ECOC 2009 – paper P4.11

Non-Linear Propagation Limits and Optimal Dispersion Map for 222 Gbit/s WDM Coherent PM-16QAM transmission

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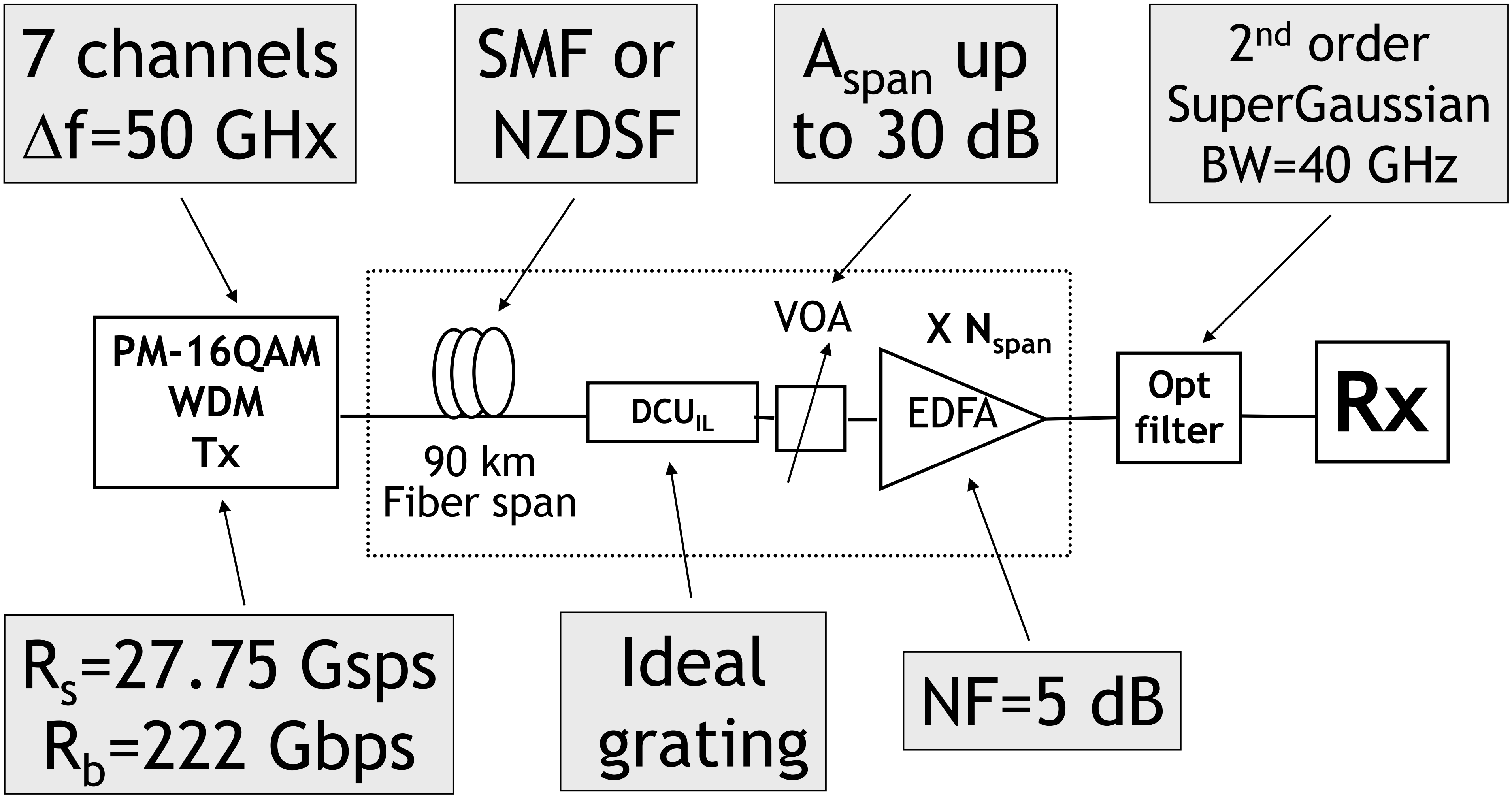
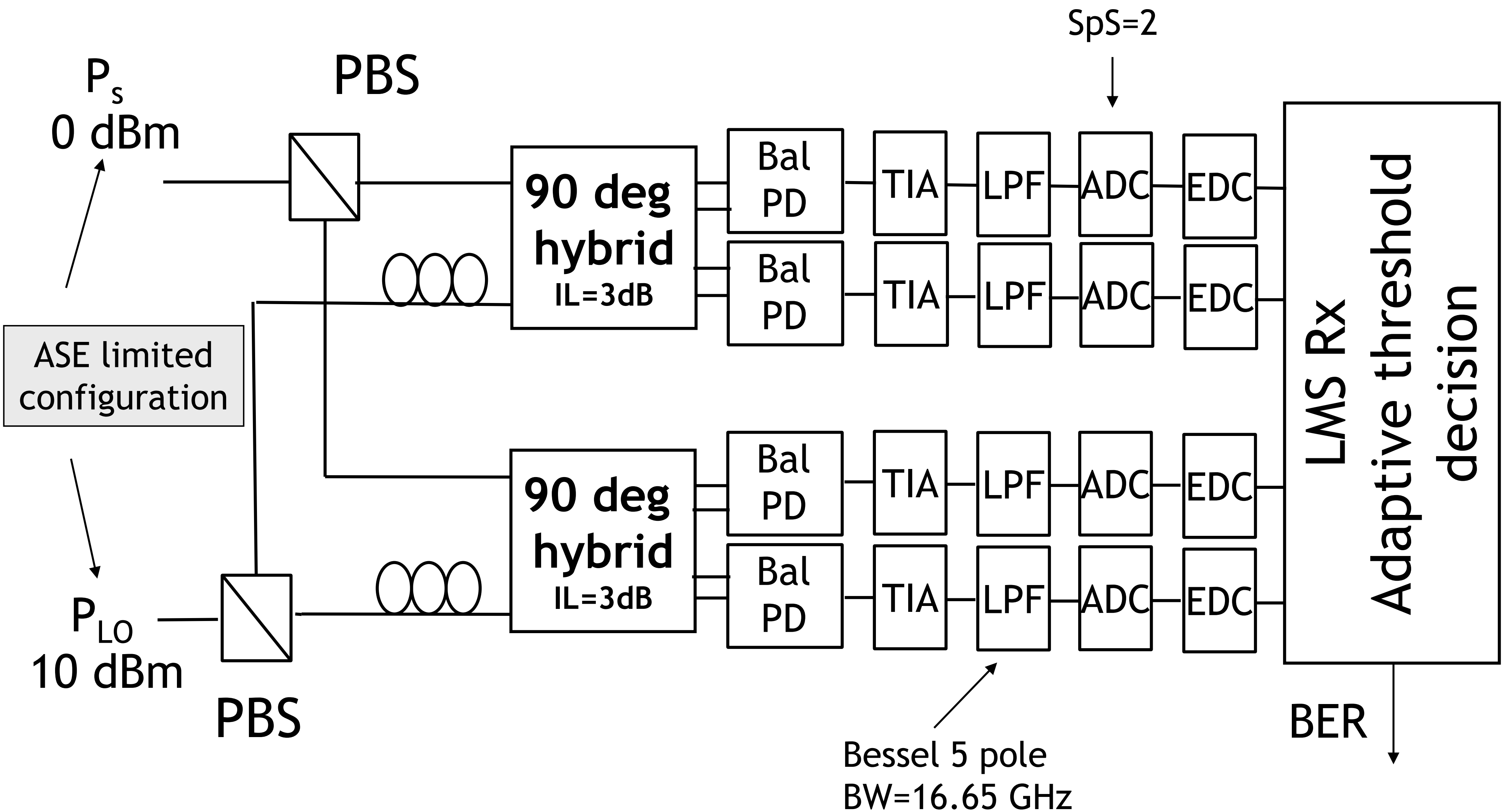
Summary

- We investigate through simulation the impact of non-linear propagation on 222Gbit/s WDM coherent PM-16QAM on SMF and NZDSF fibers
- We show that the best performance is achieved using full electronic dispersion compensation, with a significant system reach of about 1000km

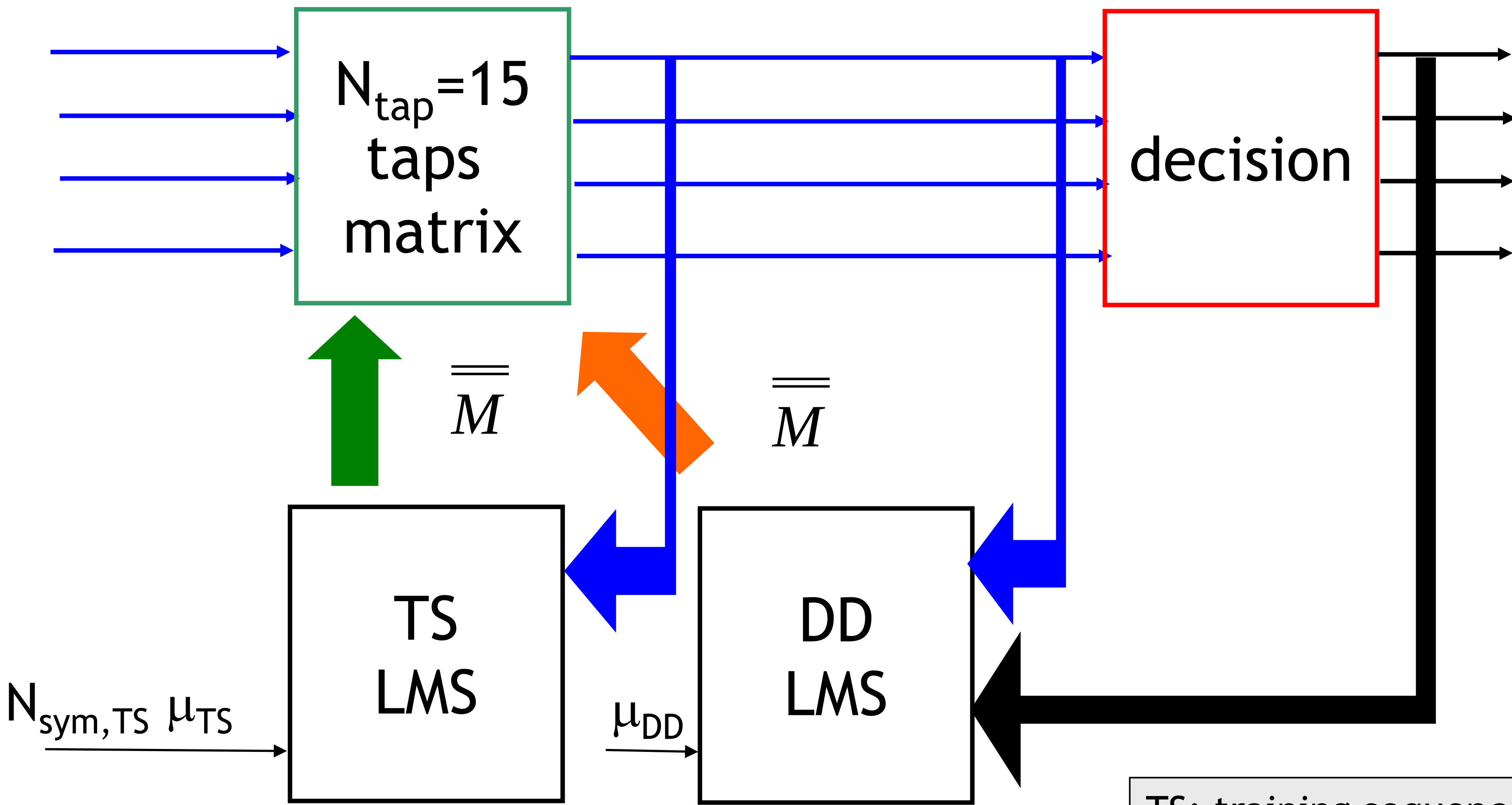
System layout



Receiver structure



Dynamic receiver based on TS and DD LMS

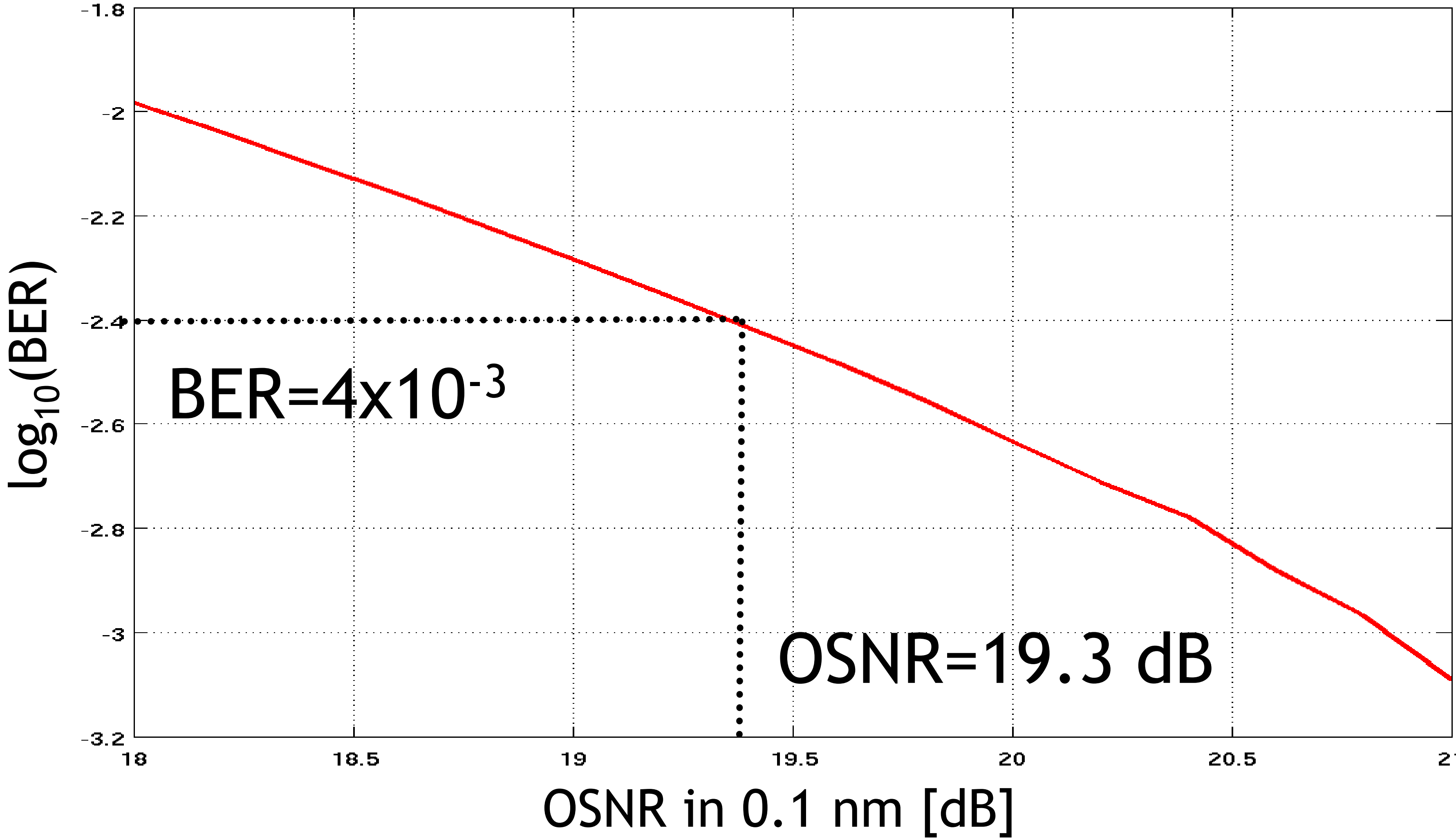


TS: training sequence
DD: decision driven
LMS: least mean square

Simulation data

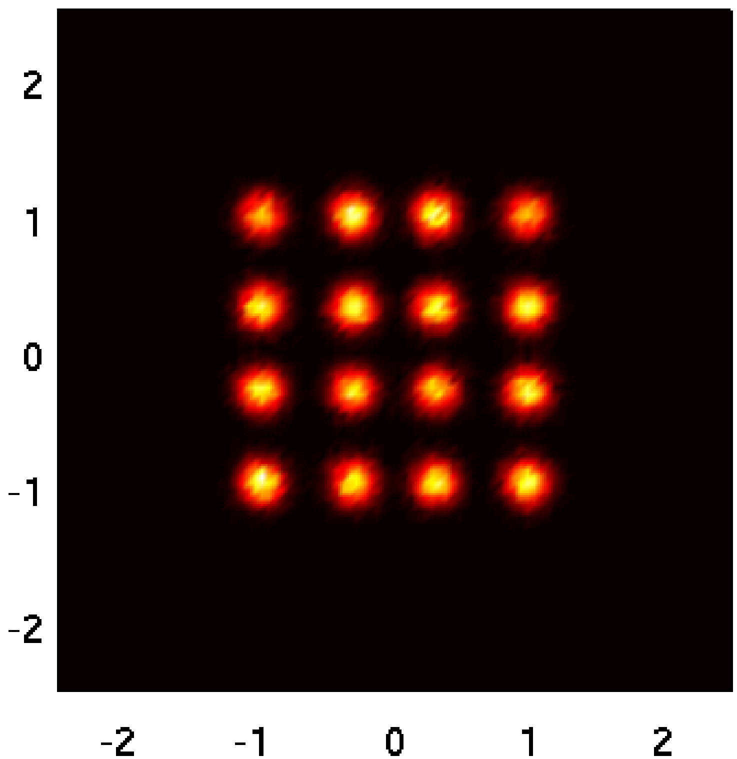
- 8 different PRBS per channel
- PRBS degree: 16
- 7 WDM channels, Δf=50 GHz
- Simulated symbols: 65536 $\Leftrightarrow$ 524288 bits per channel
- Target BER= 4×10^{-3}
- SMF
  - α=0.22 dB/km, D=16.7 ps/nm/km, γ=1.3 $(W\cdot km)^{-1}$
- NZDSF
  - α=0.22 dB/km, D=3.8 ps/nm/km, γ=1.5 $(W\cdot km)^{-1}$

Sensitivity

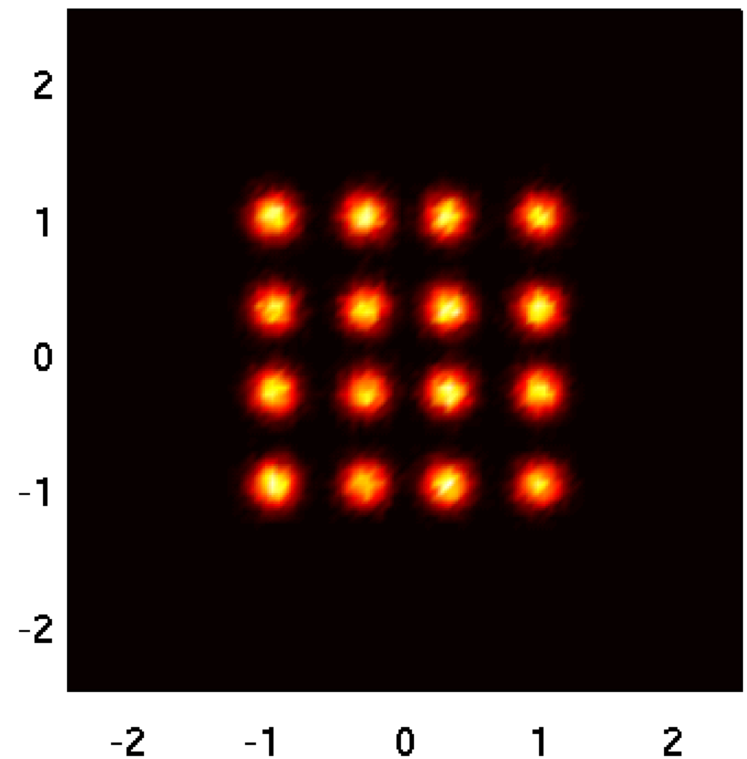


Scattering Diagrams

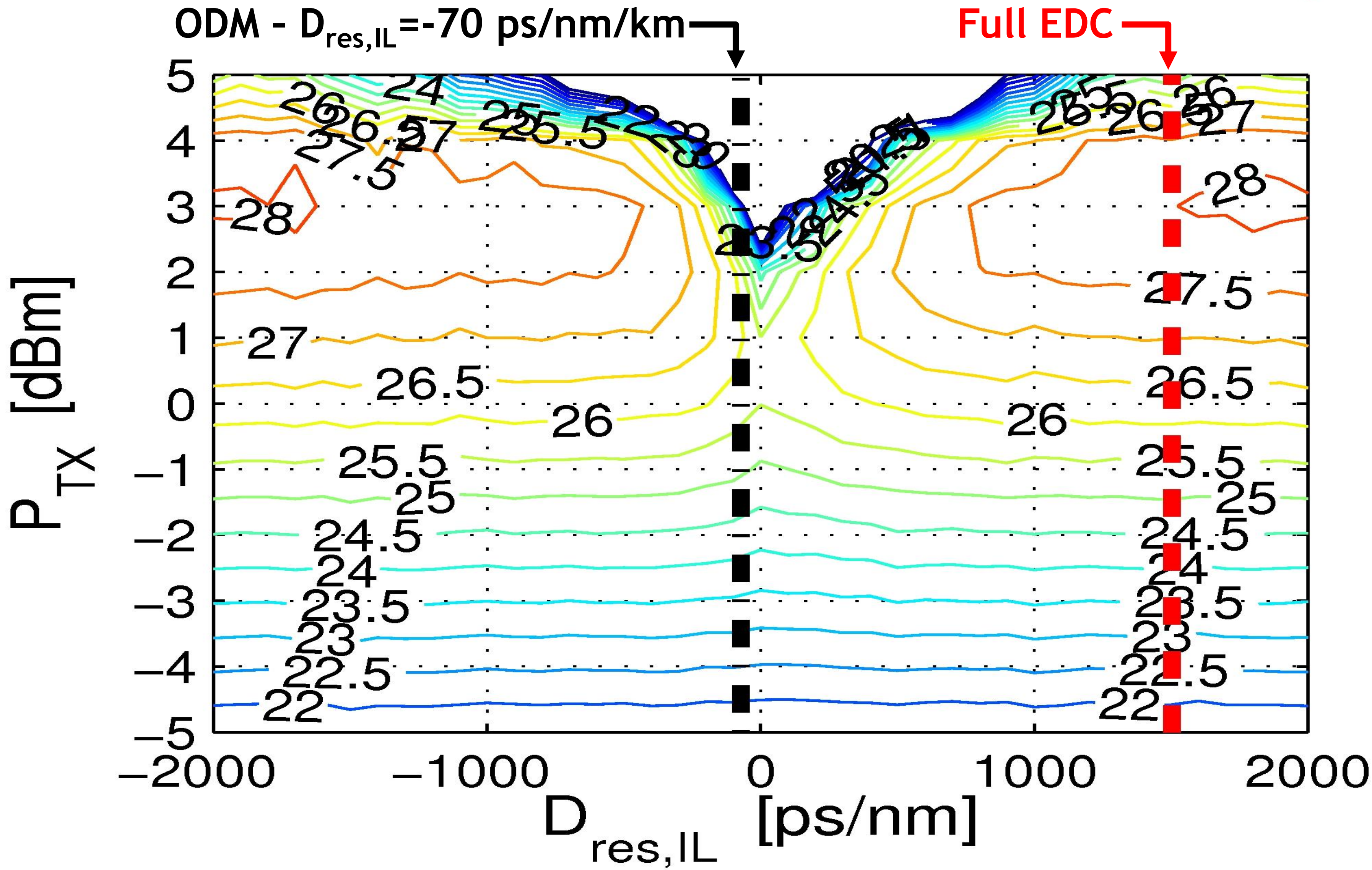
X polarization



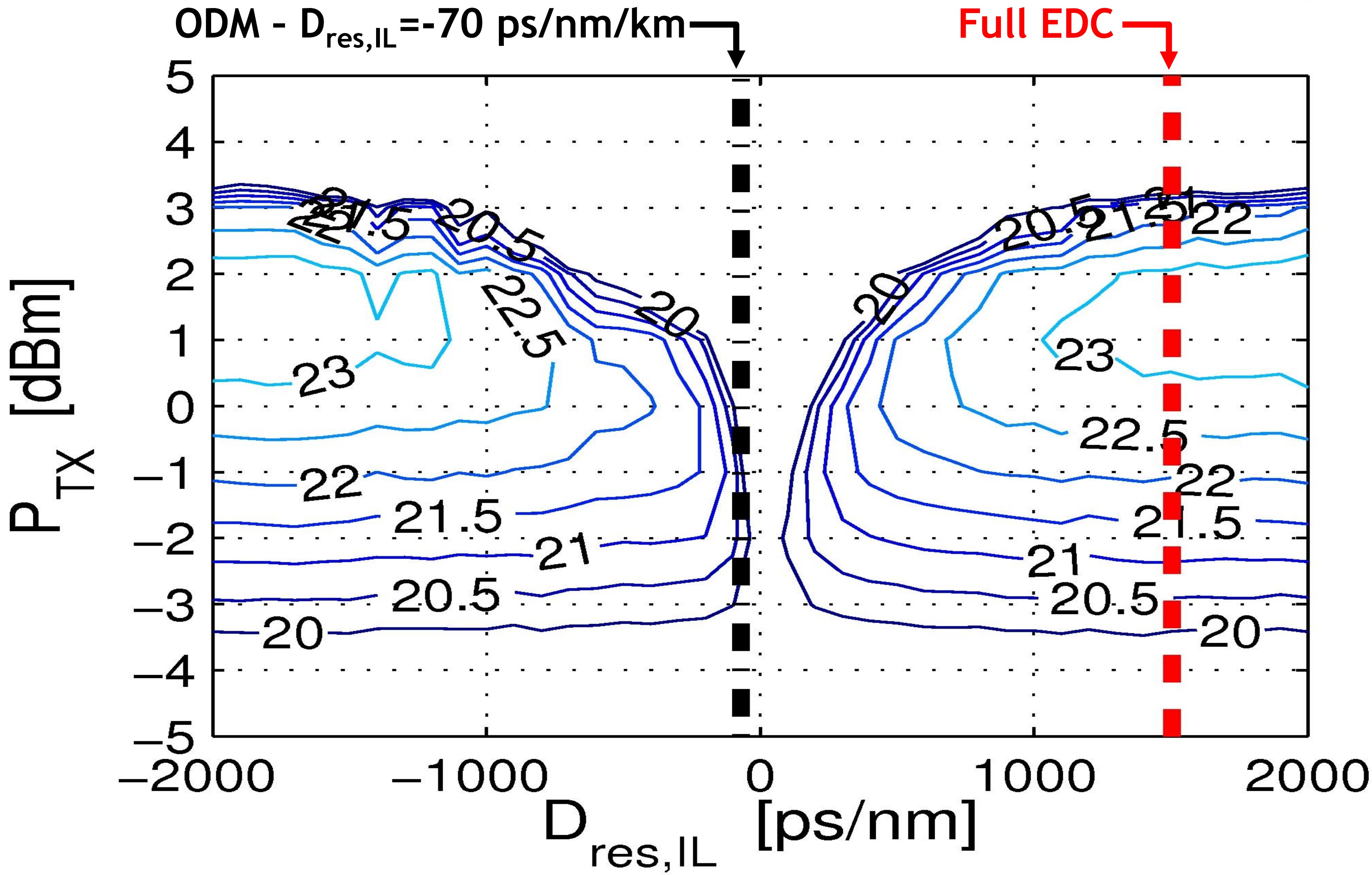
Y polarization



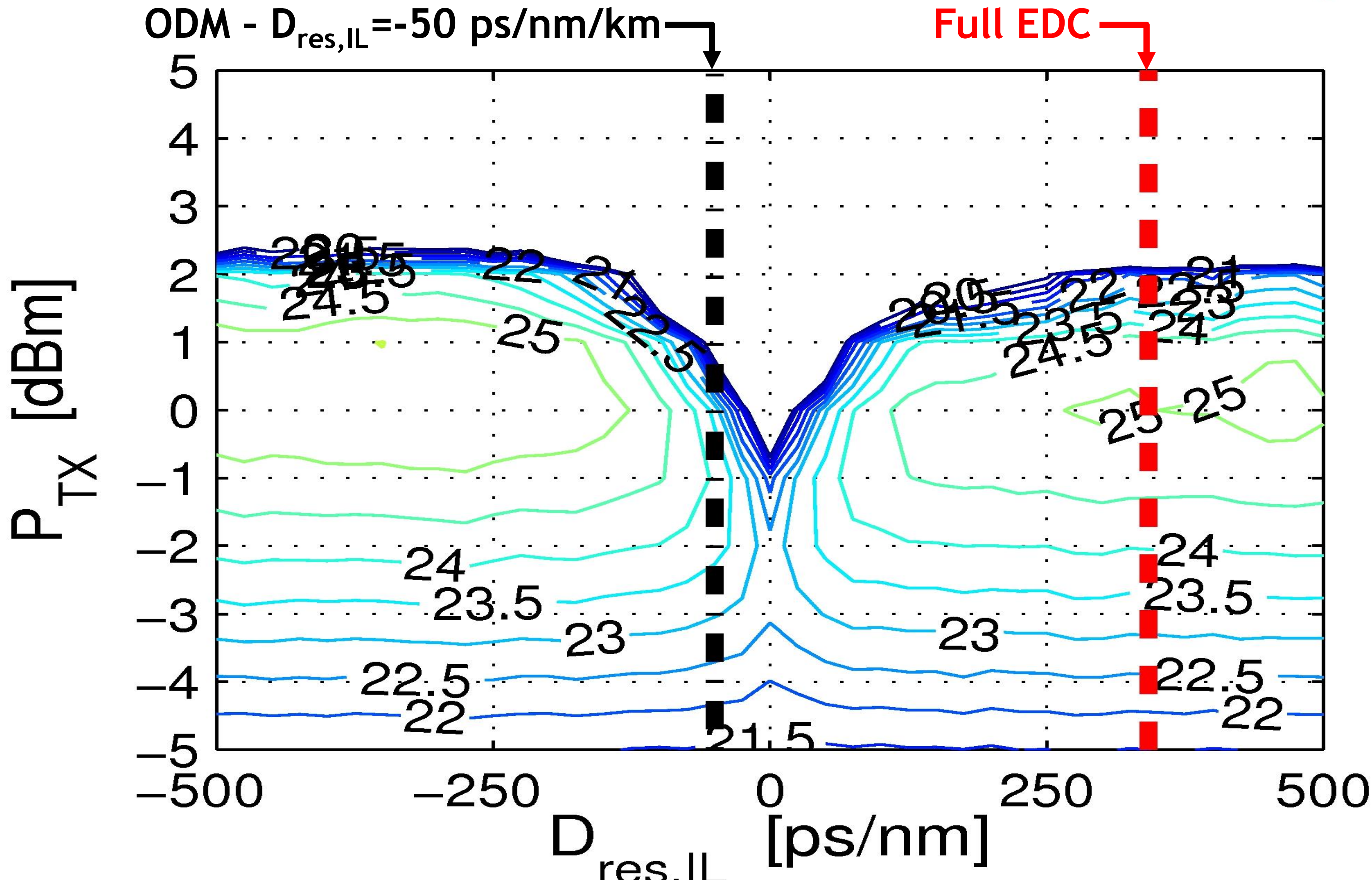
A_{span}@BER=$4x10^{-3}$ - SMF - N_{span} = 5



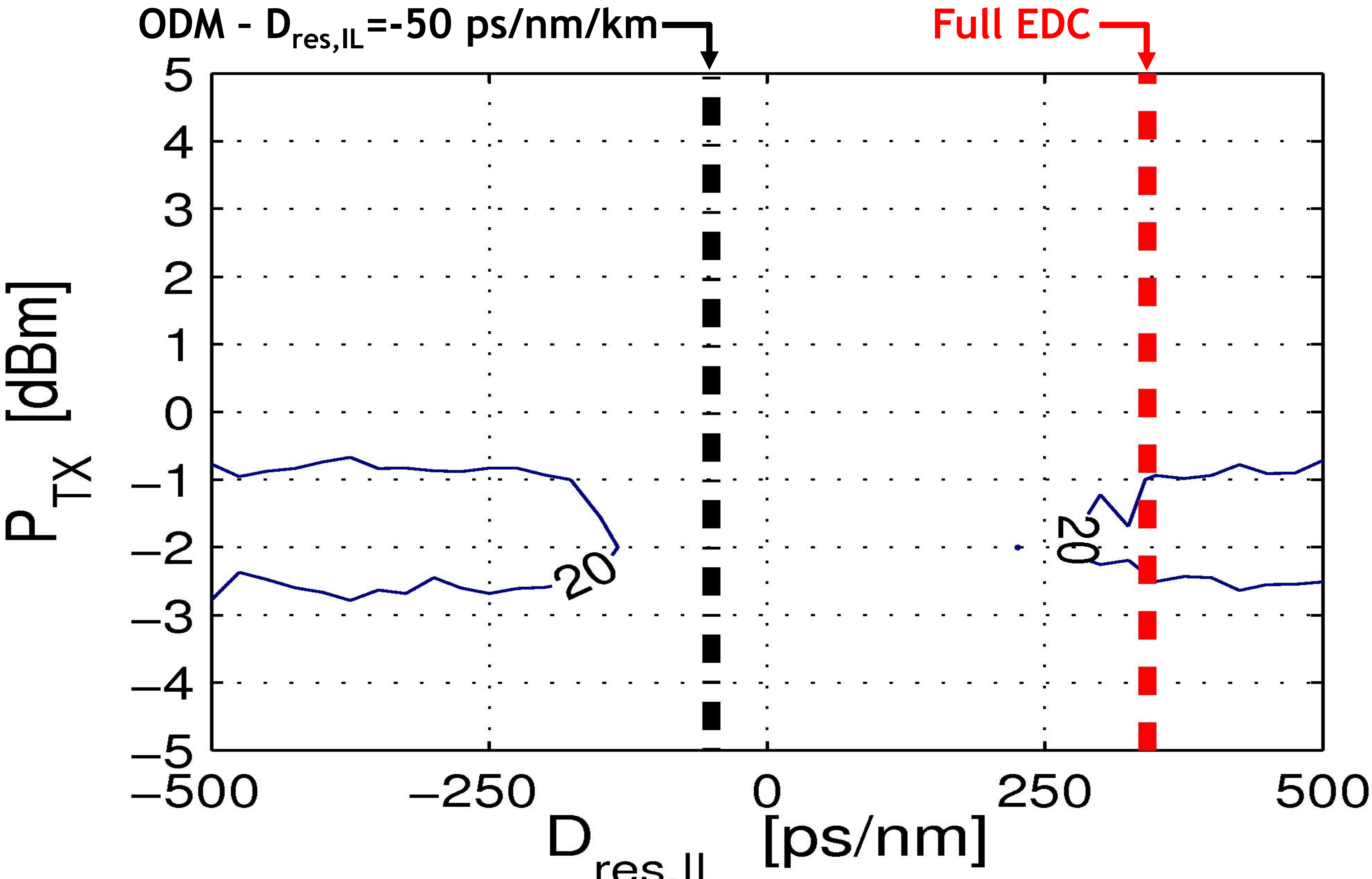
A_{span}@BER=$4x10^{-3}$ - SMF - N_{span} = 10



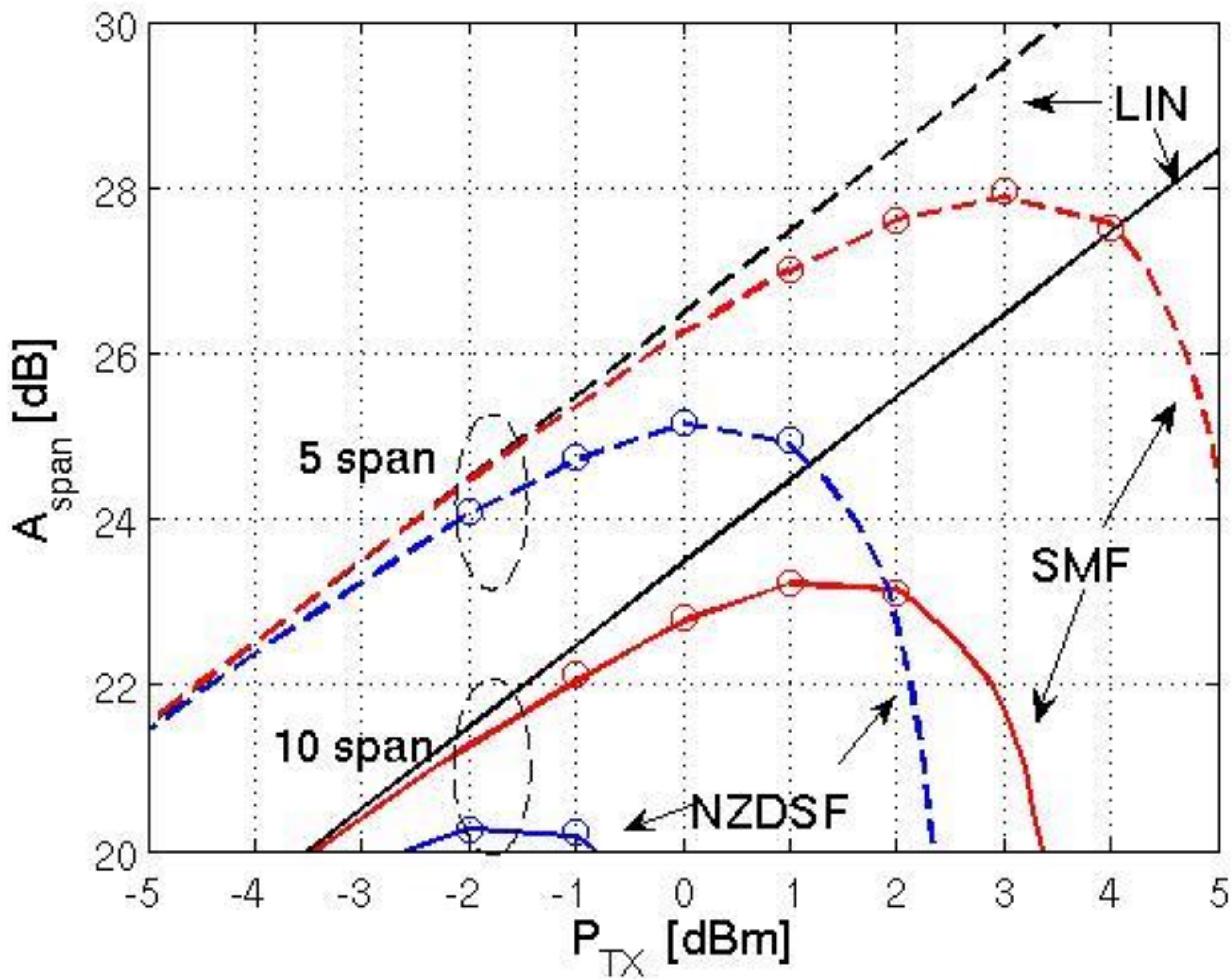
A_{span}@BER=$4x10^{-3}$ - NZDSF - N_{span} = 5



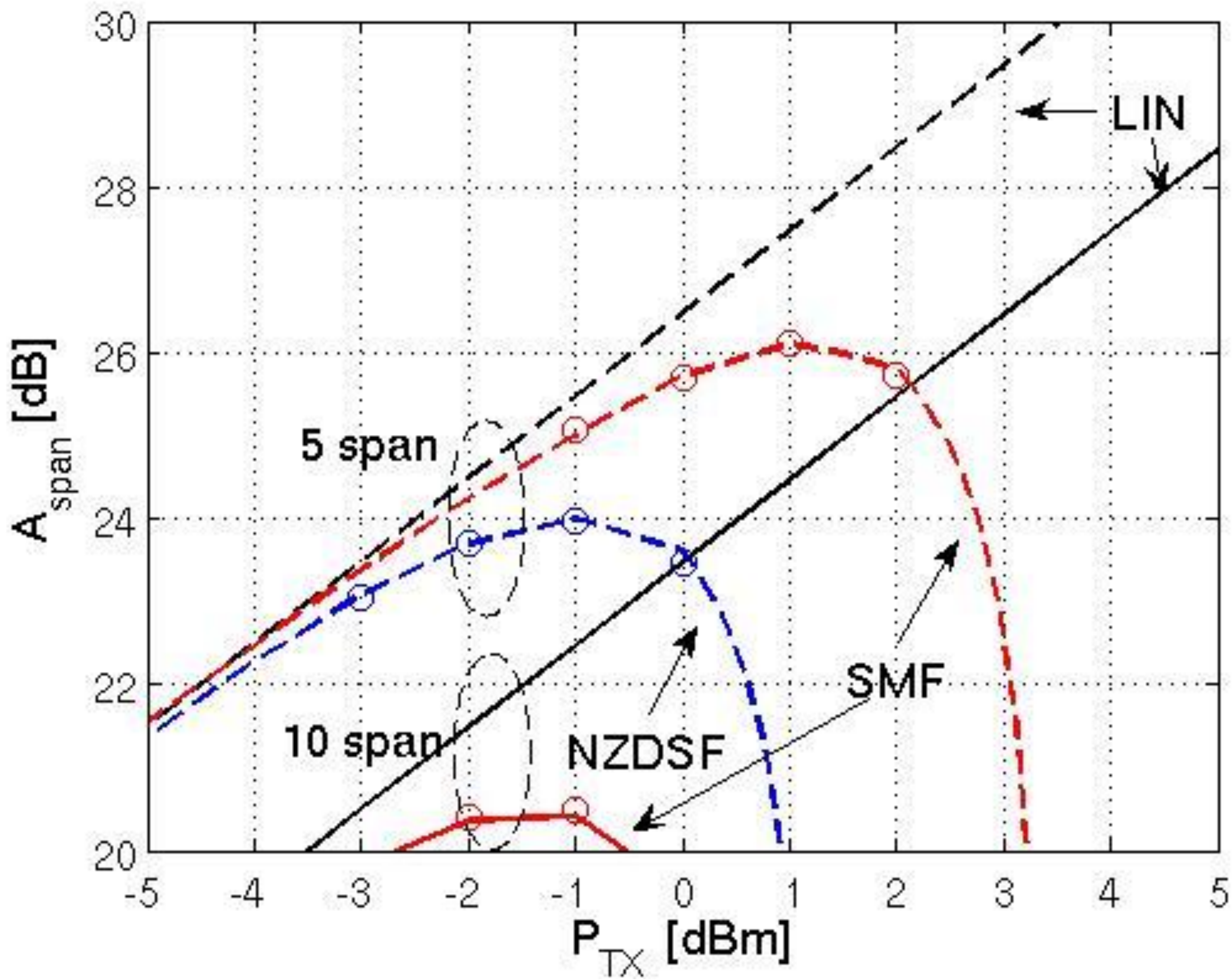
A_{span}@BER=$4x10^{-3}$ - NZDSF - N_{span} = 10



A_{span}@BER=$4x10^{-3}$ vs. P_{Tx} - Full EDC



A_{span}@BER=$4x10^{-3}$ vs. P_{Tx} - ODM



Conclusions

- Our study shows that the full-EDC approach is the optimal technique for WDM systems based on PM-16QAM at 222 Gbit/s, even in the presence of substantial non-linearity
- Operating over lines with DCUs optimized for legacy 10 Gbit/s IMDD may severely impact performance
- Despite the extreme bit-rate and spectral efficiency, the system appears capable of reaching about 1000 km over SMF