

Impact of 75 GHz filters on 400BASE-ZR black link, 80 km requirement

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- Rich Baca, Microsoft
- Mark Filer, Microsoft
- David Lewis, Lumentum
- Liang Du, Google

References in this Contribution

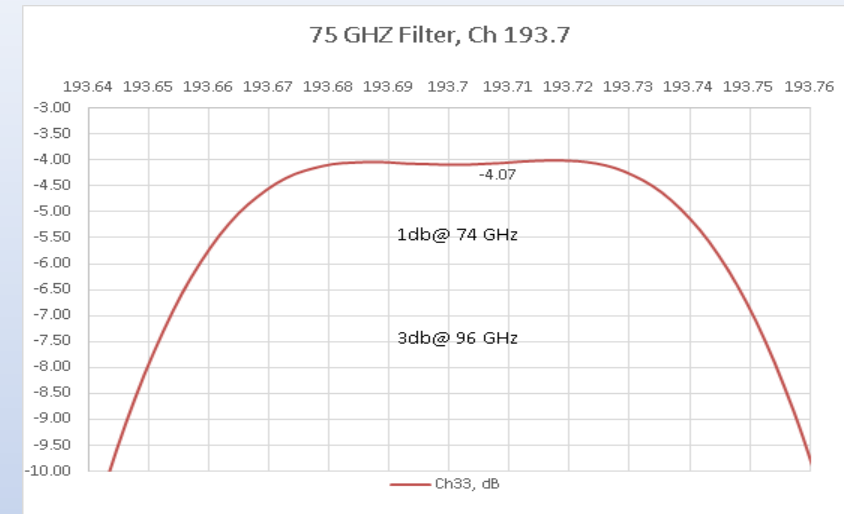
- “Coherent 100G and 400G PMD Layer WDM Considerations”
http://www.ieee802.org/3/cn/public/18_11/deandrea_3cn_01c_1118.pdf

Outline for this initial work and contribution

- Use 75 GHz Filter shape from prior contribution
- Simulate using VPI Photonics
- Vary Transmitter and Receiver LO frequency (zero offset) to observe impact of filter response on OSNR

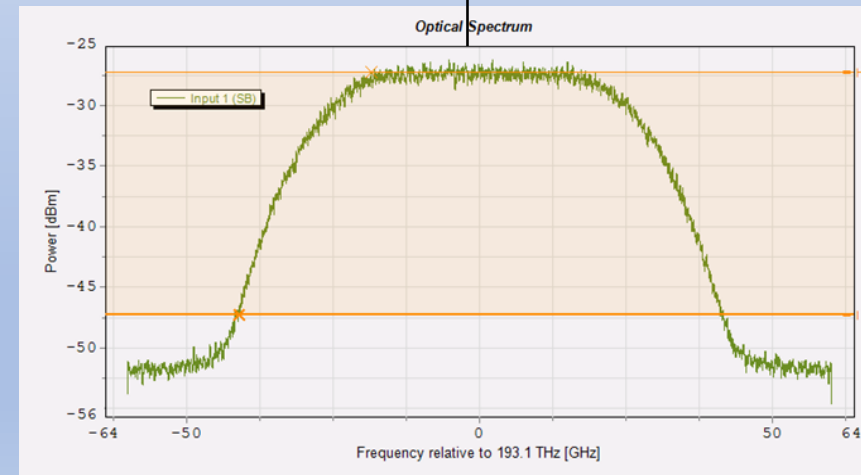
Filter and Transmitter

- Use 75 GHz filter shape
- Vary transmitter LO up to 25 GHz
- Keep Tx and RX LO difference at 0 GHz
- Impact of only Filter/TX spectrum



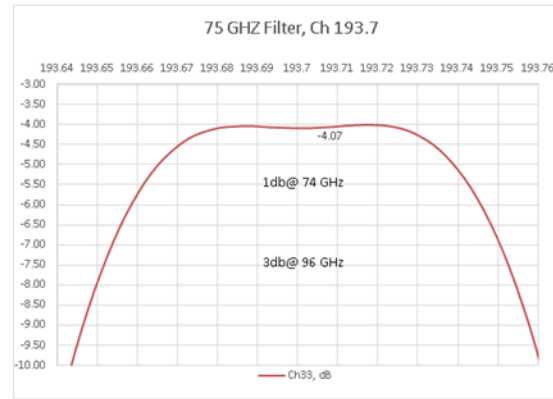
Filter Response

← | → Vary Tx LO center



Transmitter Output

Simulation setup and assumptions

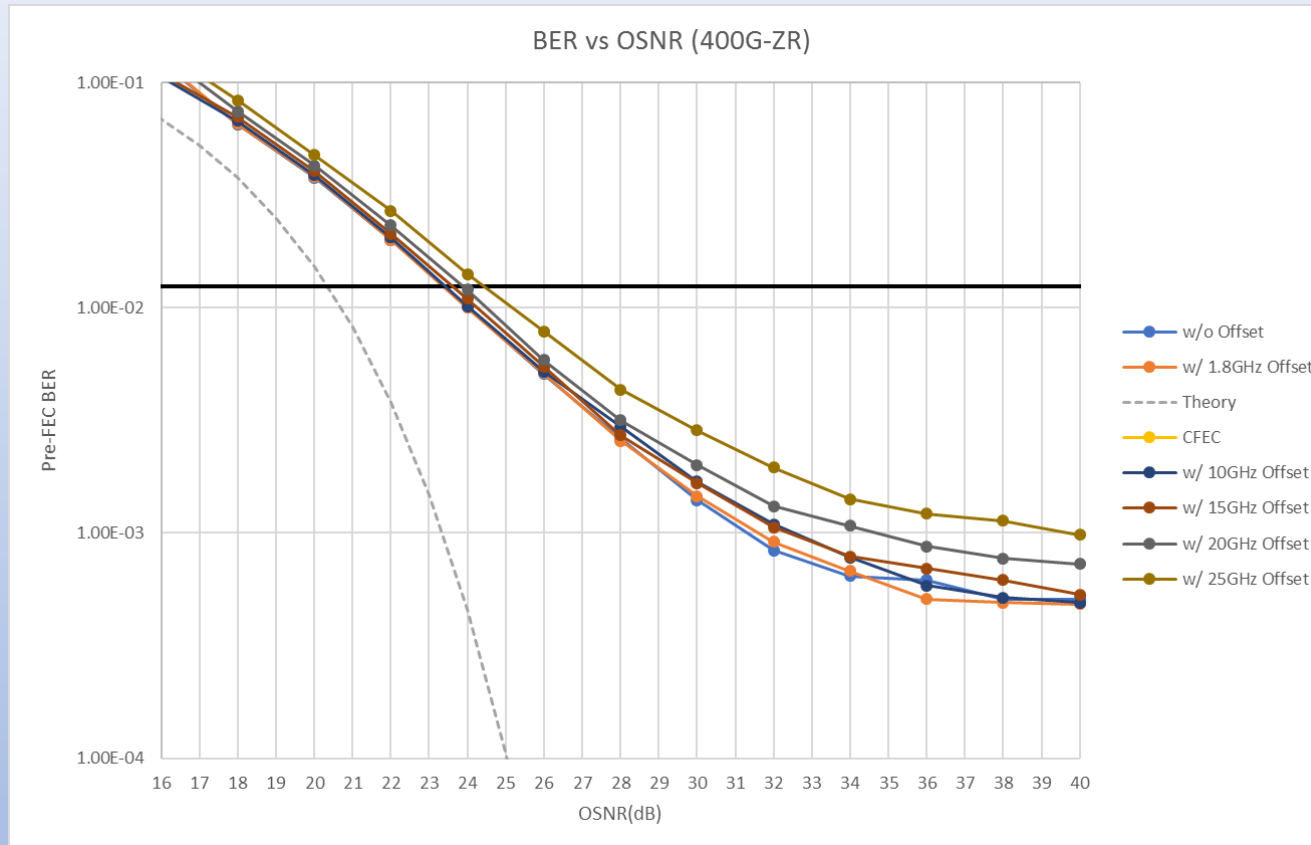


Key system parameters:

| Parameter | Value | | |
|---------------------------|--------------------------|-------------------------------------|---|
| Modulation Format | 16QAM | DAC&ADC ENOB | 5.5/5 bits |
| Baud Rate | 59.84375 GBd | TIA Transimpedance | 5000 Ohm |
| Tx & Rx Carrier Frequency | 193.7GHz +/- up to 25GHz | Rx Equalizer for Channel Estimation | Data-aided Frequency Domain Equalizer (FDE) |
| Laser Linewidth | 200 kHz | FFT Size | 128 |

Simulation Results

The Receive OSNR penalty was investigated by sweeping the carrier frequency offset:



- 0.5 dB ROSNR penalty at CFEC with 20 GHz carrier offset.
- 1 dB ROSNR penalty at CFEC with 25 GHz carrier offset.

Conclusion

- Wide filter shape (3db@96 GHz) allows large deviation of channel center for 0.5 or 1 db ROSNR penalty (or conversely, wide variation of filter center frequency accuracy)
- Initial Analysis allows further contribution, vary filter bandwidth and simulate impact:
 - Due to production variation of filter bandwidth
 - Temperature variation of filter bandwidth
 - Variation of BW across C-band
 - End of Life variation of BW
 - Cascaded filter bandwidth of 2 filters

And show how filter bandwidth and narrowing of the cascaded bandwidth would impact the black link model for a 75 GHz spaced system

Last Slide

- Q&A