PHY Objectives and Technical Feasibility

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Topics

- Proposed PHY objectives
- Recent technical results
- Criteria for Standards Development
  - Proposed draft language

PHY Objectives

Scope of study group leads to clear set of PHY objectives aligned with market need.

Propose we adopt these:

- Define single-lane 100 Gb/s PHYs for operation over
  - SMF with lengths up to at least 2 km
  - SMF with lengths up to at least 10 km

- Define four-lane 400 Gb/s PHYs for operation over
  - SMF with lengths up to at least 2 km
  - SMF with lengths up to at least 10 km

Feasibility

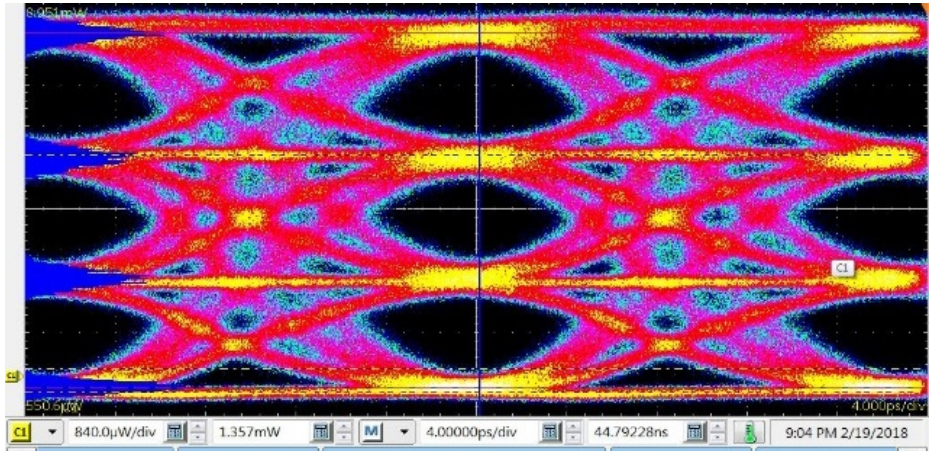
- These objectives are consistent with the scope of the study group and the market justification discussed in the CFI
- The technology to achieve these objectives is maturing quickly after the initiation on the technology development due to the 802.3bs and 802.3cd projects

Technical feasibility - Transmitters

Various transmitters capable of 100 Gb/s PAM4 have been demonstrated or presented

Optical eye

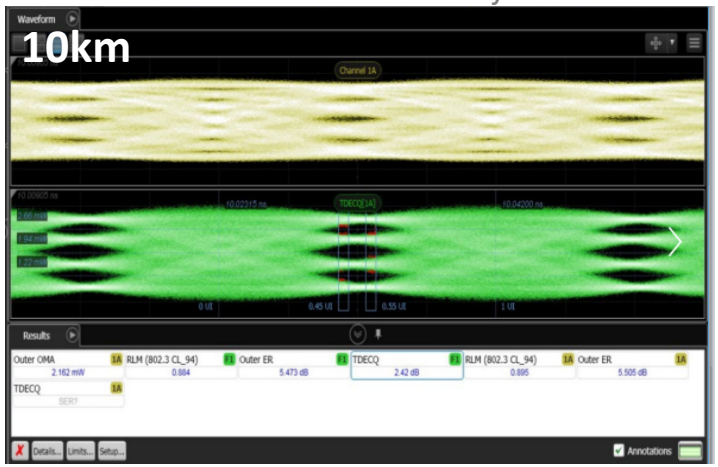
TDECQ = 1.26 dB (2 km @ 5.2 ps/nm)



53 GBaud PAM4 (106 Gb/s)

IEEE Pattern PRBS13Q See – mazzini_3cd_01a_0518

Courtesy Broadcom

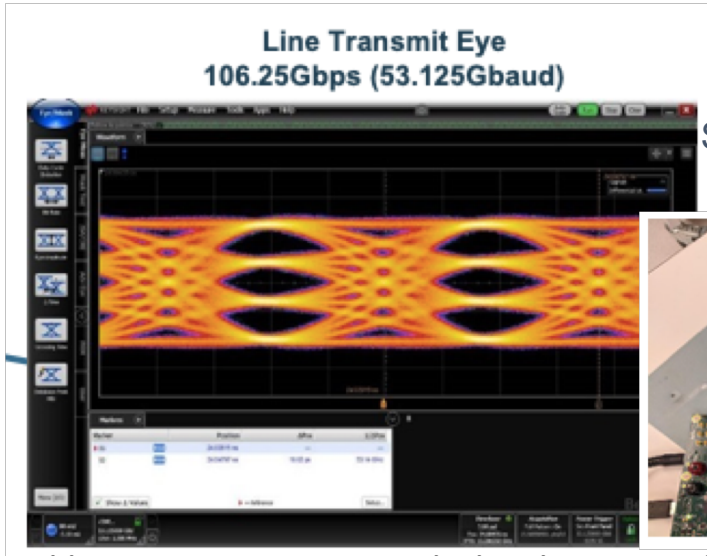


ER=6.9dB, TDECQ= 2.78dB

10 km Penalty = 0.21dB

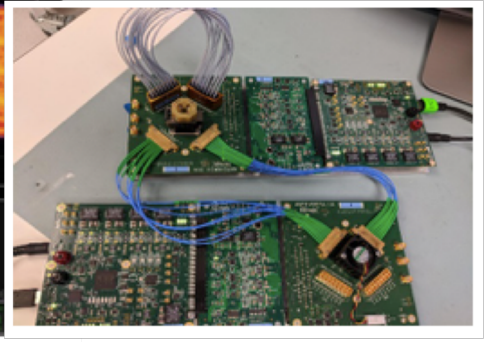
19 ps/nm

Electrical eye



Electrical Loopback
SNR >24dB, BER < 1e-12

Courtesy Inphi



http://www.ieee802.org/3/cfi/1118_1/CFI_01_1118.pdf

ER=7.4dB, TDECQ= 4.24dB

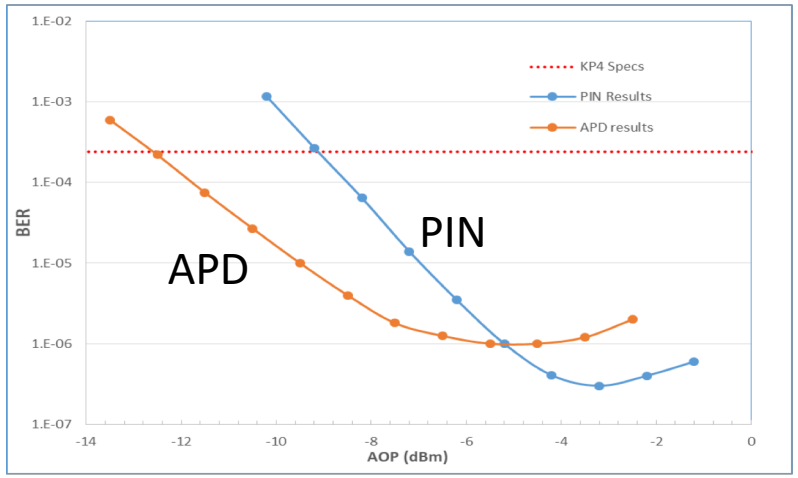
21 km Penalty = 1.54 dB

31 ps/nm

Transmitter:
AWG + linear amplifier, Vpp = 1.2V
No emphasis applied at the AWG
SSPRQ pattern at 53 GBd
56GBd EML CoC, λ = **1330nm**

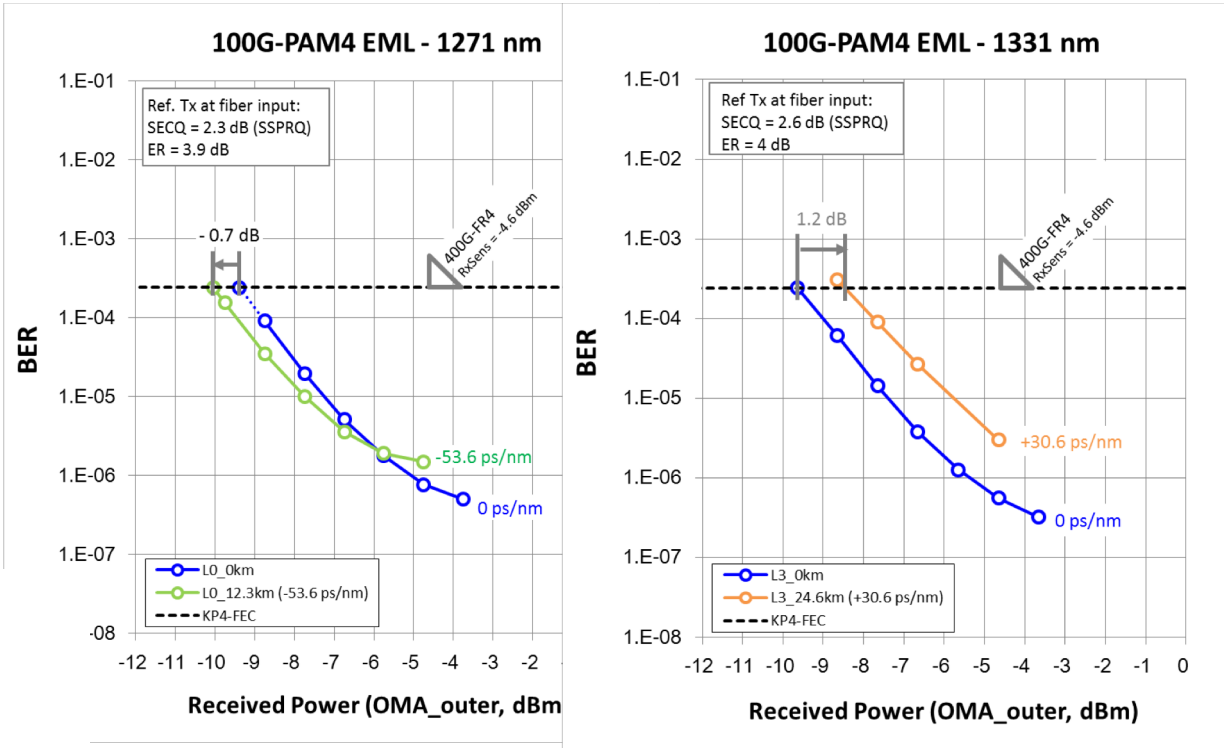
Technical feasibility – Receivers

http://www.ieee802.org/3/cfi/1118_1/CFI_01_1118.pdf



- 53.125GBaud, PAM4 PRBS31Q EML CoC (1304nm), ER ~ 5.1dB, SECQ ~ 1.8dB
- Same TIA, Same DSP

Source: IEEE OI'2018, Santa Fe, 4-6 June 2018 (Inphi/Source)
https://ieee-oi.org/program/

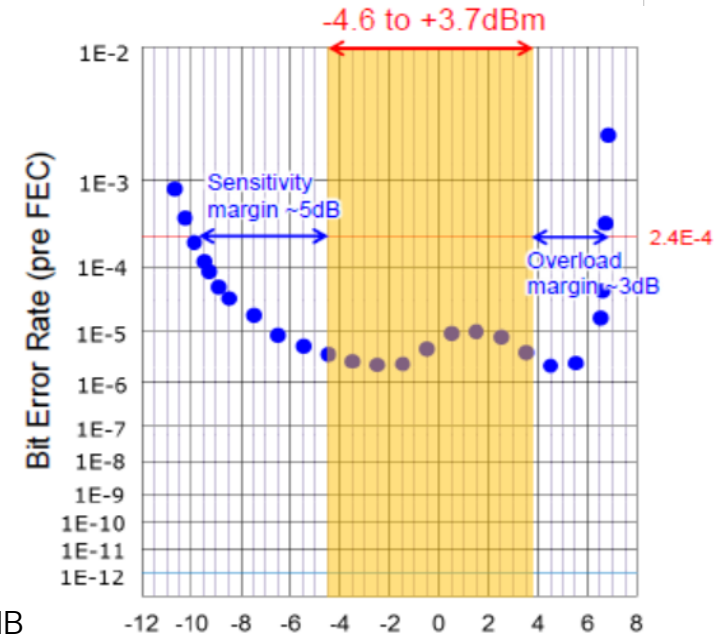


	CD (ps/nm)
IEEE MIN Spec for L0, 10km	-59.4
Measured (1271 nm, 12.3 km)	-53.6

	CD (ps/nm)
IEEE MAX Spec for L3, 10km	33.4
Measured (1331 nm, 24.6 km)	30.6

Courtesy: Oclaro

400G - 2km CWDM



53.125Gbd
PRBS15Q
ER=5.5dB
TDECQ1.6dB

Courtesy: Sumitomo Electric

Experimental Configuration:
PRBS15 53.125 Gbaud PAM4
CWDM EML CWDM PIN-PD
DSP (FFE>5 taps)
SM fiber: L0 (12.3 km) & L3 (24.6 km)

Technical Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence that the project is technically feasible within the time frame of the project. At a minimum, address the following items to demonstrate technical feasibility:

a) Demonstrated system feasibility.

b) Proven similar technology via testing, modeling, simulation, etc.

c) Confidence in reliability.

- The principle of scaling the IEEE 802.3 MAC to different speeds has been well established by previous work within the IEEE 802.3 Working Group.
- The principle of building equipment that supports IEEE 802.3 networks operating at different Ethernet rates has been amply demonstrated by a broad set of product offerings.
- The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.
  - Component vendors have presented data on the feasibility of the necessary components for 100 Gb/s and 400 Gb/s solutions. Proposals, which either leverage existing technologies or employ new technologies, have been provided.
  - Component technology for 100 Gb/s optical serial rates, are already either under development for other Ethernet projects (IEEE P802.3bs & 802.3cd) or working implementations have been demonstrated.
- The reliability of Ethernet components and systems has been established in the target environments with a high degree of confidence.

Summary

- Draft PHY objectives proposed
- Draft Technical Feasibility response language proposed
- Looking for feedback to improve ahead on January Interim meeting
- Goal to propose for adoption at Interim meeting