100Gb/s SMF PMD Observations

40Gb/s and 100Gb/s Fiber Optic Task Force

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Chris Cole

IEEE

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Outline

- Client Optics Overview
- New 100Gbs/ SMF PMD Observations
- New 100Gb/s SMF PMD Status Observation
- New 100Gb/s SMF PMD Consensus Observations

Client Optics Overview

Client optics application & media type(s)	High density data center duplex or parallel MMF	Structured data center duplex or parallel SMF	data center & central office duplex (or parallel) SMF	General data center duplex SMF	Metro inter-data center duplex SMF
nominal reach (determines min. penalty)	100m	500m	2km	10km	20, 30, 40km
minimum loss budget	2dB	2dB	4dB	6dB	11 to 21dB
bits/sec cost baseline	10G VCSEL MMF	10G VCSEL MMF	10G DFB laser SMF	10G DFB laser SMF	10G EML SMF
10G standard	10GE-SR	none	OC-192 SR-1 G.693 10G	10GE-LR	10GE-ER G.959.1 10G
40G standard	40GE-SR4	none	40GE-FR G.693 40G	40GE-LR4 G.695 10G	40GE-ER4
100G standard	100GE-SR10 100GE-SR4	100GE-nR4 ?	100GE-FR4 ?	100GE-LR4 G.959.1 25G	100GE-ER4 G.959.1 25G

Oval highlights potential new 100Gb/s SMF PMDs under study

New 100Gb/s SMF PMD Observations

- Both reach and min. loss budget must be specified to characterize a client optics application, ex. 10km/6dB
- Most datacenter and central office applications have reach distribution below 10km and require ~6dB loss budget
- 2dB and 4dB loss applications are fractions of total volume
- Any new Structured Data Center (≥500m) PMD cost must approach cost of VCSEL optics (i.e. SR4) to be compelling
- Precedence for 2km min. loss budget is 4dB; please use it
- Quad 4x25G DFB laser PIC TOSA long-term Gen2 LR4 baseline cost should be used for PMD cost comparisons
- Discrete 4x25G EML Gen1 LR4 cost is irrelevant
- There are two potential new SMF PMD applications which makes a single cost optimized solution difficult

New 100Gb/s SMF PMD Status Observations

Discussed 802.3bm SMF PMD Technology	Broad Market Potential Consensus	Near-term Technical Feasibility Consensus	Near-term Economic Feasibility Consensus	Applicable to long-term 400G Gen2 SMF PMD	Overall 802.3bm New SMF PMD Consensus
4x25GBaud LAN WDM	YES	YES	NOT YET	NO*	NOT YET
4x25GBaud CWDM	YES	YES	NOT YET	NO*	NOT YET
4x25GBaud C-band WDM	NOT YET	YES	NOT YET	NO*	NOT YET
4x25GBaud parallel	NOT YET	YES	NOT YET	NO*	NOT YET
25GBaud PAM-16	YES	NOT YET	NOT YET	YES	NOT YET
33GBaud PAM-8	YES	NOT YET	NOT YET	YES	NOT YET
50GBaud PAM-4	YES	NOT YET	NOT YET	YES	NOT YET
2x50GBaud WDM	YES	NOT YET	NOT YET	YES	NOT YET

* 16 lane wide solutions do not improve density and power versus 100G

New SMF PMD Consensus Observations

- To achieve overall consensus for a new 100Gb/s SMF PMD requires consensus on each of the five criteria.
- Overall consensus does not yet exist for any proposal.
- Broad market potential is best demonstrated by endorsements from broad range of end users.
- Technical feasibility is best demonstrated by comprehensive optical measurements.
- Economic feasibility is best demonstrated by detailed, realistic, apples-to-apples cost ratio comparisons.