10GFC Liaison Report: 850nm VSR PMDs

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Introduction:

This report is provided to inform members of the IEEE 802.3ae of the status and progress of 10GFC VSR PMD standards.

VSR PMDs adopted by 10GFC

- 850nm Parallel (25-0 vote)
  - Based on the proposal from Pat Gilliland.
- 850nm Serial (25-3 vote)
  - Based on the proposal from James Myers.

Parallel VSR Interface

- Supports bi-directional 4x2.5Gb/s on Multimode Fiber.
- Protocol Independent
  - 8B/10B block coded serial Baud rate of 3.125GBaud (each fiber).
  - 64/66B block coded serial Baud rate of 2.51GBaud (each fiber).
- Connector Independent
  - Array Connector (AC).
  - Ribbon Fiber Connector (RFC).

850nm Parallel 10Gb/s Link Performance

- >100m over installed base of 160MHz-km 62/125µm fiber.
- >200m over 400MHz-km 50/125µm ribbon fiber.
- >1km over new 2000MHz-km 50/125µm ribbon fiber.

850nm Parallel VSR Transmitter Characteristics

Description	Unit	50µm MMF	62.5µm MMF
Type		850nm Laser	
Nominal Signaling Speed	GBaud	3.125	
Rate Tolerance	ppm	±100	
Wavelength range (λ)	nm	840-860	
RMS Spectral Width	nm	0.85	
Average Launch Power (max)	dBm	-4	
Average Launch Power (min)	dBm	-10	
Rise/Fall, max (20%-80%)	ps	105	
Optical Modulation Amplitude (OMA), min	mW	0.196	
RIN_{12} (OMA), max	dB/Hz	-117	

Note: assumes 8B/10B encoded data

850nm Parallel VSR Receiver Characteristics

Description	Unit	50µm MMF	62.5µm MMF
Nominal Signaling Speed	Gbaud	3.125	
Wavelength range (λ)	nm	830-860	
Average Receive Power, max.	dBm	0	
Optical Modulation Amplitude,min	mW	0.039	
Stressed Receiver Sensitivity (OMA), min.	mW	0.096	0.109
Receiver electrical 3dB upper cutoff frequency, max.	GHz	2.5	
Stressed Receiver ISI test, min.	dB	1.26	2.03
Return Loss, min.	dB/Hz	12	

Jitter (pk-pk), max.

	Unit	α_T	δ_T	γ_T	γ_R	δ_R	α_R
Deterministic (DJ)	UI	0,13	0,14	0,26	0,28	0,39	0,40
Total (TJ)	UI	0,25	0,26	0,44	0,48	0,64	0,65

10GFC 850nm Serial Achievable Link Distance

Fiber Type	Modal BW @ 850nm (MHz·km) (overfilled launch except as noted)	Distance Range (m)
62.5µm MMF	160	2 to 27
62.5µm MMF	200	2 to 34
50µm MMF	400	2 to 65
50µm MMF	500	2 to 84
50µm MMF	2000[a]	2 to 300[b]

a. Bandwidth and launch condition details are currently being defined by TIA FO2.2.

b. Supported by experimental results (modeling predicts 260m maximum.

10GFC 850nm Serial Link Parameters

Parameter	Unit	Value	Note
Data Rate	MB/s	1020	
Signaling Rate	MB/s	1051.875	1
Rate Tollerance	Ppm	±100	
Transmitter			
Type		**Laser**	
Spectral center wavelength, min	**nm**	**840**	
Spectral center wavelength, max	**nm**	**860**	
RMS spectral width, max	**nm**	**0.65**	**2**
Average launched power, max	**dBm**	**See note 3**	**3**
Average launched power, min	**dBm**	**-5.5**	
Average launched power TX off, max	**dBm**	**-30**	
Optical Modulation Amplitude, min	**dB**	**6.5**	
Rise/Fall time (20%-80%), max	**ps**	**31.5**	**4**
RIN, max	**dB/Hz**	**-125**	
Encircled flux @ r = 15 mm in 50mm fiber, min	**%**	**85**	**5**

10GFC 850nm Serial Link Parameters

Parameter	Unit	Value	Note
Receiver			
Average received power, max	dBm	-1.0	
Optical modulation amplitude, min	mWp-p	0.064	6
Stress receive optical modulation amplitude in 50µm MMF, min	mWp-p	0.179	7
Vertical eye closure penalty in 50µm MMF, min	dB	2.5	
Stressed receive optical modulation amplitude in 62.5µm MMF, min	mWp-p	0.220	8
Vertical eye closure penalty in 62.5µm MMF, min	dB	3.0	
Stressed receiver DCD component of DJ (at TX), min	ps	8	
Receiver electrical 3dB upper cutoff frequency, max	GHz	12.3	

10GFC 850nm Serial Link Parameters

NOTES:

1. Signaling rate is 12x 1GFC with 64B/66B encoding.
2. Based on experimental data.
3. The lesser of class 1 safety limit or average receiver power, max.
4. Optical rise and fall time specifications are based on the unfiltered waveforms. For the purpose of standardizing…
5. Measured per TIA/EIA 455-203 (draft). Subject to relaxation.
6. Equivalent to a 6.5 dB ER at -13.0 dBm.
7. Equivalent to a 6.5 dB ER at -8.5 dBm.
6. Equivalent to a 6.5 dB ER at -7.6 dBm.

Conclusion:

The ongoing work at the 10GFC committee may prove useful to the IEEE 802.3ae as a reference document when completed.

By assigning 850nm VSR PMD work to 10GFC, we may reduce the number of PMDs currently in question at IEEE 802.3