



P2MP PMD Issues

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Issues and future topics

- **Type 1 ONT Tx Spectral Width**
- **The effect of FEC**
- **Burst Mode Dynamics**
- **Isolation of Receivers**
- **Power leveling ONT Tx**

ONT Spectral Widths

- **Spectral widths are calculated**
 - For given wavelength ranges
 - Including penalty for MPN ($k=0.5$)
 - Including penalty for pulse spread
- **Larger spectral widths could be obtained by considering**
 - Larger optical path penalty
 - Lower BER and FEC

Potential $\Delta\lambda$'s (nm)

Distance (km)	10	10	10	20	20	20
Penalty	1dB	2dB	3dB	1dB	2dB	3dB
BER	10^{-12}	10^{-12}	10^{-12}	10^{-4}	10^{-4}	10^{-4}
Epsilon	0.16	0.19	0.20	0.21	0.265	0.3
Industrial $D_{\max}=5.3$	2.4	2.9	3.0	1.6	2.0	2.3
Commercial $D_{\max}=3.9$	3.3	3.9	4.1	2.2	2.7	3.1

The effect of FEC

- Now, the 20km OLT uses a DFB to get a 1 dB penalty
- At BER of 10^{-4} , spectral width of 2.3 nm yields a 3 dB penalty
- If FEC has a gain $> 2\text{dB}$, then it recovers the lost penalty
 - The link still works
- Can we have one PMD?



Burst Mode Dynamics

- **Technical approach largely determines the performance regime**
- **ONT laser driver options**
 - Reuse GbE drivers
 - Reuse B-PON drivers
- **OLT analog chain options**
 - Ordinary CM
 - DC coupled
 - AC coupled

FSAN Pop-Quiz Answers

The following is the range of answers that were given to the question, “How long should the physical layer overhead be at 1.2G speed?” (expressed in Bytes)

- | | | | |
|--------------|-----|------------|-----|
| • Agere | 3-6 | • NEC | 6 |
| • Alcatel | 12 | • Oki | >3 |
| • Broadlight | 3-6 | • Quantum | 3-6 |
| • Flexlight | 3-6 | • Terawave | 8 |
| • Iamba | >3 | • Zonu | 3-6 |

Comment on “Adaptability”

- **Higher layers may advertise the ability to adapt to PMD ability**
- **Adapting to OLT is not so bad**
 - Local and single instance
- **Adapting to ONT is not so good**
 - Remote and multiple instance
- **We should at least specify ONT dynamics**
 - Keep it simple...



Isolation of Receivers

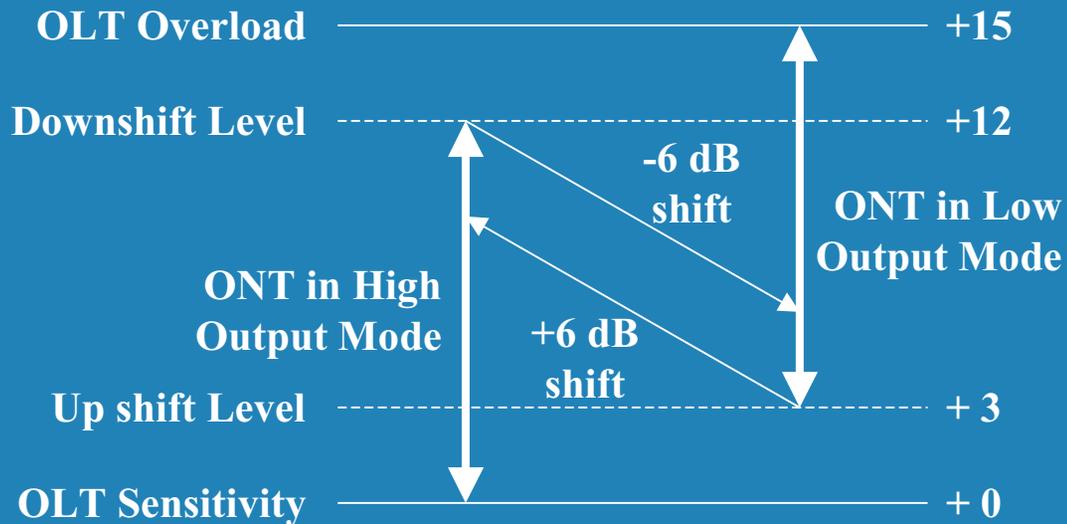
- **Basic: must specify isolation against NEXT from Tx**
 - External NEXT from ODN reflection
 - Consider NEXT internal to PMD
- **Advanced: could specify isolation against enhancement band wavelengths**
 - Requires at least cursory description of what ‘enhancement band’ carries

Power Leveling

- **Current OLT dynamic range is getting big (21~23dB)**
- **APD Rx could have trouble**
- **ONT power leveling**
 - **Possible to lower power ~6 dB using cheap electronic means**
 - **Simple 2 mode scheme feasible**

Two-mode Scheme

- **ONT has two modes**
- **OLT measures power**
- **OLT controls ONT mode**
- **Ample 3 dB hysteresis and margin**





Summary

- **There is much work to do**
- **Interplay of MPN and FEC must be clarified**
- **Dynamic performance**
- **Isolation requirements**
- **Power leveling**