

IEEE 802.3ap
Proposal for 4 lane 3.125Gbps Serial
Backplane PHY

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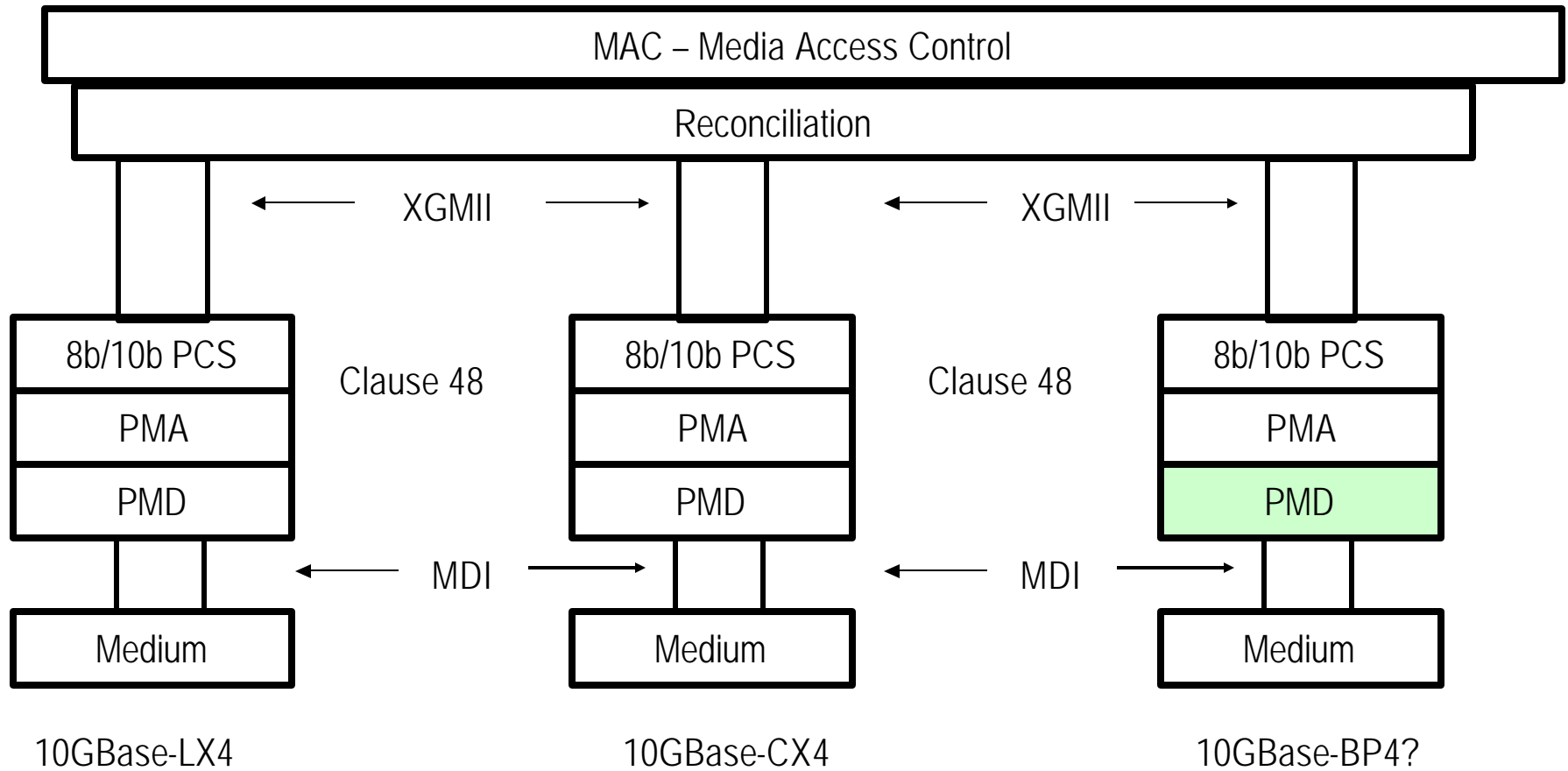
Objectives

- Propose a new PMD sublayer for 4x3.125Gbps Serial links across proposed channel using NRZ signaling
- Leverage existing PCS/PMA sublayers Clause 48 (XAUI)

Agenda

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

Layer Model



Overview

- Use Existing Clause 48 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.)

- TX Equalization can be fixed
 - Optional – increased pre-deemphasize controlled through Auto-Negotiation
- Auto-negotiation allow for multi-rate Transceivers.

Driver Characteristics Table

Parameter	Value	units
Baud rate tolerance	3.125GBd +/- 100ppm	GBd
Diff. Peak Amplitude	1600	mVp-p
Minimum Output Amplitude	800	mVp-p
Unit Interval	320	ps
Common-Mode Voltage	TBD	V
Diff. Output Return Loss minimum	Table	dB
Output Template	Figure	V
Transition Time max	130	ps
min	60	
Output Total Jitter	0.35	Ulp-p
Random	0.27	Ulp-p
Deterministic	0.17	Ulp-p

Differential Return Loss

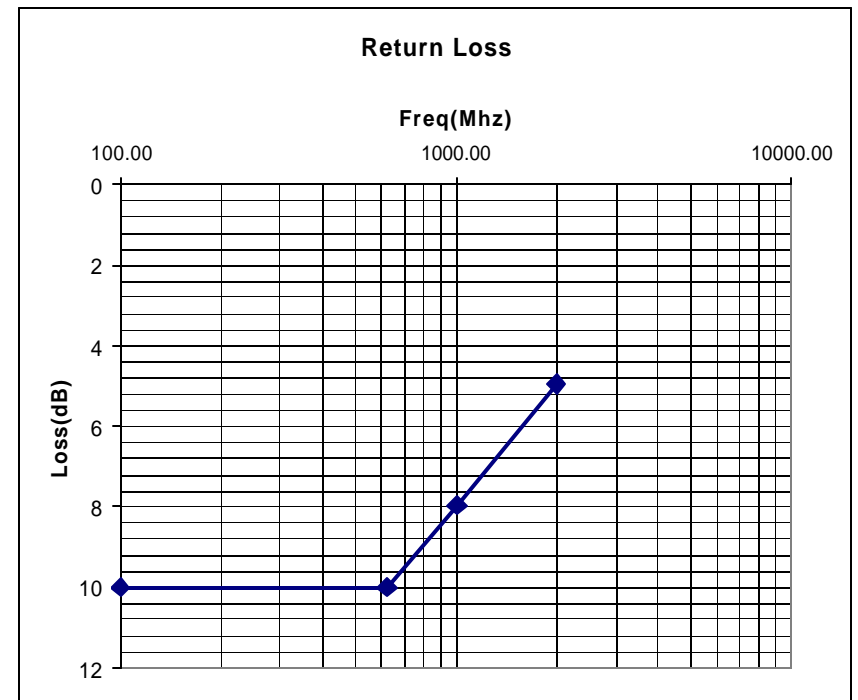
Return Loss(f) = 10

For 100Mhz = f < 625 Mhz

Return Loss(f) =

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

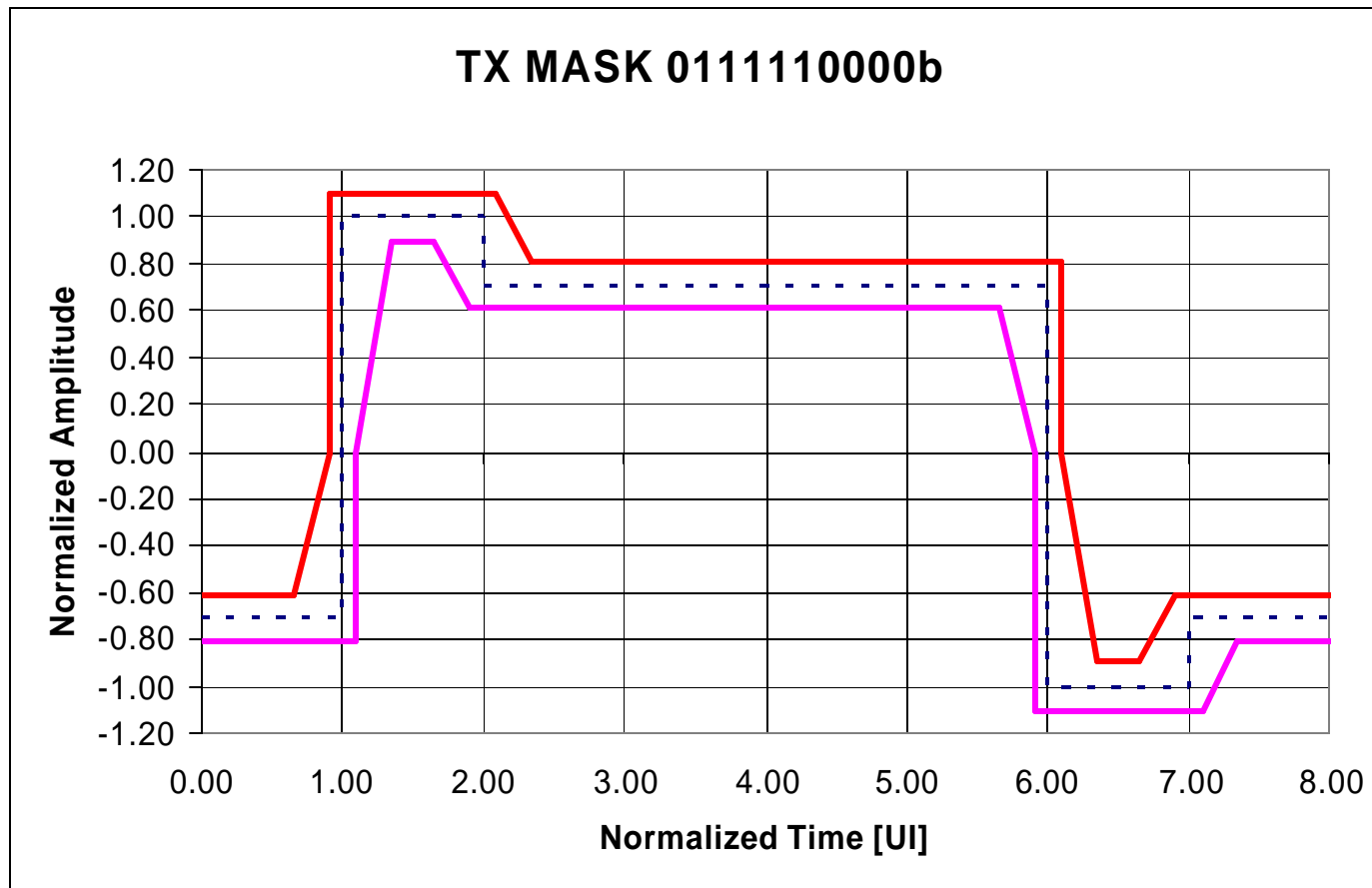
For 625Mhz = f < 2Ghz



Tx Eye Mask

3db Emphasis

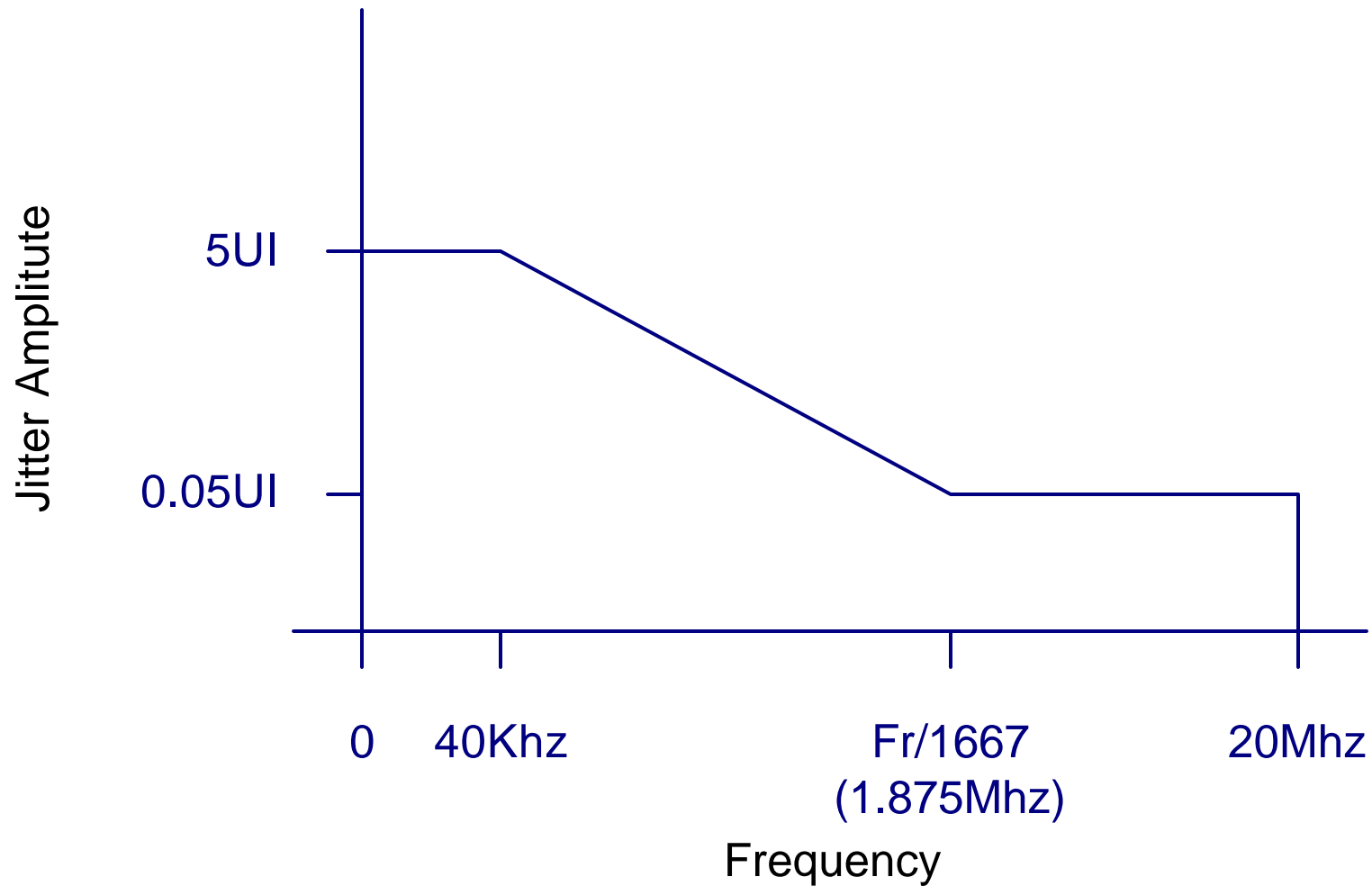
Test pattern 0000011111



RX Characteristics Table

Parameter	Value	units
Baud rate tolerance	3.125GBd +/- 100ppm	GBd
Diff. Peak Amplitude maximum	1600	mVp-p
Error Rate	10^{-12}	
Diff. Return Loss minimum	Table	dB
Input sensitivity	TBD	mVp-p
Jitter Tolerance	Table	UI

RX Jitter Tolerance

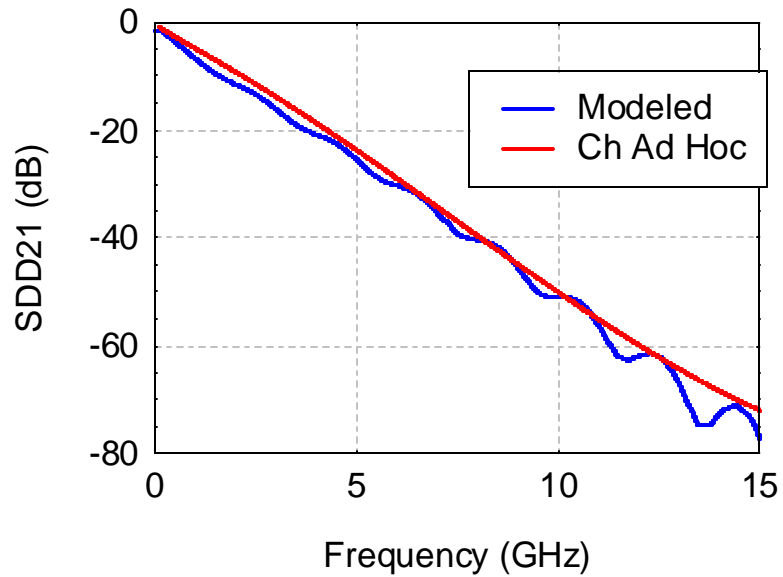


Channel Model

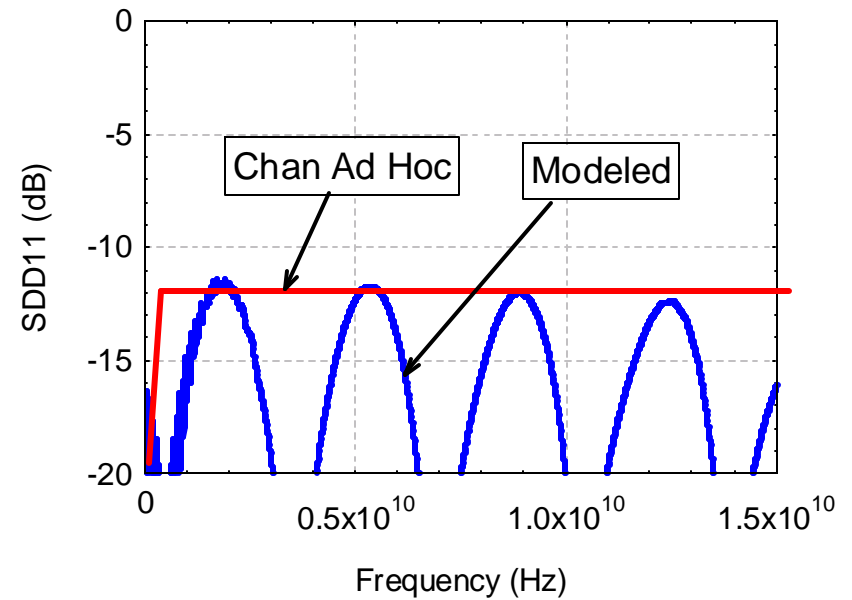
- The Channel Model is Normative
- Informative channel model developed by the Channel Ad Hoc determines the bounds of the normative model.
- Proposed specification is subject to change based on ongoing work by the Channel Ad Hoc.

Channel Model (2)

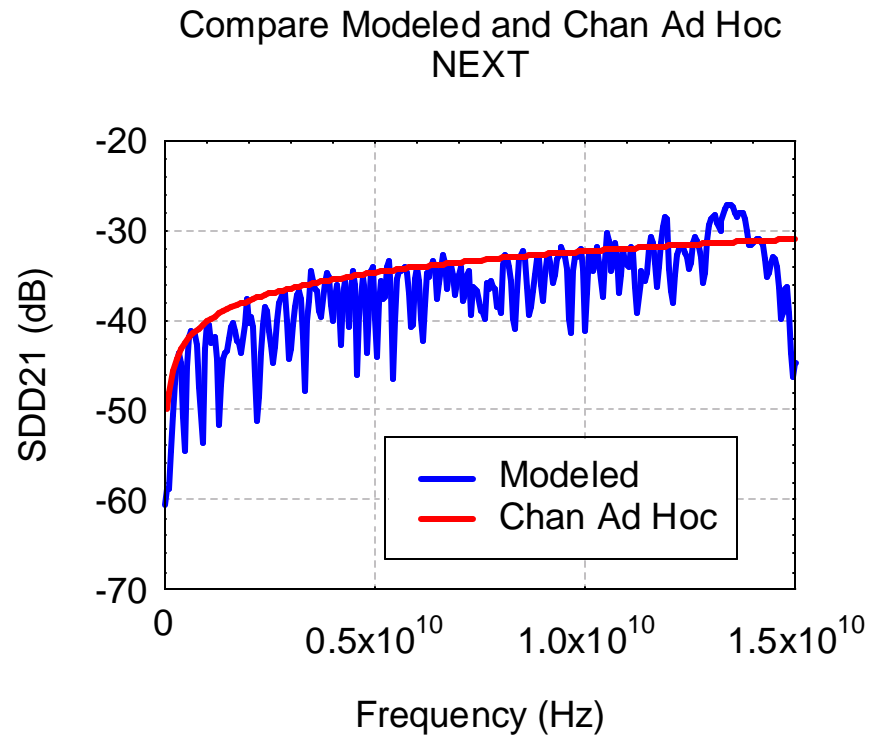
Compare Modeled and Chan Ad Hoc SDD21 Magnitudes



Compare Modeled and Chan Ad Hoc SDD11 Magnitudes



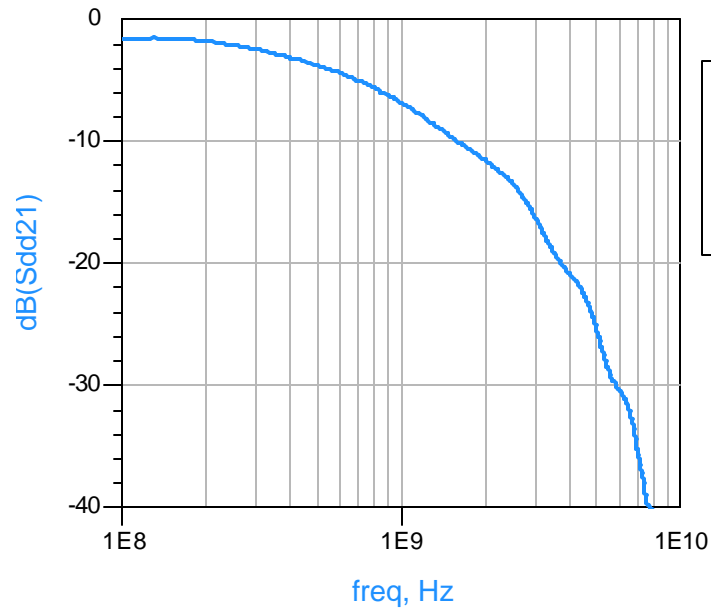
Channel Model (3)



Auto Negotiation

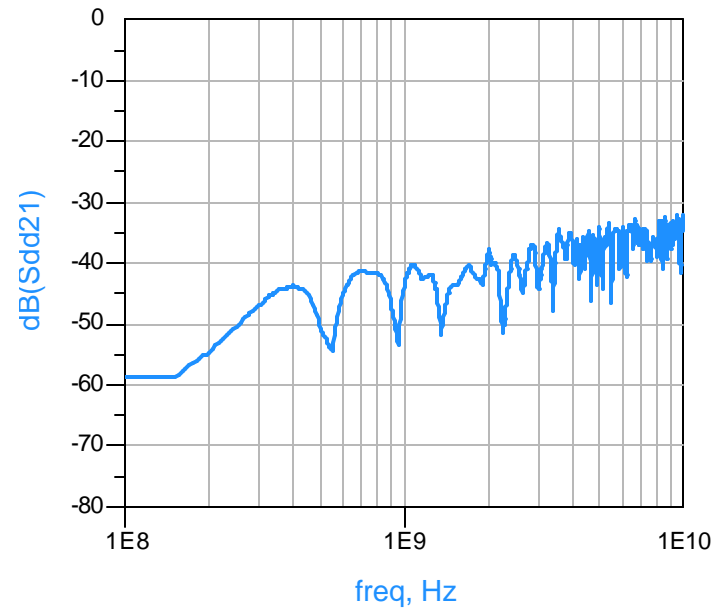
- Same as 10G and 1.25Gbps.
- Base page only required
 - Optional Next pages as defined by 10G proposal for added equalization.
- See 10G proposal.

Simulation Data

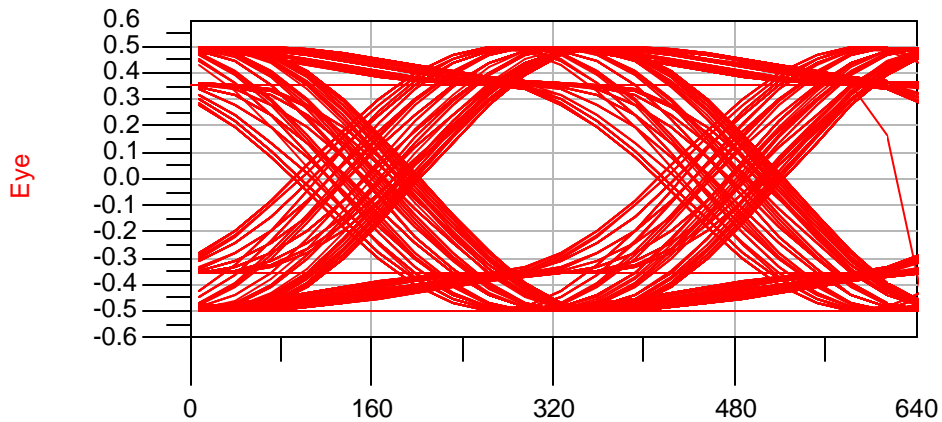


IEEE Ad Hoc Through
Transmission
40 inch Channel

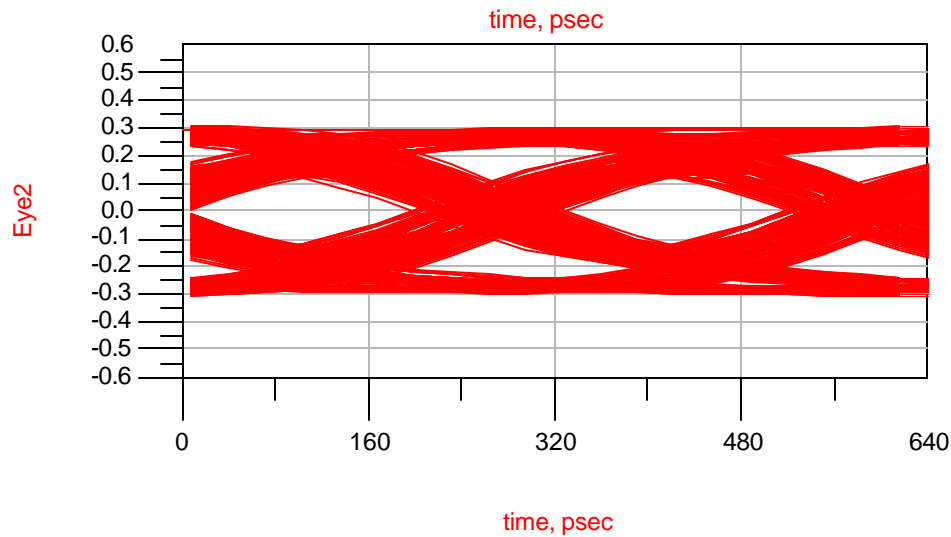
IEEE Ad Hoc Xtalk
Transmission



Simulation Data

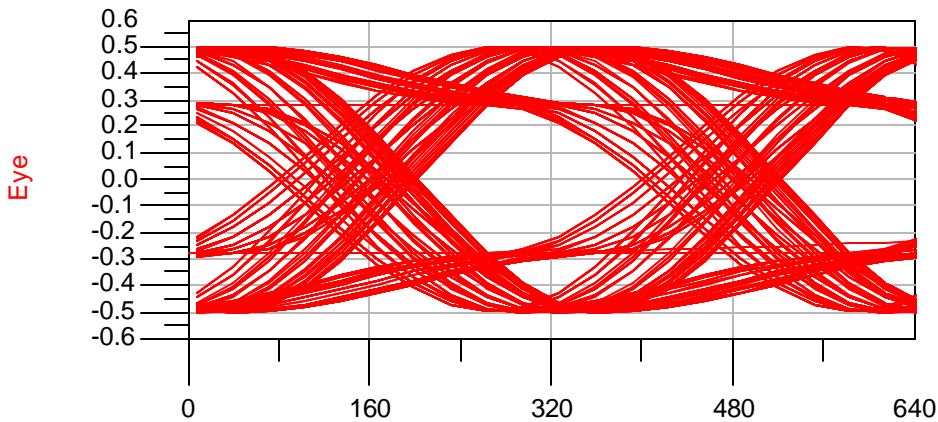


Tx Eye
3 dB Emphasis
Tx Jitter = 0.3 UIpp

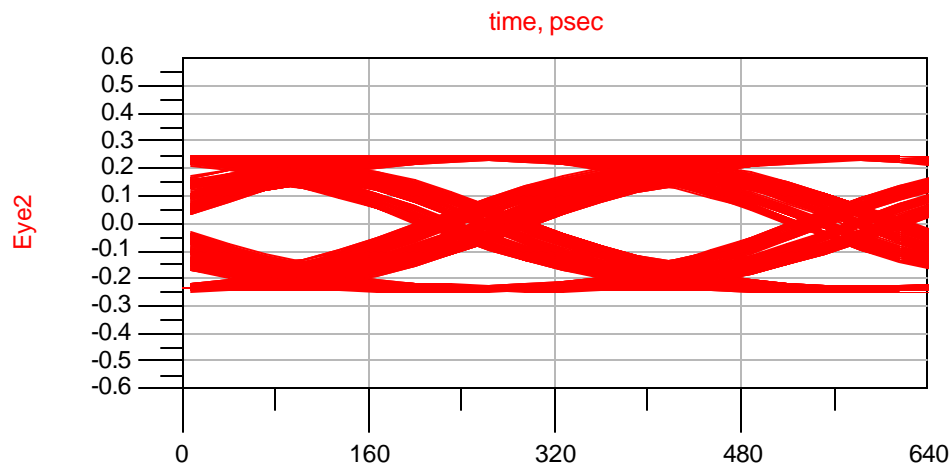


Rx Eye
3 dB Emphasis
Tx Jitter = 0.3 UIpp
WithCrosstalk

Simulation Data



Tx Eye
5 dB Emphasis
Tx Jitter = 0.3 UIpp



Rx Eye
5 dB Emphasis
Tx Jitter = 0.3 UIpp
With Crosstalk

Conclusion

- The proposal meets objective for 4 x 3.125Gbps 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