

IEEE 802.3ap Proposal for 1Gbps Serial Backplane PHY

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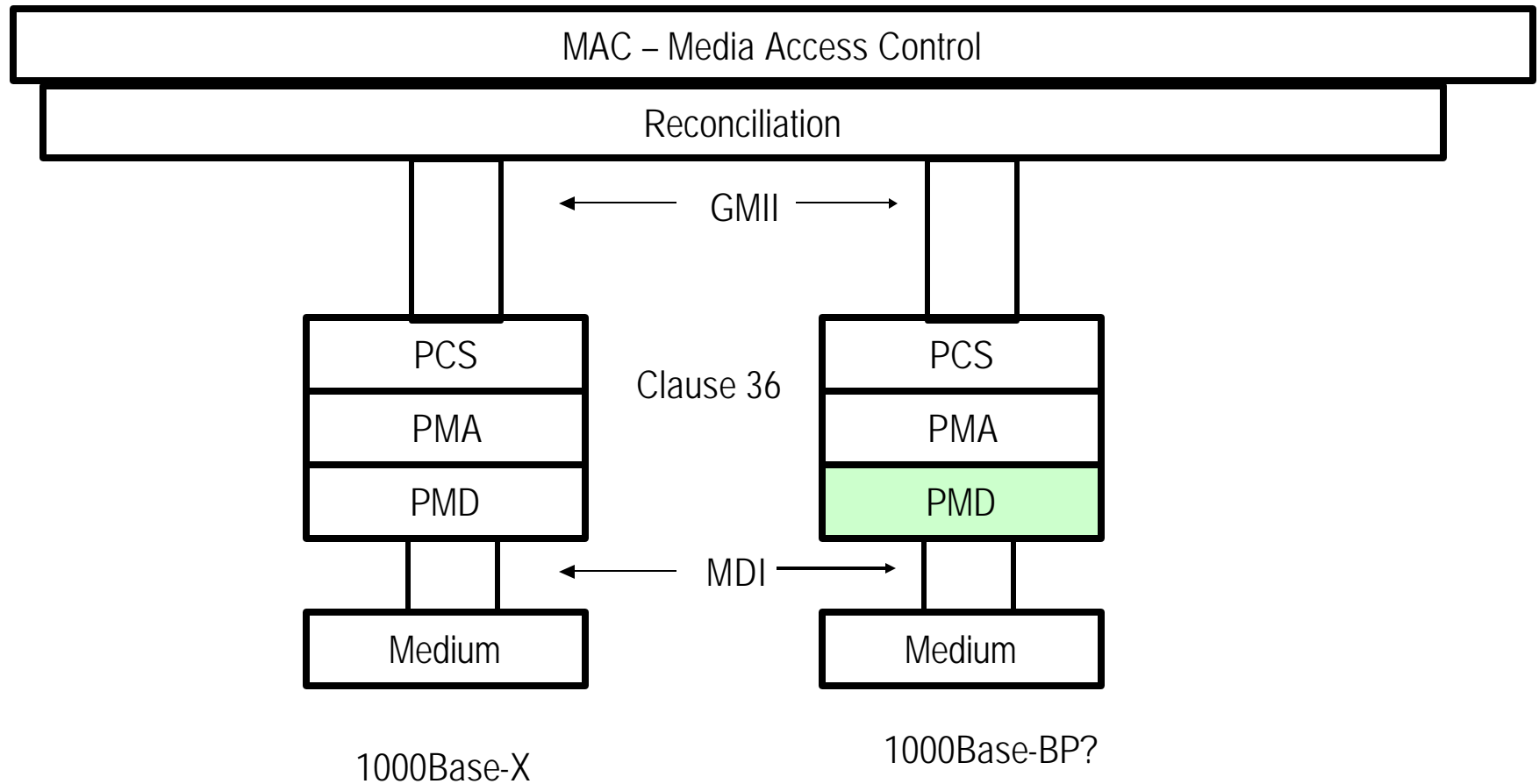
Objectives

- Propose a new PMD sublayer for 1.25Gbps Serial link across proposed channel using NRZ signaling
- Leverage existing PCS/PMA sublayers Clause 36 (1000Base-X)

Agenda

- Overview
- TX specifications
- RX specifications
- Channel Model
- Auto-negotiation
- Data
- Conclusion

Layer Model



Overview

- Use Existing Clause 36 for PMA and PCS layer
- Define NRZ Transmitter characteristics based on TX eye mask, output amplitude, jitter, etc
- Use Normative Channel Model
- Define receiver
 - Jitter tolerance, input sensitivity

Overview (Cont.)

- No TX Equalization is required
 - Optional – increased pre-deemphasize controlled through Auto-Negotiation
- Auto-negotiation allow for multi-rate Transceivers.

Driver Characteristics Table

Parameter	Value	units
Baud rate tolerance	1.25GBd +/- 100ppm	GBd
Diff. Peak Amplitude max. Min.	1600 800	mVp-p
Common-Mode Voltage	TBD	V
Diff. Output Return Loss minimum	Figure	dB
Output Template	Figure	V
Transition Time max min	300 85	ps
Output Jitter – Total Deterministic	0.24 0.10	UI

Differential Return Loss

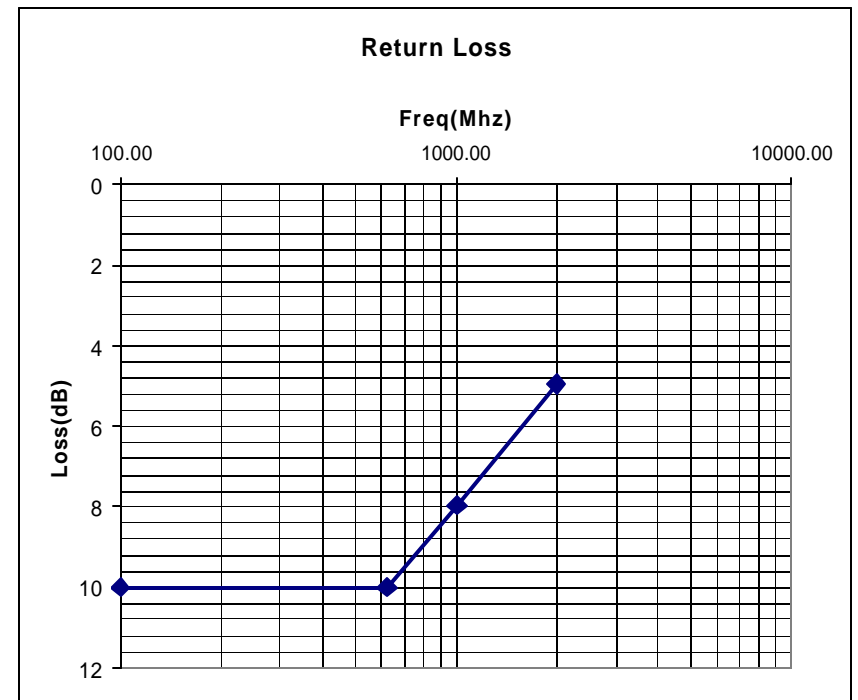
Return Loss(f) = 10

For 100Mhz = f < 625 Mhz

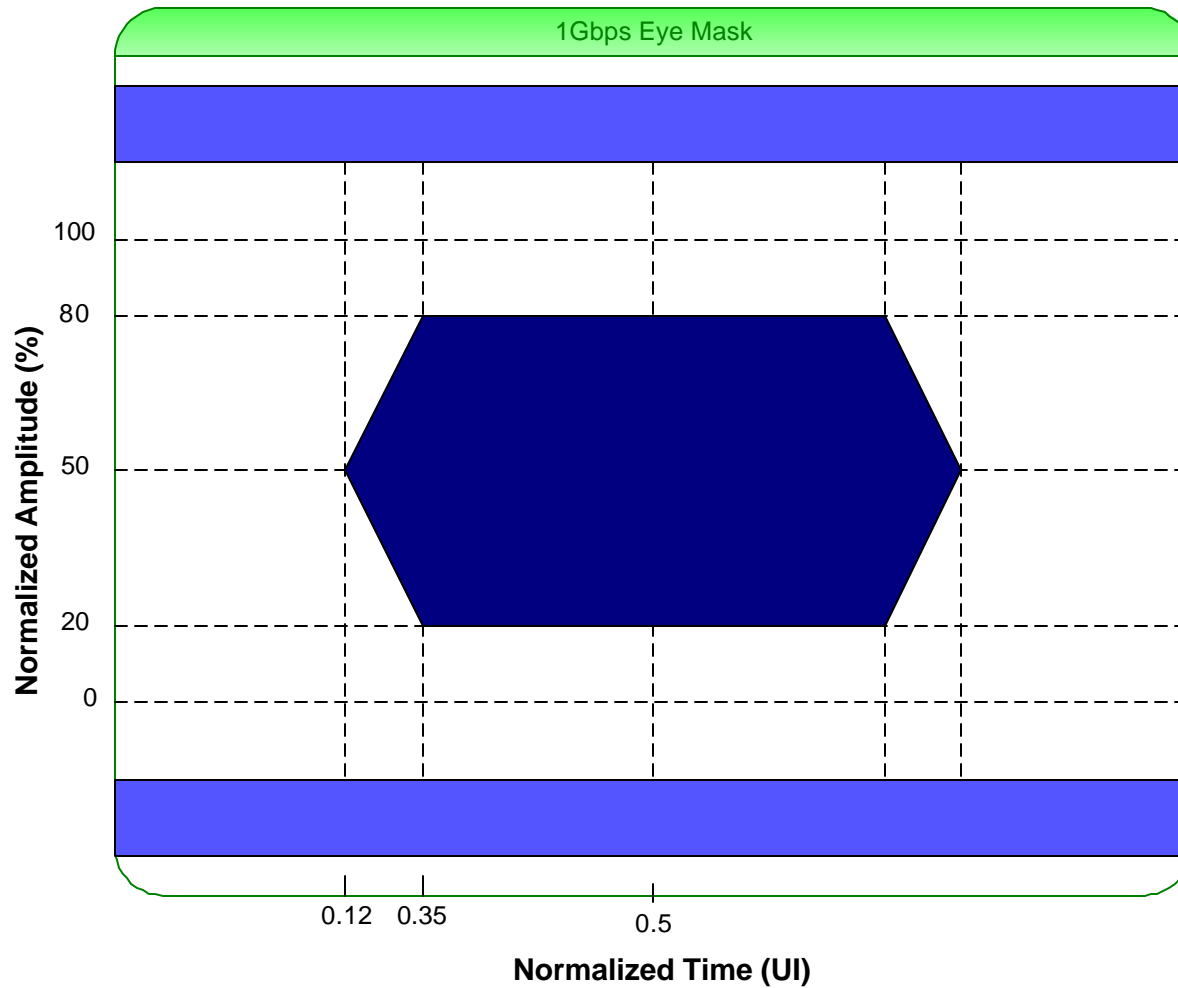
Return Loss(f) =

$$10 - 10 * \log\left(\frac{f}{625\text{Mhz}}\right)$$

For 625Mhz = f < 2Ghz



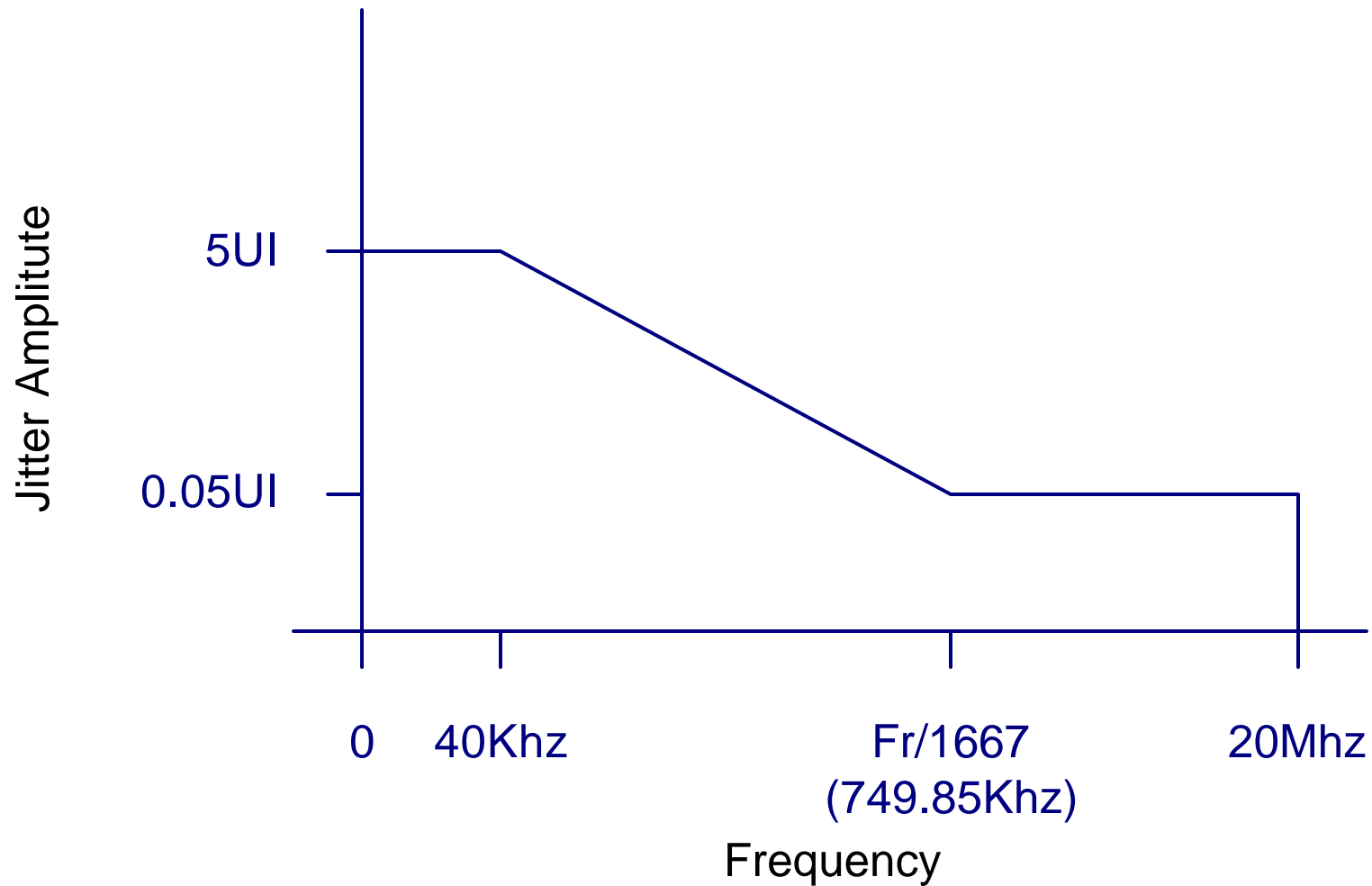
Tx Eye Mask



RX Characteristics Table

Parameter	Value	units
Baud rate tolerance	1.25GBd +/- 100ppm	GBd
Diff. Peak Amplitude maximum	1600	mVp-p
Error Rate	10^{-12}	
Diff. Return Loss minimum	See TX Return Loss	dB
Diff. Input sensitivity	300	mVp-p
Jitter Tolerance	Table	UI

RX Jitter Tolerance

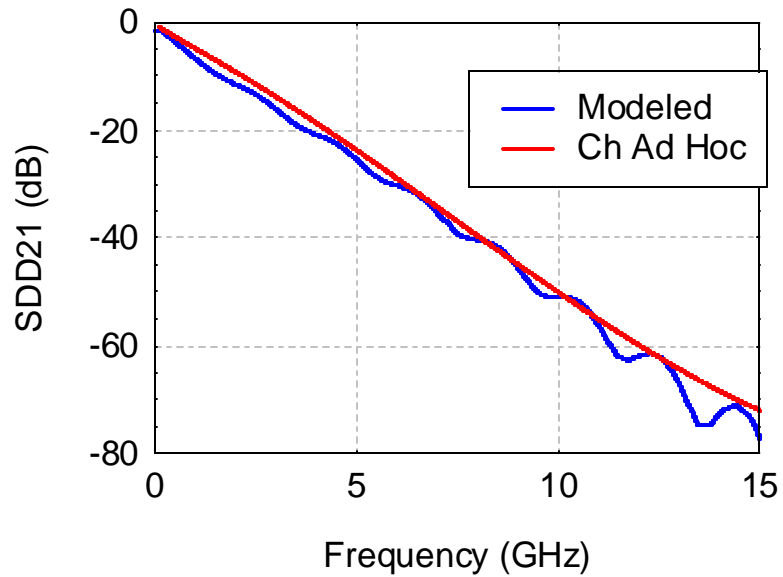


Channel Model

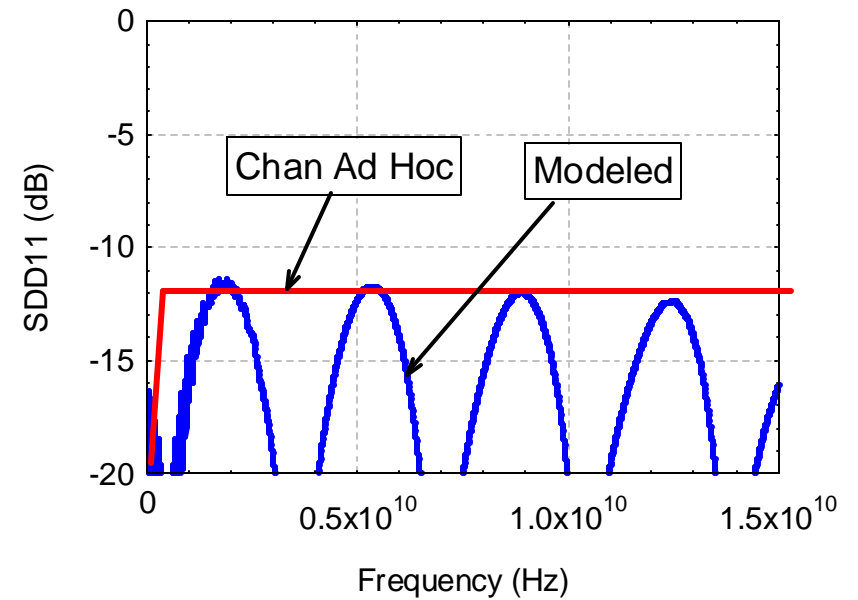
- The Channel Model is Normative
- Informative channel model developed by Channel Ad Hoc determines bounds the normative model.
- Proposed specification is subject to change based on ongoing work by the Channel Ad Hoc.

Channel Model (2)

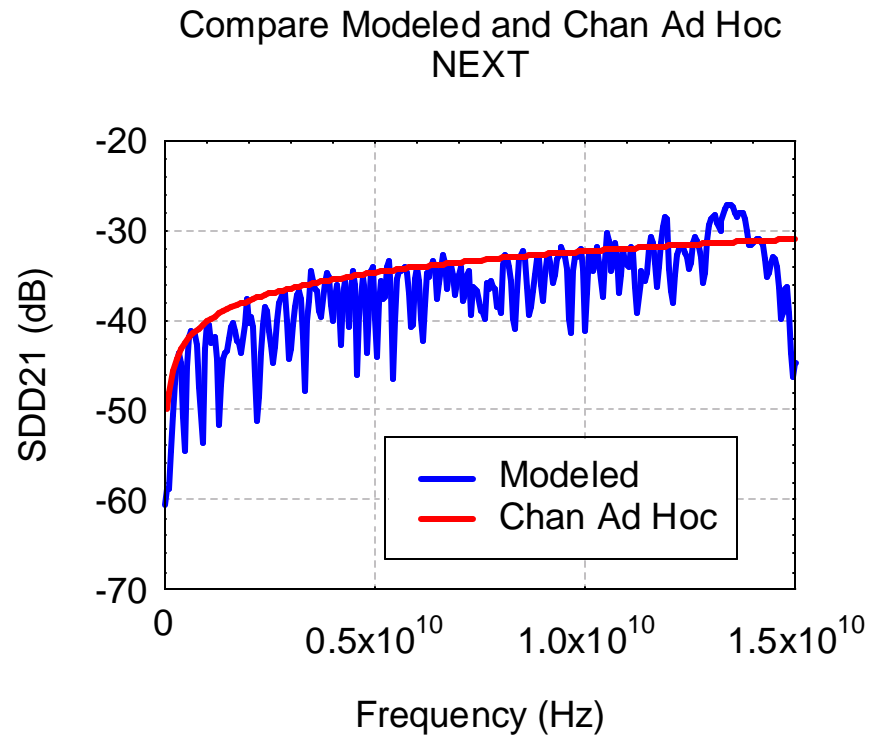
Compare Modeled and Chan Ad Hoc SDD21 Magnitudes



Compare Modeled and Chan Ad Hoc SDD11 Magnitudes



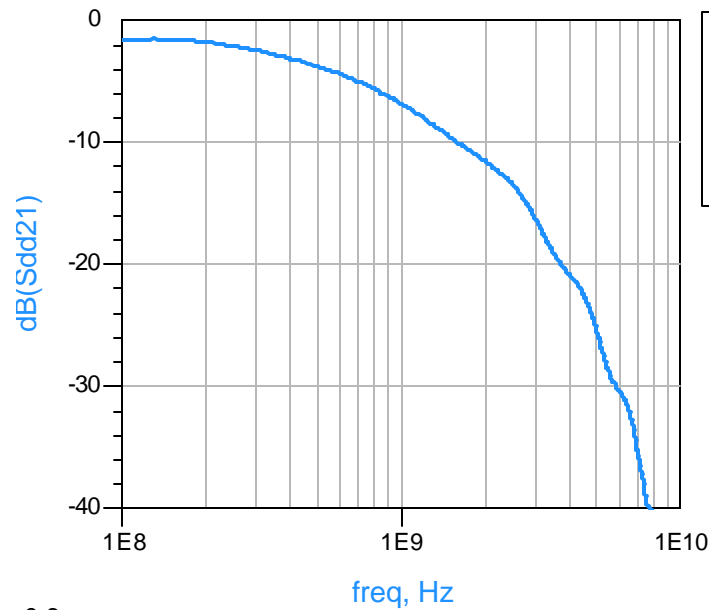
Channel Model (3)



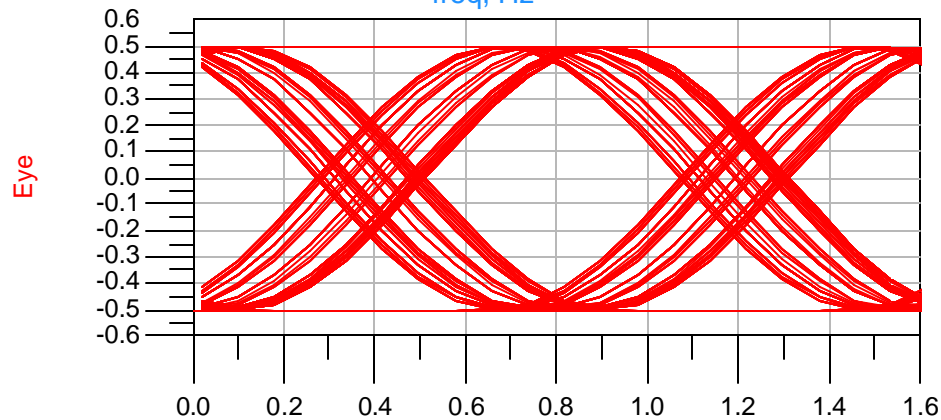
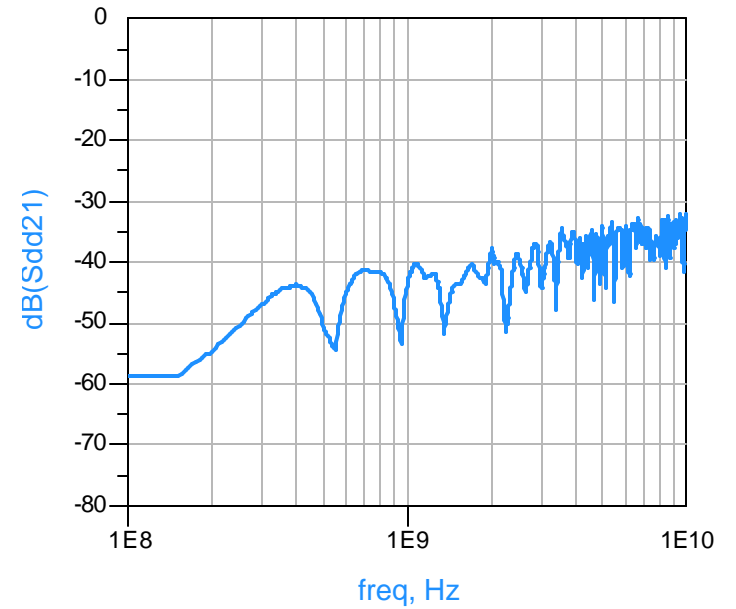
Auto Negotiation

- Same as 10G and 4x3.125Gbps.
- Base Page Only required
 - Next page for optional additional equalization.
- See 10G proposal

Simulation Data



IEEE Ad Hoc Through
Transmission
40 inch Channel



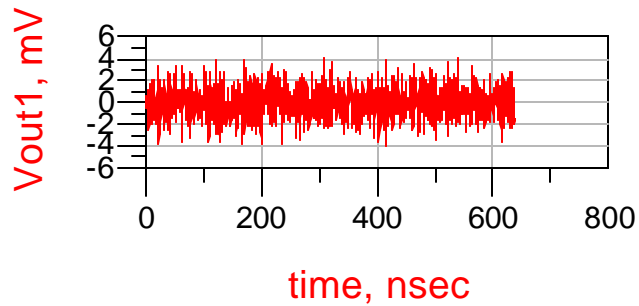
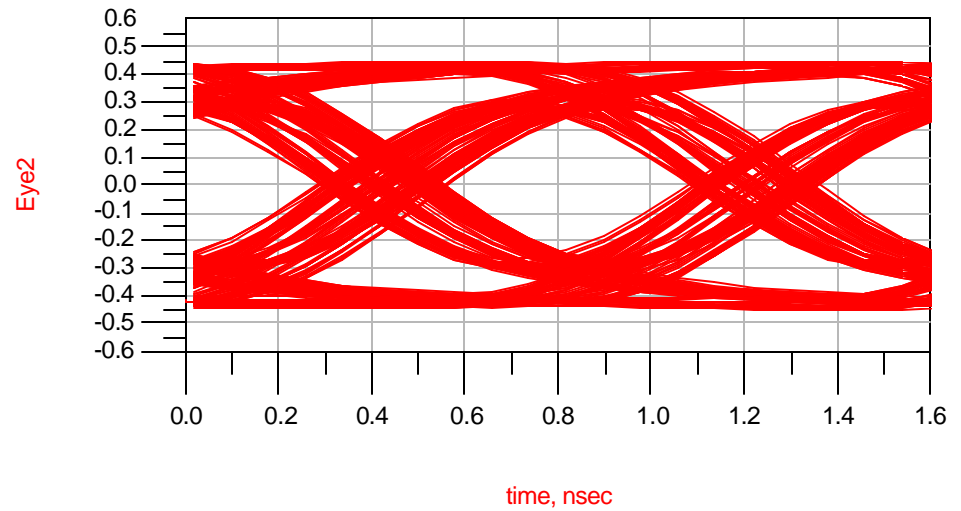
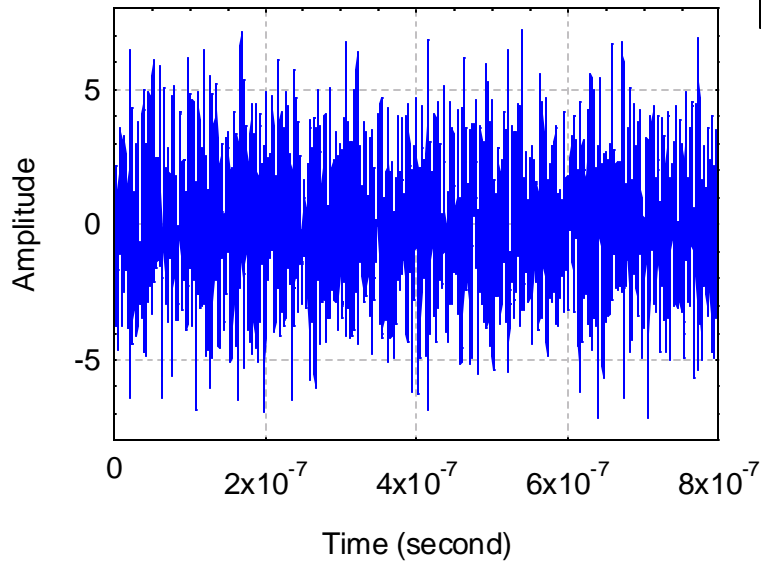
Tx Eye
No Emphasis
Tx Jitter = 0.3 UIpp

IEEE Ad Hoc Xtalk
Transmission

Simulation Data

Transmit Crosstalk, 8 Aggressors, No Emphasis

Xtalk At Tx
With 8 Aggressors
and No Emphasis



Crosstalk at
Receiver Using IEEE
Total NEXT

Rx Eye
No Emphasis
Tx Jitter = $0.3 U_{Ipp}$
With Crosstalk

Conclusion

- The proposal meets objective for 1Gbps Serial PMD
- Specified in a manner that is consistent with existing IEEE 802.3 PMD and clauses
- Does not specify a specific implementation
- Leverages existing Clauses