Inter-Channel Crosstalk Requirement for 75GHz-spaced 400GBase-ZR

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April 13, 2020

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Inter-Channel Crosstalk OIF-400ZR Reference

- **Definition in IA OIF-400ZR**
  - 13.3.10 Inter-channel crosstalk is defined as the ratio of total power in all of the disturbing channels to that in the wanted channel, where the wanted and disturbing channels are at different wavelengths.
- **13.1.180**

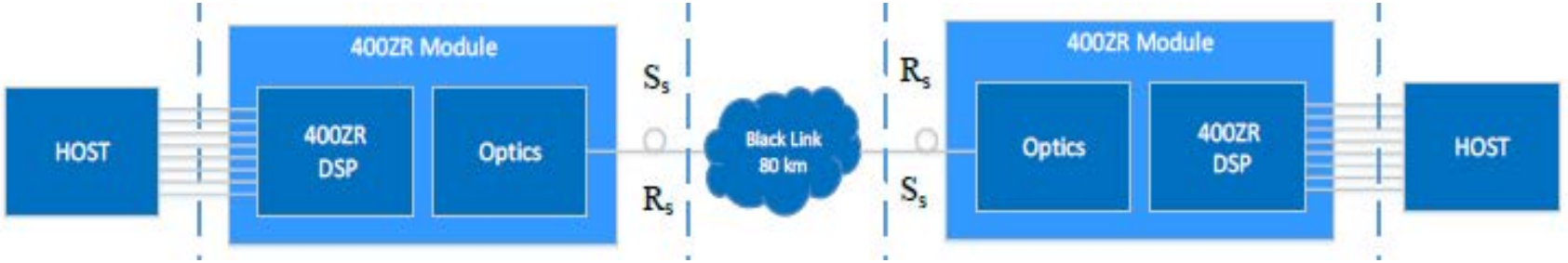
(IA # OIF-400ZR-0.12, June 24, 2019)

Inter-channel crosstalk at R_s: Max -40 dBc (Ref. Claus 9.6.2 and Fig.9-17 in ITU-T G.sup39 100GHz grid)

(IA # OIF-400ZR-0.13, Aug 1, 2019)

Inter-channel crosstalk at R_s: Max -8 dB (Ref. Claus 9.6 and Fig.9-17 in ITU-T G.sup39)

This change was due to the consideration of non-adjacent channel interferences in a direct-detection system→ not justifiable in a coherent-detection system with a DWDM demultiplexer.



No need to consider non-adjacent channel crosstalk in coherent detection systems

(ITU-T G.sup39)

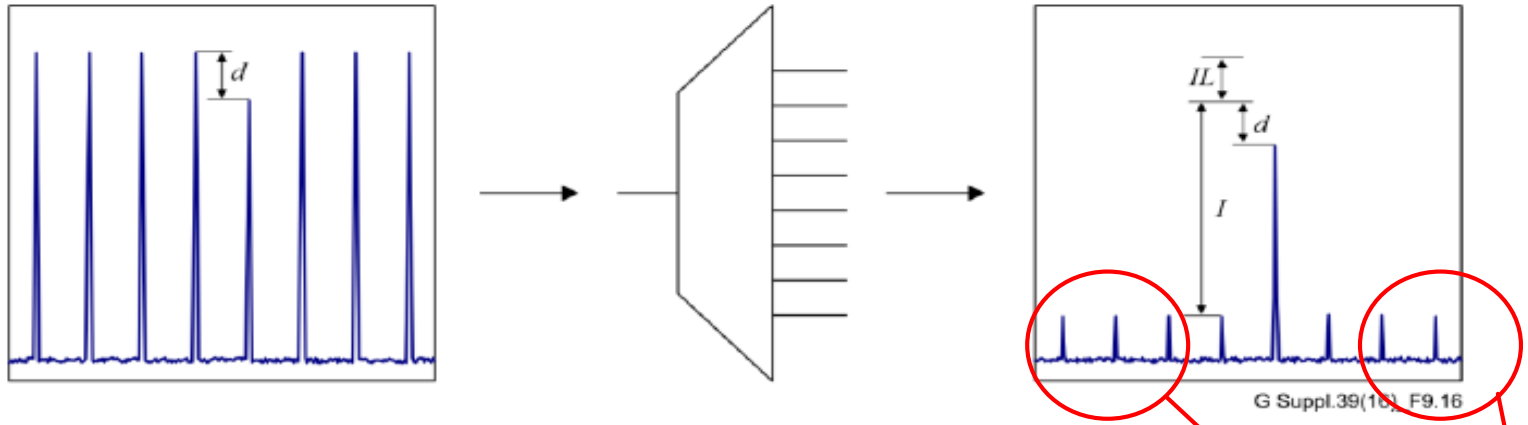


Figure 9-16 – Simple demultiplexer example

In the situation shown by Figure 9-16, an equation can be written for the inter-channel crosstalk of a k channel system C_C:

$$C_C = d - I + 10\log_{10}(k-1) \quad \text{dB} \qquad (9\text{-}26)$$

Coherent receiver CMRR (Common Mode Rejection Ratio)

Measures how well a coherent receiver can reject the direct detection terms of undesired channels.

Even without a DWDM demultiplexer, when 80 channels coincident on a single coherent receiver, the induced OSNR can be lower than 0.5dB[1].

All non-adjacent channel crosstalk will not contribute to coherently detected signal penalty, so no need to include these crosstalks

[1] *"Colorless reception of a single 100Gb/s channel from 80 coincident channels via an intradyne coherent receiver," L. Nelson, et al., IEEE Photonics Conference, paper TuE4, Sep 2012.*

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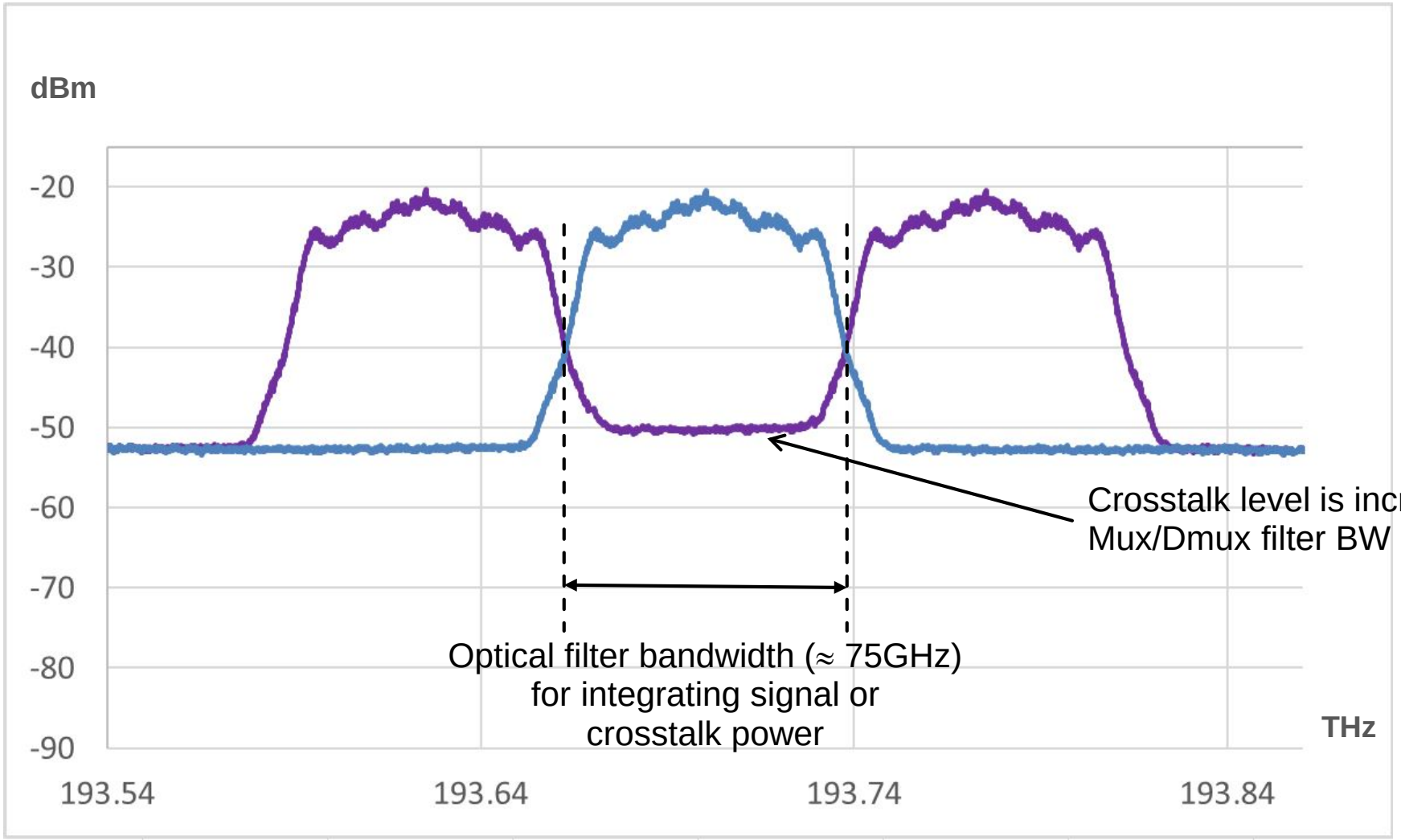
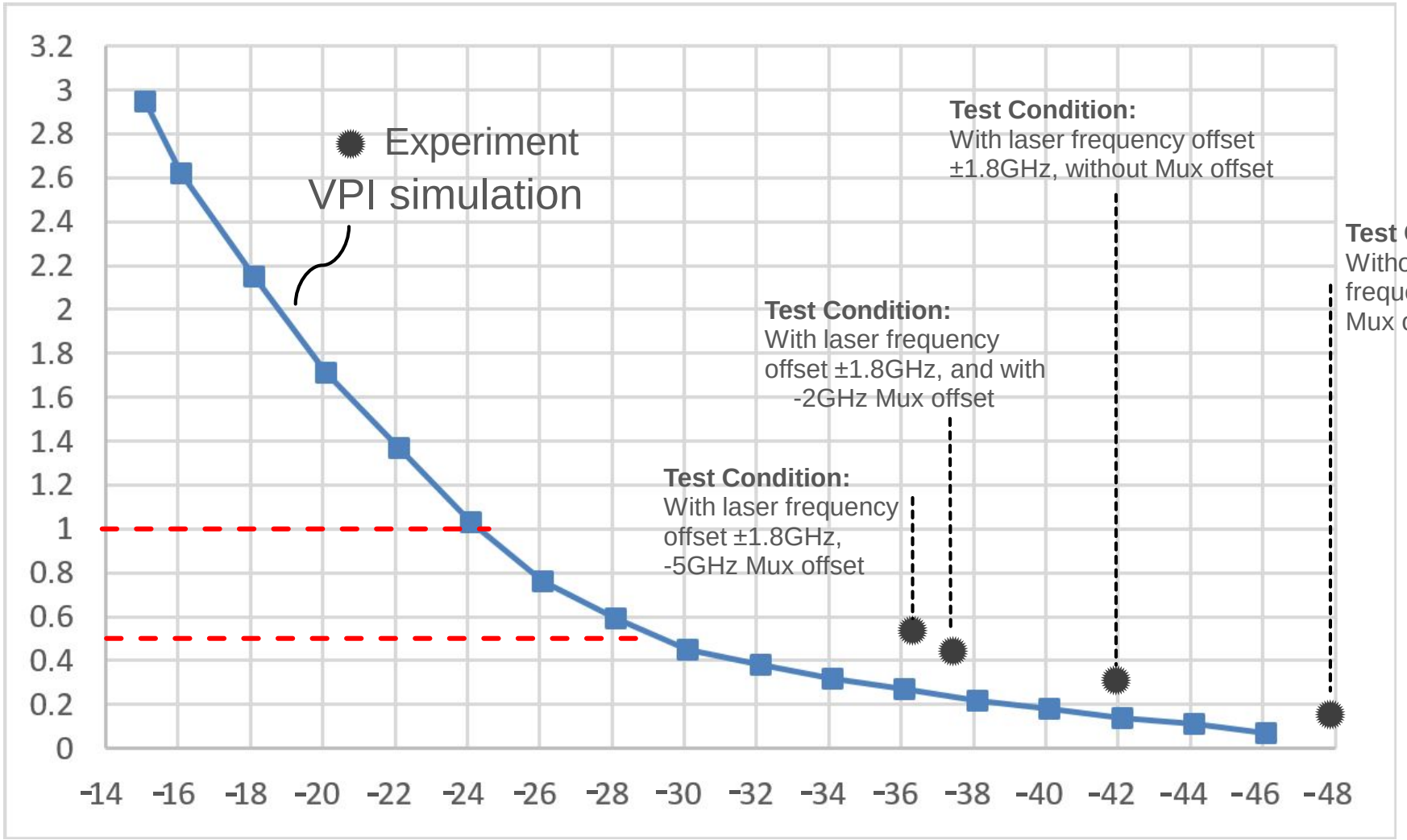
Adjacent Channel Crosstalk VPI Simulation (and Experiment) – Method 1

- 3 channels of 400ZR signals 75GHz-spaced
- Adjacent channel crosstalk power (XT) obtained after DEMUX via an optical power meter, when the middle signal channel is OFF and the two interfering channels are ON.
- Wanted signal power (S) obtained after DEMUX via an optical power meter, when the middle signal channel is ON and the two interfering channels are OFF.
- We need to determine XT/S to keep OSNR penalty below a certain threshold
- Note: Non-adjacent channel crosstalk is negligible in a coherent detection system with a typical DWDM DEMUX

Method 1 (VPI simulation)
– Three 75GHz-spaced channels with the same polarization



OSNR Penalty (referenced to OSNR ~23dB) vs. Inter-channel Crosstalk



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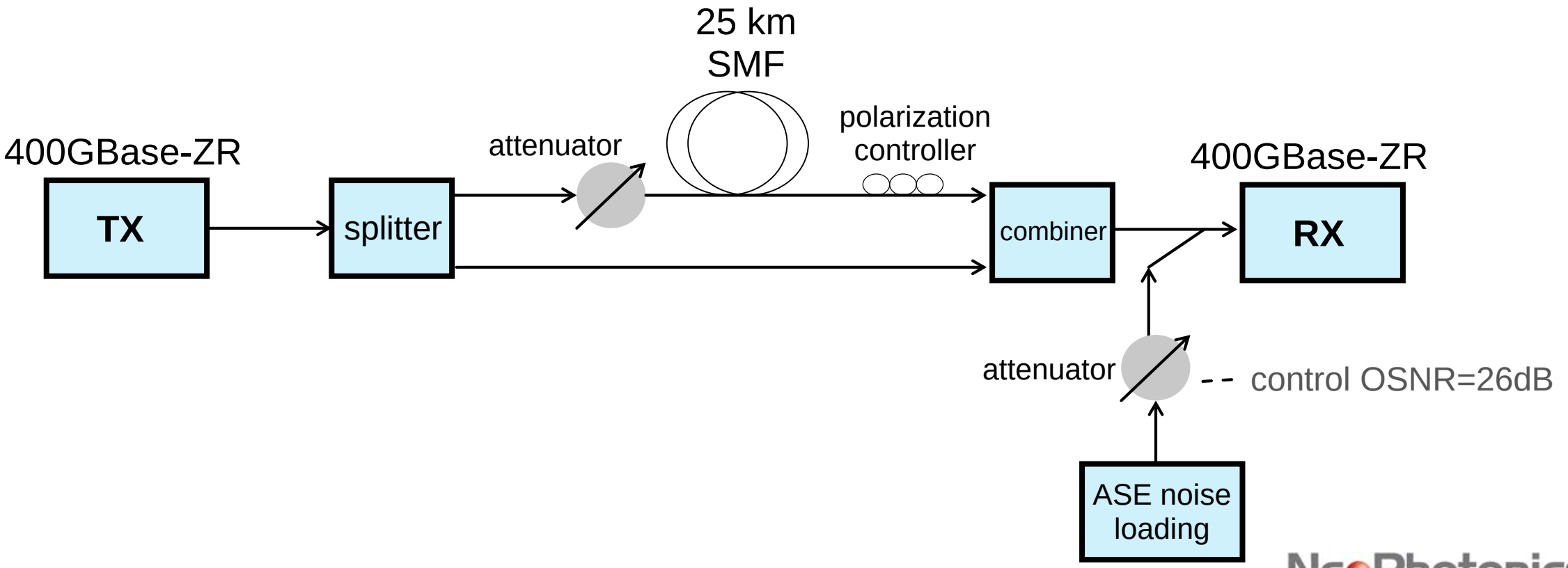
VPI Simulation – Method 2

In-band incoherent crosstalk tolerance test

-independent of TX spectral shape and mux/demux filter shape



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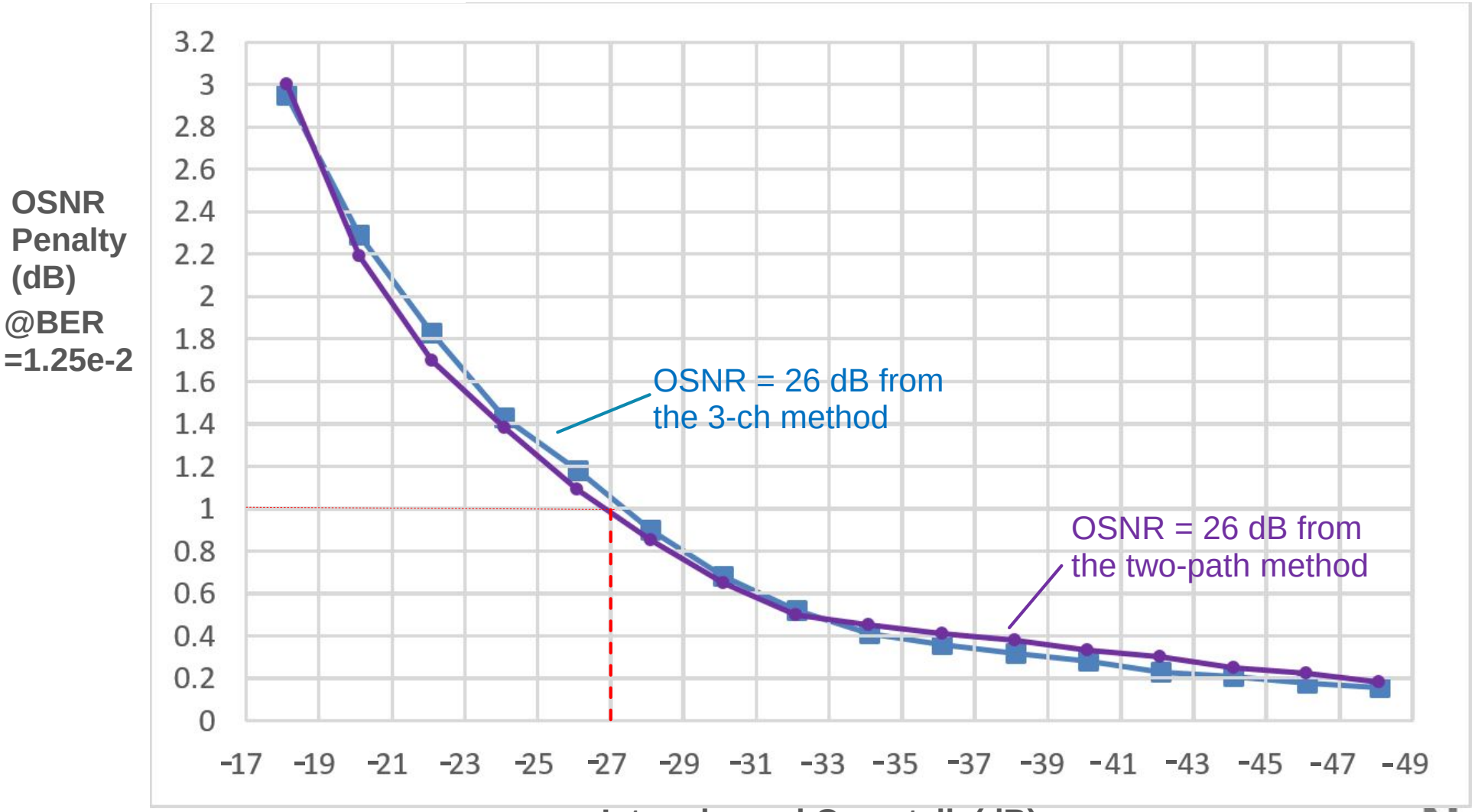
Comparison of the two methods



Summary

- We propose a -27dB inter-channel crosstalk for an OSNR penalty of 1 dB in a 75GHz-spaced 400ZR DWDM black link.