Proposed 1060 nm baseline

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This contribution

- Proposes baseline characteristics for 200G PAM4 PMDs based on 1060 nm VCSEL and new MMFs optimized for operation at 1060 nm
  - Nomenclature as per TF Motion 2 motions_and_straw_polls_3ds_01a_260325.pd adopted at the March 25th telephonic interim but with a single PMD for the 30 and 50 m objectives and maximum reach determined by fiber type.
  - Fiber EMB's are provisionally based on the requirements outlined in: rodes_3ds_01a_2603.pdf with a target effective BW equal to Nyquist (53.125 GHz)
    - "L1060_4000" with EMB(min) of 4000 MHz-km, targeted at 50 m with spectral width of 0.5 nm
    - "L1060_2200" with EMB(min) of 2200 MHz-km, targeted at 30 m with spectral width of 0.5 nm
    - "L1060_800" with EMB(min) of 800 MHz-km, as a catch-all for fibers not meeting the above specs, and targeted at 10 m reach

Operating Ranges

PMD type	Operating range
200GBASE-MR1	0.5 m to 10 m for "L1060_800"
400GBASE-MR2	0.5 m to 30 m for "L1060_2200"
800GBASE-MR4	0.5 m to 50 m for "L1060_4000"
1.6TBASE-MR8	

Transmit Characteristics

Description	200GBASE-MR1 400GBASE-MR2 800GBASE-MR4 1.6TBASE-MR8	Unit	Remarks
Signaling rate, each lane (range)	106.25 +/- 50 ppm	GBd	
Modulation format	PAM4		
Center wavelength (range)	1052 - 1068	nm	
RMS spectral width[a] (max)	0.5	nm	
Average launch power, each lane (max)	5	dBm	
Average launch power, each lane (min)	-3.4	dBm	
Outer optical modulation amplitude (OMAouter), each lane (max)	3.5	dBm	
Outer optical modulation amplitude (OMAouter), each lane (min) for max(TECQ, TDECQ) <= 1.8 dB for 1.8 < max(TECQ, TDECQ) <= TBD dB	 -1.4 -3.2 + max(TECQ, TDECQ)	 dBm dBm	
Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane (max)	TBD	dB	
Transmitter eye closure for PAM4 (TECQ), each lane (max)	TBD	dB	
Transmitter overshoot and undershoot, each lane (max)	TBD	%	at 3E-3 hit ratio
Transmitter power excursion, each lane (max)	2.3	dBm	
Extinction ratio, each lane (min)	2	dB	
Transmitter transition time, each lane (max)	9	ps	
Average launch power of OFF transmitter, each lane (max)	-15	dBm	
RINxOMA (max)	-135	dB/Hz	
Optical return loss tolerance (max)	TBD	dB	
Encircled flux[b]	 >= 86% at TBD mm <=30% at TBD mm		

a RMS spectral width is the standard deviation of the spectrum

b Measured into type "L1060_xxx" fiber, in accordance with TBD.

Receive Characteristics

Description	200GBASE-MR1 400GBASE-MR2 800GBASE-MR4 1.6TBASE-MR8	Unit	Remarks
Signaling rate, each lane (range)	106.25 +/- 50 ppm	GBd	
Modulation format	PAM4		
Center wavelength (range)	1052 - 1068	nm	
Damage threshold[a] (min)	6	dBm	
Average receive power, each lane (max)	5	dBm	
Average receive power, each lane[b] (min)	-5	dBm	
Receive power (OMAouter), each lane (max)	3.5	dBm	
Receiver reflectance (max)	TBD	dB	
Receiver sensitivity (OMAouter) (max) for TECQ <= 1.8 dB for 1.8 < TECQ <= TBD dB	 -3.3 -5.1 + TECQ	 dBm dBm	
Stressed receiver sensitivity (OMAouter)[c] (max)	TBD	dBm	
Conditions of stressed receiver sensitivity test:[d] Stressed eye closure for PAM4 (SECQ), lane under test OMAouter of each agressor lane	 TBD 3.5	 dB dBm	

a The receiver shall be able to tolerate, without damage, continuous exposure to an optical signal having this average power level on one lane. The receiver does not have to operate correctly at this input power.

b Average receive power, each lane (min) is not the principal indicator of signal strength. A received power below this level cannot be compliant; however, a value above this does not ensure compliance.

c Measured with conformance test signal at TP3 for the BLER specified in 300.2.

d These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Illustrative Link Power Budget

Description	200GBASE-MR1 400GBASE-MR2 800GBASE-MR4 1.6TBASE-MR8			Unit	Remarks
	"L1060_800"	"L1060_2200"	"L1060_4000"		
Effective modal bandwidth at 1060 nm (min)	800	2200	4000	MHz.km	
Power budget (for max TDECQ)	TBD			dB	
Operating distance	0.5 to 10	0.5 to 30	0.5 to 50	m	
Channel insertion loss	1.7			dB	
Allocation for penalties (for max TDECQ)	TBD			dB	
Additional insertion loss allowed	0			dB	