

# *Optical PMD Proposals for 10GbE*

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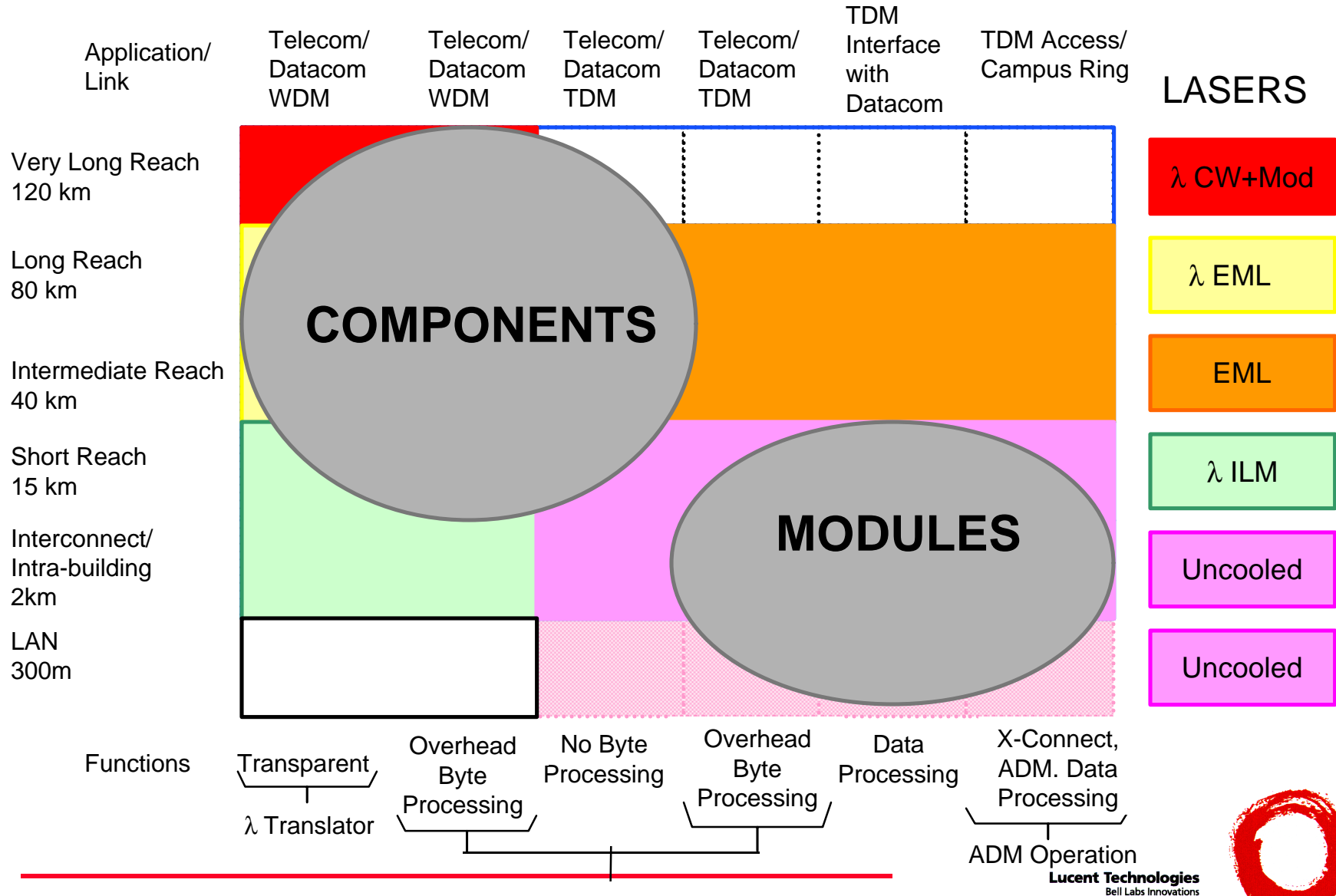


# Outline

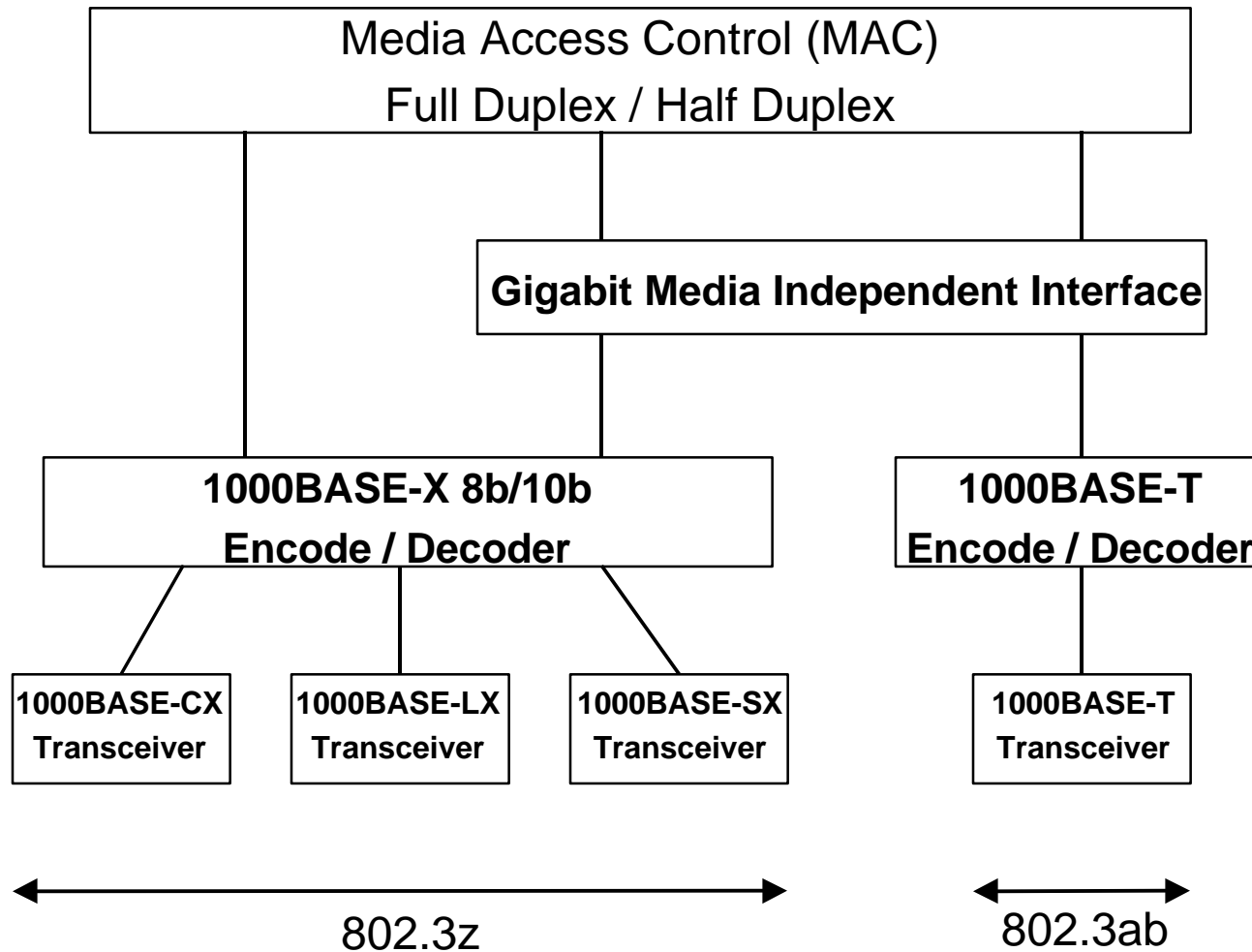
- 10 Gigabit Market Segments
- Updated Serial SMF Proposals
- Update on T1X1.5 efforts
- A Quick View of Current Proposals
- Conclusions



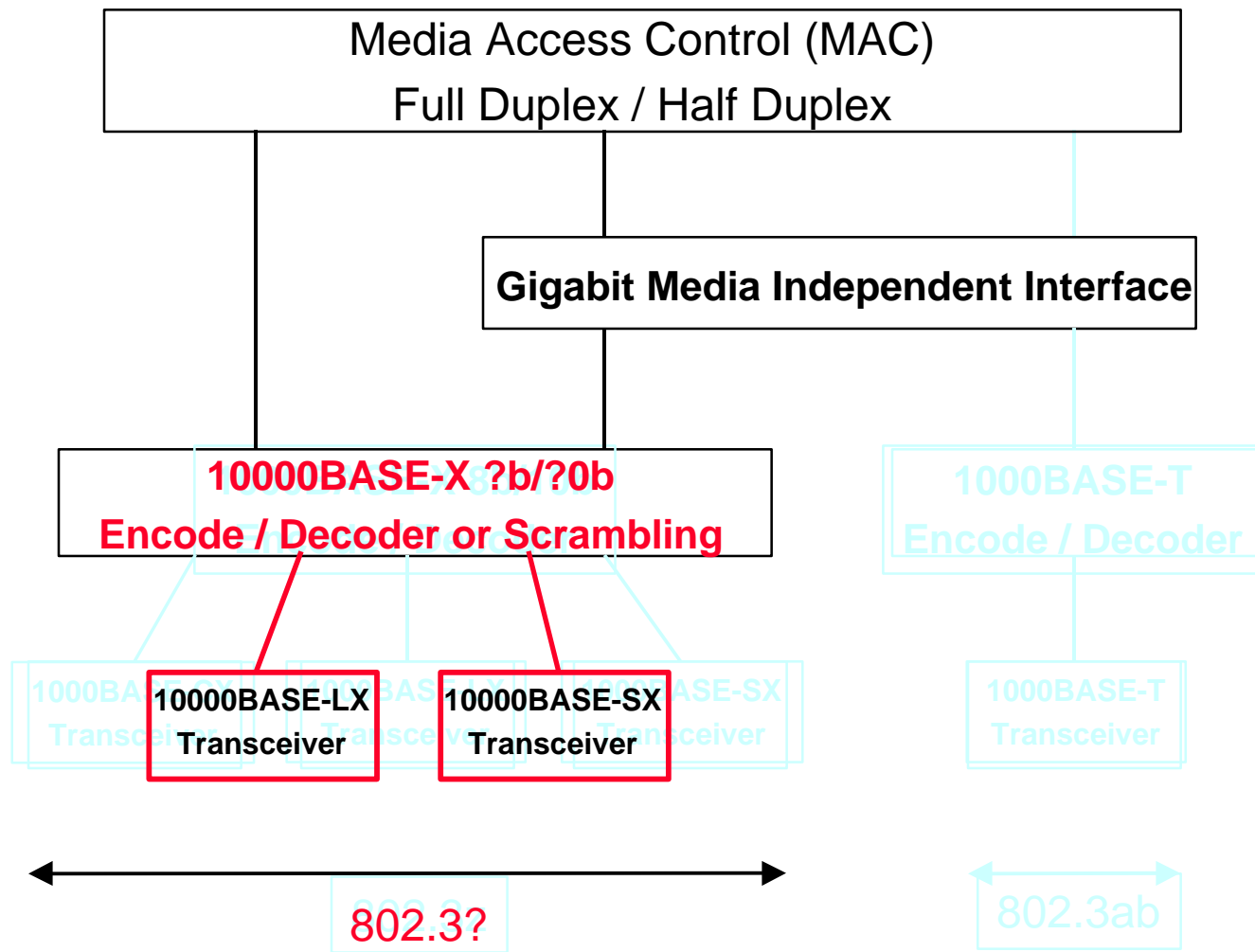
# 10Gb/s Market Segmentation



# Current GbE Structure



# Proposed 10GbE Structure



# Preliminary 2km Specifications

Fabry-Perot (MLM) 1310nm			
	Min	Max	Units
<b><i>Transmitter</i></b>			
Signaling Speed		<b>11.25</b>	GBd
Average Power	<b>-5</b>	<b>0</b>	dBm
Wavelength	<b>1290</b>	<b>1330</b>	nm
RMS Spectral Width		<b>2.5</b>	nm
Extinction Ratio	<b>7</b>		dB
10%-90% Rise/ Fall Time		<b>35</b>	psec
Relative Intensity Noise		<b>-125</b>	dB/Hz
<b><i>Receiver</i></b>			
Signaling Speed		<b>11.25</b>	GBd
Wavelength	<b>1290</b>	<b>1330</b>	nm
Average Receive Power		<b>0</b>	dBm
Receiver Sensitivity	<b>-14</b>		dBm
Return Loss			

*Calculations based on standard single mode fiber and unisolated uncooled laser*



# Preliminary 15km Specifications

Distributed Feedback (SLM) 1310nm			
	Min	Max	Units
<b><i>Transmitter</i></b>			
Signaling Speed		<b>11.25</b>	GBd
Average Power	<b>-5</b>	<b>0</b>	dBm
Wavelength	<b>1295</b>	<b>1323</b>	nm
RMS Spectral Width		<b>0.5</b>	nm
Side Mode Supression	<b>30</b>		dB
Extinction Ratio	<b>7</b>		dB
10%-90% Rise/ Fall Time		<b>35</b>	psec
Relative Intensity Noise		<b>-145</b>	dB/Hz
<b><i>Receiver</i></b>			
Signaling Speed		<b>11.25</b>	GBd
Wavelength	<b>1295</b>	<b>1323</b>	nm
Average Receive Power		<b>0</b>	dBm
Receiver Sensitivity	<b>-14</b>		dBm



# T1X1.5 Update

Preliminary Parameter Values for OC-192 1km intraoffice interface

Parameter (unit)	Value
<b>Transmitter</b>	MLM
Operating wavelength range (nm)	1285-1343
rms spectral width, $\sigma$ (nm)	3
Max transmit power (dBm)	-3
Min transmit power (dBm)	-8
Extinction ratio (dB)	7
Temperature	-5 to 85C

Physical Layer, GR-1377-CORE Issue 4, March 1998  
20km specification

Parameter (unit)	Value
<b>Transmitter</b>	SLM
Operating wavelength range (nm)	1290-1330
SSR min (dB)	30
Spectral width, $\sigma$ (nm)	1.0
Max transmit power (dBm)	0
Min transmit power (dBm)	-4
Extinction ratio (dB)	8.2
Temperature	-40 to 85C

- The T1X1.5 link distances are calculated using the G.957 model and epsilon model therein. The epsilon model found in Annex A is used to account for mode partition noise in F-Ps, and chirp for DFB sources.
- Future work is required to understand if there is any correlation between the GbE link model MPN figure and the epsilon model.





# Optical PMD Options

## SERIAL

### Advantages

- Lowest complexity for LAN, MAN, and WAN applications
- Potentially lowest cost for std SMF and enhanced MMF
- Shipping in certain market segments and supported by several suppliers

### Challenges

- Relaxation of Extinction ratio spec
- Si may not be suitable for 10G operation----> **moving to** SiGe or GaAs

## Analog Multilevel Signaling

### Advantages

- Potential to support the embedded base of SMF and MMF
- Lower speeds will allow the use of Si electronics

### Challenges

- Requires linear optics
- Non-STD from an optical transceiver vendor perspective



# Optical PMD Option Contd

## Parallel

### Advantages

- Exists for short distances <500m on MMF @ 1Gbps/channel
- Has potential for 2x per channel in the future

### Challenges

- Ribbon cable
- Limited reach

## WWDM

### Advantages

- Good potential solution for existing MMF
- Uses lower speed electronics(Si 2.5Gbps)

### Challenges

- Complex manufacturing because of wavelength selection and coupling
- Uses 4 DFB lasers, optical mux/demux, and 4 times the electronics(economics, reliability and mfg. uncertain).



# Conclusions

- Serial 10 gigabit has the lowest complexity and potentially the lowest cost for existing single mode fiber and enhanced multimode fiber
- Further investigation is required for link distances achievable with low cost uncooled sources
- Serial 10 gigabit solutions have a better potential for multisourcing

