

200GBASE-DR4: A Baseline Proposal for the 200G 500m Objective

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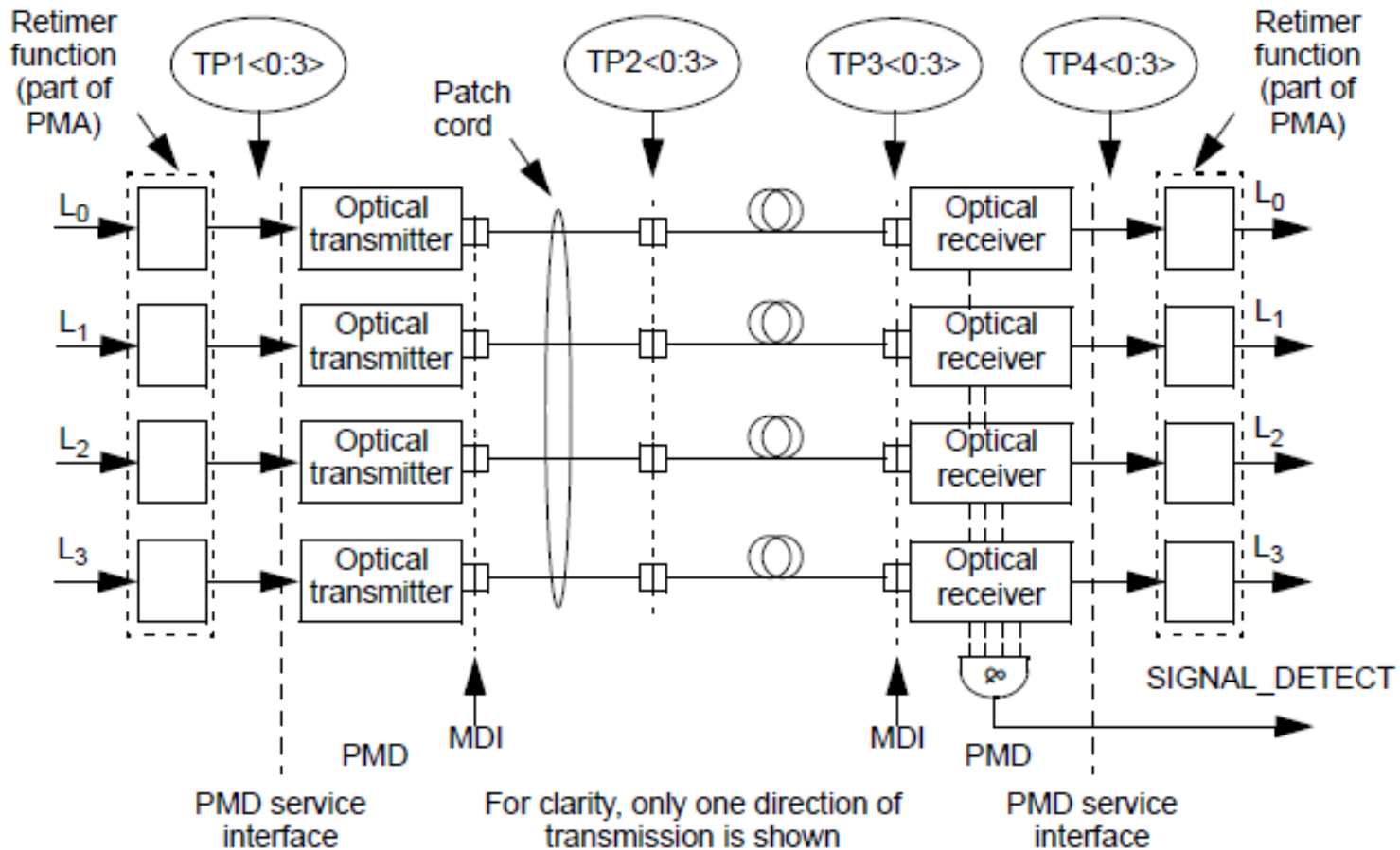
Notes

- Differences from draft presented in April 19th SMF Ad Hoc highlighted in blue.
- Updated from prior version presented in SMF Ad Hoc meetings to use TDECQ in place of TDP.
- Updated from prior version presented in SMF Ad Hoc meetings to use SECQ as an SRS test condition.

200G-DR4

- Configuration: A 4x50 Gb/s parallel SMF interconnect.
 - Four fibers per direction
- Reach $\geq 500\text{m}$
- Lane Speed: 50 Gb/s per lane using 25 GBaud-PAM4 optical signaling
- Uncorrected BER $< 2.4\text{e-}4$
- Single wavelength solution

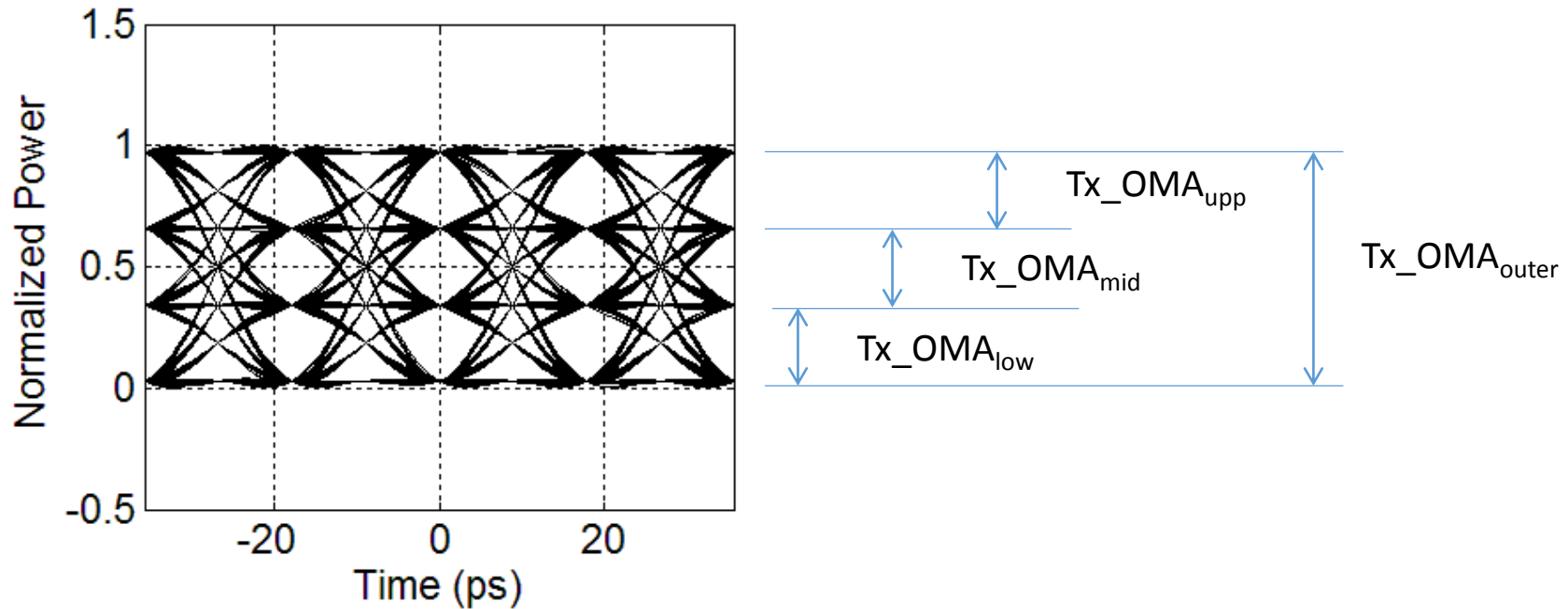
200G-DR4 Block Diagram



PMD:IS_UNITDATA_0.request
to PMD:IS_UNITDATA_3.request

PMD:IS_UNITDATA_0.indication
to PMD:IS_UNITDATA_3.indication

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

200G-DR4: Transmitter Specifications (TP2)

Description	Value	Unit
Signaling rate, each lane (Range)	26.5625 ± 100 ppm	GBd
Modulation Format	PAM4	
Lane wavelengths (range)	1304.5 to 1317.5	nm
Side-mode suppression ratio (SMSR), (min)	30	dB
Average launch power, each lane (max)	3	dBm
Average launch power, each lane (min)	-4.6	dBm
Outer Optical Modulation Amplitude (OMA _{outer}), each lane(max)	2.8	dBm
Outer Optical Modulation Amplitude (OMA _{outer}), each lane(min)	-2.5	dBm
Launch power in OMA _{outer} minus TDECQ, each lane (min)	-3.5	dBm
Transmitter and dispersion eye closure (TDECQ), each lane (max)	2.5	dB
Average launch power of OFF transmitter, each lane (max)	-30	dBm
Extinction ratio, each lane, (min)	4.5	dB
RIN ₂₅ OMA (max)	-142	dB/Hz
Optical return loss tolerance (max)	24.7	dB
Transmitter reflectance (max)	-26	dB

All Parameters Subject to Change

200G-DR4: Receiver Specifications (TP3)

Description	Value	Unit
Signaling rate, each lane (Range)	26.5625 ± 100 ppm	GBd
Modulation Format	PAM4	
Lane wavelengths (range)	1304.5 to 1317.5 nm	nm
Damage threshold, each lane	6.5	dBm
Average receive power, each lane (max)	3.0	dBm
Average receive power, each lane (min)	-7.6	dBm
Receive power, each lane (OMA _{outer}) (max)	2.8	dBm
Receiver reflectance (max)	-26	dB
Receiver sensitivity (OMA _{inner}), each lane (max)	-11.4	dBm
Stressed receiver sensitivity (OMA _{outer}), each lane (max) [†]	-4.1	dBm
Conditions of stressed receiver sensitivity test:		
SECQ [†]	2.5	dB
OMA _{outer} of each aggressor lane	2.8	dBm

[†] Links with lower OMA and TDEQ values must not have BER > 2.4e-4

200G-DR4 : Link Parameters

Description	Value	Unit
Operating distance	500	m
Signaling rate, each lane (Range)	26.5625 ± 100 ppm GBd	
Encoding type	PAM4	
Lane wavelength (range)	1304.5 to 1317.5 nm	nm
Uncorrected BER	< 2.4e-4	
Channel insertion loss (max)	3	dB
Channel insertion loss (min)	0	dB
Allocation for penalties, at max TDECQ (dB) [†]	2.6	dB
MPI Penalty	0.1	dB
Power margin, at min TDECQ	9.1	dB
Maximum discrete reflectance	-45	dB
Max number of -45 dB reflections	4	
Positive dispersion (max)	0.8	ps/nm
Negative dispersion (min)	-0.93	ps/nm
DGD_max	2.24	ps
Optical return loss (min)	39	dB

All Parameters Subject to Change

200G-DR4 : Link Parameters (continued)

Description	Value	Unit
Nominal fiber specification wavelength	1310	nm
Cabled optical fiber attenuation (max)	0.5	dB/km
Zero dispersion wavelength (λ_0)	$1300 \leq \lambda_0 \leq 1324$	nm
Dispersion slope (max) (S_0)	0.093	ps/nm ² km

PMD type	Dispersion (ps/nm)		Insertion Loss	Optical Return Loss	Max mean DGD
	Minimum	Maximum			
200GBASE-DR4	$0.0011625 \times \lambda \times [1 - (1324/\lambda)^4]$	$0.0011625 \times \lambda \times [1 - (1300/\lambda)^4]$	Minimum	24.7	0.5 ps

All Parameters Subject to Change

Optical Lane Assignments

- The four transmit and four receive optical lanes of 200GBASE-DR4 shall occupy the positions depicted in Figure xxx-x when looking into the MDI receptacle with the connector keyway feature on top. The interface contains eight active lanes within twelve total positions. The transmit optical lanes occupy the left-most four positions. The receive optical lanes occupy the right-most four positions. The four center positions are unused.

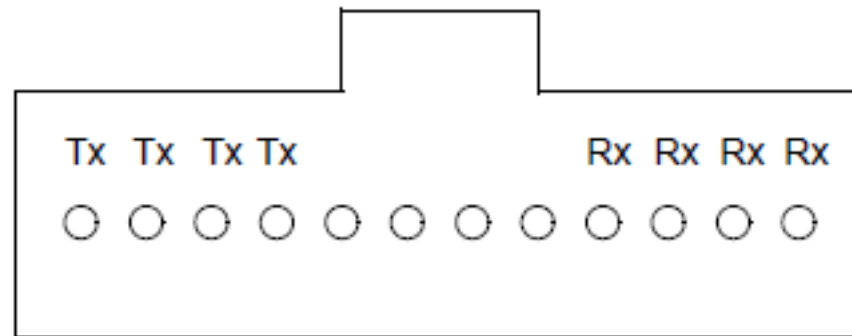
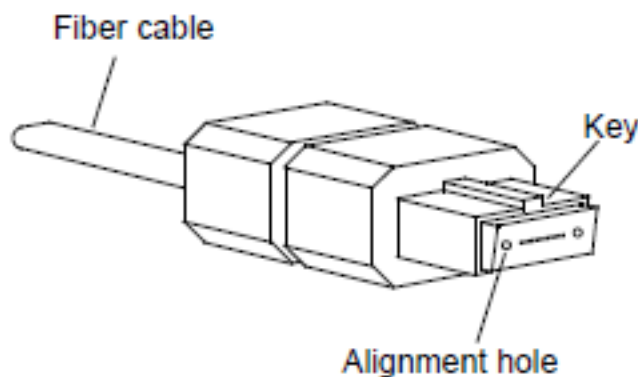


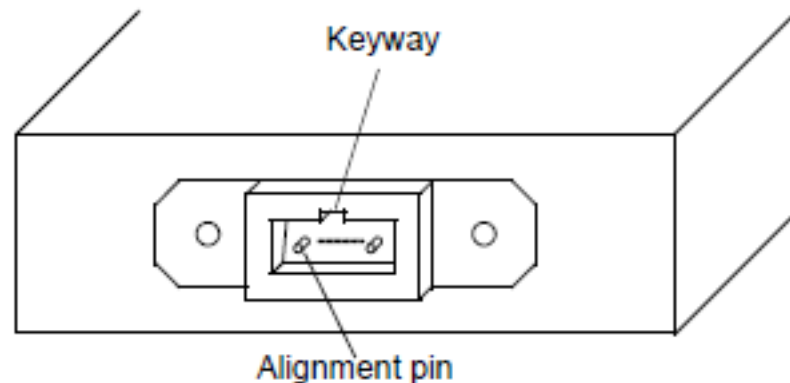
Figure xxx-x- 200GBASE-DR4 optical lane assignments

MDI Specifications

- The MDI shall meet the dimensional specifications of IEC 61754-7-1 interface 7-1-9: *MPO device receptacle, angled interface*. The plug terminating the optical fiber cabling shall meet the dimensional specifications of IEC 61754-7-1 interface 7-1-1: *MPO female plug connector, down-angled interface for 2 to 12 fibers*. The MDI shall optically mate with the plug on the optical fiber cabling. The below figures shows the MPO female plug connector and MDI receptacle. The MDI shall meet the interface performance specifications of IEC 61753-012-2 for performance level D/2.



MPO female plug connector with down-angled interface



MDI as an active device receptacle with angled interface

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Thank You