Considerations on TBDs in D0.1

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Outlines

- Introduction
- TDECQ vs. OMA, Averaged Power and ER for low cost consideration
- Overshoot considerations due to pre-emphasis
- Summary

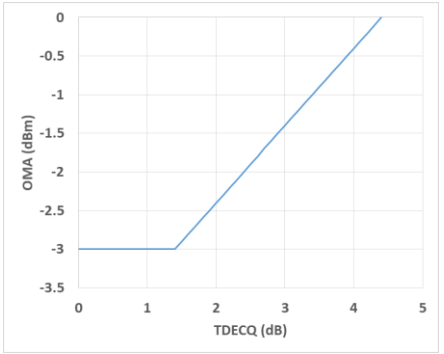
Introduction

- There are 6+ main TBDs left in D0.1. The main goal is to balance Tx and Rx for low cost.
- The TDECQ vs. averaged power is analyzed in this work to add extra dimension for low cost consideration.
- The overshoot was proposed to limit the penalty of error floor in 802.3cu (rodes_3cu_01a_052620).
- The effect of pre-emphasis on overshoot is investigated in the following slides.

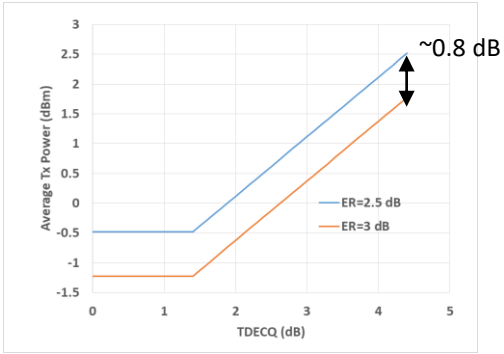
TDECQ vs. OMA, Averaged Power and ER for low cost

Transmitter excursion, each lane (max)	2		dBm
Transmitter overshoot/undershoot as a fraction of OMA_{outer}	TBD	TBD	
Launch power in OMA_{outer} minus TDECQ (min)	TBD	-4.4	dBm
TECQ, each lane (max)	TBD	4.4	
TDECQ, each lane (max)	TBD	4.4	dB
Average launch power of OFF transmitter, each lane (max)	-30		dB
Extinction ratio, each lane (min)	2.5		dB

Murty_3db_01_021821



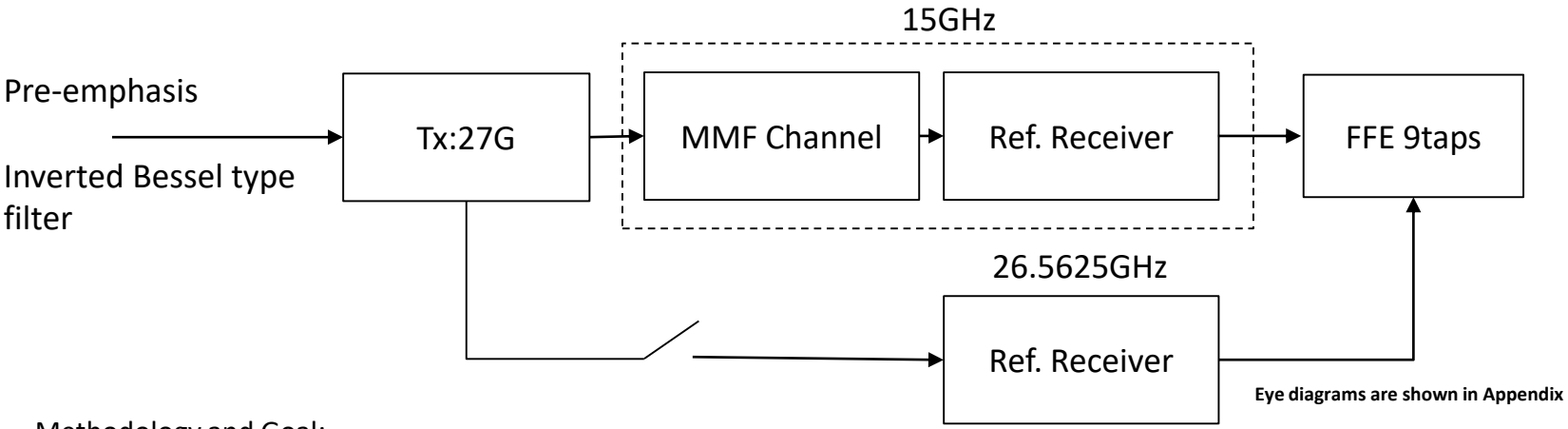
TDECQ vs. OMA



TDECQ vs. Averaged Power

- 0.5 dB ER relaxation results in 0.8 dB higher requirement on LD averaged power at same TDECQ value.
- Suggest to take into account feasibility of VCSEL averaged power while considering low cost. Balance between Tx and Rx. (Of course it is vender's freedom to design the module solution)

Overshoot considerations due to pre-emphasis（1）



Methodology and Goal:

- The simulation/analysis is mainly for effect of pre-emphasis on overshoot before and after fiber. The VCSEL impairment (eye-skew, oscillation relaxation, nonlinear L-I curve) should be investigated to match overshoot of Tx.

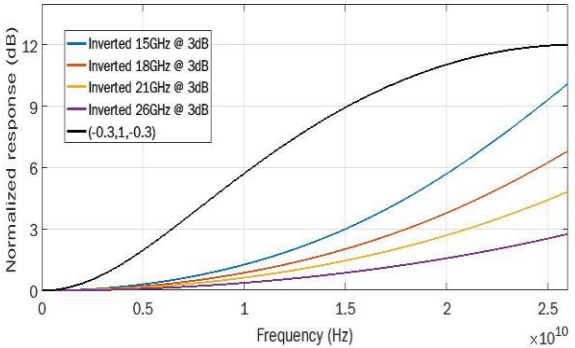
- The Ceq is calculated as follow with N(f) bandwidth equal to **26.5625GHz**, with FFE taps equal to 9.

$$C_{eq} = \sqrt{\int_f N(f) \times |H_{eq}(f)|^2 df}$$

- Scan the pre-emphasis strength to investigate the overshoot before and after fiber.

Overshoot considerations due to pre-emphasis (2)

- If pre-emphasis is aimed to compensate the MMF channel, a large overshoot would occur before fiber.
- If pre-emphasis is aimed to compensate the device, there might be >1 dB residue ISI penalty after fiber.
- Suggest to monitor the overshoot/undershoot parameters both at obtb and at longest reach.
- Suggest to have more investigations on overshoot to limit penalty of error floor (rodes_3cu_01a_052620).



Normalized pre-emphasis frequency response

	Response BW =15 GHz		Response BW =26.5625 GHz	
Pre-emphasis 3dB BW	Ceq (dB)	Overshoot	Ceq (dB)	Overshoot
15G	0.2	3%	-1.2	51%
18G	0.8	<3%	-0.6	16%
21G	1.3	NA	-0.1	5%
27G	1.8	NA	0.3	3%
(-0.3,1,-0.3)	-0.4	15%	-1.6	>50%

Summary

- Suggest to take into account feasibility of VCSEL averaged power while considering low cost.
- The effect of pre-emphasis on overshoot is investigated using simplified model. Suggest to monitor the overshoot/undershoot parameters both at obtb and at longest reach.
- Suggest to have more investigations to limit overshoot concerns.

Thank you

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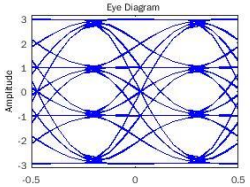
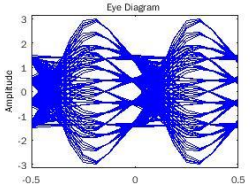
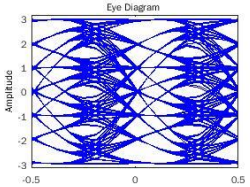
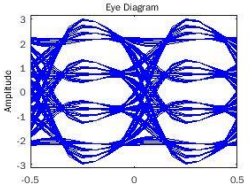
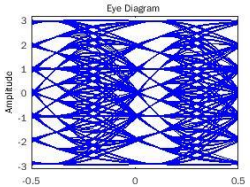
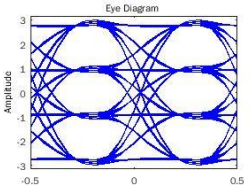
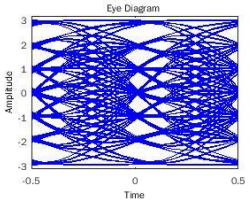
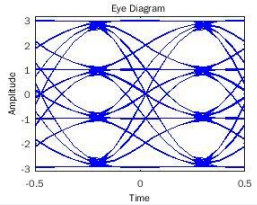
Appendix: Eye-diagrams with different pre-emphasis

	15GHz	26GHz
15G @ 3dB		
18G @ 3dB		
21G @ 3dB		
27G @ 3dB