Baseline proposal of 25GBASE-BR30 PMD

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IEEE P802.3cp Bidirectional 10G, 25G, and 50G Optical access PHYs

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Motion#4 in Salt Lake City meeting

Motion # 4

Move to use the existing 10GBASE-ER, 25GBASE-ER, and 50GBASE-ER optical Tx and Rx characteristics for the 10GBASE-BER, 25GBASE-BER, and 50GBASE-BER optical Tx and Rx characteristics (tables 158-12, -13; 159-6, -7; 160-6, -7) with the exception of operating wavelength, and with the caveat that TDP/TDEC(Q) will need to be re-evaluated.

Moved: Frank Effenberger Second: Han Hyub Lee

For: 8 Against: 0 Abstain: 0

Technical (≥ 75%) Motion Passed

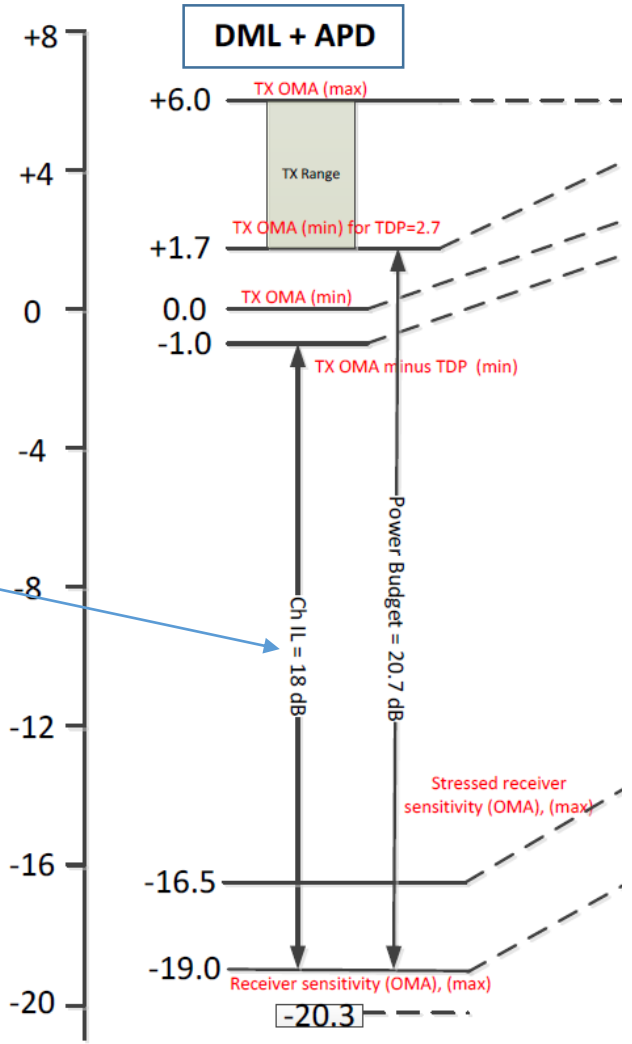
- From the motion#4, 25GBASE-BER (or BR30) may use same PMD parameter values of 25GBASE-ER. But, BR30 power budget have 2 dB GAP against 25GBASE-ER power budget due to access loss components.
- In this contribution, we discuss an approach to compromise 2 dB GAP between 25GBASE-ER and 25GBASE-BR30 and propose a baseline of 25GBASE-BR30 PMD.

25GBASE-ER Link Budget

Table 114–8—25GBASE-LR and 25GBASE-ER illustrative link power budgets

Parameter	25GBASE-LR	25GBASE-ER		Unit
Power budget (for maximum TDP)	9.7	20.7		dB
Operating distance	10	30	40[a]	km
Channel insertion loss	6.3[b]	15[b]	See 114.9[a]	dB
Maximum discrete reflectance	See 114.10	See 114.10		dB
Allocation for penalties[c] (for maximum TDP)	3.4	20.7 minus maximum channel insertion loss per Table 114–12		dB
Additional insertion loss allowed	0	Maximum channel insertion loss per Table 114–12 minus 15	0	dB

18dB



Channel insertion loss
= Fiber loss + Connector loss + Margin

25GBASE-ER PMD was determined considering 25G DML Tx with 4 dB ER and 25G APD Rx and target BER=5E-5.

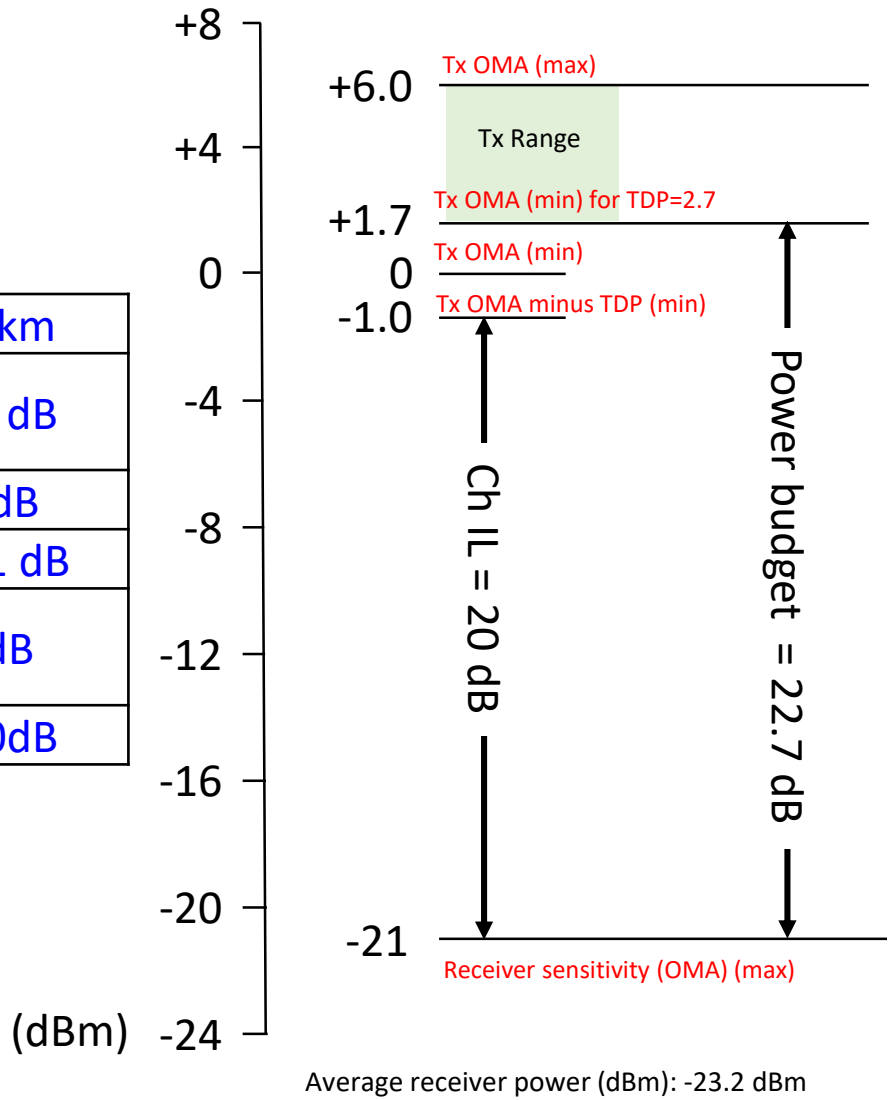
http://www.ieee802.org/3/cc/public/16_10/lewis_3cc_01_1016.pdf

25GBASE-BR30 Power Budget

Channel insertion loss

Distance (km)		30 km
6 Connector loss	0.35 dB each x 6 per link	2.1 dB
Splice loss	0.1 dB each x 1/km	3 dB
Fiber loss	0.47 dB/km	14.1 dB
Repair/ageing margin	1 dB	1dB
Total		~20dB

The 40 km optical access objective
http://www.ieee802.org/3/cp/public/1906/OpticalAccess40km.pdf



Average receiver power (dBm): -23.2 dBm

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Extend Power Budget: FEC (BER=1E-3)

- A simple way to extend PMD spec is decreasing a receiver sensitivity by changing a target BER from 5E-5 to 1E-3 so that ~2-dB optical gain is achievable. (ex. RS 255,223)

FEC gain: Optical FEC gain is different from electrical FEC gain

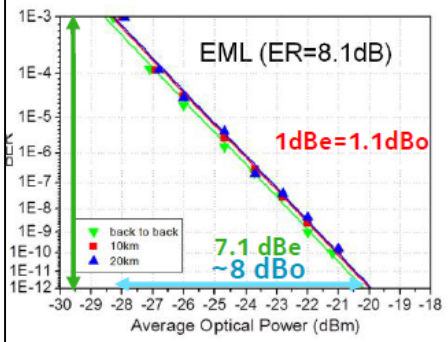
Due to optical receiver noise:

- APD receiver case

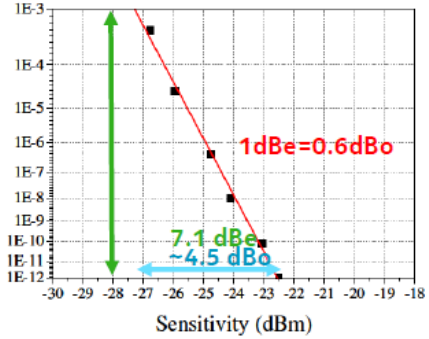
0.7-0.9 × electrical gain (depending on thermal/shot noise ratio)

>1 × electrical gain (practical links)

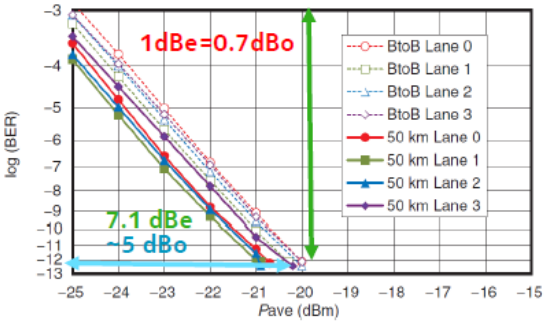
However the slope is important to determine optical FEC gain relative to RS(255,223)



pan_3ca_1_0916.pdf



M. Huang et al. ,"Breakthrough of 25Gb/s Germanium on Silicon Avalanche Photodiode" OFC 2016, Tu2D.2.



T. Yoshimatsu et al., "Compact and high-sensitivity 100-Gb/s (4 × 25 Gb/s) APD-ROSA with a LAN-WDM PLC demultiplexer," Opt. Express **20**, B393-B398 (2012)

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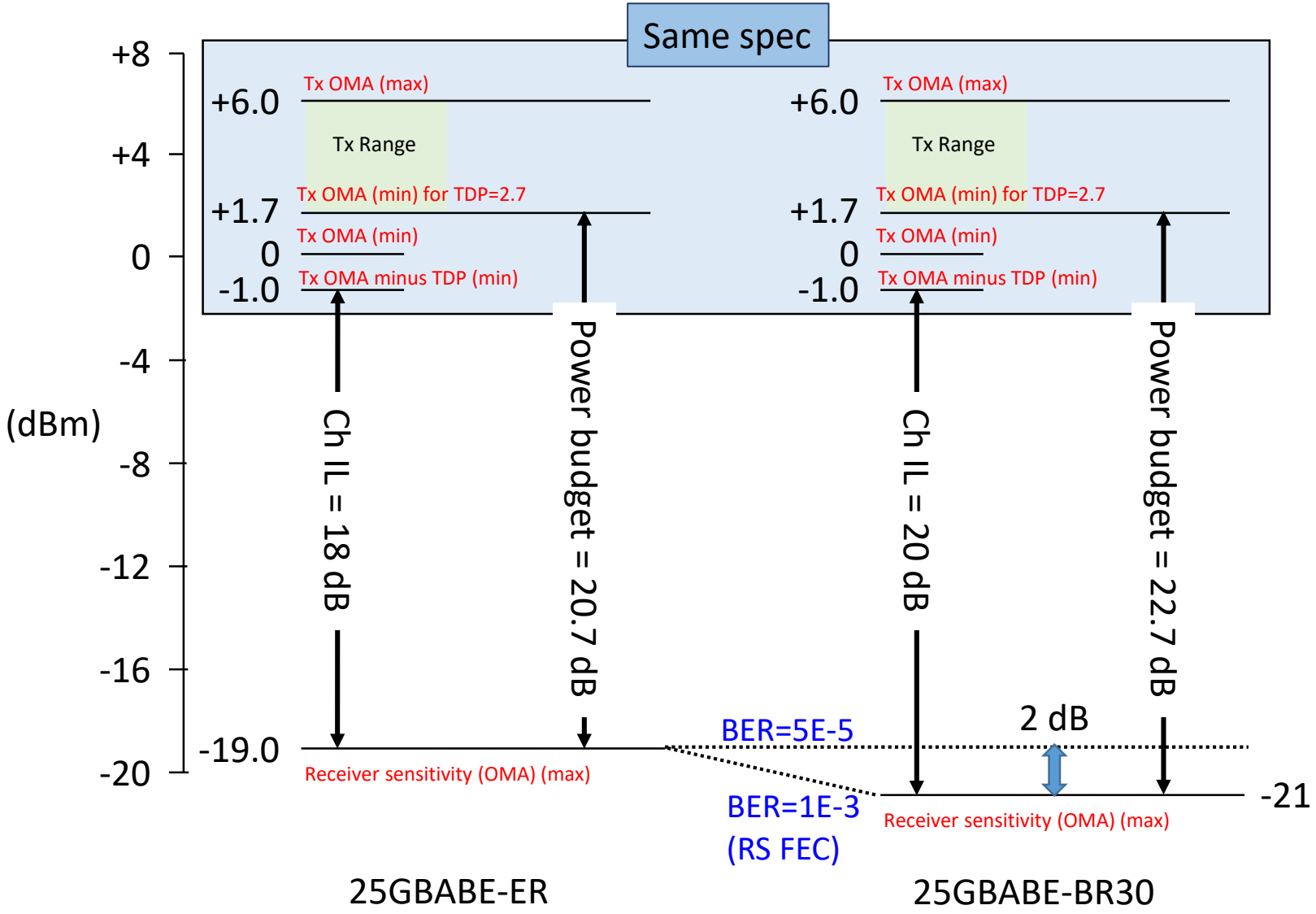

Thanks!