Possible Optical PMD Scenarios

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Introduction

- Purpose: To suggest a solution set of Optical PMDs, as a guideline for further work.

- All quantitative values are approximate, and need further work.

- This is a presentation from me as an individual, not necessarily representing the views of the Optical PMD group.

- For brevity, "PMD" stands for "Optical PMD". Also, temperature extended version of 1000BASE-X is not included in the count.

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Assumptions

- Forward Error Correction (FEC) can add 4 dB net coding gain (optical), at no extra cost to PMD. In large volumes, it can be integrated into the PHY chip.

- Preferably, FEC can be introduced such that it is backward compatible with 1000BASE-LX.

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One-PMD Scenario

	MEETS OBJECTIVES (10 KM, 1:16)				EXTENDED PERFORMANCE - 10 KM 1:32, or 20 km 1:16			
	P2P ONU	P2P OLT	P2MP ONU	P2MP OLT	P2P ONU	P2P OLT	P2MP ONU	P2MP OLT
PMD TYPE	1A	1A	1A	1A	1A+LOC+ FEC	1A+LOC+ FEC		

LOC: DC balanced, Low Overhead Code

Description:

1A: A single-fiber, single-wavelength PMD, with 3-dB integral couplers. Tx: 1310 nm FP. Rx: APD. Total budget 22 dB plus 7 dB for internal couplers. FEC may help replace APD with PIN. Return loss at MDI: 20 dB min.

Cost, relative to 1000BASE-LX:

1A: 5x

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Two-PMD Scenario

	MEETS OBJECTIVES (10 KM, 1:16)				EXTENDED PERFORMANCE - 10 KM 1:32, or 20 km 1:16			
	P2P ONU	P2P OLT	P2MP ONU	P2MP OLT	P2P ONU	P2P OLT	P2MP ONU	P2MP OLT
PMD TYPE	2A	2B	2A	2B	2A	2B	2A+FEC	2B+FEC

Description:

2A: A single-fiber, two-wavelength PMD, with wavelength-selective integral couplers. Tx: 1310 nm, DFB, FP or VCSEL, -3 dBm. Rx:1490 nm, PIN, -22 dBm. If FP is used, it is in conjunction with either temperature control or a low overhead DC-balanced line code.

2B: A single-fiber, two-wavelength PMD, with wavelength-selective integral couplers. Tx: 1490 nm, DFB or VCSEL, -1 dBm. Rx:1310 nm, PIN, -24 dBm.

Cost, relative to 1000BASE-LX:

2A: 1.1x (FP) **2B:** 1.75x

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Concluding Remarks

- The two-PMD scenario is better, but not fully satisfactory! Yet, we must avoid adding a third PMD.

- Further work: We need contributions on the following topics.

    - Detailed scrutiny of proposed solutions.

    - Feasibility of temperature control of FP lasers.

    - Determination of FEC net coding gain, optical. Is 4 dB feasible, while maintaining backward compatibility with 1000BASE-LX?

    - Study of LOC vs. 8B10B tradeoff.

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