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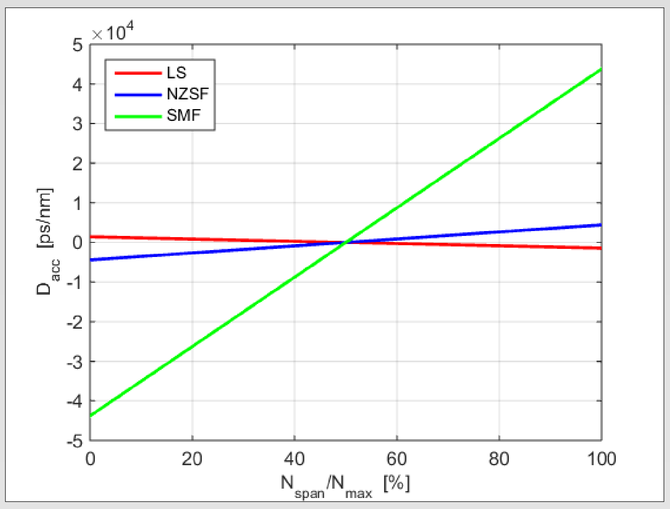
Electronic Dispersion Pre-Compensation in PM-QPSK Systems over Mixed-Fiber Links

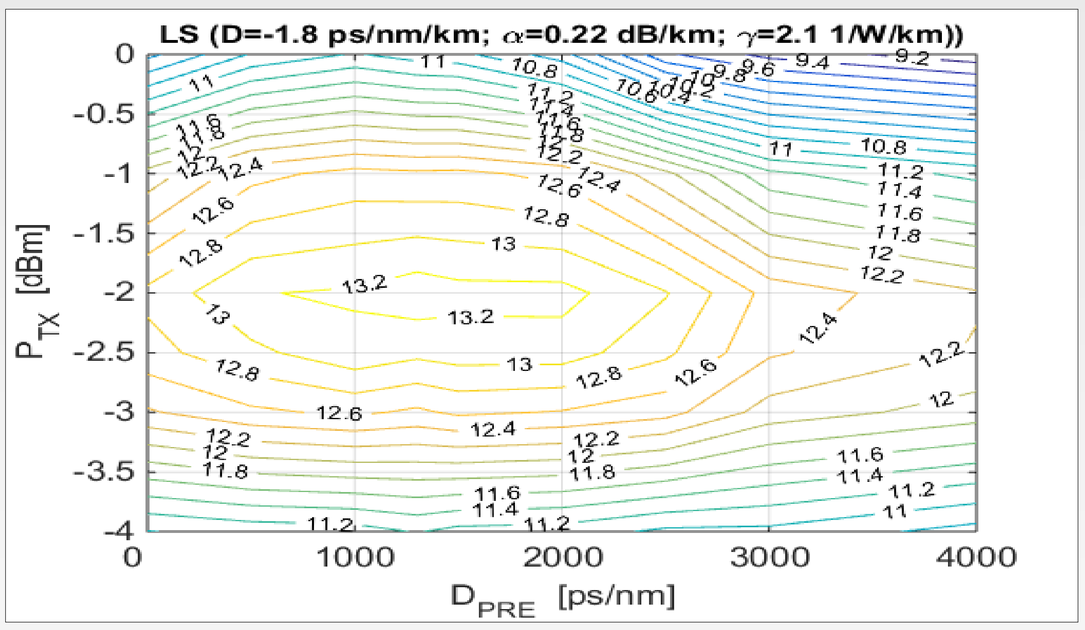
Homogeneous links

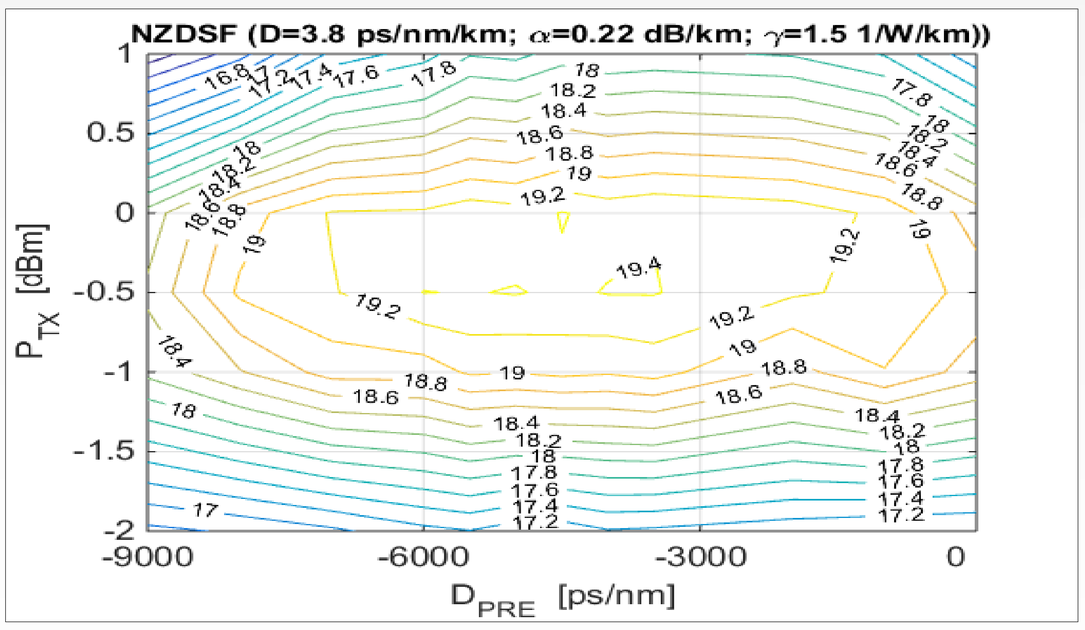
- In uncompensated links made of a single fiber type optimal chromatic dispersion pre-compensation (CDP) was found to be 50% of the total link accumulated dispersion
- However, the potential gain is modest
- The newly proposed EGN model allows to predict performances with CDP

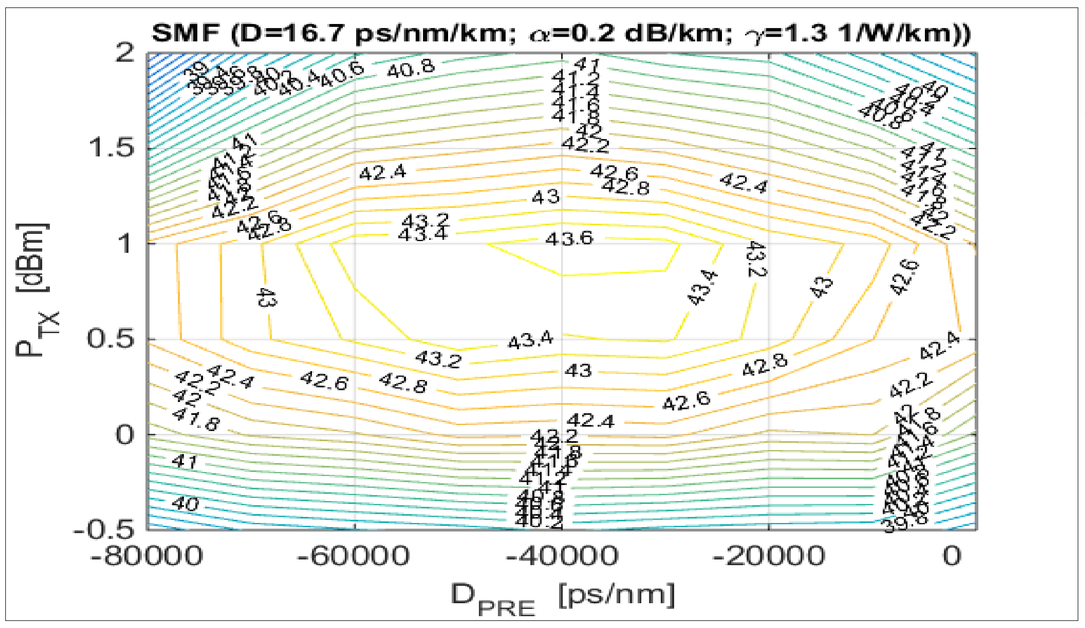


Maximum Reach - N_{span}

PM-QPSK - R_S=32 Gbaud
Nyquist-WDM - 15 channels
roll-off=0.05 – Δf= 33.6 GHz
L_{span}=120 km- BER target = 10^{-2}

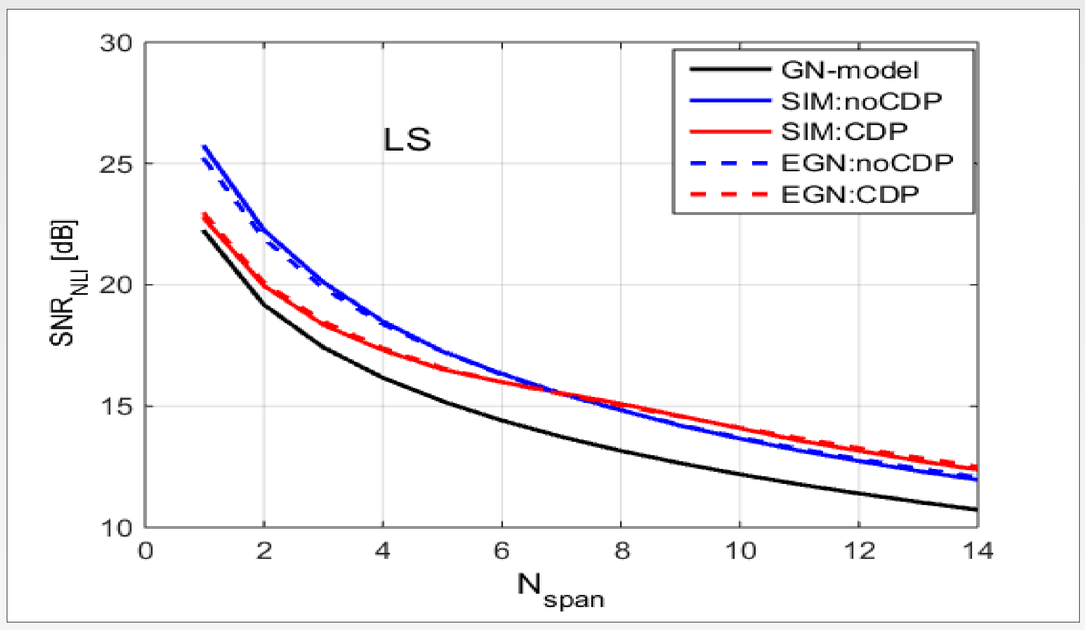


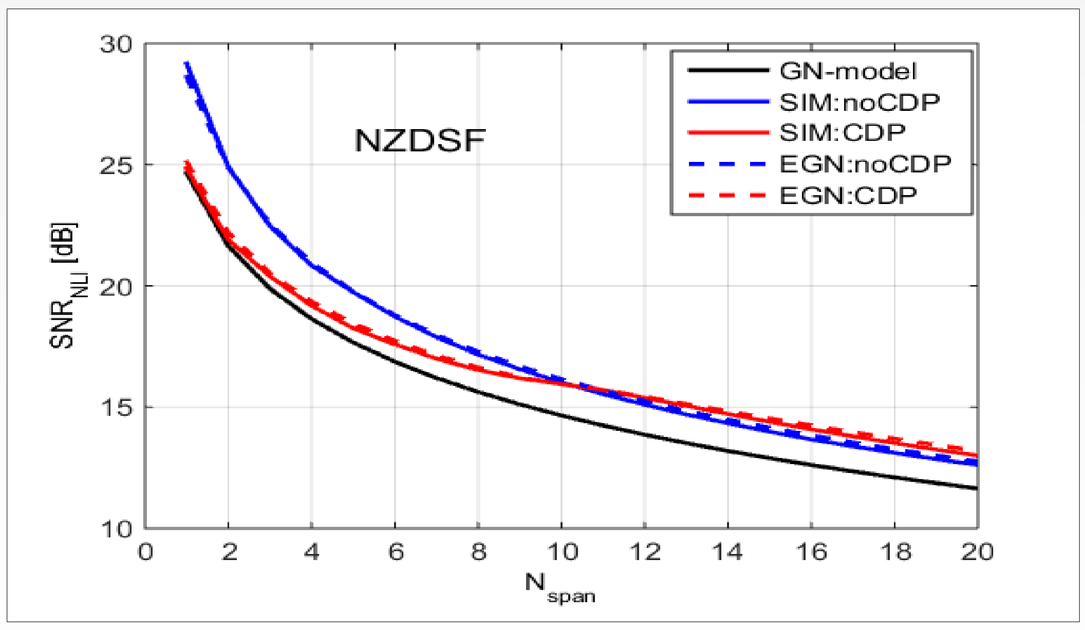


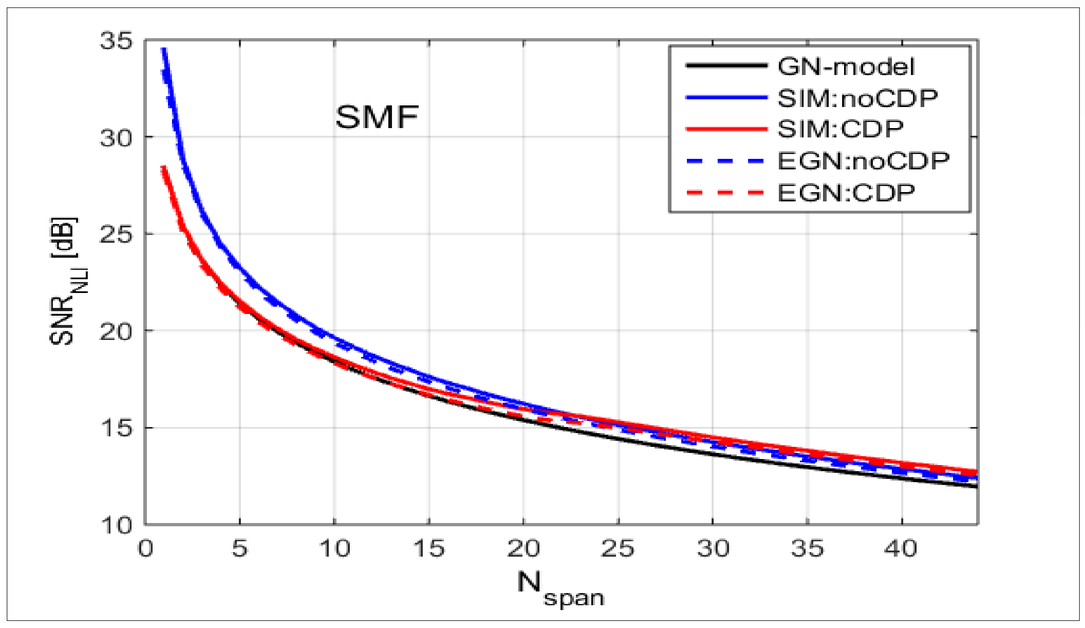


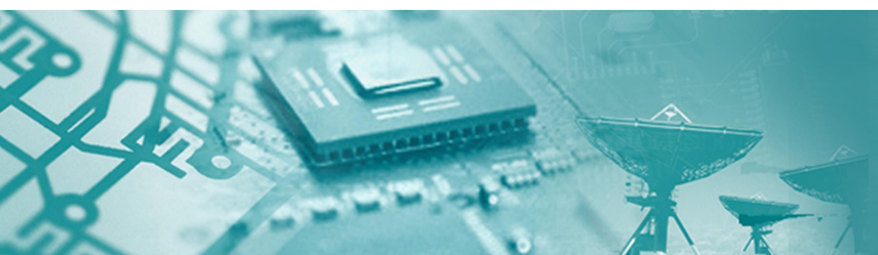
Non-Linear Interference (NLI) prediction @ $P_{TX,max}$

$$SNR_{NLI} = \frac{P_{TX,\max}}{P_{NLI}}$$









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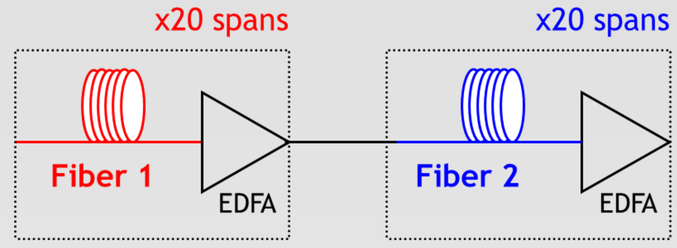
Inhomogeneous links

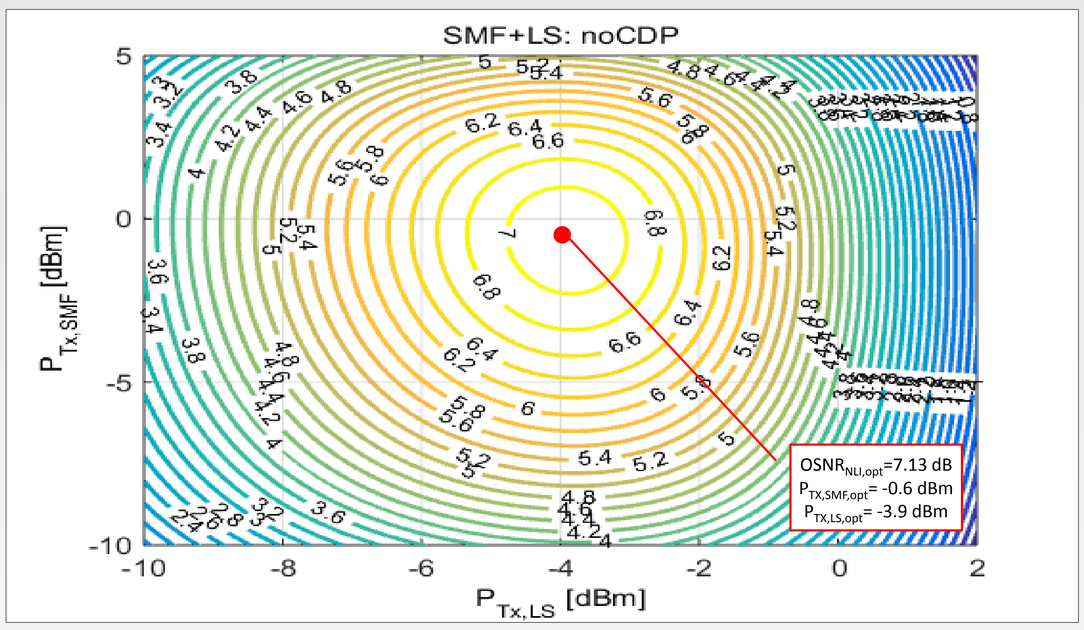
- We consider inhomogeneous links made of two fiber types: LS and SMF
- CDP, when applied, sets the zero accumulated dispersion in the middle of the LS section, this is conceivably close to the optimum
  - D_{PRE}=-31600 ps/nm in the SMF+LS case
  - D_{PRE}=+1800 ps/nm in the LS+SMF case

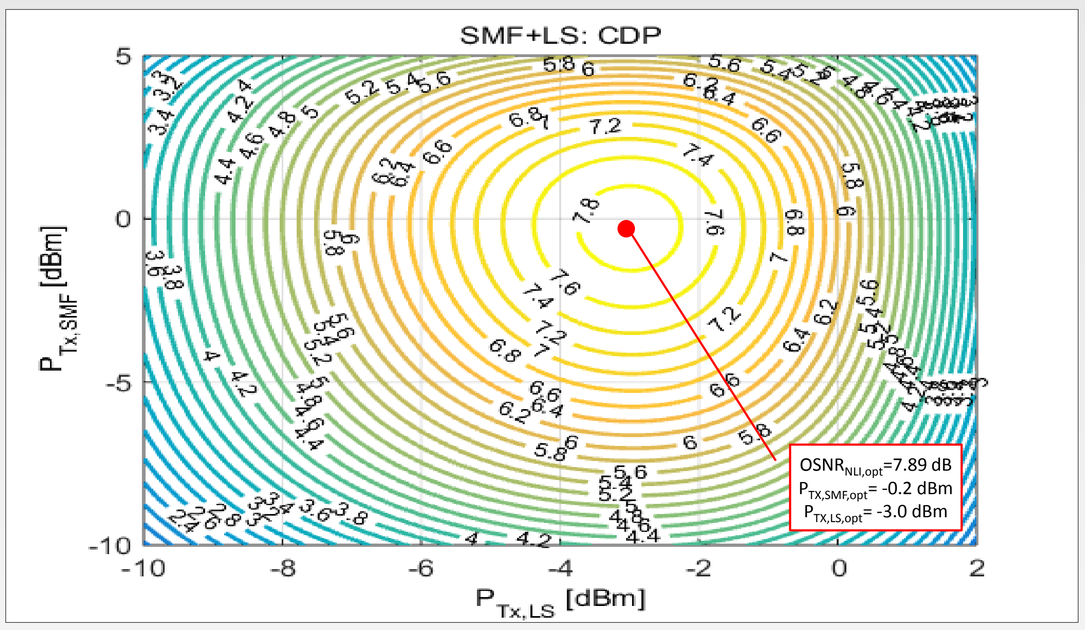
PM-QPSK - R_S=32 Gbaud
Nyquist-WDM - 9 channels
roll-off=0.05 - Δf= 33.6 GHz
40 spans - L_{span}=100 km

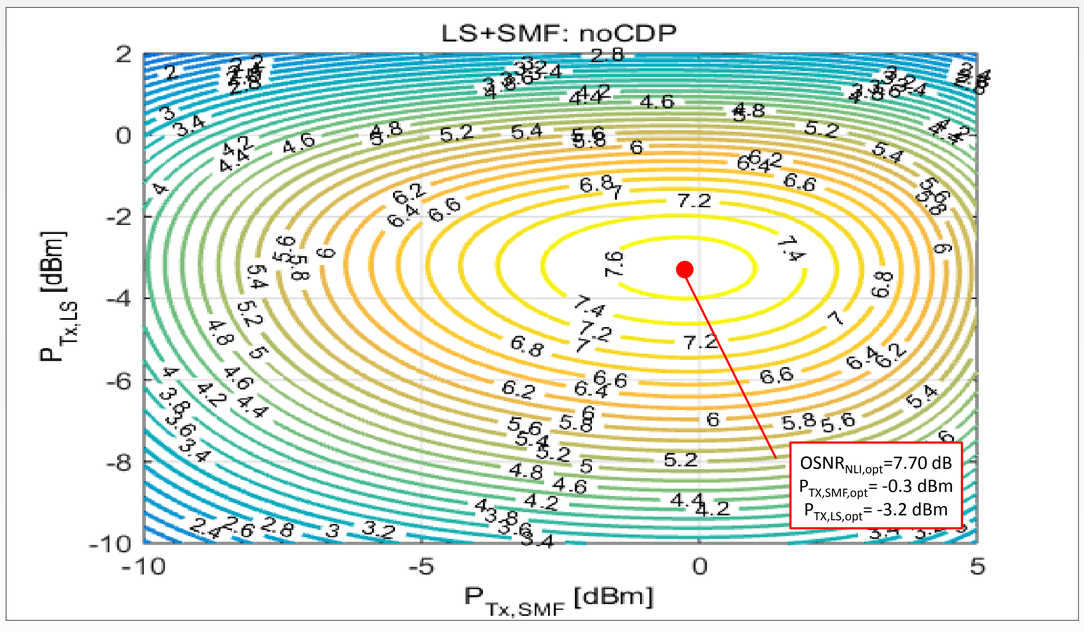


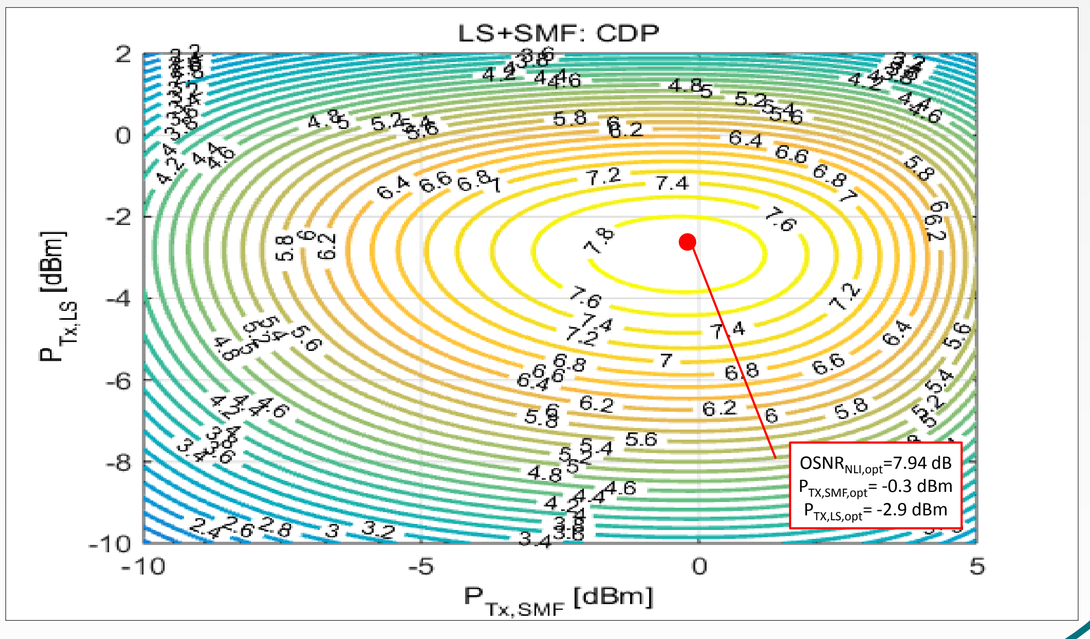
Launch Power Optimization based on EGN-model

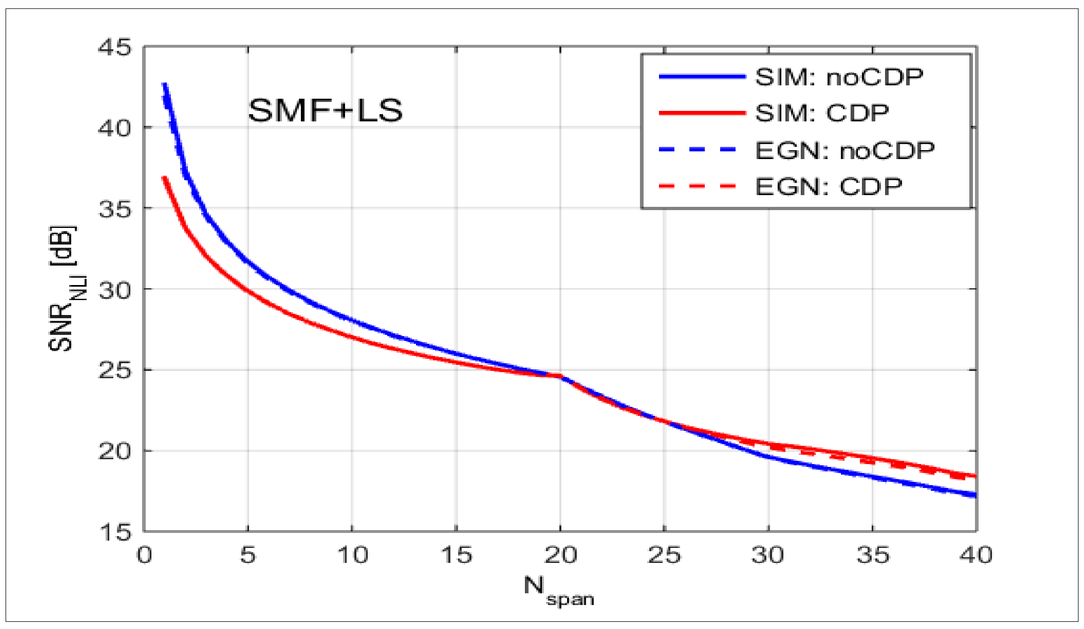
$$OSNR_{NLI} = \frac{P_{RX}}{P_{ASE} + P_{NLI}}$$











Conclusions

- Applying CDP the OSNR gain in inhomogeneous links depends on fiber order and may be non-negligible
- CDP equalizes the performance in two directions
- CDP dramatically increases signal PAPR: this may result in substantial penalties due to TX-DAC resolution and range

Acknowledgements

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