Nonlinearity Penalty for 100G DMT Based on 25G-class DFB Transmitter

40Gb/s and 100Gb/s Fiber Optic Task Force

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Outline

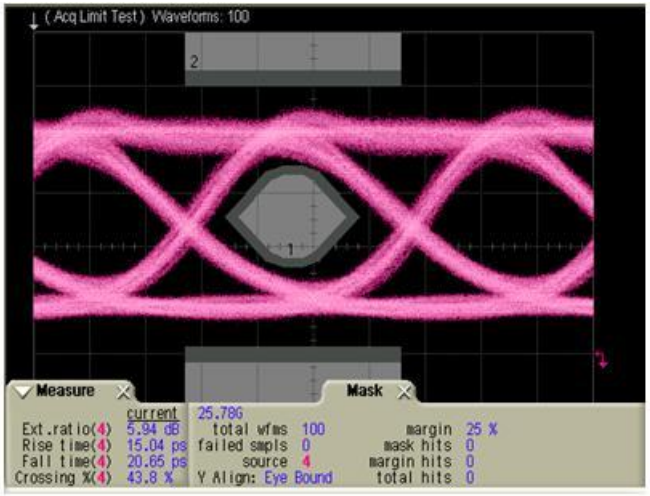
- Objectives
- DMT Simulation Model
- Simulation Results
- Conclusions

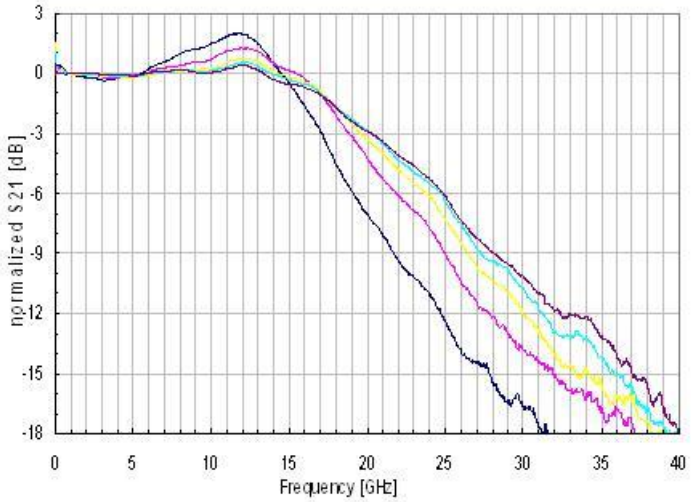
Objectives

- Quantify the penalty for 112 Gb/s DMT modulation of a DML based on LR4 production grade 25G-class DFB transmitter
- Demonstrate 112 Gb/s DMT feasibility with a moderate FFT size N = 128

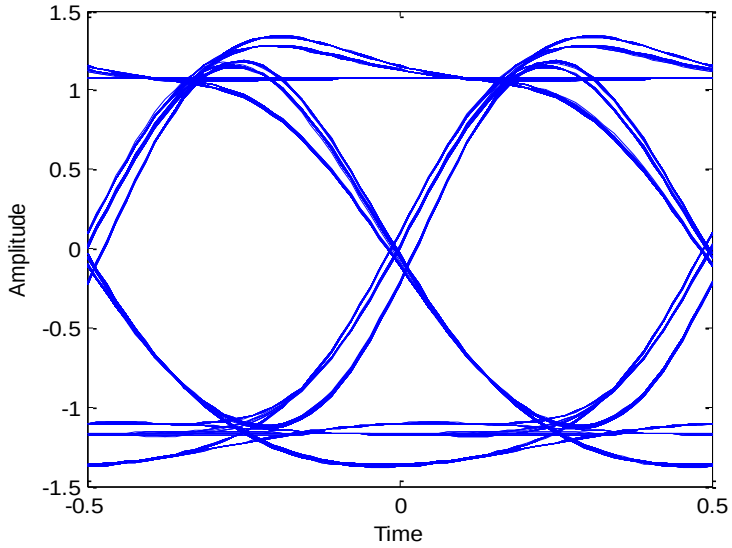
CFP2 LR4 25.8 Gb/s DFB Laser

Measurement





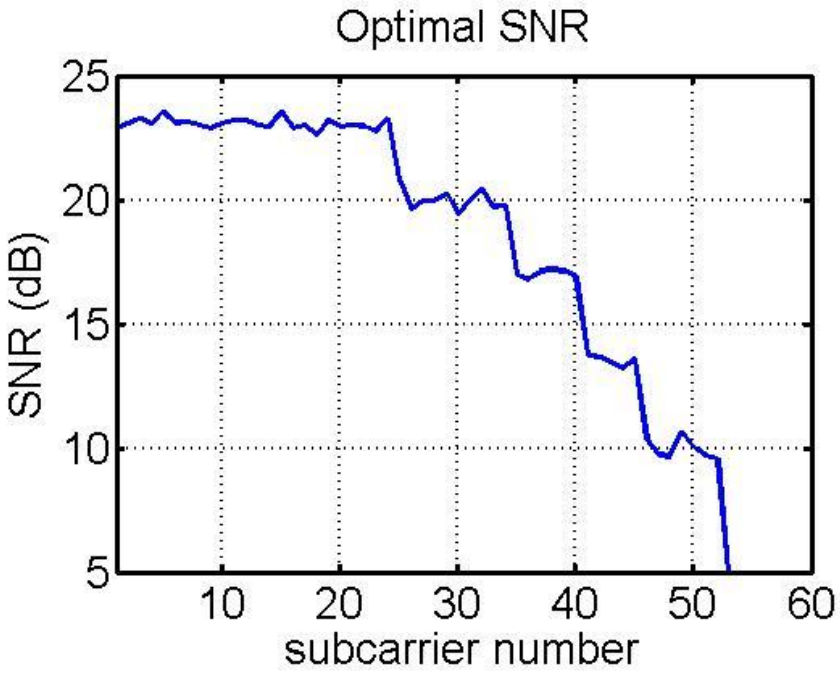
Rate Equation Model

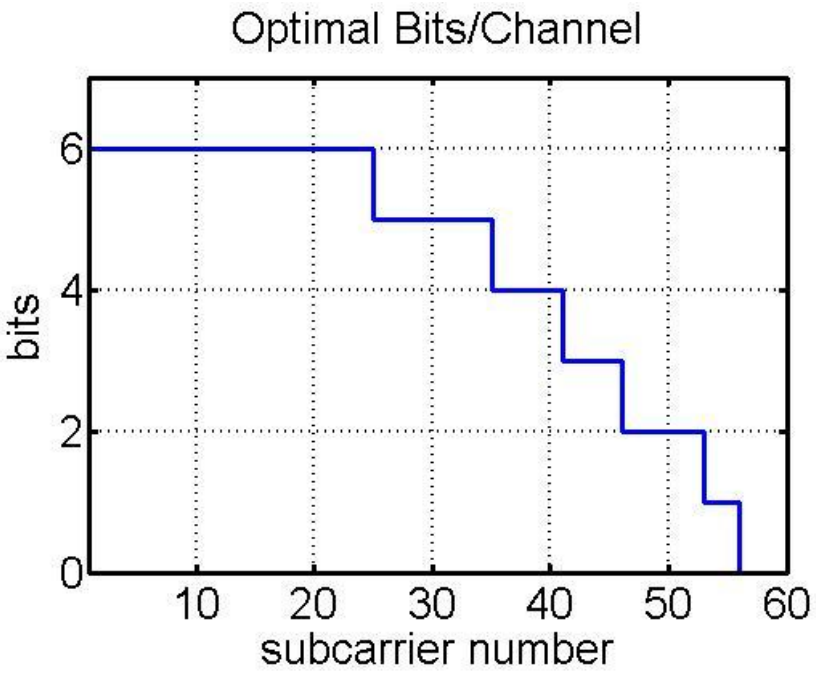


112 Gb/s DMT Simulation Parameters

Parameter	Value
Sampling rate, F_s	60 Gs/s
FFT size, N	128
Cyclic prefix, CP	4
Clipping ratio, R_{cl}	8.5 dB
QAM modulation	optimized bit loading
DAC quantization	6 bits
Tx LPF (4-pole Bessel) Bandwidth	20 GHz
Rx LPF (4-pole Bessel) Bandwidth	12 GHz
Thermal noise density, S_{th}	16 pA/sqrt(Hz)
Photodiode responsivity, ρ	0.8 A/W
DFB laser bias current and driver amplitude	similar to 25.8Gb/s LR4

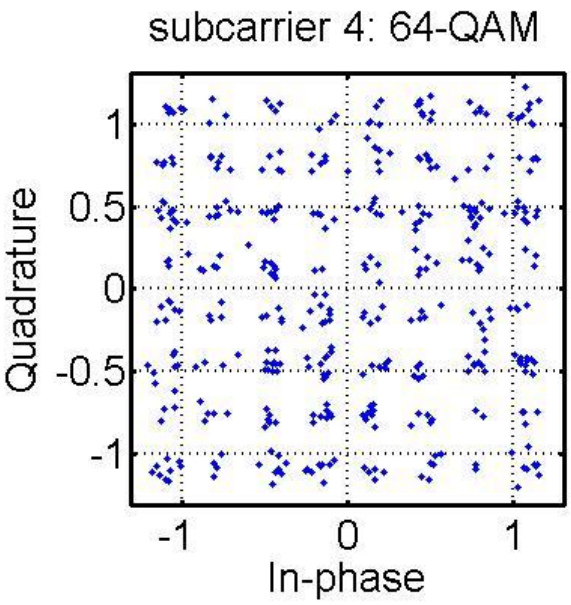
DMT Bit Loading Scheme

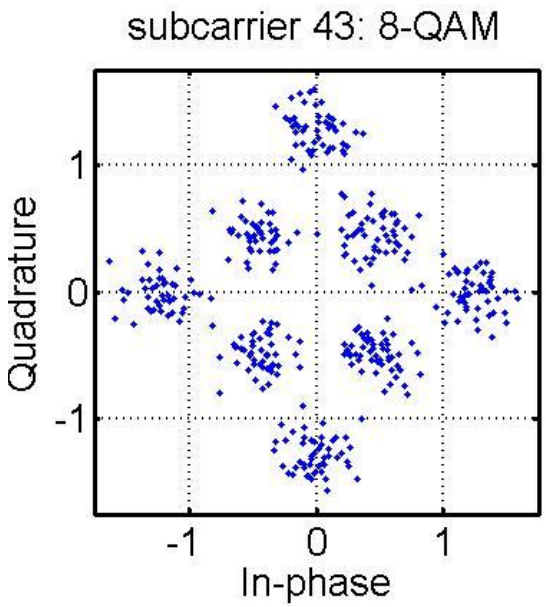


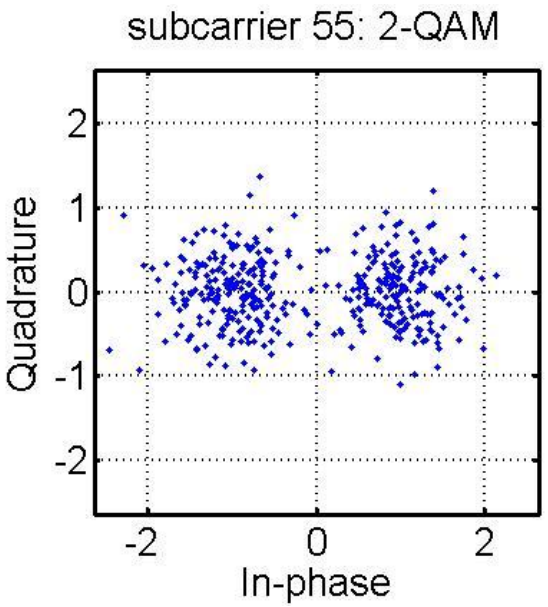


Note: Optimal SNR means after optimizing subcarrier power allocation

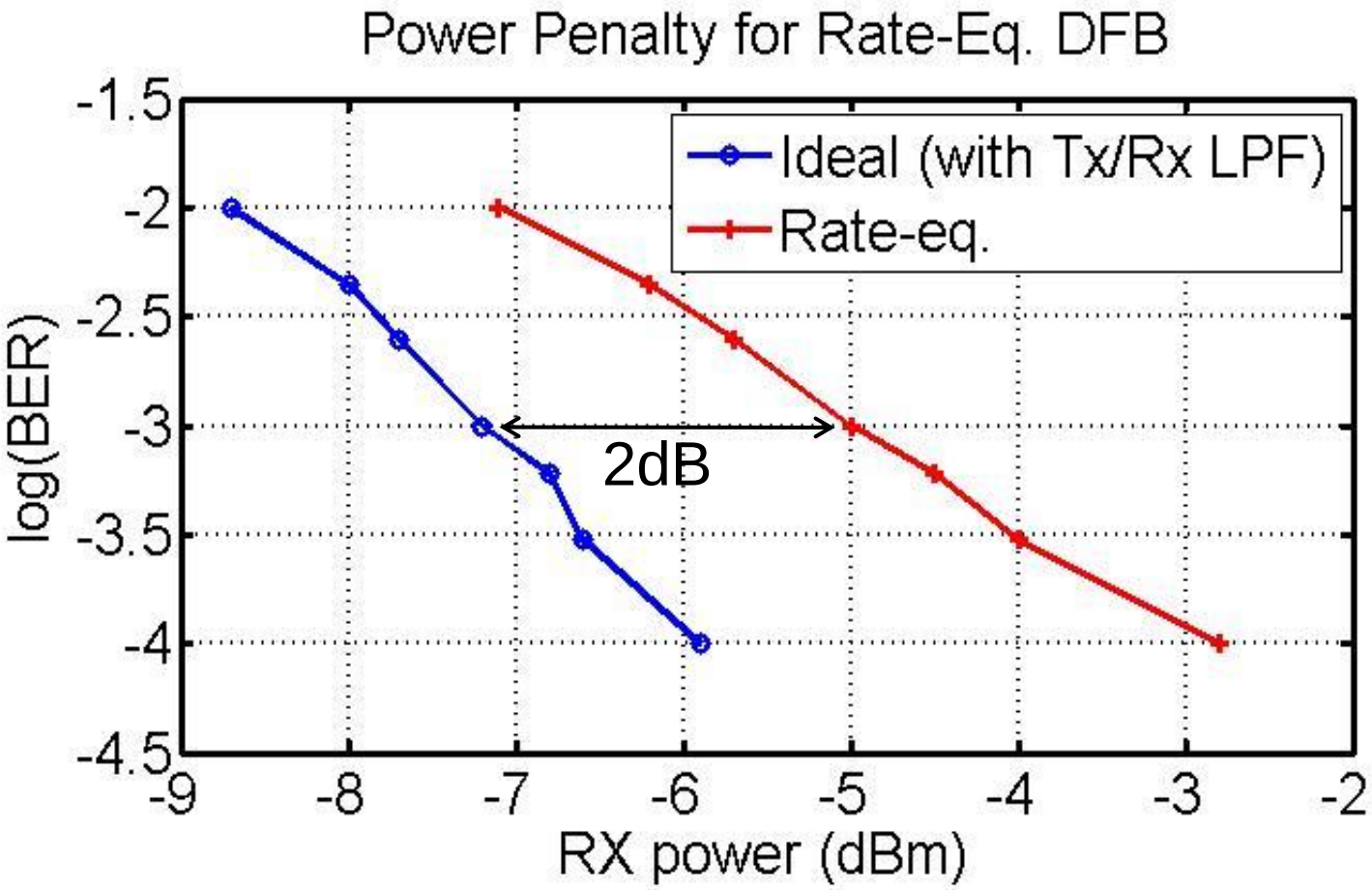
DMT Constellations (BER=1.e-3)







112 Gb/s DMT Simulation Results



FFT Size Tradeoffs

- Previous work in tanaka_01_0113_optx demonstrated feasibility of 100G DMT based on 10G-class DML transmitter using a system design with FFT size N=512
- Number of computations in FFT scales as N*Log2(N)
- DSP latency scales with DMT symbol period ~ N
- By employing a system design based on a 25G-class DFB transmitter, we show potential for reducing FFT size to N=128

Conclusions

- We presented Monte-Carlo simulation results on 112 Gb/s DMT modulation based on a realistic 25G-class DFB laser transmitter model
- The simulations demonstrate feasibility of 112 Gb/s DMT with DFB transmitter penalty ~ 2 dB at BER=1.e-3
- By employing LR4 25G-class DFB transmitters, it may be feasible to design DMT systems with a moderate FFT size N=128