Backplane Signaling Proposal for 1Gb/s Serial PHY

Backplane Ethernet Task Force
IEEE P802.3ap

Ottawa, Canada

September 27 - 30, 2004

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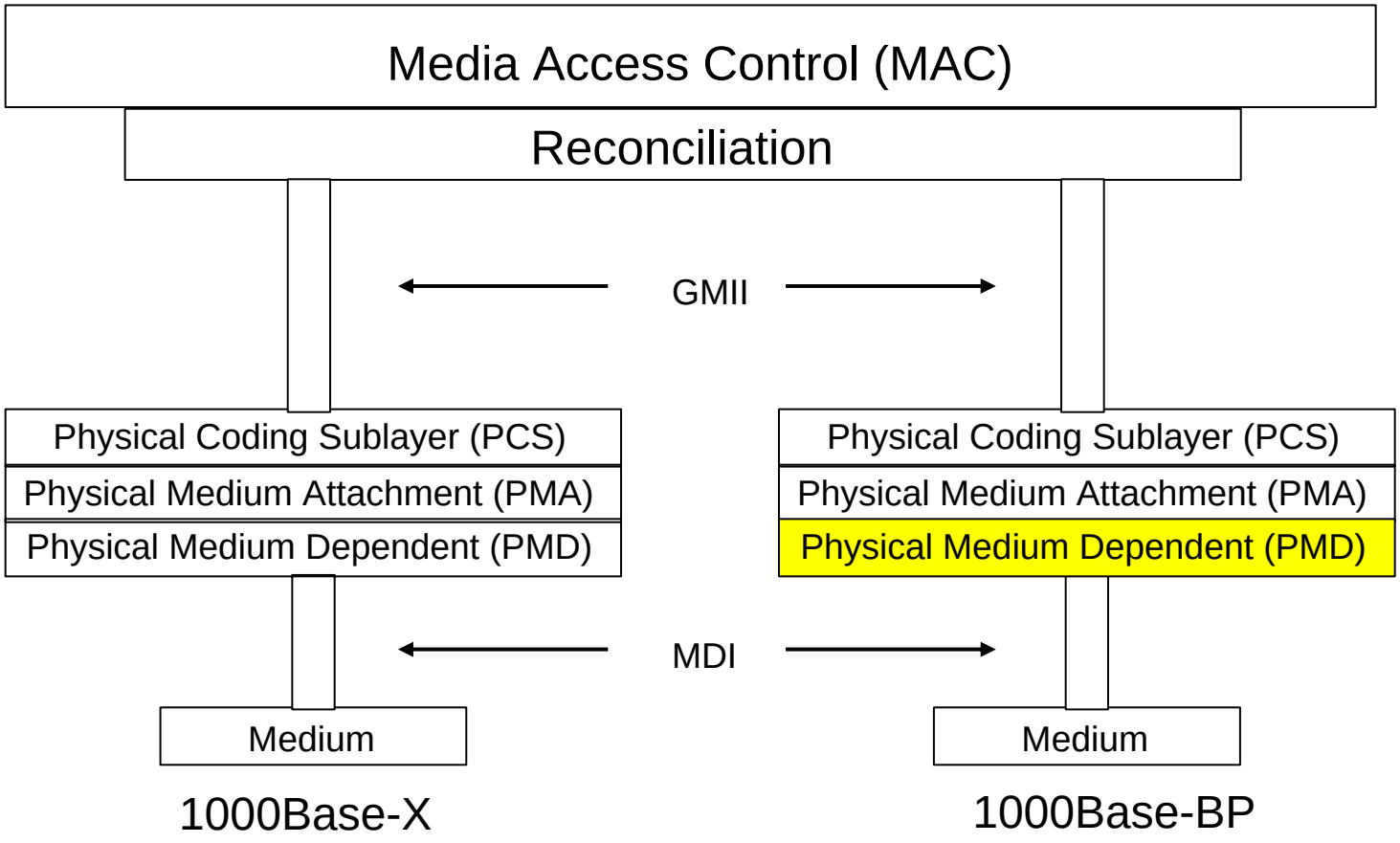
Outline

1. Layer Model
2. Overview
3. TX Specifications
4. RX Specifications
5. Conclusion

Incorporation into IEEE802.3 Layer Model



New backplane PMD only

Use current Clause 36 for PCS and PMA Sublayers

Overview

- Electrical characteristics derived from PICMIC 3.1 and extended to accommodate:
  - IEEE 802.3ap objectives
  - Real world system considerations
- No pre-emphasis required
- No RX Equalization required
- Define Transmitter Characteristics based on TX eye mask, output amplitude, etc
- Define receiver characteristics with input sensitivity, Jitter tolerance, etc
- Builds on 802.3ap Channel Model
  - Accommodates
    - 40 inch channels with two connectors
    - 32 inch long channels with three connector
- Align auto-negotiation with 10G and 4X3.125 Gb/s when available

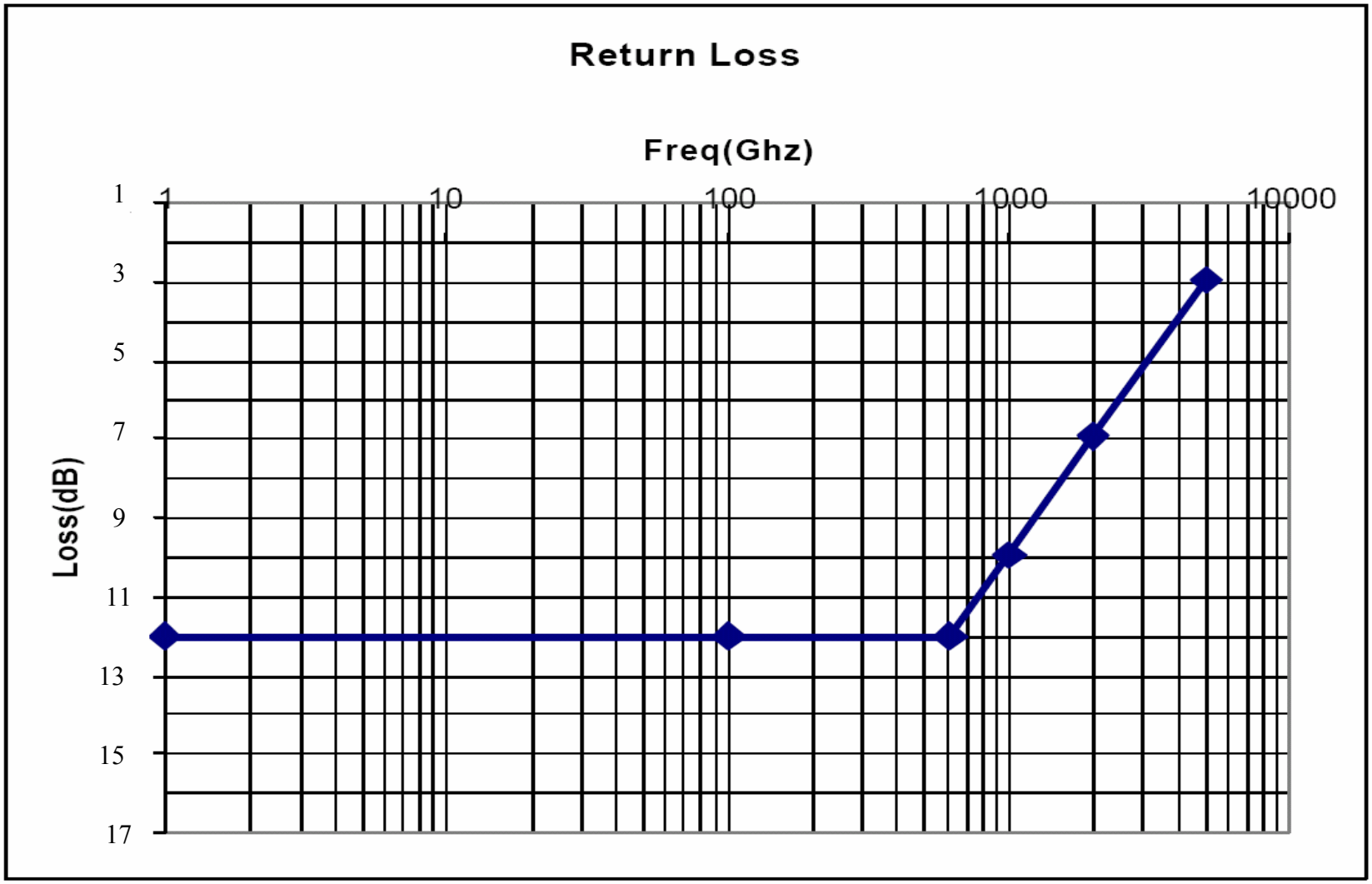
Driver Characteristics Table

Parameter	Symbol	Min	Nom	Max	Units	Comments	Notes
Unit Interval	UI		800		ps	Each UI is 800ps +/- 100ppm	2
Differential Peak to Peak Output Voltage	VTX-DIFFp-p	750		1600	mV	VTX-DIFFp-p = 2*|VTX-D+ - VTX-D-|	1
Minimum TX Eye Width	TTX-EYE	0.75			UI	The maximum Transmitter jitter can be derived as TTXMAX-JITTER = 1 - TTX-EYE= .25 UI	1
Tx Jitter Caused by Duty Cycle Distortion	TTx_TJ_DUTY			50	ps	Measured at TX with a high-frequency (101010…) pattern	
Differential Return Loss	RLTX-DIFF	12			dB	50MHz-625MHz	1

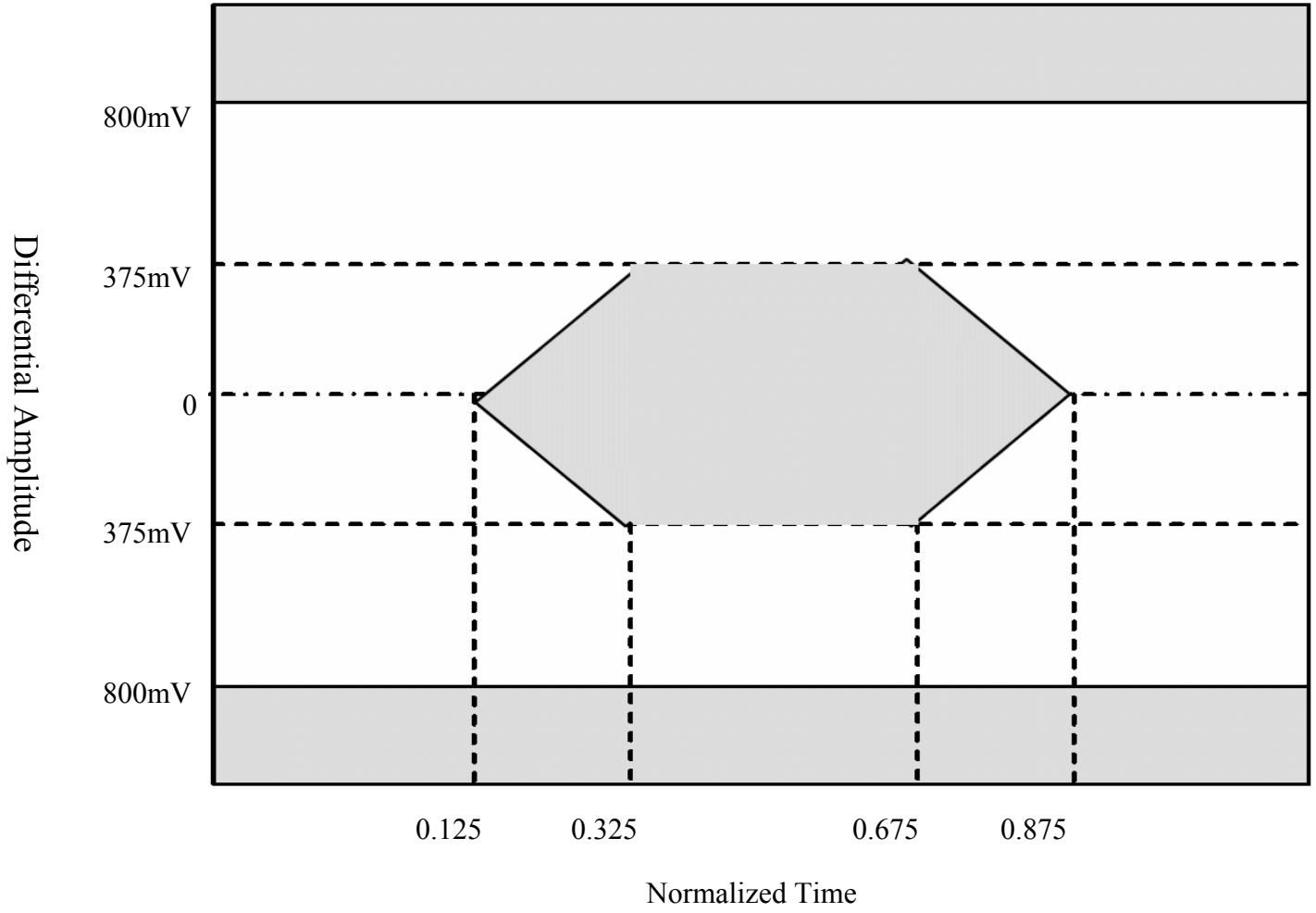
Notes:

1. Measured with test load
2. Measured over 3000 UI

Differential Return Loss



Tx Eye Mask


800mV
375mV
0
375mV
800mV
Differential Amplitude
0.125
0.325
0.675
0.875
Normalized Time

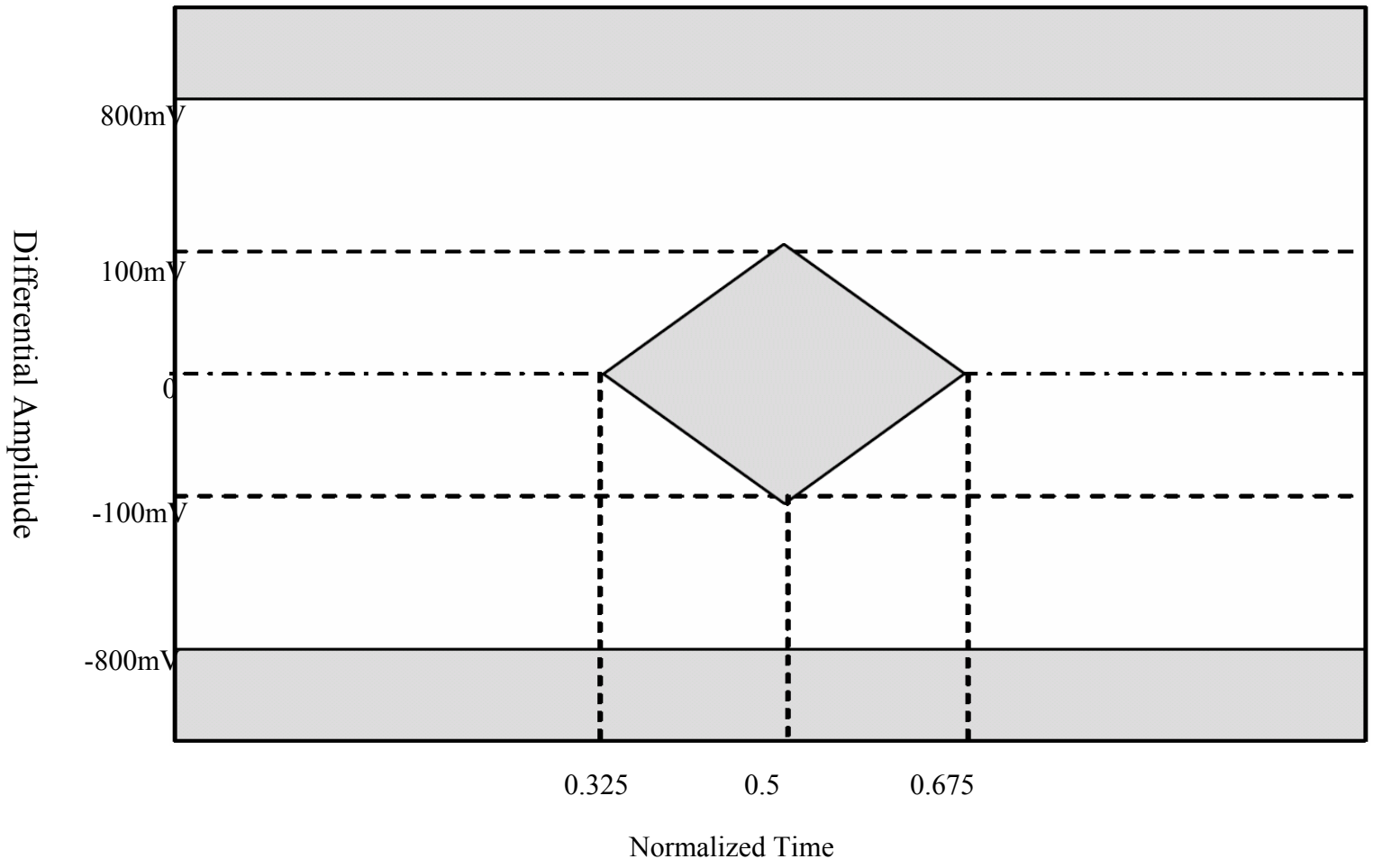
RX Characteristics Table

Parameter	Symbol	Min	Nom	Max	Units	Comments	Notes
Unit Interval	UI		800		ps	Each UI is 800ps +/- 100ppm	2
Differential Peak to Peak Input Voltage	VRX-DIFFp-p	200		1600	V	VRX-DIFFp-p = 2*|VRX-D+ - VRX-D-|	1
Minimum RX Eye Width	TRX-EYE	0.35			UI	The maximum Interconnect and Transmitter jitter that can be tolerated by the Receiver can be derived as TRXMAX- JITTER = 1 - TRX-EYE= .65 UI	1
Differential Return Loss	RLRX-DIFF	12			dB	50MHz-625MHz	3
Error Rate				10E-12			

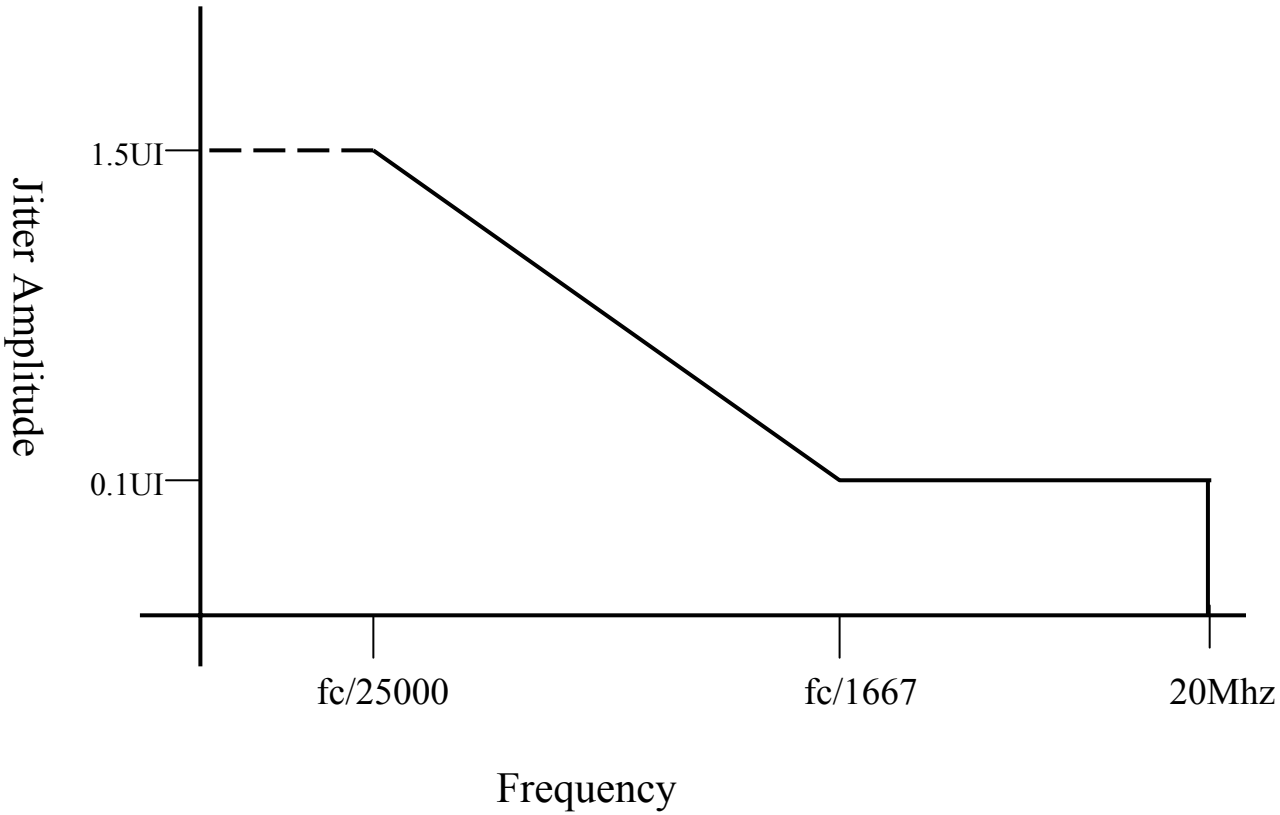
Notes:

1. Measured with test load The in situ system pin specification can be determined by multiplying the Rx spec by (1-2ρ), where ρ is the reflection coefficient looking into the package and die combination. Return loss is 20*log(|ρ|).
2. Measured over 3000 UI
3. Measured at the device pins with a 50 ohm referenced Vector Network Analyzer (VNA). Meeting differential return loss does not guarantee operation.

Rx Eye Mask


800mV
100mV
0
-100mV
-800mV
Differential Amplitude
0.325
0.5
0.675
Normalized Time

RX Jitter Tolerance



Conclusion

- The proposal:
  - Meets the objectives for a 1Gb/s serial PMD
  - Aligns with existing IEEE 802.3 Layer Model
  - Uses existing Clauses for PCS & PMA
  - Does not specify a specific implementation

- Proposed specification is subject to change based on ongoing work by the Channel Ad Hoc.

Thank You

Questions