

# **200GBASE-FR4 & -LR4 Specification Proposal**

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400 Gb/s Ethernet Task Force  
802.3 Interim Meeting  
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# Transmit Characteristics

Description (PAM4)	200GBASE-FR4	200GBASE-LR4	Unit
Reach	2	10	km
Signaling Rate, each lane	26.5625	26.5625	GBd
Operating BER	2.4E-04	2.4E-04	
Total average launch power (max)	11.2	11.7	dBm
OMA <sub>outer</sub> , each lane (max)	5.0	5.5	dBm
OMA <sub>outer</sub> , each lane (min)	-0.7	0.1	dBm
Diff. in launch power between any two lanes (OMA <sub>outer</sub> ) (max)	4.4	4.4	dB
Launch Power in OMA <sub>outer</sub> minus TDP, each lane (min)	-1.7	-0.9	dBm
Transmitter and dispersion penalty, (TDP) each lane (max)	2.4	2.8	dB
Extinction ratio (ER) (min)	4.5	4.5	dB
RIN OMA (max)	follow 400G	follow 400G	dB/Hz

# Receive Characteristics

Description (PAM4)	200GBASE-FR4	200GBASE-LR4	Unit
Signaling Rate, each lane	26.5625	26.5625	GBd
Operating BER	2.4E-04	2.4E-04	
Receiver reflectance (max)	-26	-26	dB
Receiver Sensitivity ( $OMA_{inner}$ ), each lane (max)	-10.8	-12.5	dBm
Difference in receive power between any two lanes ( $OMA_{outer}$ ) (max)	4.5	5.0	dB
Stressed receiver sensitivity ( $OMA_{outer}$ ), each lane (max)	follow 400G	follow 400G	dBm
Conditions of stressed receiver sensitivity test	follow 400G	follow 400G	

# Illustrative Link Power Budgets

Description (PAM4)	200GBASE-FR4	200GBASE-LR4	Unit
Power Budget (for maximum TDP)	6.7	9.6	dB
Operating Distance	2	10	km
Channel Insertion Loss	4.0	6.3	dB
Maximum Discrete Reflectance	-35.0	-35.0	dB
Allocation for Penalties (for maximum TDP)	2.7	3.3	dB
Modulation Penalty	4.8	4.8	dB
MPI Penalty	0.3	0.5	dB

# WDM Lane Assignments

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<b>200GBASE CWDM Lane</b>	<b>Center Wavelength nm</b>	<b>Wavelength Range nm</b>
L0	1271	1264.5 to 1277.5
L1	1291	1284.5 to 1297.5
L2	1311	1304.5 to 1317.5
L3	1331	1324.5 to 1337.5

# Optical Margin

Description (PAM4)	200GBASE-FR4	200GBASE-LR4	Unit
Receiver Sensitivity ( $OMA_{inner}$ ), each lane, pre-DeMux (max)	-10.8	-12.5	dBm
DeMux Loss	2.0	2.0	dB
Cross-talk penalty	0.3	0.3	dB
Receiver Sensitivity ( $OMA_{inner}$ ), each lane, post-DeMux (max)	-13.1	-14.8	dBm
Receiver Sensitivity ( $OMA_{inner}$ ) single lane (typical measured)	-17.0	-17.0	dBm
Optical Margin	3.9	2.2	dB

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Thank you

