Optical vs. electronic chromatic dispersion compensation in WDM coherent PM-QPSK systems at 111 Gbit/s

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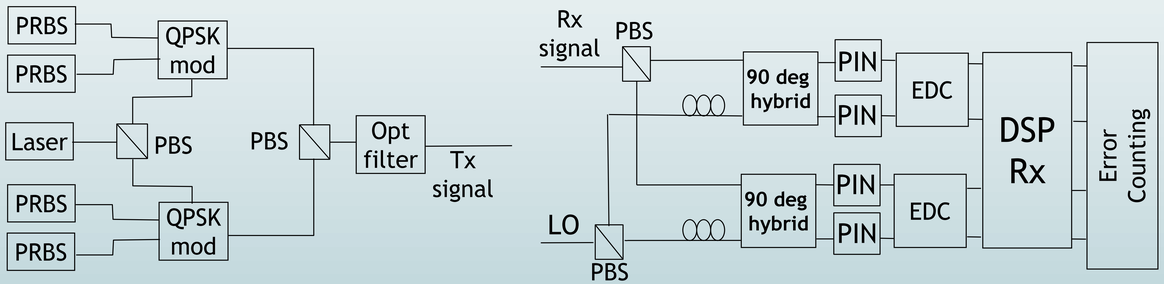
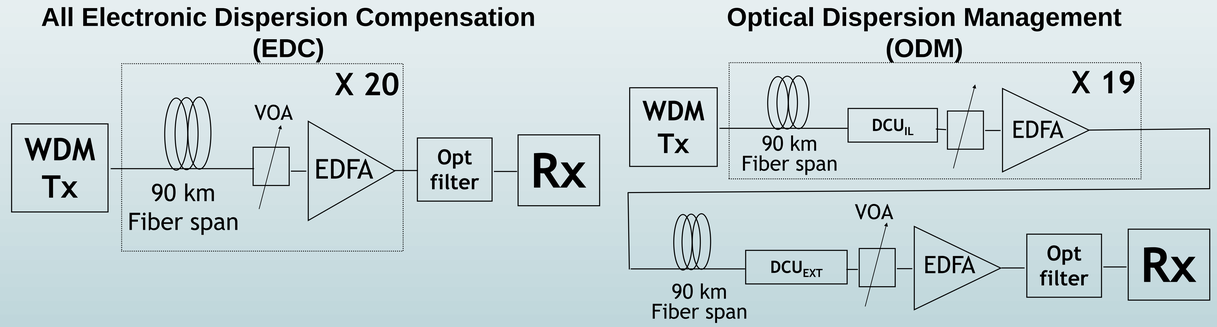
Abstract - We carried out a simulative study of optical dispersion management using inline DCUs vs. all-electronic dispersion compensation for PM-QPSK WDM systems at 111Gbit/s. All-electronic compensation performs better than dispersion management in high-dispersion fibers.

PM-QPSK: transmitter and receiver



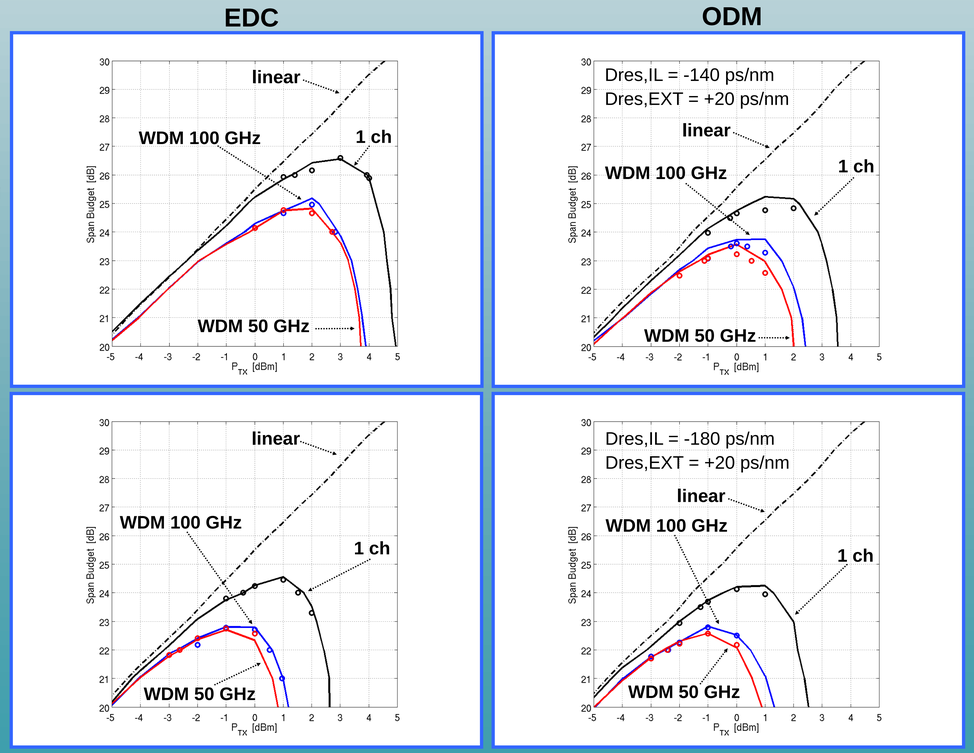
System layouts



Simulation results: Span Budget vs. P_{TX}

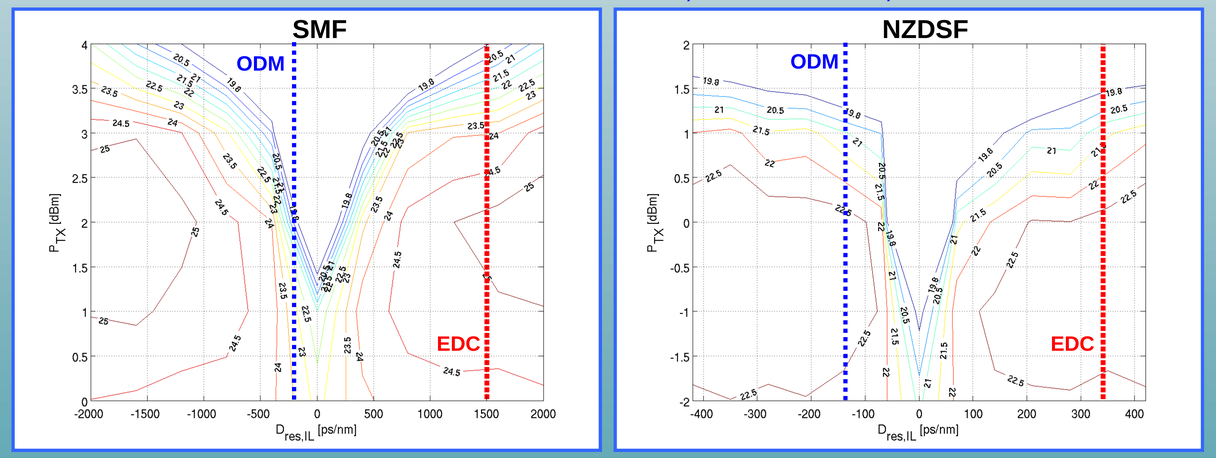
SMF
D=16.7 ps/nm/km
α=0.22 dB/km
γ=1.3 1/W/km

NZDSF
D=3.8 ps/nm/km
α=0.22 dB/km
γ=1.5 1/W/km



Dots refer to simulations with noise added along the link.

Simulation results: Span Budget vs. ($D_{res,IL}$, P_{TX}) - $D_{res,EXT}$=0 ps/nm



Conclusions

We carried out a simulative analysis that demonstrates that all-electronic dispersion compensation shows better performance than optical dispersion management using inline DCUs for systems based on PM-QPSK modulation at 111Gbit/s. The performance advantage increases with fiber dispersion. A WDM system with 50 GHz spacing is equivalent to the case with Δf=100 GHz for all the analyzed scenarios. According to these results, all-EDC at the receiver emerges as a very attractive option, allowing system cost reduction and introducing more flexibility in managing transmission links, without incurring penalty.