Impact of Clipping for Optical DMT

IEEE802.3bs, SMF Ad Hoc

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Masato Nishihara, Toshiki Tanaka, Tomoo Takahara, Jens C. Rasmussen

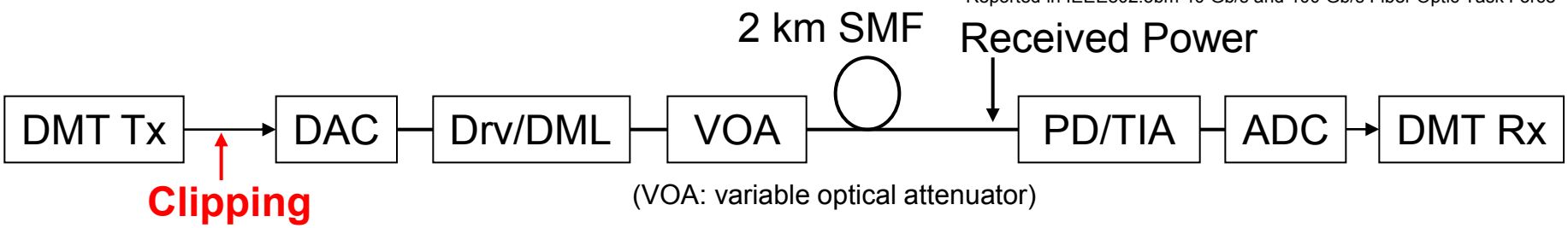
Fujitsu Laboratories Ltd.

Introduction

- We reported simulation results for the impact of “Clipping level” in IEEE802.3bm 40Gb/s and 100Gb/s Fiber Optic Task Force on July 2013.
- We re-posted these results to 400Gb/s Ethernet Task Force for confirmation of the influence of clipping penalty to the DMT characteristics.

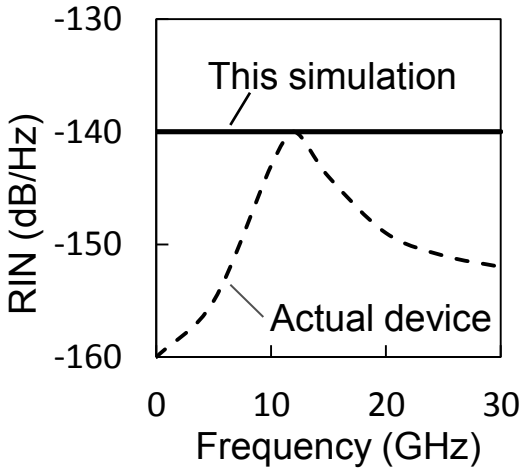
Recap: Simulation Model for Optical 100Gbps DMT

Reported in IEEE802.3bm 40 Gb/s and 100 Gb/s Fiber Optic Task Force



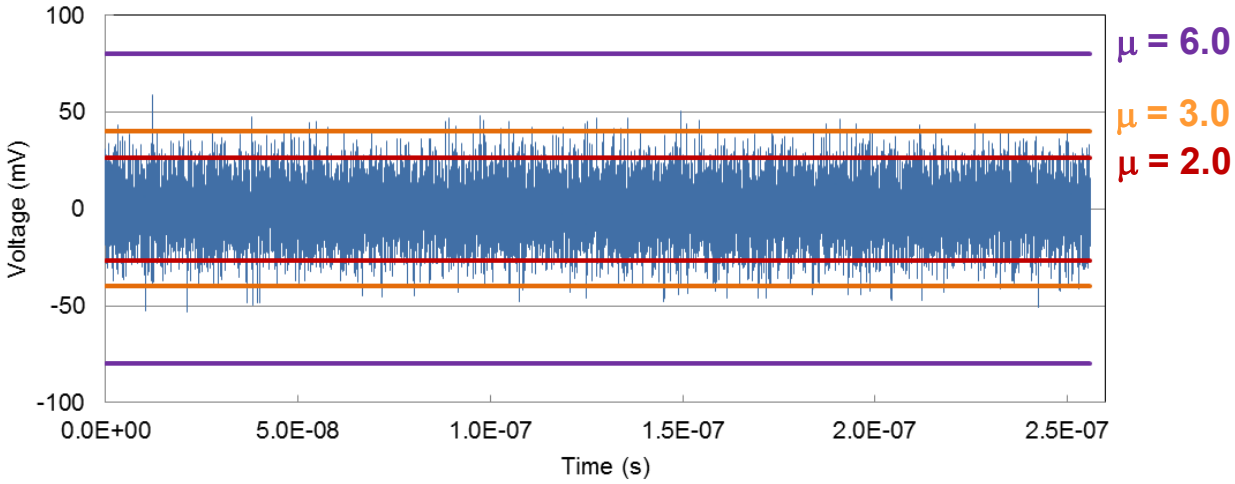
Parameter	Value	Note
DAC/ADC Sampling rate	64 GS/s	
DAC-bandwidth	15 GHz	4th Bessel
ADC-bandwidth	18 GHz	4th Bessel
Drv/10GDML-bandwidth	14 GHz	4th Bessel
PD/TIA-bandwidth	18 GHz	4th Bessel
Target capacity	116 Gbps	
DML-RIN	-140 dB/Hz	→
DML-linewidth	20 MHz	
DML-chirp	3.5	
PD responsivity	0.8 A/W	
PD/TIA-noise	15 pA/√Hz	
Subcarrier (SC) Number	256	Cyclic Prefix: 32

■ RIN modeling



Recap: Clipping of DMT signal

Reported in IEEE802.3bm 40 Gb/s and 100 Gb/s Fiber Optic Task Force

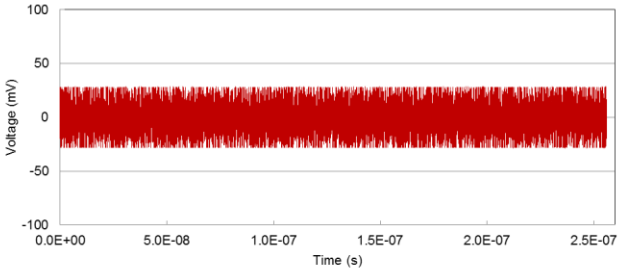


$X = -1 \cdot \mu$ if $x<\mu$, $x<0$
$X = x$ if $|x|<\mu$
$X = \mu$ if $x>\mu$, $x>0$

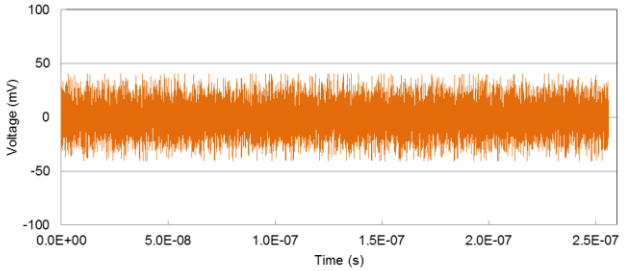
μ: Clipping level

Clipped DMT signal

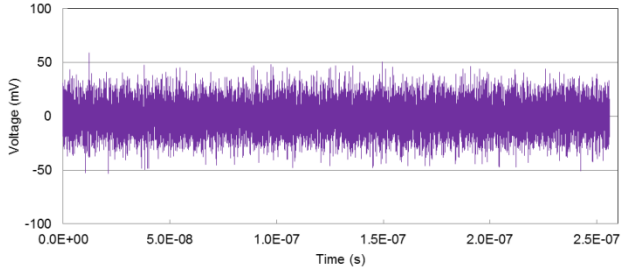
$$\text{Crest factor} = \frac{|x|_{peak}}{x_{rms}}$$



μ = 2.0
Crest factor: 2.14



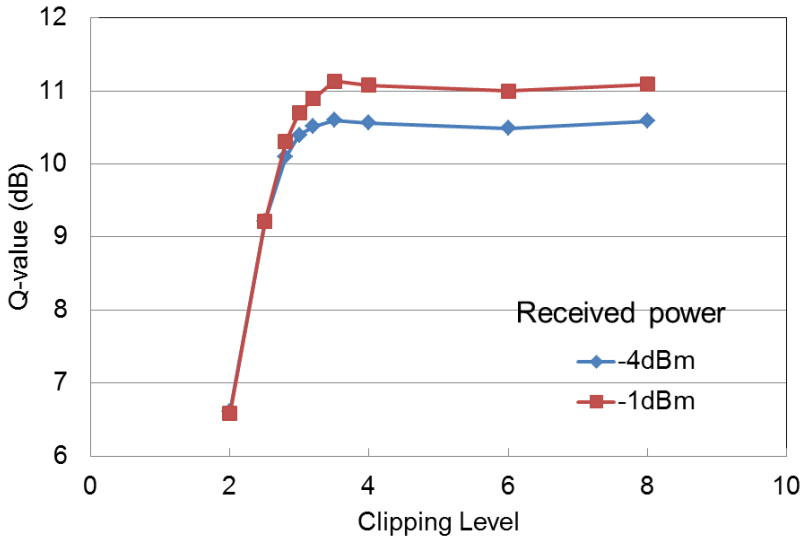
μ = 3.0
Crest factor: 3.05

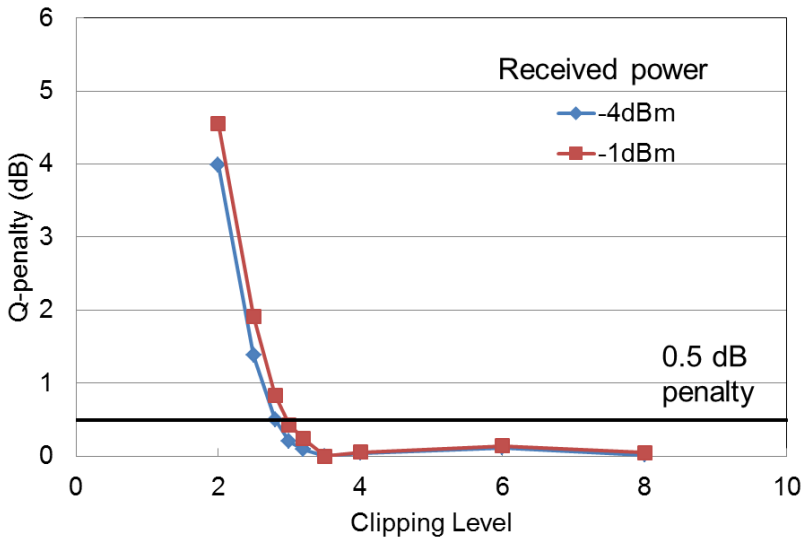


μ = 6.0
Crest factor: 4.44

Recap: Impact of Clipping

Reported in IEEE802.3bm 40 Gb/s and 100 Gb/s Fiber Optic Task Force





- No degradation due to thermal noise as shown in “Iyubomirsky_01_0113_optx” for minimum received power of -4dBm.
- Q penalty less than 0.5 dB is achieved by clipping level 3 or larger.

Summary

- Simulation of impact of clipping level on level diagram in optical DMT
- Q penalty less than 0.5 dB is achieved by clipping level of 3 or larger.
- Clipping penalty has already been included in our previous results of the experiment and simulation.

Thank you