

400G-PSM4: A Proposal for the 500m Objective using 100 Gb/s per Lane Signaling

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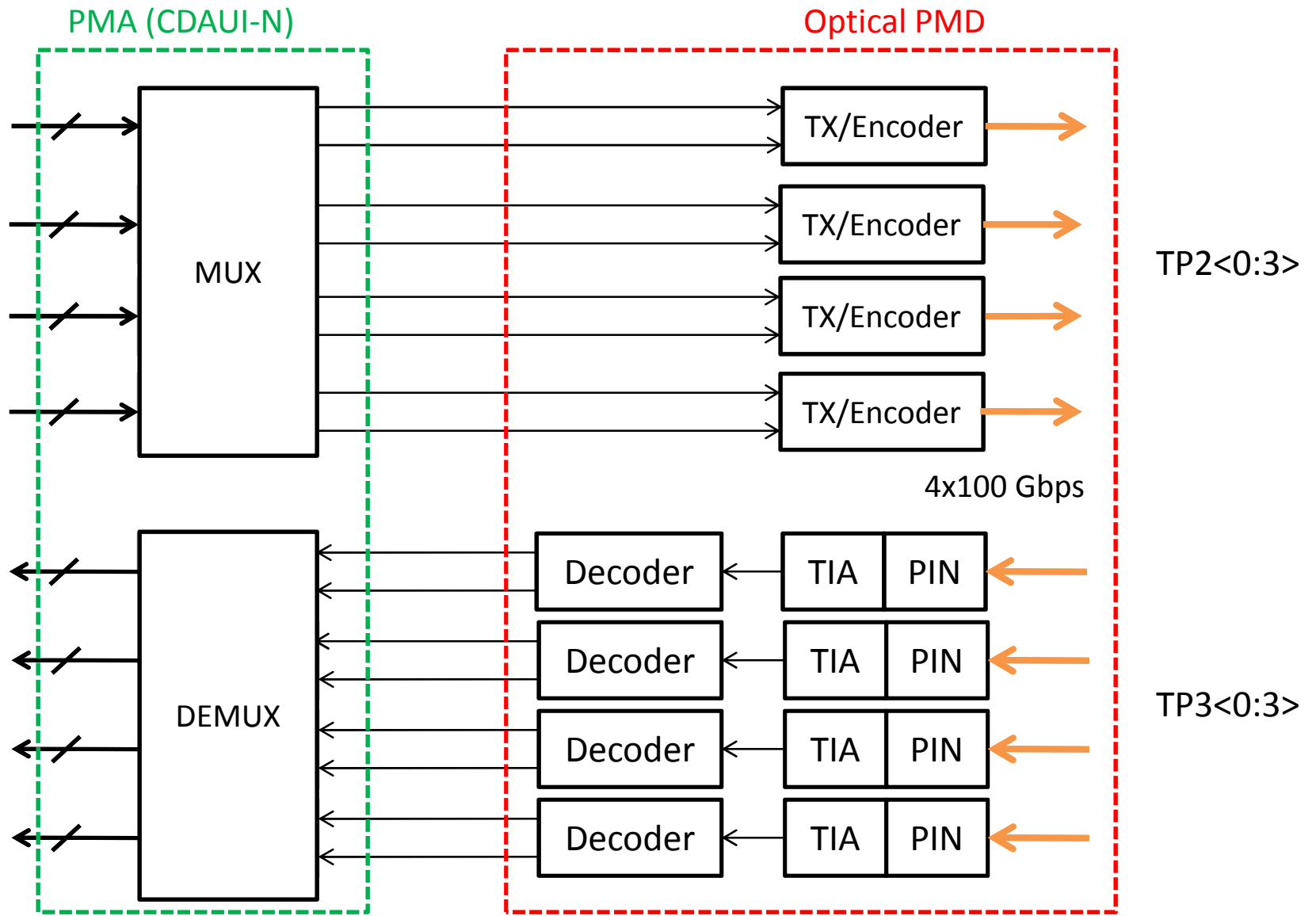
400G-PSM4

- Proposal: A 4x100 Gb/s parallel SMF interconnect to satisfy the 500m objective.
- Lane Speed: 100 Gb/s per lane using 50 GBaud-PAM4 optical signaling
- Corrected BER < 1e-15
- Single wavelength solution

Technical Updates Since Last Meeting

- Changed to KP4 type FEC
 - Common FEC with longer reach objectives
 - Corrected BER < 1e-15
 - Assuming host side “end-to-end” FEC
- Power Budget Changes
 - TX OMA increased by 0.5 dB
 - RX Sensitivity increased by 0.3 dB
 - Power Budget increased by 0.2 dB
- Prior Baseline Proposal:
http://www.ieee802.org/3/bs/public/15_01/welch_3bs_01a_0115.pdf

400G-PSM4 Block Diagram



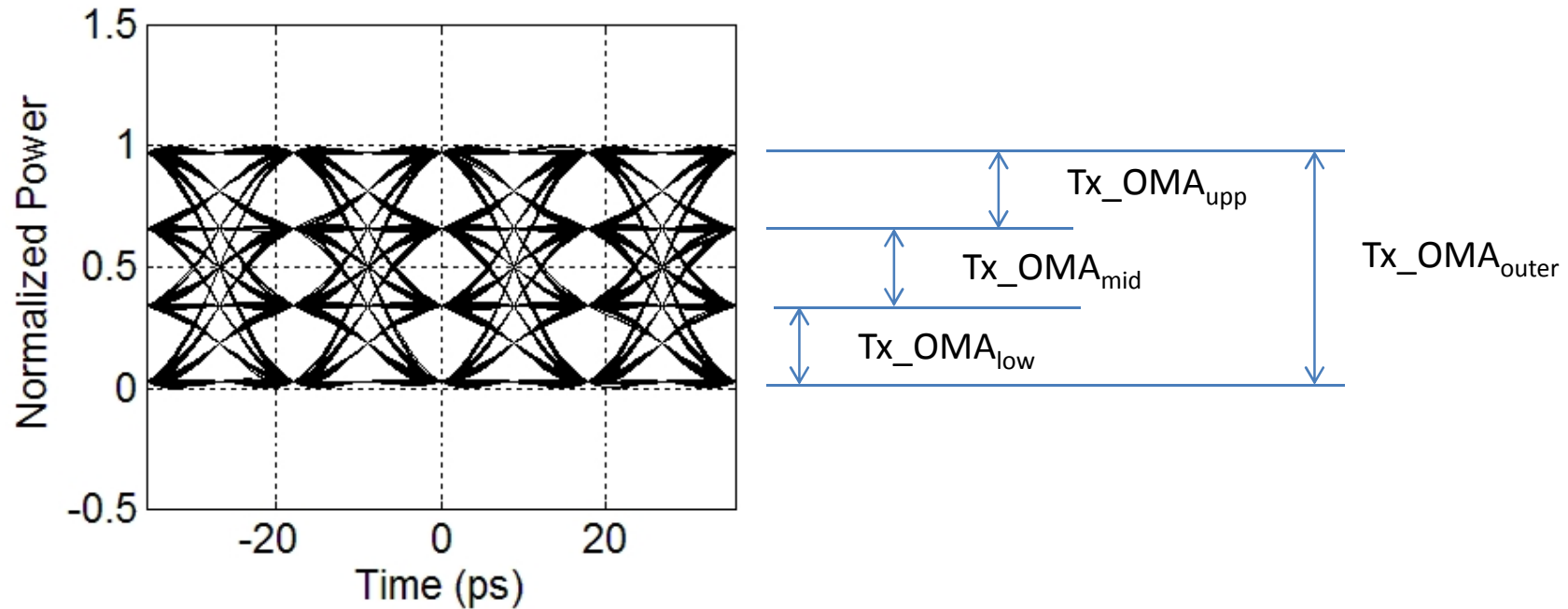
400G-PSM4 : Link Parameters

400G-PSM4	
Reach (m)	> 500
Signaling rate, each lane (Range)	53.125 ± 100 ppm GBd
Encoding type	PAM4
Wavelength(s)	1297 to 1323 nm
Uncorrected BER	< 2.3e-4
Corrected BER	< 1e-15
802.3bs Objective BER	< 1e-13
Channel insertion loss, max (dB) [†]	3
Allocation for penalties, at max TDP (dB) [‡]	4.25
Power margin, at min TDP (dB)	9.50
Maximum discrete reflectance (dB)	-35

[†] From http://www.ieee802.org/3/bs/public/14_05/kolesar_3bs_01_0514.pdf

[‡] Sum of Max TDP (3.5 dB), MPI penalty (0.5 dB), and excess Laser RIN penalty (0.25 dB)

Transmitter Specifications



- Max OMA and ER specified based on outer Tx_OMA_{outer}
- Sensitivity and link budget based on inner $Tx_OMA_{low/mid/upp}$
 - Spec applies to minimum of 3 inner eye transitions

400G-PSM4: Transmitter Specifications (TP2)

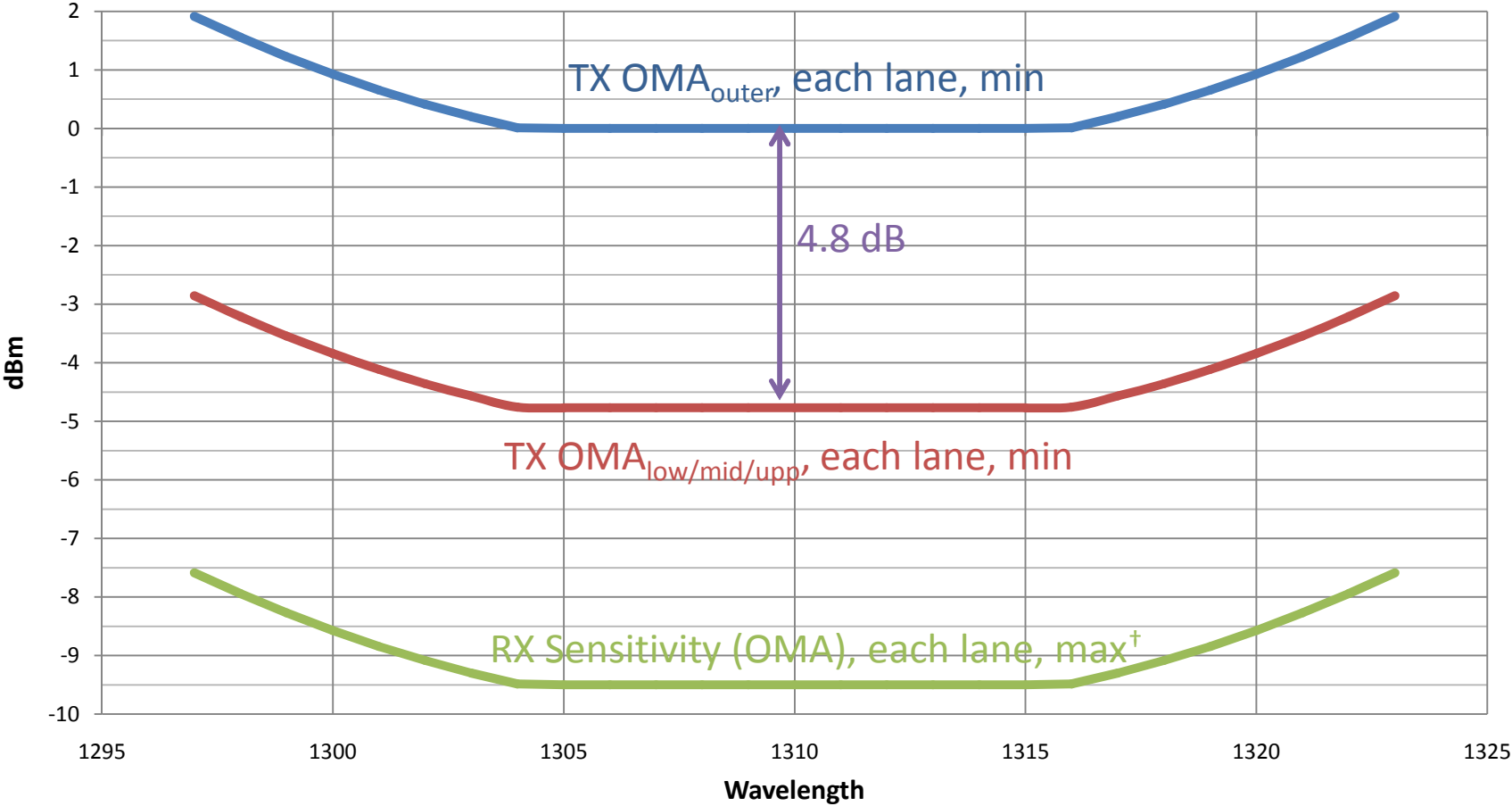
400G-PSM4	
Signaling rate, each lane (Range)	53.125 ± 100 ppm GBd
Encoding type	PAM4
Wavelength(s)	1297 to 1323 nm
OMA_{outer} , each lane, max (dBm)	$MAX(3.8+(\lambda-1310)^2/70, 4.3)$
OMA_{outer} , each lane, min (dBm)	$MAX(-1.3+(\lambda-1310)^2/70, -0.8)+MAX(TDP, 0.8)$
$OMA_{low/mid/upp}$, each lane, min (dBm)	$MAX(-6.07+(\lambda-1310)^2/70, -5.57)+MAX(TDP, 0.8)$
ER_{outer} , each lane, min (dB)	5
Average launch power, each lane max (dBm)	5
Average launch power, each lane min (dBm)	$MAX(-3.4+(\lambda-1310)^2/70, -2.9)+0.8$
TDP, each lane, max (dB)	3.5
Transmitter RIN_{ave} , max (dB/Hz)	-142
Transmitter reflectance, max (dB)	-20
Transmitter Eye Mask	TBD

400G-PSM4: Receiver Specifications (TP3)

400G-PSM4	
Signaling rate, each lane (Range)	53.125 ± 100 ppm GBd
Encoding type	PAM4
Wavelength(s)	1297 to 1323 nm
Receiver sensitivity (OMA), each lane max (dBm) [†]	MAX(-10+(λ-1310) ² /70,-9.5)
Average receive power, each lane max (dBm)	3.5
Average receive power, each lane min (dBm)	-5.1
Damage threshold (dBm)	4.5
Receiver reflectance, max (dB)	-26
Stressed receiver sensitivity (OMA), each lane max (dBm)	TBD
Conditions of stressed receiver sensitivity test:	
Vertical eye closure penalty, each lane (dB)	TBD
Stressed eye J2 Jitter, each lane (UI)	TBD
Stressed eye J4 Jitter, each lane (UI)	TBD
Stressed eye mask definition	TBD

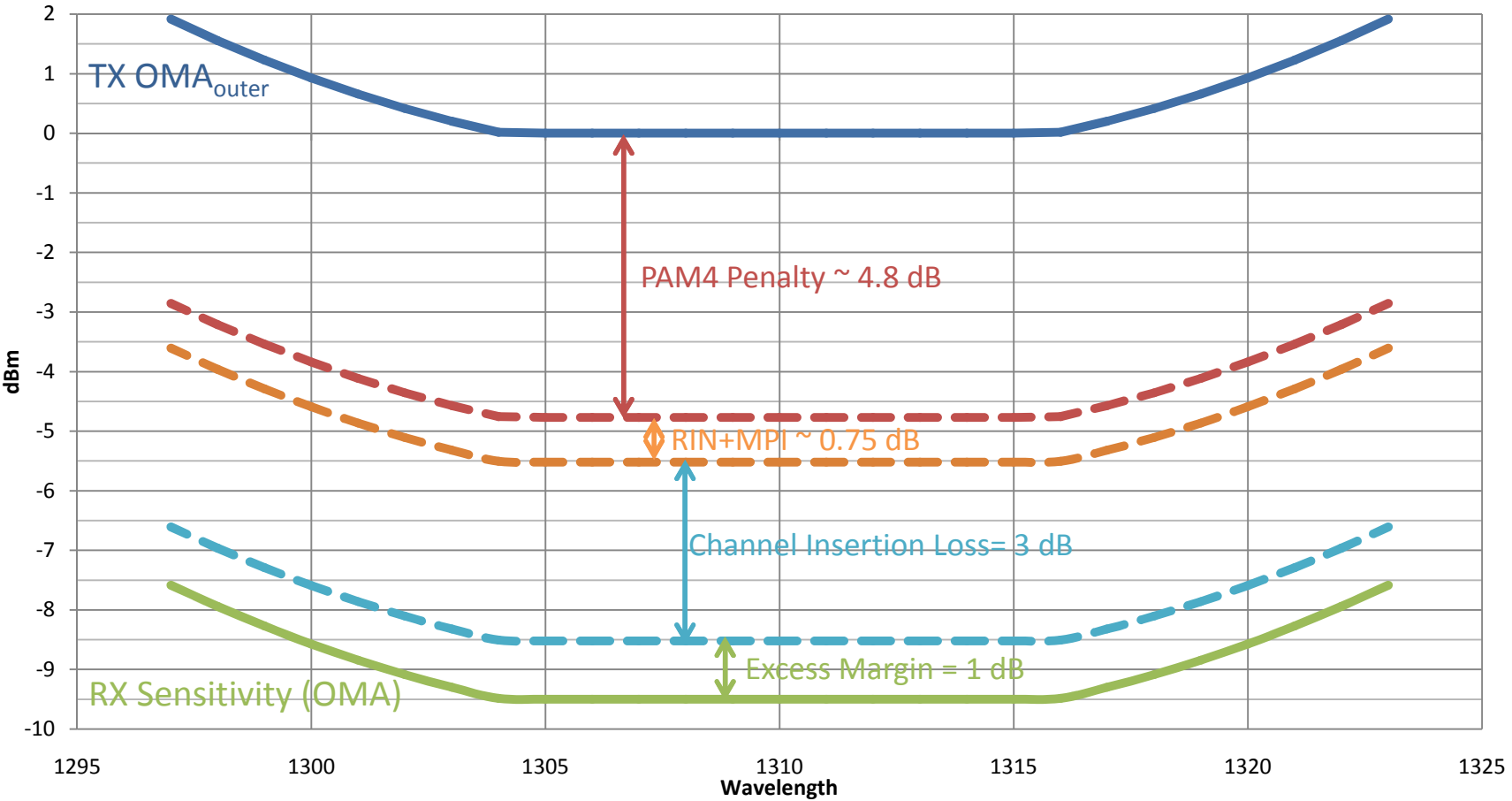
† Received sensitivity reported in 'NRZ mode' and uncorrected BER, equivalent to sensitivity for any sub-eye low/mid/upp

400G-PSM4 Specifications



† Received sensitivity reported in 'NRZ mode' and uncorrected BER, equivalent to sensitivity for any sub-eye low/mid/upp

400G-PSM4 Link Budget (at TDP = 0.8 dB)



400G-PSM4

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Thank You