

# **400Gb/s 500m PSM4 NRZ PMD Nominal Specifications**

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400 Gb/s Ethernet Task Force  
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# Background

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- Nominal specifications based on:

[http://www.ieee802.org/3/bs/public/adhoc/smf/14\\_10\\_14/cole\\_01a\\_1014\\_smf.pdf](http://www.ieee802.org/3/bs/public/adhoc/smf/14_10_14/cole_01a_1014_smf.pdf)

- The NRZ channel insertion loss is reduced by ½ dB from above because of lower MPI penalty

	2km NRZ	2km PAM-4	10km NRZ	10km PAM-4
Channel Loss	4.0	4.0	6.0	6.0
MPI Penalty	0.5	1.0	0.5	1.0
Total Insertion Loss	4.5	5.0	6.5	7.0

(See Appendix 2 & 3 for updated summary tables)

- 10km spec. is w/ BCH FEC, but KP4 FEC is viable option
- These specifications are not a final proposal because of insufficient measurements

# Transmit Characteristics (duplex SMF)

Description	500m NRZ		Unit
Signaling Rate, each lane	53.2		GBd
Operating BER	2.0E-04		
Total average launch power (max)	11.2		dBm
OMA, each lane (max)	2.0		dBm
OMA, each lane (min)	-3.3		dBm
Launch Power in OMA – TDP, each lane (min)	-4.3		dBm
Transmitter and dispersion penalty, (TDP) each lane (max)	1.8		dB
Extinction ratio (ER) (min)	4.5		dB
RIN OMA (max)	-130.0		dB/Hz
Transmitter 3dB frequency (min)	21		GHz
Optical return loss tolerance (max)	20.0		dB

# Receive Characteristics (PSM4)

Description	500m NRZ		Unit
Signaling Rate, each lane	53.2		GBd
Operating BER	2.0E-04		
Receiver reflectance (max)	-26.0		dB
Receiver Sensitivity (OMA), each lane (max)	-8.8		dBm
Receiver 3 dB electrical upper cutoff frequency, each lane (max)	42.0		GHz
Stressed receiver sensitivity (OMA), each lane (max)	TBD		dBm
Conditions of stressed receiver sensitivity test	TBD		

# Illustrative Link Power Budgets (PSM4)

Parameter	500m NRZ		Unit
Power Budget (for maximum TDP)	6.3		dB
Operating Distance	2.0		km
Channel Insertion Loss	4.5		dB
Maximum Discrete Reflectance	-26.0		dB
Allocation for Penalties (for maximum TDP)	1.8		dB
Allocation for Modulation Penalties	0.0		dB

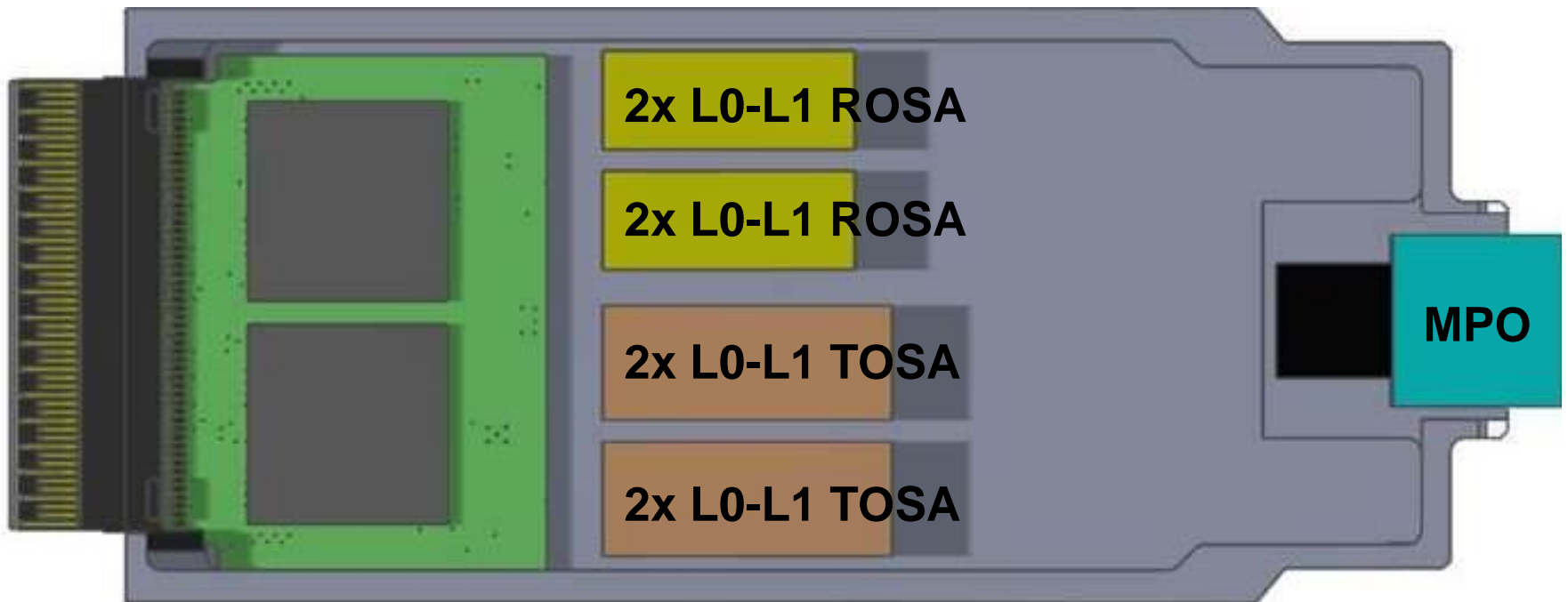
# WDM Lane Assignments

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Lane	Center Frequency THz	Center Wavelength nm	Wavelength Range nm
L0	233.8	1282.26	1277.89 to 1286.66
L1	229.8	1304.58	1300.05 to 1309.14

# Appendix1: 400G Gen1 Example CFP2 Layout

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# Appendix 2: 400G PSM4 PMDs Specs

Specifications	4x25G NRZ CWDM4 KR4 MOD / DML	2x50G NRZ KP4 FEC MOD	2x50G PAM4 KP4 FEC MOD / DML	1x100G BCH FEC PAM4 MOD	1x100G DMT BCH FEC 25G DML
Symbol (or Sample) Rate Gbaud (or GS)	25.8	53.2	26.6	55.9	55.9
Operating BER	5.0E-05	2.0E-04	2.0E-04	1.0E-03	1.0E-03
ER Full Scale (min) dB	3.5	4.5	4.5	7.0	4.5
TX OMA (min) @TDP (max) dBm	<b>-2.0</b>	<b>-2.5</b>	<b>-1.5</b>	<b>0.0</b>	<b>2.0</b>
Modulation Penalty (MP) dB	0.0	0.0	5.0	5.0	9.0
TDP (max) dB	3.0	1.8	1.0	2.0	2.5
TX OMA - MP -TDP each lane (min) dBm	<b>-5.0</b>	<b>-4.3</b>	<b>-7.5</b>	<b>-7.0</b>	<b>-9.5</b>
Channel Insertion Loss & MPI penalty dB	5.0	4.5	5.0	5.0	5.0
RX Sens. OMA pre-FEC each lane (max) dBm	<b>-10.0</b>	<b>-8.8</b>	<b>-12.5</b>	<b>-12.0</b>	<b>-14.5</b>



# 500m PSM4 NRZ PMD Nominal Specs

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Thank you

