

RIN Impact on Power Budget in Optical 100GbE DMT

IEEE802.3 Orlando Plenary, March, 2013

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Introduction

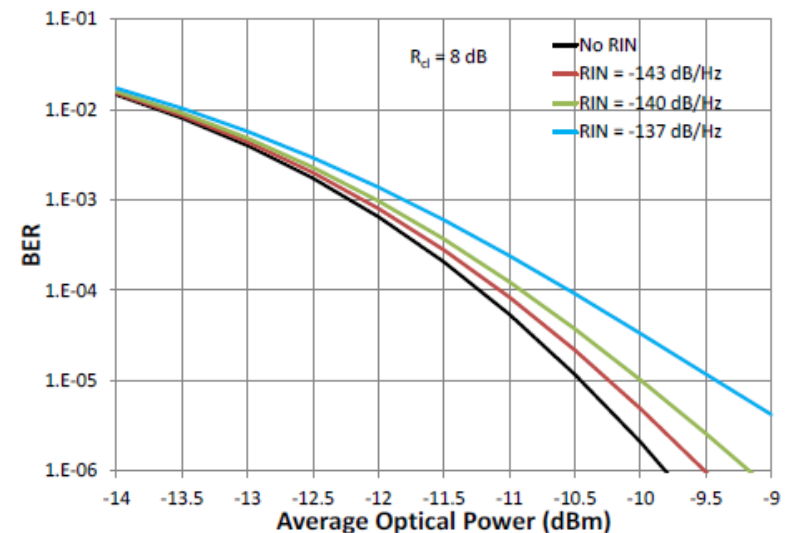
- Theoretical analysis of impact of RIN^{*1} in optical 100Gbps DMT was provided in IEEE802.3 Phoenix Interim meeting.in January, 2013.
- In this presentation, we would like to investigate (simulate) the RIN impact in the case of our condition, where we propose to use a 10G DML and the adaptive bit and power allocation algorithm.

(Ref.: I. Lyubomirsky, IEEE802.3 Interim January,2013, lyubomirsky_01_0113_optx)

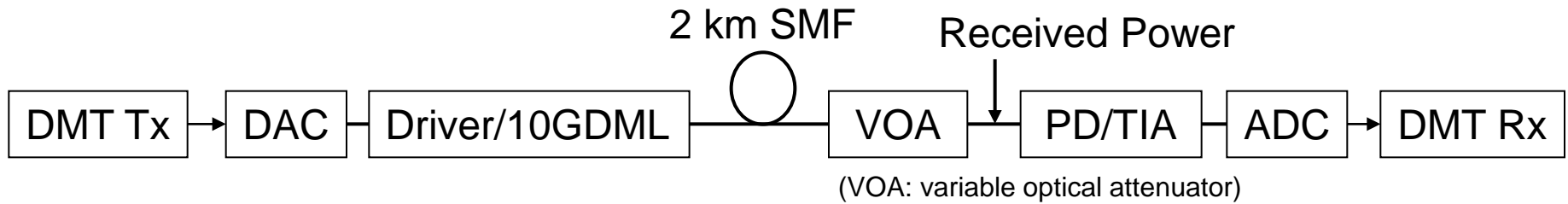
Monte-Carlo Simulation Parameters

Parameter	Value
Sampling rate, F_s	60 Gs/s
FFT size, N	128
Number of nonzero subcarriers, N_{sc}	55
High freq. subcarriers padded to zero	8
DC subcarriers padded to zero	1
Cyclic prefix, CP	4
Clipping ratio, R_{cl}	8 dB
<u>QAM modulation order, M</u>	<u>16</u>
<u>Noise bandwidth, Δf</u>	<u>25.8 GHz</u>
Thermal noise density, S_{th}	16 pA/sqrt(Hz)
Photodiode responsivity, ρ	0.8 A/W

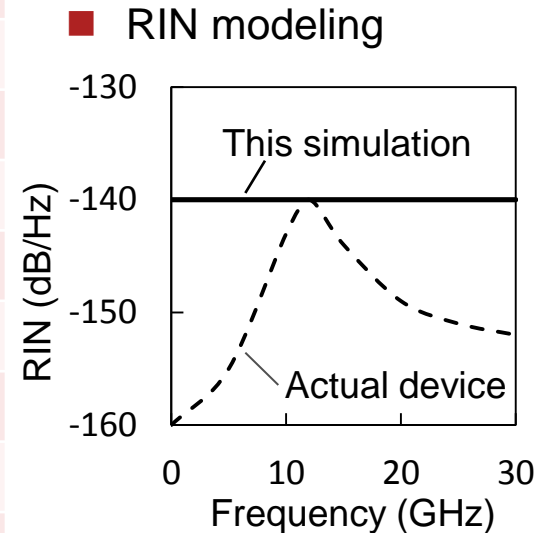
Impact of RIN



Simulation Model for Optical 100Gbps DMT

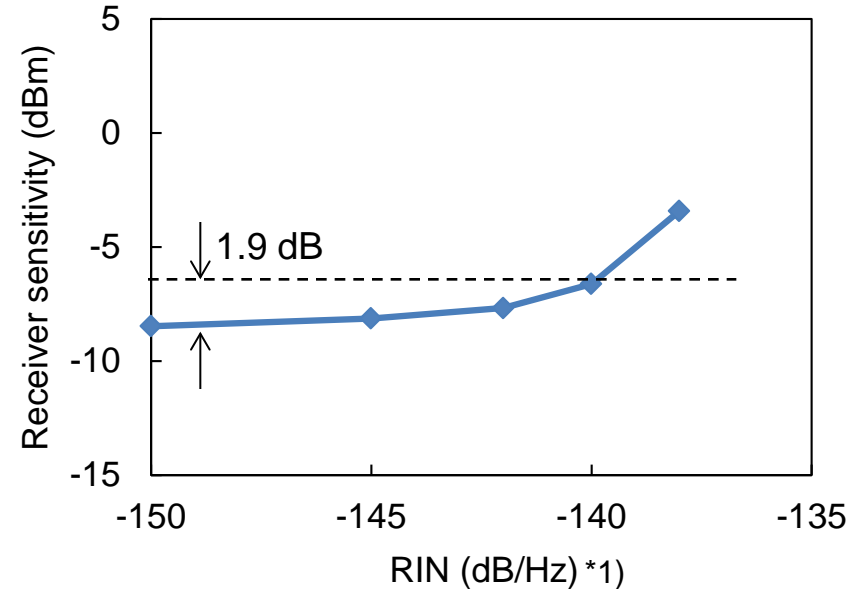
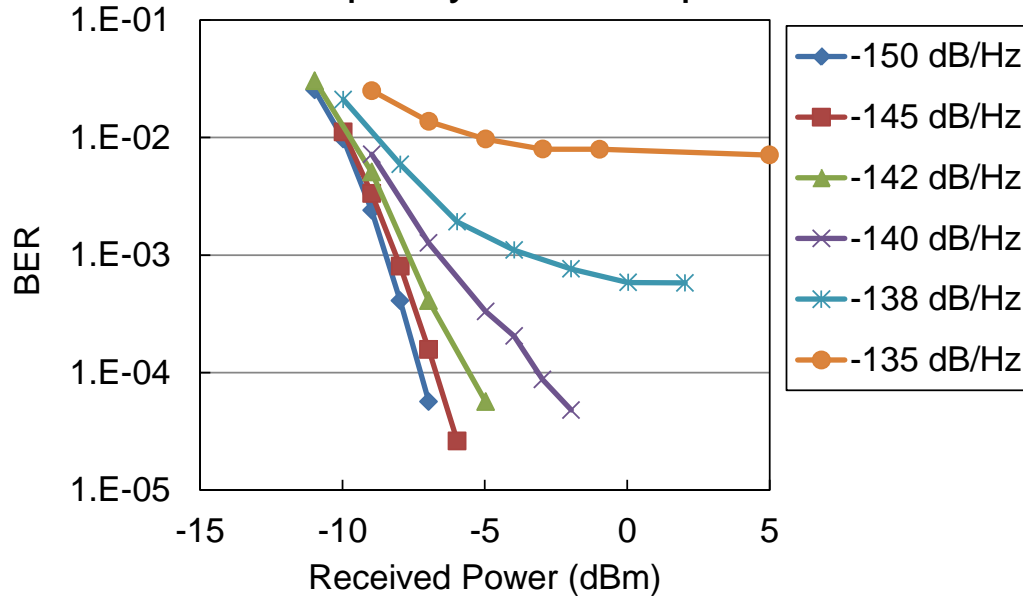


Parameter	Value	Note
DAC/ADC Sampling rate	64 GS/s	
DAC-bandwidth	15 GHz	4 th Bessel
ADC-bandwidth	18 GHz	4 th Bessel
Driver/10GDML-bandwidth	14 GHz	4 th Bessel
PD/TIA-bandwidth	18 GHz	4 th Bessel
Target capacity	112 Gbps	
DML-RIN	-135 ~ -150 dB/Hz	→
DML-linewidth	20 MHz	
DML-chirp	3.5	
PD responsivity	0.8 A/W	
PD/TIA-noise	15 pA/√Hz	
Subcarrier (SC) Number	256	Cyclic Prefix: 16



Simulation Results

Capacity = 112 Gbps



- When the RIN was less than -140dB/Hz
 - The achievable receiver sensitivity: < -6.6 dBm
 - Impact on the receiver sensitivity: < 1.9 dB

*1) Relative Intensity Noise (RIN) is modeled as a white optical noise.

This is worst-case calculations because normally the frequency band width is limited.

Summary

- Investigation (simulation) of RIN impact on power budget in optical 100Gbps DMT with 10G DML
- For the capacity of 112 Gbps
 - The receiver sensitivity of < -6.6 dBm was achieved by RIN less than -140 dB/Hz.
 - Impact on the receiver sensitivity was < 1.9 dB when the RIN was less than -140 dB/Hz.

Thank you