DWDM black link adjacent channel spectral isolation for 802.3cw

Supporting contribution for D2.4 comment 1

Eric Maniloff - Ciena

IEEE P802.3cw

September 25, 2023

Comments:

Cl **156** *SC* **156.8** *P* **101** *L* **31** # 1

Maniloff, Eric Ciena

Comment Type **T** *Comment Status* **X**

The comment "interpolation
between the defined frequencies is not possible as the curve is not linear" doesn't provide sufficient detail. The derivation of the values in Table 156-10 should be provided.

SuggestedRemedy

Add an equation to 156.8 that provides the values at arbitrary frequencies. A contribution with the equation will be provided.

Proposed Response *Response Status* **O**

Cl **156** *SC* **156.8** *P* **102** *L* **13** # 2

Maniloff, Eric Ciena

Comment Type **E** *Comment Status* **X**

Fig 156-8 should be replaced with a figure based on the actual values. Current figgure is illustrative but not sufficiently accurate.

SuggestedRemedy

Update Fig 156-6 with a more accurate figure.

Proposed Response *Response Status* **O**

Background

In 802.3cw D2.4 Adjacent Channel Spectral Isolation is specified at discrete frequencies in Table 156-10

Annex156A provides details of the filters that were used to calculate the values in Table 156-1

This contribution provides the equation used to calculate spectral isolation at arbitrary frequencies

Adjacent channel isolation specification

- Filter parameters are used to calculate the adjacent channel isolation in a black link approach
- The following parameters for Mux & Demux are used to derive the DWDM black link adjacent channel spectral attenuation:
  - BW max = 76GHz
  - Filter order = 3
  - |Center frequency variation| ≤ 4 GHz
  - Insertion loss variation ≤ 1.5dB
  - Adjacent channel floor = -30dB

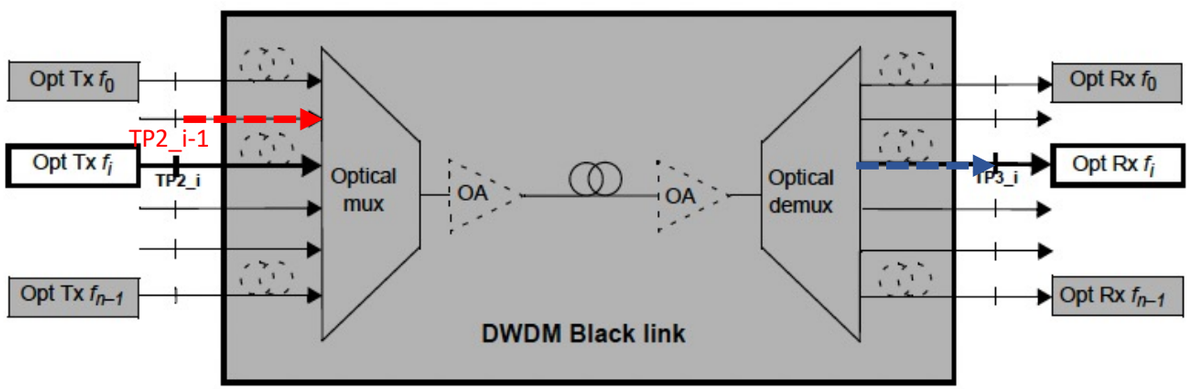


Figure 156–3—Black link example configuration for specifying *n* DWDM channels

Filter Shape

- The Mux and Demux filters follow the following shape:

- $T(f) = C * [(1\text{-floor}) \exp[-\ln(2) \bullet ((2(f- f_0 +O) /B)^6)]+\text{floor}]$
  - T is the transmission in linear units
  - f is the frequency in GHz
  - f0 the nominal center frequency in GHz
  - O is the filter's offset from its specified center frequency
  - B is the filter bandwidth
  - C is a factor to allow for loss variation
  - Floor is the loss floor in the adjacent channel

Spectral Attenuation function

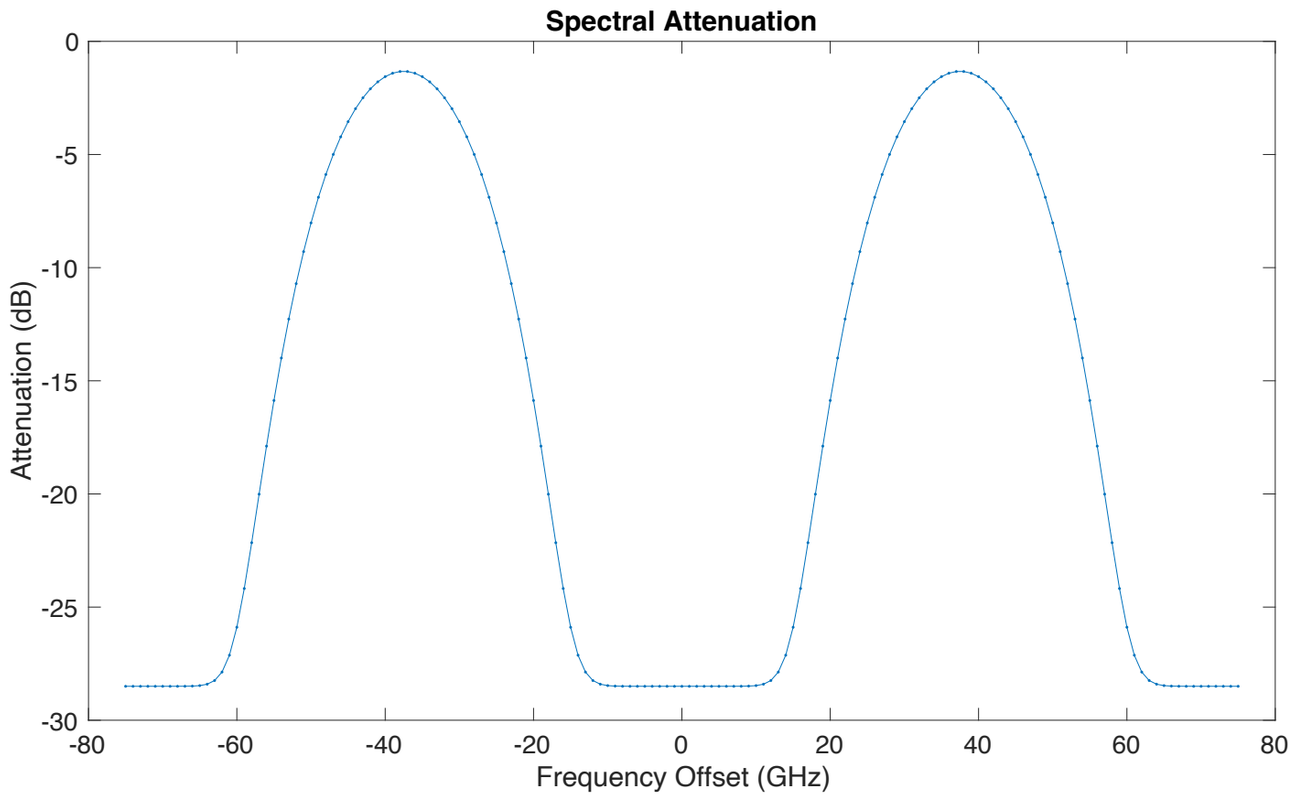
- The minimum attenuation, A, from channels nominally spaced at ± 75GHz to a channel being specified (f=0) as a function of frequency is:

$$A(f) = 10*\log10 \{10^{(L/10)} * [(1-10^{(Floor/10)}) \exp[-\ln(2) \bullet ((2(|f|- f_0 +O_M) /B)^6)]+ 10^{(Floor/10)})] * [(1-10^{(Floor/10)})$$

$$\exp[-\ln(2) \bullet ((2(|f| +O_D) /B)^6)]+ 10^{(Floor/10)}]\}$$

- With:
  - L = 1.5dB
  - Floor = -30dB
  - F_0 = 75GHz
  - O_M = 4GHz
  - O_D = -4GHz
  - B = 76 GHz

Spectral Attenuation vs Frequency



Summary

Two options should be considered to improve the specification:

1. Provide equation based on worst case conditions from Annex 156A in clause 156

2. Modify text to state that the values in Table 156-1 are determined based on the filters defined in Annex 156A, and include the equation in 156A.

Replace Fig 156-6 with the figure from this contribution

Thanks!