Feasibility of Unretime 100Gbase-SR4

IEEE 802.3bm Task Force

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List of Supporters

- Brad Booth – Dell
- Ahmet Balcioglu – Hittite
- Piers Dawe - IPtronics
- Oren Slea – Mellanox

Overview

- Material presented here previously have been presented at one or more of the following venue
  - 100GNGOPTX task force
  - http://www.ieee802.org/3/bm/public/nov12/ghiasi_02_1112_optx.pd
  - 'Feasibility of Unretimed 100 GbE Based on 4x25. 78 GBd',OWJ1.2, OFC 2012
  - IEEE Photonic Interconnect, 'Enabling 850 nm VCSEL for 100 GbE Applications, Santa Fe, 2012
- There has been renewed interest in the low cost, low power, unretime cPPI-4 interface for 20-30 m SR4 application and this presentation explores
  - Meeting transmitter TP1a jitter requirement
  - Example channels meeting cPPI-4
  - How to make limiting interface
- The key questions are
  - Does the 20 m SR4 PMD interoperate with 100 m SR4 PMD
  - Is FEC required
  - Is the interface limiting or linear

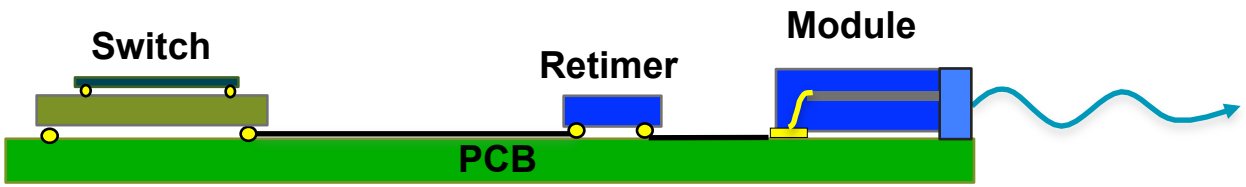
802.3bm Objective

- 802.3bm objective defines PMD for operation up to 100 m which is retimed and uses FEC
- The 20 m objective was to included to define lower power, cost, and size driven by data center applications
  - How do we address 20 m reach objective

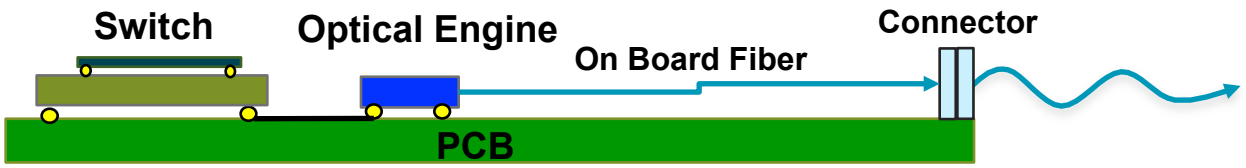
- Define re-timed 4-lane 100G PMA to PMA electrical interfaces for chip to chip and chip to module applications
- Define a 40 Gb/s PHY for operation over at least 40 km of SMF
- Define a 100 Gb/s PHY for operation up to at least 500 m of SMF
- Define a 100 Gb/s PHY for operation up to at least 100 m of MMF
- Define a 100 Gb/s PHY for operation up to at least 20 m of MMF

Applications Reference Diagram

- Adding retimers increases the 100Gbase-SR4 power dissipation by ~2x
- To support 100GBase-CR4 a retimer already exist in close proximity of the module



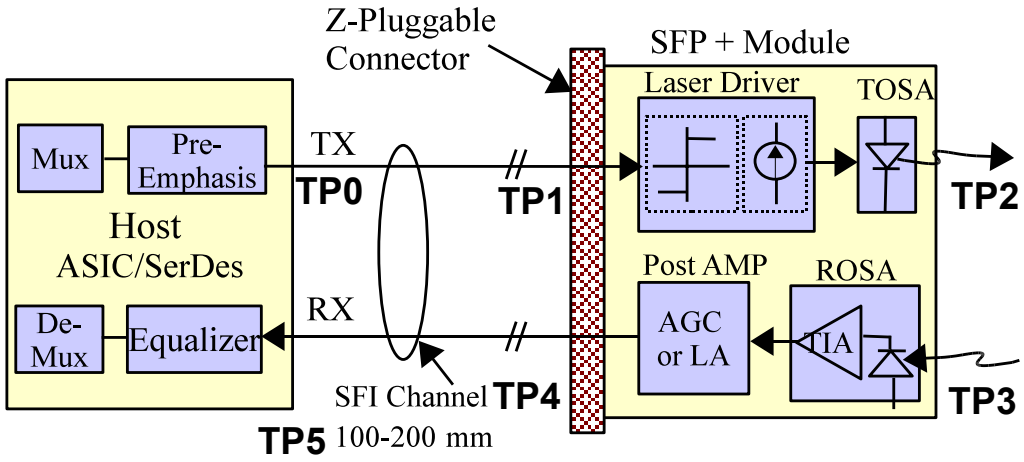
Option 1
(Module)

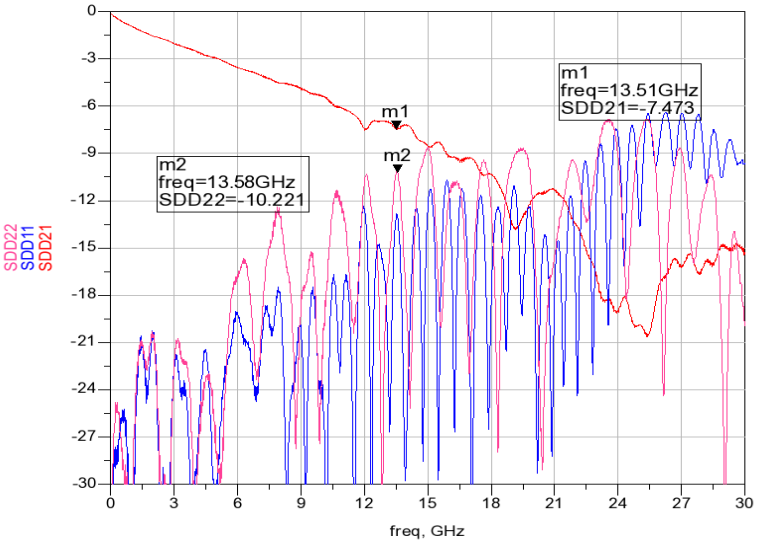


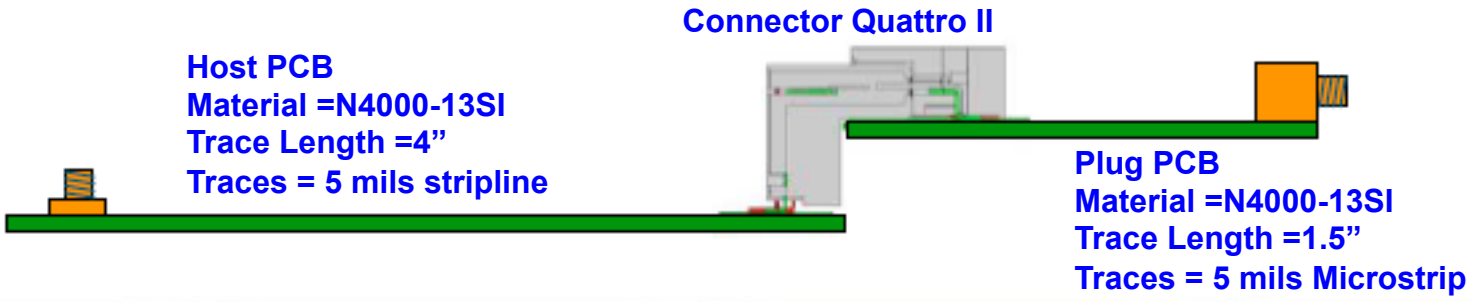
Option 2
(On Board)

Suitable Channel for Unretime Application

- Channel has 7.4 dB loss at Nyquist

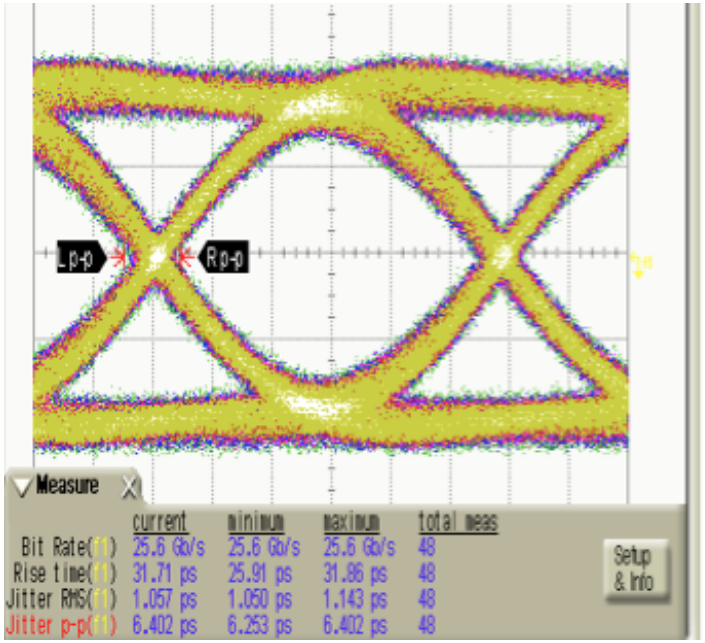


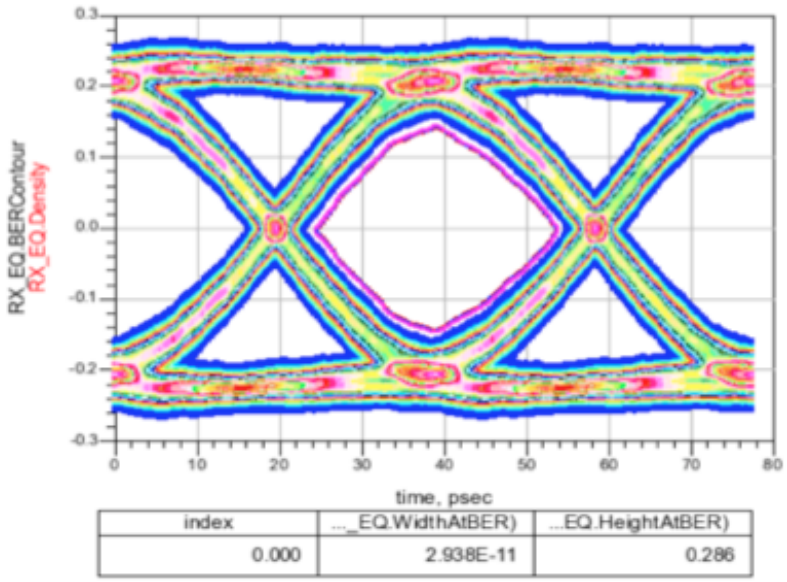




Far End Eye

- Measured and simulated eyes are good enough to drive the optics with <0.28 UI of TJ at TP1a similar to SFP+!





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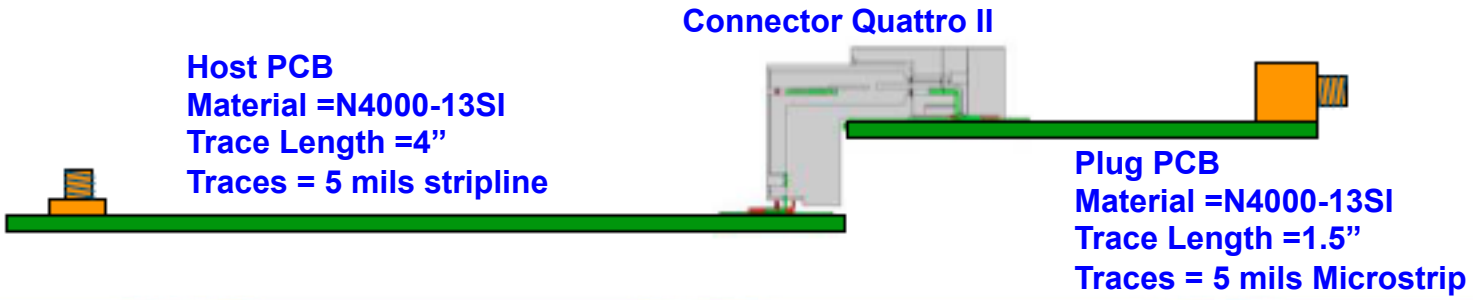

Summary

- To make transmitter meeting DDPWS and J2 requirements the cPPI-4 channel would have to be ~ 7 dB instead of 10.5 dB in case of CAUI-4
  - Still have 4 dB of host PCB allocation which equates to ~5” on Megtron-6
- In case of limiting interface an additional ~ 0.1 UI of transmit and ~ 0.1 UI of receive jitter must be must be found and the source of the improvement are
  - Reduction of fiber reach from 100 m to 20-30 m
  - Improvement of the SerDes
- To make linear module receiver work
  - Crosstalk does add some penalty but the fact one the host can now equalize for the fiber/Laser there is net gain
  - This interface DFE as result of MTTFPA the interface require at least FEC encoder and we might as well turn on
- With addition of FEC both limiting and linear interface become very feasible
- If we don’t define unretime interface in this group it will be define by MSA’s.

Thank You