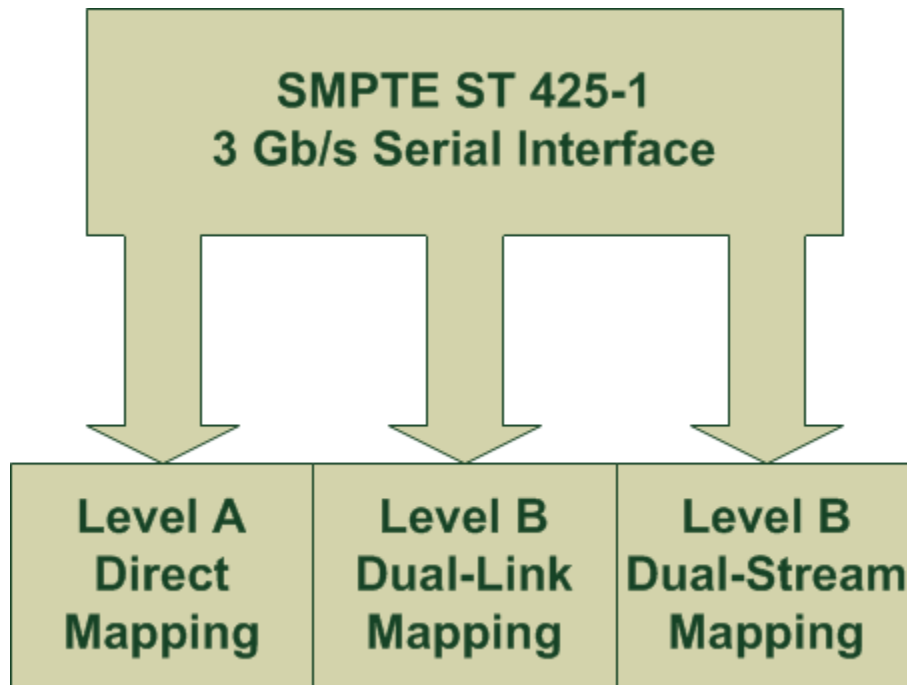


## **Application Note**

### **3G SDI Interfaces**

**Revision 1.0      May 2015**



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## 1 Overview

When we talk about 3G-SDI we have to be more precise in order to avoid misunderstandings. E.g. when sending a 1080p50 signal from one device to another, it is not ensured that the transmission will be successful, although both devices can handle 3G-SDI signals.

The reason for this is the option of different mapping schemes for transporting video signals over the serial digital interface.

In this Application Note the three SMPTE ST 425-1 mapping schemes **Level A**, **Level B Dual-Link**, and **Level B Dual-Stream** of *fast progressive formats* (YCbCr 4:2:2 10Bit 60p 59p 50p) will be discussed.

## 2 Payload ID (VPID)

Because of the numerous video formats a (physical) 3G serial digital interface can carry, the use of a Payload Identifier is mandatory. Without a VPID the receiving device is not able to correctly decode the incoming signal.

SMPTE ST 352 "*Payload Identification Codes for Serial Digital Interfaces*" describes this 4-byte identifier.

SDI-Analyzers, supporting 3G SDI, also need a VPID to correctly decode the signals. It is displayed for example in the "Video Session" display of Tektronix WFM's (see Figure 2, Figure 4, and Figure 6).

### 3 Level A Direct Mapping

Figure 1 shows the transmission of a 1080p50 signal over 3G serial interface using 3G Level A Direct Mapping.

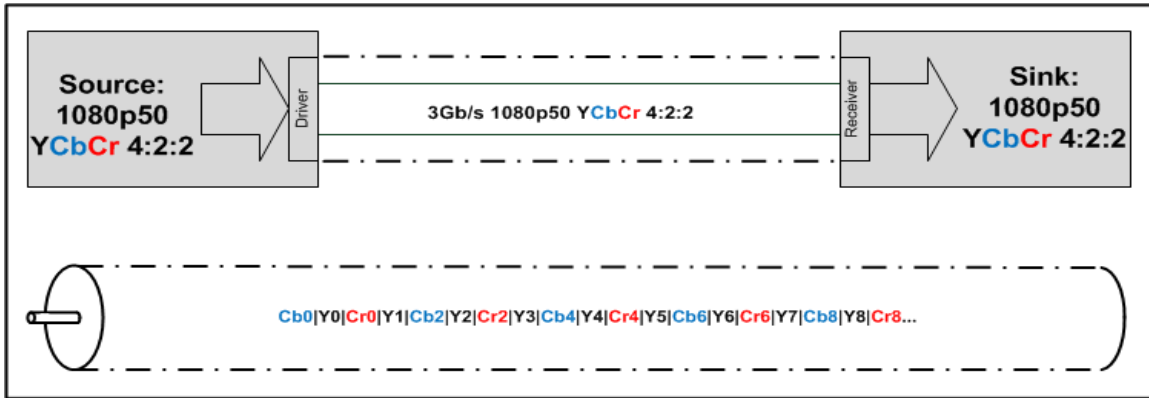


Figure 1 – Direct Mapping

This mapping is well known as it is the same as already used for 1.485 Gb/s HD-SDI.

Chrominance- and luminance-pixels are transmitted alternately. As it is a 4:2:2 format, even luminance pixels are accompanied by chrominance pixels, odd luminance pixels are transmitted solely.

Figure 2 shows a screenshot of the upper half of WFM’s Video Session with a VPID for Level A Direct Mapping.

Video Session			
Input:	SDI Input 2A – 3Ga	Signal:	Locked
Effective:	Auto 1080p 50 – YCbCr 422 10b – 425M – A 2.970 Gbps		
Selected:	Auto Format – Auto Structure – Auto Transport		
352M Payload:	89h C9h 00h 01h		
SAV Place Err:	OK	Y Stuck Bits:	-----
Field Length Err:	OK	C Stuck Bits:	-----
Line Length Err:	OK	AP CRC:	6E85h BF5Dh
Line Number Err:	OK	CRC Changed since reset:	No
Ancillary Data:	Y and C Present		

Figure 2 – VPID Level A Direct Mapping

## 4 Level B Dual-Link Mapping

Figure 3 shows the transmission of a 1080p50 signal over a 3G serial interface using 3G Level B Dual-Link Mapping.

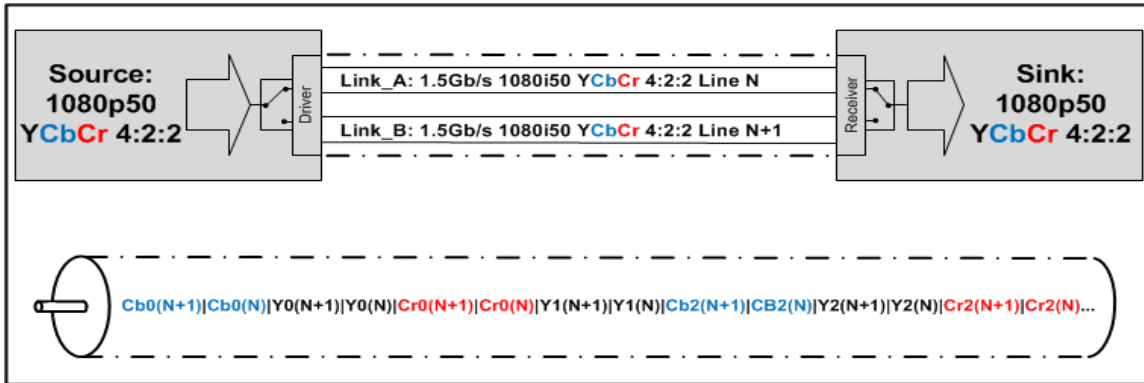


Figure 3 – Dual-Link Mapping

For this mapping, luminance and chrominance is multiplexed inside each link alternately in the usual 4:2:2 10 bit scheme. Succeeding lines (N, N+1) will be mapped between Link\_A and Link\_B as well.

Even though the original image is progressively scanned, it is split line by line between the two links according to SMPTE ST 372.

Two succeeding 1080p frames are packed into the two fields of the 1080i transport format.

Link\_A and Link\_B exist only virtually. They are multiplexed into one data-stream and transmitted over one single cable as shown in the lower part of Figure 3.

Figure 4 shows a screenshot of the upper half of WFM’s Video Session with a VPID for Level B Dual-Link Mapping.

Video Session			
Input:	SDI Input 2A – 3Gb	Signal: Locked	
Effective:	Auto 1080p 50 – YCbCr 422 10b – 425M-B 2.970 Gbps		
Selected:	Auto Format – Auto Structure – Auto Transport		
352M Payload:	Link A: 8Ah 49h 00h 01h	Link B: 8Ah 49h 00h 41h	
SAV Place Err:	OK	Link A: Y Stuck Bits:	-----
Field Length Err:	OK	Link A: C Stuck Bits:	-----
Line Length Err:	OK	Link B: Y Stuck Bits:	-----
Line Number Err:	OK	Link B: C Stuck Bits:	-----
Ancillary Data:	Y and C Present	Link A: AP CRC:	6E85h BF5Dh
		Link B: AP CRC:	ACDBh 5EE8h
		CRC Changed since reset:	No

Figure 4 – VPID Level B Dual-Link Mapping

Both links contain VPIDs that differ in the last byte to identify Link\_A and Link\_B of the Dual-Link signal.

## 5 Level B Dual-Stream Mapping

Figure 5 shows the transmission of **two independent** 1080p24 signals over a 3G serial interface using 3G Level B Dual-Stream Mapping.

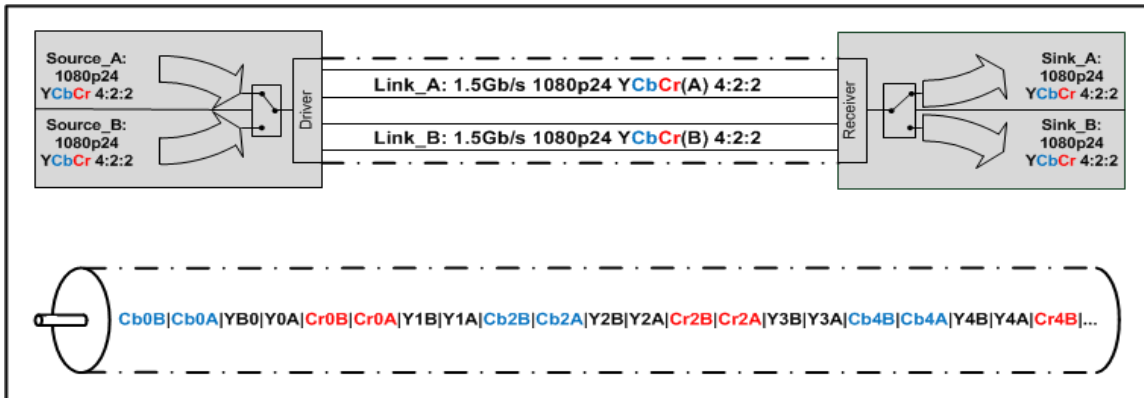


Figure 5 – Dual-Stream Mapping

This mapping scheme is typically used for the transmission of stereoscopic signals. In this application, Source\_A represents the left-eye signal and Source\_B is the right-eye signal of the 3D-image.

Again, luminance and chrominance is multiplexed inside each link alternately in the usual 4:2:2 10 bit scheme. Link\_A carries Source\_A pixels and Link\_B carries Source\_B pixels respectively.

Link\_A and Link\_B exist only virtually. They are multiplexed into one data-stream and transmitted over one single cable as shown in the lower part of Figure 5.

Figure 6 shows a screenshot of the upper half of WFM’s Video Session with a VPID for Level B Dual-Stream Mapping.

Video Session			
Input:	SDI Input 2A – 3Gb	Signal:	Locked
Effective:	Auto 1080p 24 – HD SDI 422 – 425M – B 2.970 Gbps		
Selected:	Auto Format – Auto Structure – Auto Transport		
352M Payload:	Strm 1: 8Ch C3h 00h 01h	Strm 2: 8Ch C3h 00h 01h	
SAV Place Err:	OK	Stream 1: Y Stuck Bits:	-----
Field Length Err:	OK	Stream 1: C Stuck Bits:	-----
Line Length Err:	OK	Stream 2: Y Stuck Bits:	-----
Line Number Err:	OK	Stream 2: C Stuck Bits:	-----
Ancillary Data:	Y and C Present	Stream 1: AP CRC:	6E85h BF5Dh
		Stream 2: AP CRC:	FACCh 0B13h
		CRC Changed since reset:	No

Figure 6 – VPID Level B Dual-Stream Mapping

Both links contain identical VPIDs therefore Link\_A (Stream 1) and Link\_B (Stream 2) are identified only through their position in the multiplexed data-stream.