shall be divided into Sub UHDTV1 Class images 3 and 4 as per two consecutive horizontal samples.

The 0 components of the 4:2:0 (even-numbered samples on odd-numbered lines of unassigned $Y'C'_BC'_R$ or C_TC_P) system image data shall be assigned 200_h ($512_{(10)}$) in case of a 10-bit system and 800_h ($2048_{(12)}$) in case of a 12-bit system.

Table 5 – Source image formats of UHDTV2 Class

System Number	System nomenclature	Sampling Structure/Pixel Depth	Frame Rate/sec	Sub-image format defined in SMPTE ST 435-1
U2.1	7680 x 4320/24/P 7680 x 4320/25/P 7680 x 4320/30/P	4:2:0($Y'C'_BC'_R$)/10-bit 4:2:2($Y'C'_BC'_R$)/10-bit 4:2:0(IC_TC_P)/10-bit 4:2:2(IC_TC_P)/10-bit	24, 25 and 30 Frames Progressive	System 1.1
	7680 x 4320/23.98/P 7680 x 4320/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U2.2	7680 x 4320/24/P 7680 x 4320/25/P 7680 x 4320/30/P	4:4:4(R'G'B')/10-bit	24, 25 and 30 Frames Progressive	System 2.2
	7680 x 4320/23.98/P 7680 x 4320/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U2.3	7680 x 4320/24/P 7680 x 4320/25/P 7680 x 4320/30/P	4:4:4(R'G'B')/12-bit	24, 25 and 30 Frames Progressive	System 2.3
	7680 x 4320/23.98/P 7680 x 4320/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U2.4	7680 x 4320/24/P 7680 x 4320/25/P 7680 x 4320/30/P	4:4:4($Y'C'_BC'_R$)/10-bit 4:4:4(IC_TC_P)/10-bit	24, 25 and 30 Frames Progressive	System 2.4
	7680 x 4320/23.98/P 7680 x 4320/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U2.5	7680 x 4320/24/P 7680 x 4320/25/P 7680 x 4320/30/P	4:2:0($Y'C'_BC'_R$)/12-bit 4:2:2($Y'C'_BC'_R$)/12-bit 4:4:4($Y'C'_BC'_R$)/12-bit 4:2:0(IC_TC_P)/12-bit 4:2:2(IC_TC_P)/12-bit 4:4:4(IC_TC_P)/12-bit	24, 25 and 30 Frames Progressive	System 2.5
	7680 x 4320/23.98/P 7680 x 4320/29.97/P		24/1.001, 30/1.001 Frames Progressive	
U2.6	7680 x 4320/50/P 7680 x 4320/60/P	4:2:0($Y'C'_BC'_R$)/10-bit 4:2:2($Y'C'_BC'_R$)/10-bit 4:2:0(IC_TC_P)/10-bit 4:2:2(IC_TC_P)/10-bit	50 and 60 Frames Progressive	System 2.1
	7680 x 4320/59.94/P		60/1.001 Frames Progressive	
U2.7	7680 x 4320/50/P 7680 x 4320/60/P	4:2:0($Y'C'_BC'_R$)/12-bit 4:2:2($Y'C'_BC'_R$)/12-bit 4:2:0(IC_TC_P)/12-bit 4:2:2(IC_TC_P)/12-bit	50 and 60 Frames Progressive	System 4.1
	7680 x 4320/59.94/P		60/1.001 Frames Progressive	
U2.8	7680 x 4320/50/P 7680 x 4320/60/P	4:4:4(R'G'B')/10-bit 4:4:4($Y'C'_BC'_R$)/10-bit 4:4:4(IC_TC_P)/10-bit	50 and 60 Frames Progressive	System 4.2
	7680 x 4320/59.94/P		60/1.001 Frames Progressive	
U2.9	7680 x 4320/50/P 7680 x 4320/60/P	4:4:4(R'G'B')/12-bit 4:4:4($Y'C'_BC'_R$)/12-bit 4:4:4(IC_TC_P)/12-bit	50 and 60 Frames Progressive	System 4.3
	7680 x 4320/59.94/P		60/1.001 Frames Progressive	
NOTE: IC_TC_P sampling is only applied to High Dynamic Range (HDR) image formats defined in Recommendation ITU-R BT.2100				

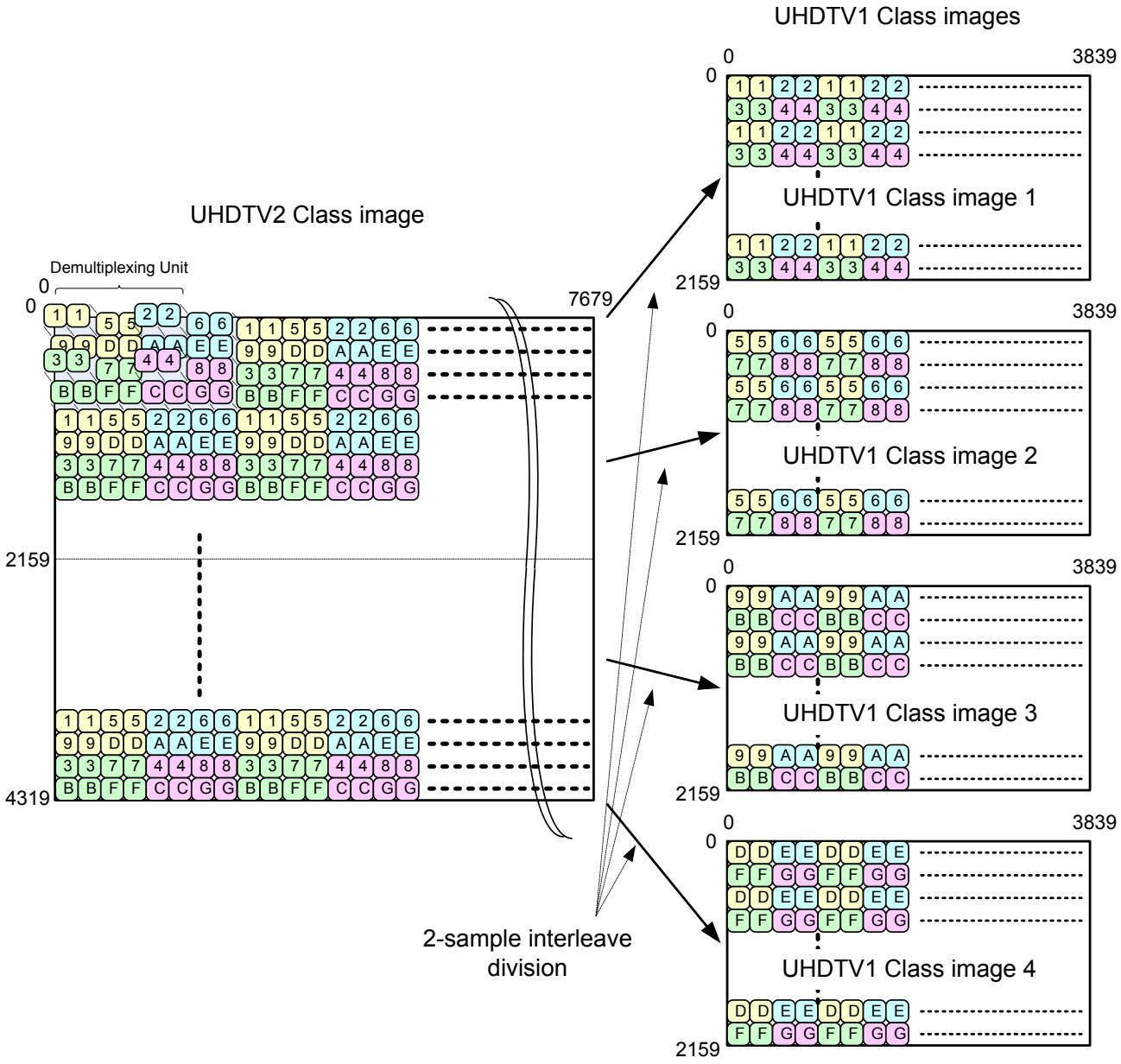

Figure 4 – 2-sample interleave division of UHDTV2 Class image into UHDTV1 Class images

7.2 Quad-link 10G-SDI for System U2.1 to U2.5

Four Sub UHDTV1 Class images generated from System U2.1 shall be mapped into Quad-link 10G-SDI. Sub UHDTV1 Class image *k* is equivalent to System number 8.2 defined in Section 6.4 of SMPTE ST 435-1:2012 and shall be mapped into CH1, CH3, CH5, CH7 (Link As) of 10G-SDI Link *k*; i.e.:

- UHDTV1 class image 1 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 1;
- UHDTV1 class image 2 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 2;
- UHDTV1 class image 3 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 3;
- UHDTV1 class image 4 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 4.

NOTE: Link B is not used in this mapping.

Four Sub UHDTV1 Class images generated from System U2.2 to U2.5 shall be mapped into Quad-link 10G-SDI. Sub UHDTV1 Class image *k*, where *k* is a number from 1 to 4, shall be mapped into 10G-SDI Link *k* in the same way as described in Section 6.4 of SMPTE ST 435-2:2012; i.e.:

- UHDTV1 class image 1 shall be mapped into CH1 through CH8 of 10G-SDI Link 1;
- UHDTV1 class image 2 shall be mapped into CH1 through CH8 of 10G-SDI Link 2;
- UHDTV1 class image 3 shall be mapped into CH1 through CH8 of 10G-SDI Link 3;
- UHDTV1 class image 4 shall be mapped into CH1 through CH8 of 10G-SDI Link 4.

7.3 Octa-link 10G-SDI for System U2.6 to U2.9

Four Sub UHDTV1 Class images generated from System U2.6 shall be mapped into Octa-link 10G-SDI. Sub UHDTV1 Class image *k*, where *k* is a number from 1 to 4, shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link (2*k*-1) and Link (2*k*), i.e.:

- UHDTV1 class image 1 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 1 and Link 2;
- UHDTV1 class image 2 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 3 and Link 4;
- UHDTV1 class image 3 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 5 and Link 6;
- UHDTV1 class image 4 shall be mapped into CH1, CH3, CH5 and CH7 (Link As) of 10G-SDI Link 7 and Link 8.

NOTE: Link B is not used in this mapping.

Four Sub UHDTV1 Class images generated from System U2.7, U2.8 and U2.9 shall be mapped into Octa-link 10G-SDI. Sub UHDTV1 Class image *k*, where *k* is a number from 1 to 4, shall be mapped into CH1, CH2, CH3, CH4, CH5, CH6, CH7 and CH8 of 10G-SDI Link (2*k*-1) and Link (2*k*), i.e.:

- UHDTV1 class image 1 shall be mapped into CH1 through CH8 of 10G-SDI Link 1 and Link 2;
- UHDTV1 class image 2 shall be mapped into CH1 through CH8 of 10G-SDI Link 3 and Link 4;
- UHDTV1 class image 3 shall be mapped into CH1 through CH8 of 10G-SDI Link 5 and Link 6;
- UHDTV1 class image 4 shall be mapped into CH1 through CH8 of 10G-SDI Link 7 and Link 8.

7.4 Optical Interface Characteristics

The optical interface characteristics of the Quad-link and the Octa-link 10G-SDI shall be in conformance with SMPTE ST 435-3.

DWDM technology may be used for the transport of the Quad-link or the Octa-link 10G-SDI. Table 6 defines the optical wavelengths of the 4ch and the 8ch DWDM interfaces. The approximate nominal central wavelengths of 1557.36 nm, 1556.55 nm, 1555.75 nm and 1554.94 nm shall be assigned for the Link 1 though 4 for the 4ch DWDM interfaces and 1557.36 nm, 1556.55 nm, 1555.75 nm, 1554.94 nm, 1554.13 nm, 1553.33 nm, 1552.52 nm and 1551.72 nm shall be assigned to the Link 1 though 8 for the 8ch DWDM interfaces in conformance with SMPTE ST 435-3.

Table 6 – Nominal central wavelengths of 4ch and 8ch DWDM interfaces for UHDTV2

Link No.	Approximate nominal central wavelengths for 4ch DWDM	Approximate nominal central wavelengths for 8ch DWDM
1	1557.36 nm	1557.36 nm
2	1556.55 nm	1556.55 nm
3	1555.75 nm	1555.75 nm
4	1554.94 nm	1554.94 nm
5		1554.13 nm
6		1553.33 nm
7		1552.52 nm
8		1551.72 nm

7.5 ANC/Audio Data Mapping

7.5.1 ANC Data Mapping

Ancillary data if present shall be mapped into the blanking area of CH1 Basic Stream of 10G-SDI. The data format shall be in conformance with SMPTE ST 291-1.

The ancillary data shall be mapped into CH1 Basic Stream of 10G-SDI Link 1 first, and any remaining data shall be mapped into CH1 of 10G-SDI Link 2 through Link 4 (or Link 8) in the order of Link 1, Link 2, Link 3 and so on.

7.5.2 Audio Data Mapping

When present, audio data shall be mapped into the C'_B/C'_R data streams of the HANC data space in conformance with SMPTE ST 299-1 and shall be mapped in the following order:

(1^{st}) CH1 Basic Stream of 10G-SDI Link 1, up to a maximum of 16 channels at a sampling frequency of 48 kHz or up to a maximum of 8 channels at a sampling frequency of 96 kHz.

(2^{nd}) CH1 Basic Stream of 10G-SDI Link 2, up to a maximum of 16 channels at a sampling frequency of 48 kHz or up to a maximum of 8 channels at a sampling frequency of 96 kHz.

(3^{rd}) CH1 Basic Stream of 10G-SDI Link 3, up to a maximum of 16 channels at a sampling frequency of 48 kHz or up to a maximum of 8 channels at a sampling frequency of 96 kHz.
…

(4^{th}) (or 8^{th} in the case of Octa-link) CH1 Basic Stream of 10G-SDI Link 4(or 8), up to a maximum of 16 channels at a sampling frequency of 48 kHz or up to a maximum of 8 channels at a sampling frequency of 96 kHz.

Audio data shall be mapped into the CH1 Basic Stream of 10G-SDI Link 1 first, up to its maximum transmission capacity of HANC data area, then into the CH1 Basic Stream of 10G-SDI Link 2, up to its maximum transmission capacity of HANC data area and so on. It shall not be permitted to map Audio data into the CH1 Basic Streams of 10G-SDI Link (n; n = 2 ~ 4(or 8)), if the CH1 Basic Stream of 10G-SDI Link (n-1) is not filled up to its maximum transmission capacity.

The maximum channel number carried by Quad-link 10G-SDI Mode D is 64 channels at a sampling frequency of 48 kHz or 32 channels at a sampling frequency of 96 kHz. The maximum channel number carried by Octa-link 10G-SDI is 128 channels at a sampling frequency of 48 kHz or 64 channels at a sampling frequency of 96 kHz.

NOTE: Mode D defined in SMPTE ST 435-2 can carry the HANC Data included in CH1,3,5,7 Basic Streams at frame rates from 23.98 Hz through 25 Hz. In this document the audio data is only mapped into the HANC Data area of CH1 Basic Stream irrespective of frame rates.

Audio control packets shall be mapped into the Y' data streams of the HANC data space of CH1 Basic Stream of 10G-SDI Link 1 through Link 4 (or 8) (if necessary), and shall be in conformance with SMPTE ST 299-1.

7.5.3 Payload ID Mapping

The payload identifier shall be mapped into the blanking area of each Basic Stream of 10G-SDIs. Table 7 defines the payload identifier for the UHDTV 2 video payload.

This payload identifier shall be in conformance with the payload identifier format defined in SMPTE ST 352. The byte 1 value of $A2_h$ is mandatory and identifies the video payload format as UHDTV2. The remaining 3 bytes values specify the other features of the video payload for UHDTV2.

The specification and carriage of this payload identifier shall be in conformance with SMPTE ST 352.

NOTE: Designers need to be aware that the first eleven samples after SAV of Line 10 and Line 572 on each Basic Stream channel are reserved for payload identifier usage.

Table 7 – Payload identifier definitions for UHDTV2 video payloads on a Quad-link or an Octa-link 10 Gb/s (nominal) serial digital interface

<table>
<tr><th>Bits</th><th>Byte 1</th><th>Byte 2</th><th>Byte 3</th><th>Byte 4</th></tr>
<tr><td>Bit 7</td><td>1</td><td>Interlaced (0) or progressive (1) transport</td><td>Reserved (0)</td><td rowspan="2">Channel assignment within 10G link
Ch1 (0h), Ch2 (1h),
Ch3 (2h), Ch4 (3h),
Ch5 (4h), Ch6 (5h),
Ch7 (6h) or Ch8 (7h)</td></tr>
<tr><td>Bit 6</td><td>0</td><td>progressive (1) picture</td><td rowspan="3">10G link assignment of Quad/Octa link
Link1 (0h), Link2(1h)
Link3 (2h), Link4 (3h),
Link5 (4h), Link6 (5h),
Link7 (6h) or Link8 (7h)</td></tr>
<tr><td>Bit 5</td><td>1</td><td rowspan="2">Transfer characteristics
SDR-TV (0h),
HLG (1h),
PQ (2h),
unspecified (3h)</td></tr>
<tr><td>Bit 4</td><td>0</td><td>Colorimetry
ITU-R Rec 709[a] (0h)
ITU-R Rec 2020[b] (1h)</td></tr>
<tr><td>Bit 3</td><td>0</td><td rowspan="4">Picture rate
(see Table 2
SMPTE ST 352:2013)</td><td rowspan="4">Sampling structure
4:2:2 (Y′C′_BC′_R or IC_TC_P) = (0h),
4:4:4 (Y′C′_BC′_R or IC_TC_P) = (1h),
4:4:4 (G′B′R′) = (2h),
4:2:0 (Y′C′_BC′_R or IC_TC_P) = (3h),
Other values reserved</td><td>Reserved (0)</td></tr>
<tr><td>Bit 2</td><td>0</td><td>Luminance and color difference signal
Y′C′_BC′_R (0),
IC_TC_P (1)</td></tr>
<tr><td>Bit 1</td><td>1</td><td rowspan="2">Bit depth
10-bit full range (0h),
10-bit narrow range (1h),
12-bit narrow range (2h),
12-bit full range (3h)</td></tr>
<tr><td>Bit 0</td><td>0</td></tr>
<tr><td colspan="5">NOTE: The usage of bytes 2, 3 and 4 is consistent for all modes except bits b6 to b4 of byte 3 in this document but the definitions are repeated for the convenience of the reader.
[a] ITU-R Rec 709 indicates Conventional reference primaries as defined in SMPTE ST 2036-1:2014 Table 3 and is equivalent to ITU-R recommendation BT.709 colorimetry.
[b] ITU-R Rec 2020 indicates UHDTV color primaries and reference white as defined in SMPTE ST 2036-1:2014 Table 2 or Recommendation ITU-R BT.2100 and is equivalent to ITU-R recommendation BT.2020.</td></tr>
</table>

When identifying UHDTV2 video payloads mapped onto a Quad-link or an Octa-link 10 Gb/s serial digital interface, the following limitations shall apply:

The interlace/progressive transport shall be identified by Byte 2, bit 7 having the following values:

- (0) identifies an interlaced transport;
- (1) identifies a progressive transport;

Byte 2, bit b6 shall be set to 1 to signify the progressive picture;

The transfer characteristics shall be identified by Byte 2, bits b5 and b4 having the following values:

- (0h) identifies SDR-TV in accordance with SMPTE ST 2036-1;
- (1h) identifies HLG HDR-TV in accordance with Recommendation ITU-R BT.2100;
- (2h) identifies PQ HDR-TV in accordance with Recommendation ITU-R BT.2100;
- (3h) identifies Transfer Characteristic is not specified;

NOTE: The Reference EOTF as defined in SMPTE ST 2084 is the same as the Reference PQ EOTF defined in Recommendation ITU-R BT.2100.

The picture rate shall be identified by Byte 2, bits b3 to b0 in accordance with SMPTE ST 352:2013, Table 2;

The sampling structure shall be identified by bits b3 to b0 of byte 3 having the following values:

– (0h) identifies 4:2:2 ($Y'C'_BC'_R$ or IC_TC_P);

– (1h) identifies 4:4:4 ($Y'C'_BC'_R$ or IC_TC_P);

– (2h) identifies 4:4:4 (G′B′R′);

– (3h) identifies 4:2:0 ($Y'C'_BC'_R$ or IC_TC_P)

The assignment order of the Basic Stream channels and the 10G links for the payload IDs shall correspond to the numeric order of the 10 Gb/s SDI input channel and link numbers as defined in Section 7.2 and Section 7.3.

The 10G (SMPTE ST 435-1) link assignment in Byte 3, bits b6 to b4 shall be set to the following values in the case of a Quad-link:

– (0h) identifies the first link;

– (1h) identifies the second link;

– (2h) identifies the third link;

– (3h) identify the fourth link.

The 10G (SMPTE ST 435-1) link assignment in Byte 3, bits b6 to b4 shall be set to the following values in the case of an Octa-link:

– (0h) identifies the first link;

– (1h) identifies the second link;

– (2h) identifies the third link;

– (3h) identifies the fourth link;

– (4h) identifies the fifth link;

– (5h) identifies the sixth link;

– (6h) identifies the seventh link;

– (7h) identifies the eighth link.

The Basic Stream (SMPTE ST 292-1) channel number in Byte 4, bits b7 to b5 shall be set to the following values:

– (0h) identifies CH1;

– (1h) identifies CH2;

– (2h) identifies CH3;

– (3h) identifies CH4;

– (4h) identifies CH5;

– (5h) identifies CH6;

– (6h) identifies CH7;

– (7h) identifies CH8;

The colorimetry shall be identified in Byte 4, bit b4 having the following values:

– (0h) identifies conventional color primaries as defined by SMPTE ST 2036-1:2014 Table 3;

– (1h) identifies UHDTV color primaries and reference white as defined by SMPTE ST 2036-1:2014 Table 2 or Recommendation ITU-R BT.2100;

The luminance and color difference signal shall be identified in Byte 4, bit b2 having the following values:

– (0) indicates $Y'C'_BC'_R$ in accordance with SMPTE ST 2036-1 or Recommendation ITU-R BT.2100;

– (1) indicates IC_TC_P in accordance with Recommendation ITU-R BT.2100;

NOTE: In the case where Byte 3 bits b3:b0 indicate G'B'R', this bit can be ignored.

See informative Annex B – Further Guidance on luminance and color difference signal Identification.

The bit depth of the sample quantization shall be identified in Byte 4, bits b1 and b0 having the following values:

– (0h) identifies quantization using 10 bits per sample with the full range coding in accordance with Recommendation ITU-R BT.2100;

– (1h) identifies quantization using 10 bits per sample with the narrow range coding in accordance with Recommendation ITU-R BT.2100;

– (2h) identifies quantization using 12 bits per sample with the narrow range coding in accordance with Recommendation ITU-R BT.2100;

– (3h) identifies quantization using 12 bits per sample with the full range coding in accordance with Recommendation ITU-R BT.2100;

Code values falling within the protected range shall be clipped in accordance with SMPTE RP 2077

7.6 Blanking Data (Informative)

As defined in the Sub image source format document SMPTE ST 274, HANC and VANC spaces with no ancillary data packets or audio data packets contain data words that represent video black level for the video structure being carried.

64 for 10-bit RGBYI signals
512 for 10-bit $C'_BC'_RC_TC_P$ signals.

256 for 12-bit RGBYI signals
2048 for 12-bit $C'_BC'_RC_TC_P$ signals.

4 for 10-bit Full Range RGBYI signals

512 for 10-bit Full Range $C'_BC'_RC_TC_P$ signals.

16 for 12-bit Full Range RGBYI signals
2048 for 12-bit Full Range $C'_BC'_RC_TC_P$ signals.

Annex A Bibliography (Informative)

SMPTE ST 274:2008, Television — 1920 × 1080 Image Sample Structure, Digital Representation and Digital Timing Reference Sequences for Multiple Picture Rates

SMPTE ST 2036-2:2008, Ultra High Definition Television — Audio Characteristics and Audio Channel Mapping for Program Production

SMPTE ST 2084:2014, High Dynamic Range Electro-Optical Transfer Function of Mastering Reference Displays

Recommendation ITU-R BT.1201-1 (03/2004), Extremely High Resolution Imagery

Recommendation ITU-R BT.709-6 (06/2015), Parameter values for the HDTV standards for production and international programme exchange

Recommendation ITU-R BT.2020-2 (10/2015), Parameter values for ultra-high definition television systems for production and international programme exchange

Recommendation ITU-R BT.2077-2 (06/2017), Real-time serial digital interfaces for UHDTV signals

Annex B Further Guidance on Luminance and Color Difference Signal Identification (Informative)

The following table provides additional information for the logical association and meaning of “transfer characteristics”, “sampling structure” and “luminance and color difference signal” Identification as signaled in the Payload Identifier for UHDTV1 and UHDTV2 image structures applicable to this interface.

Table B1 – Transfer Characteristics, Sampling Structure and Luminance and Color Difference Signal ‘truth table’

Transfer Characteristics	Sampling Structure	Luminance and color difference (L&CD) identifier	Meaning of L&CD Identifier
SDR-TV	$Y'C'_BC'_R$	0	Indicates $Y'C'_BC'_R$ in accordance with SMPTE ST 2036-1
	$Y'C'_BC'_R$	1	Indicates Constant luminance $Y'C'_BC'_R$ in accordance with Recommendation ITU-R BT.2020 This is not permitted in this document but it is permitted in Recommendation ITU-R BT.2077.
HLG or PQ	$Y'C'_BC'_R$	0	Indicates Non-constant luminance $Y'C'_BC'_R$ in accordance with Recommendation ITU-R BT.2100
	IC_TC_P	1	Indicates IC_TC_P in accordance with Recommendation ITU-R BT.2100.
SDR-TV HLG or PQ	G’B’R’	Not valid	L&CD can be ignored