Receiver Sensitivity Analysis for Baseline Proposal

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Feb 18, 2021
IEEE P802.3db Short Reach Fiber Task Force Interim

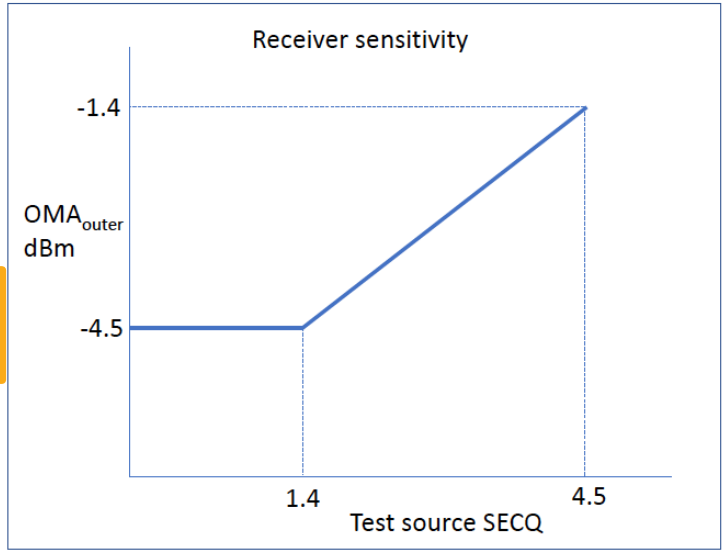
Introduction

- There is a broad existing user base around MMF on top of the new applications under consideration in 802.3db
- Expectations are that costs will be low
- We know that two factors are key to achieving this:
  - Good manufacturing margin and yield
  - Broad supply base of components
- When reviewing the current proposed baseline, it is observed that the 1.5 dBo theoretical SNR penalty to move from 50 Gb/s → 100 Gb/s in the current proposed baseline is just pushed to the receiver with no relaxation
  - This is inconsistent with what was done on SMF interfaces
  - Risks impacting the two key factors mentioned above

Receiver Sensitivity Estimate – Previous Study

Jonathan King, "100 Gb/s PAM4 VCSEL Links – Feasibility, Strawman Link Budget", June 2019, T11-2019-00161-v000.pdf

- 53 Gb/s PAM4: receiver sensitivity was specified at -6.5 dBm for an SECQ of 1.4 dBm
- 112 Gb/s PAM4: strawman receiver sensitivity estimated at -4.5 dBm for test source SECQ of 1.4 dBm
  - 2 dB higher than for 50 Gb/s, and consistent with receiver sensitivities of single mode 100 Gb/s optics
- The rest of link budget is built up from receiver sensitivity, assuming similar TDECQ (fibre and reach TBD) and insertion loss allocations



Receiver Sensitivity IEEE 50G SMF vs 100G SMF

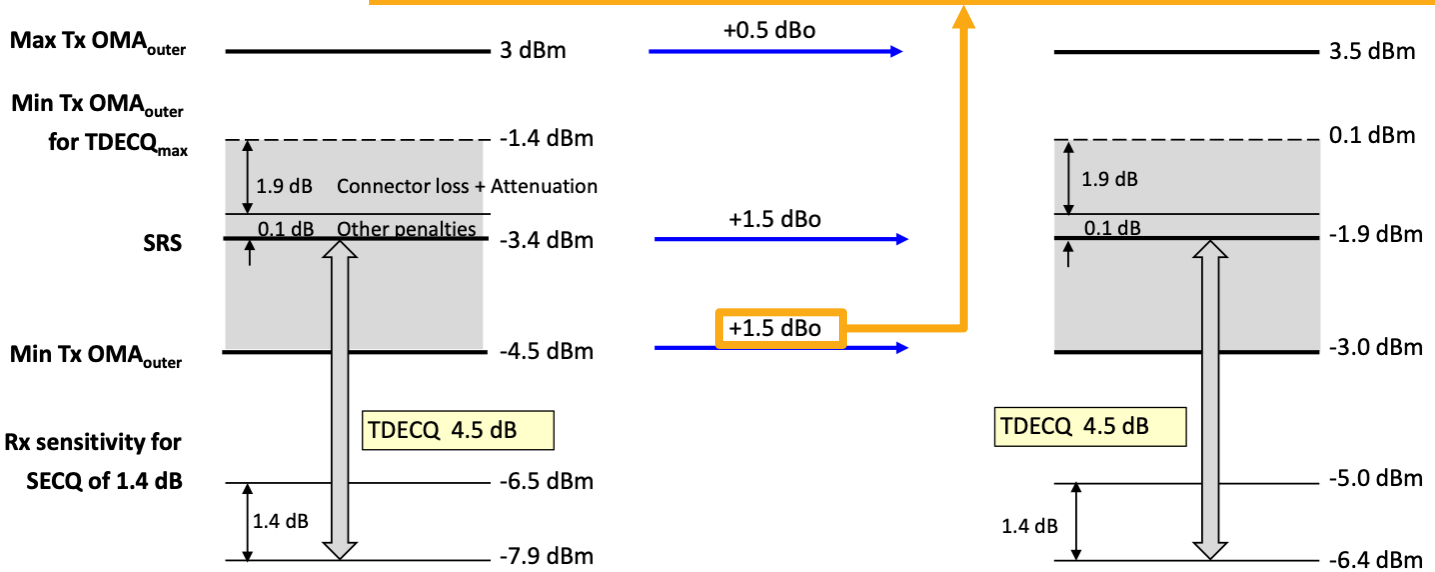
	200GBASE-DR4 802.3cn	100GBASE-DR 802.3cu	Unit
TDECQ	3.2	3.4	dB
Launch power in OMA_{outer} minus TDECQ (min)	-4.4	-2.2 (ER>=5dB) -1.9 (ER<5dB)	dBm
Stressed receiver sensitivity (OMA_{outer}), Each Lane, Max	-4.3	-1.9	dBm
Receiver sensitivity (OMA_{outer})	Max(-3.9, SECQ-7.5)	Max(-6.1, SECQ-5.3)	dBm

Receiver sensitivity for 100G SMF is 2.2dB – 2.4dB higher than for 50G SMF

Current Baseline Proposal

Issue with the current baseline proposal:

- 1.5dB of signal power increase is needed just to maintain SNR when bandwidth doubles while noise density remains the same.
- Other factors such as noise density degradation by bandwidth scaling, DSP quantization noise and crosstalk can result in additional penalty.

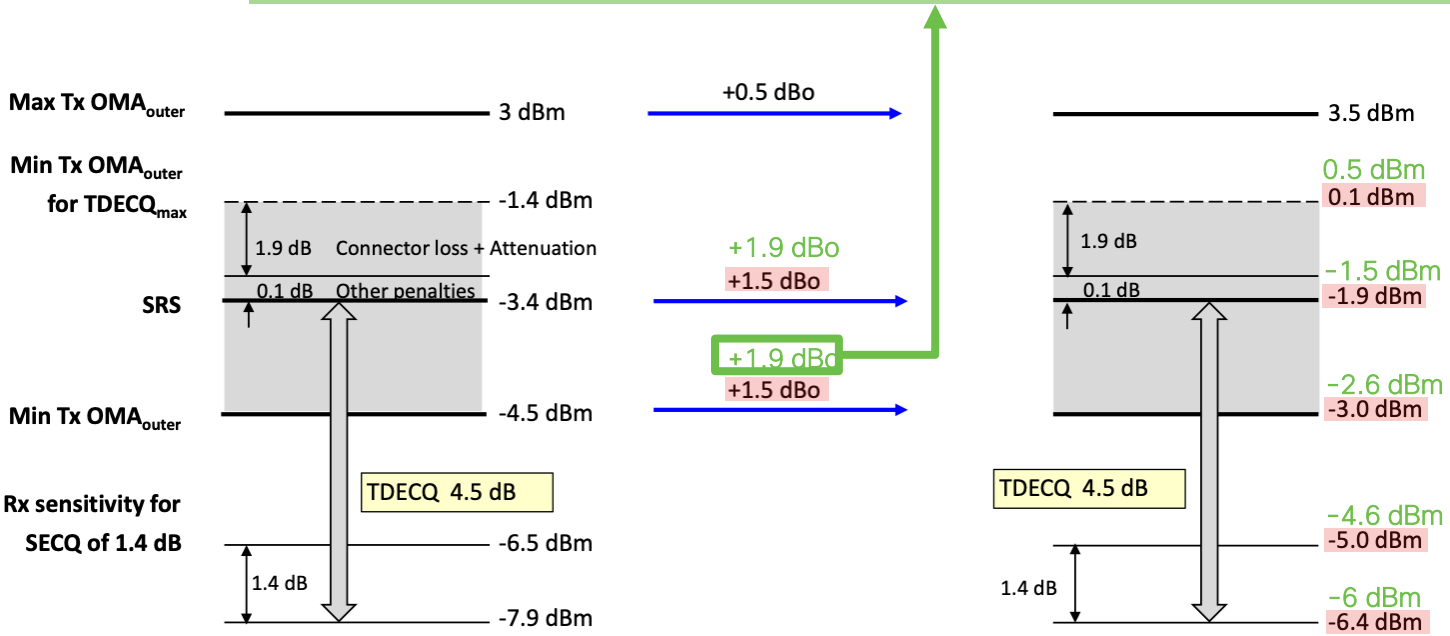


802.3cd 50GBASE-SR, 26.5625GBd, 100m OM4

802.3db 100GBASE-xR, 53.125GBd, 100m OM4

Changes Proposed

Propose to add 1.9dB instead of 1.5dB for 100G to allow some margin at RX



802.3cd 50GBASE-SR, 26.5625GBd, 100m OM4

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Changes Proposed

	Characteristics	802.3cd 50GBASE-SR 100m OM4	802.3db 100GBASE-SR Baseline Proposal "murty_3db_adhoc_01a_121720"	Changes Proposed to 802.3db 100GBASE-SR Baseline Proposal	Unit
TX	Average launch power, each lane (min)	-6.5	-5	-4.6	dBm
	Output OMA_{outer}, each lane (min)	-4.5	-3	-2.6	dBm
	Launch power in OMA_{outer} minus TDECQ (min)	-5.9	-4.4	-4	dBm
RX	Average receiver power, each lane (min)	-8.4	-6.9	-6.5	dBm
	Stressed receiver sensitivity OMA_{outer}, each lane (max)	-3.4	-1.9	-1.5	dBm
	Receiver sensitivity OMA_{outer}, each lane (min)	Max(-5, SECQ-7.9)	Max(-5, SECQ-6.4)	Max(-4.6, SECQ-6)	dBm

Summary

Maintaining focus on lower cost requires considering the manufacturability and yield of 802.3db PMDs

Accommodating the higher speed SNR penalty should be considered carefully