Comment #83 – “Black Link” Comment Discussion

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Black Link – Agreed Upon Definition Per 7/2/20 Interim Mtg

- This definition was proposed at 7/2 interim meeting -
  - "A black link is an approach to defining a single-mode fiber based DWDM channel by specifying the characteristics of the input and output of the ***link*** and its transfer characteristics, without specifying how the ***link*** is implemented."
- However, two issues
  - the use of the term "link" by itself is a potential issue, given existing 802.3 definition (1.4.302)
  - "Black Link" is a generic approach and that should be reflected in the definition
- Proposed remedy -
  - Modify **1.4.160a Black Link** to "The "Black link" methodology is an approach where the input, output, and transfer characteristics of the uni-directional transmission path between TP2 to TP3 are specified, without specifying how the transmission path is implemented."
  - Recommend adding the following language to Clause 154.6 with editorial license - "In the context of this clause, the "black link" methodology specifies the input, output, and transfer characteristics of a DWDM channel without specifying how the DWDM channel in the DWDM system is implemented."
  - Implement additional modifications noted in Slides 4-9 with editorial license.

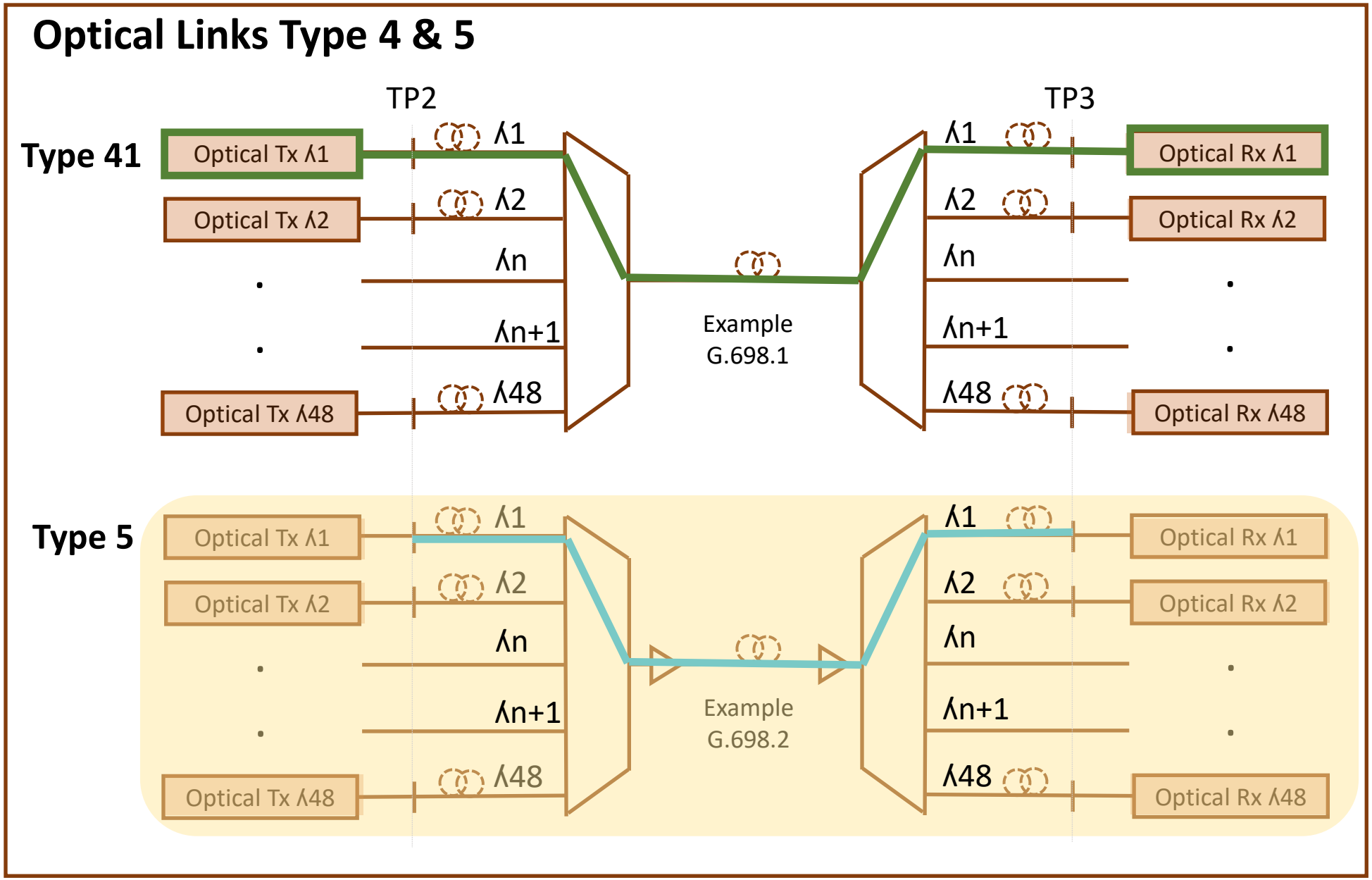
DWDM Link Types and Terminology

DWDM PHY:

DWDM Channel:

DWDM Link:

DWDM System:



Observations

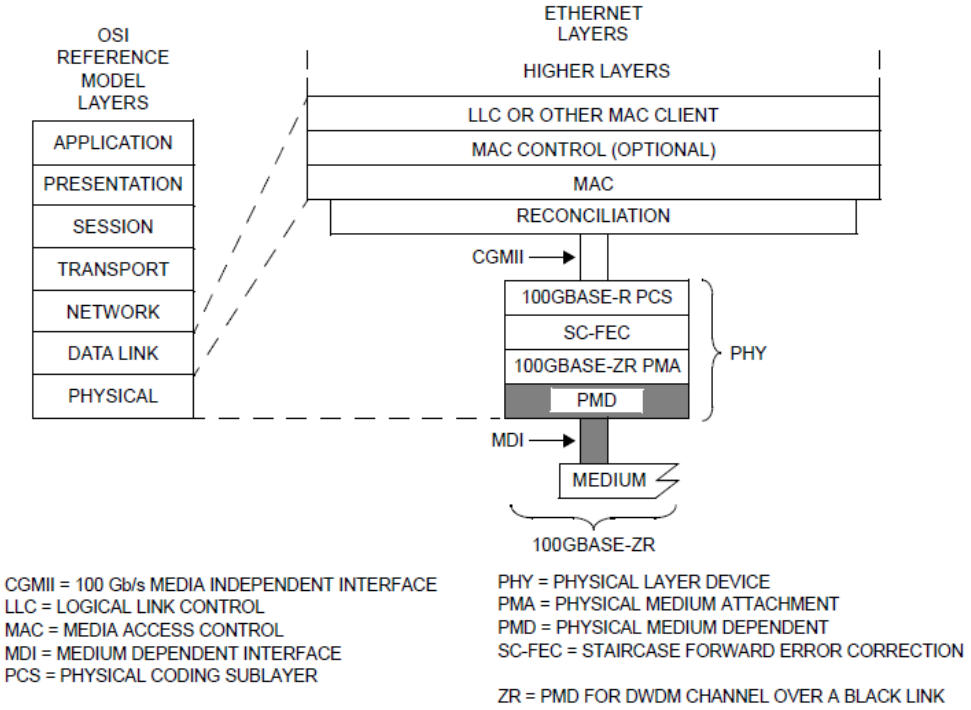


Figure 154–1—100GBASE-ZR PMD relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and IEEE 802.3 Ethernet model

"black link" is how we describe the DWDM channel / medium – it is not the medium.

Suggest
ZR= PMD for DWDM System – 80 km

Observations -

- **154.5.3 PMD receive function**
- The PMD Receive function shall convert the composite optical signal received from the MDI into two DQPSK symbol streams for delivery to the PMD service interface using the messages PMD:IS_UNIT-DATA_0.indication(rx_symbol) and PMD:IS_UNITDATA_1.indication(rx_symbol), all according to the receive optical specifications in this clause. The PMD maps the phase changes on each of the retrieved DQPSK signals to the DQPSK rx_symbol streams for delivery to the PMD service interface, as specified in Table 154–4. NOTE—
- After transmission through the black link the direct correlation between symbol stream and polarization has been lost due to non-negligible polarization rotation and signal mixing. It is therefore the task of the receiver to retrieve the original symbol streams transmitted from the composite optical signal at TP3.

"black link" is how we specify the DWDM channel / medium – it is not the medium.

Suggest
After transmission through the DWDM channel….

Observations

- **154.6 The DWDM channel**

This subclause provides details of the medium associated with the 100GBASE-ZR PMD, over which the PHY operates at a single optical frequency (often also referred to by its associated wavelength) on a defined frequency grid. The medium associated with the 100GBASE-ZR PMD is also referred to as a DWDM channel which is defined as the transmission path over a single wavelength/frequency on a defined frequency grid between a DWDM PHY transmitting to another DWDM PHY. In this case the medium is a single-mode fiber based DWDM channel defined in the form of a black link, which may contain one or more optical amplifiers. The intent of this approach is to enable as wide an application space as possible for this PMD type. This means that optical interface parameters are specified only at the single-channel points at the input (TP2 in Figure 154–2) and output (TP3 in Figure 154–2) of the black link. Additional specifications are provided for black link transfer parameters (from TP2 to TP3), such as chromatic dispersion, ripple, polarization mode dispersion, etc. The black link is intentionally “black”, implying that no details are provided on how the link is constructed, configured or operated so that the end-to-end parameter requirements are met. This approach enables interoperability at the single-channel points (TP2 and TP3) using a direct wavelengthmultiplexing configuration. However, it does not enable interoperability at multichannel points between the optical multiplexer and demultiplexer that are likely to be included in the black link.

Avoid the term “link” alone by itself –
Suggest
The black link is intentionally “black”, implying that no details are provided on how the DWDM channel or system is constructed, configured or operated so that the end-to-end parameter requirements specified by the black link are met.

Observations

but also not specifically excluded as long at the end-to-end link requirements are met. The arrangement of (DWDM) elements within the black link shown in Figure 154–3 is not intended to place constraints on the construction of the black link, but simply to define the location of the single channel interfaces at TP2 and TP3.

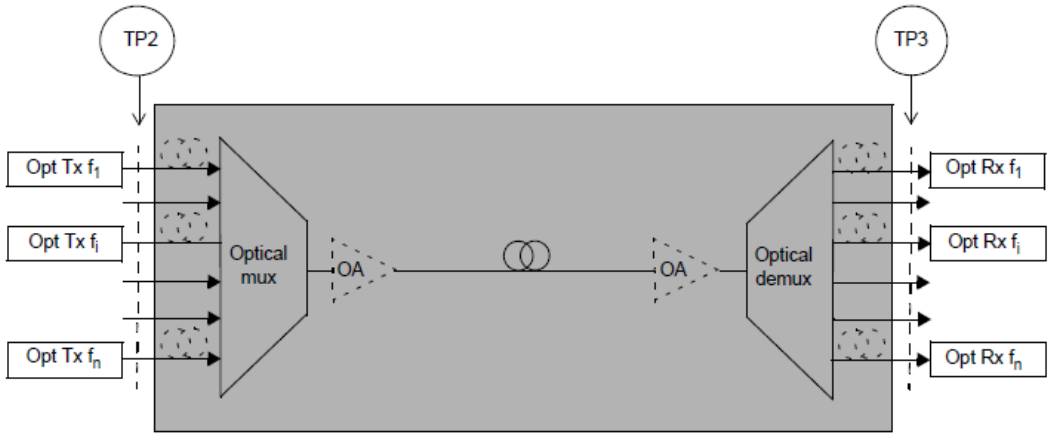


Figure 154–3—Example configuration of the black link approach

- Black link isn't constructed – the DWDM channel or system is
- Suggest
- The arrangement of (DWDM) elements within the black link shown in Figure 154–3 is not intended to place constraints on the construction of the DWDM channel or system, but simply to define the location of the single channel interfaces at TP2 and TP3.

Observation

- Note for Table 154-6
- NOTE—Coexistence of DWDM optical signals with characteristics other than the 100GBASE-ZR PMD over the same black link is not covered by this standard.
- Change to
- NOTE—Coexistence of DWDM optical signals with characteristics other than the 100GBASE-ZR PMD over DWDM channels within the same DWDM system is not covered by this standard.

- 154.7 PMD to MDI optical specifications for 100GBASE-ZR
- Change
- A 100GBASE-ZR compliant PMD operates over a black link meeting the specifications in Table 154–10.

To

A 100GBASE-ZR compliant PMD operates over a DWDM channel meeting the black link specifications in Table 154–10.

Observations

- 154.10
- Change -
- The 100GBASE-ZR PMD is coupled to the black link medium at the MDI, being the interface between the PMD and the medium.
- To
- The 100GBASE-ZR PMD is coupled to the DWDM channel at the MDI.