THE POSSIBILITIES ARE INFINITE FUJITSU

40GE 10km SMF PMD Proposal

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IEEE 802.3ba 40Gb/s and 100Gb/s Ethernet
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Supporters

FUJITSU

Sosaku Sawada, Eudyna Devices

Keiji Satoh, Eudyna Devices

Hideaki Horikawa, Oki Electric

Hitoshi Watanabe, Mitsubishi Electric

Jack Jewell, JDSU

Farzin Firoozmand, SMI

Craig Hornbuckle, SMI

Song Shang, SMI

Masaru Onishi, Fujitsu Ltd

Tadashi Ikeuchi, Fujitsu Lab

Approaches for this slot

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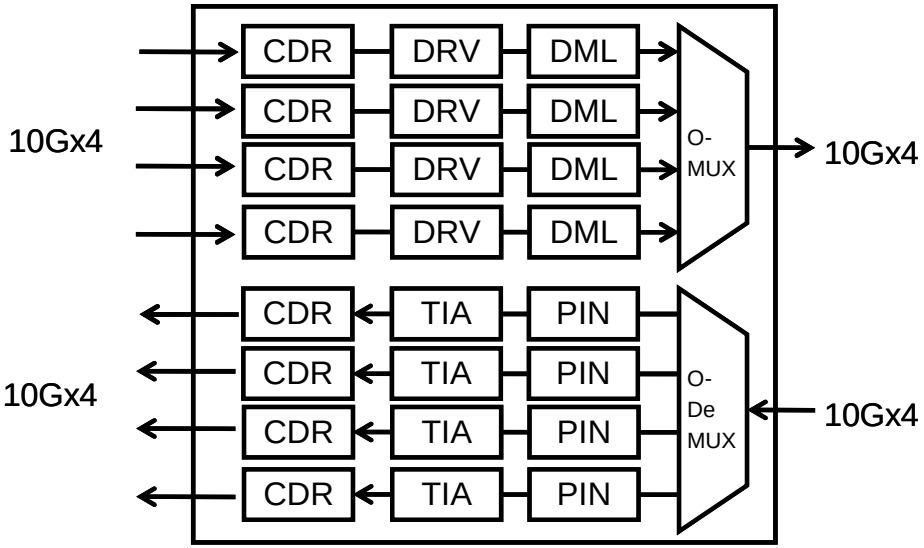
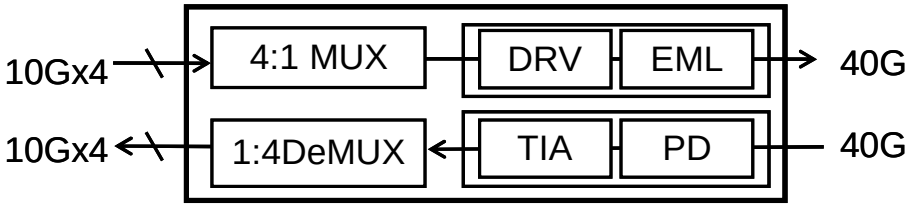
“Parallel & Serial” configurations were discussed.

cole_03_0308/ traverso_04_0308/ tsumura_40_01_0208





Elemets	Parallel	Serial
LD	4 X 10G 1.31u Uncooled DML	40G 1.31u EML
PD	4 X (10G PIN + TIA)	40G PIN + TIA
Elctr IF	SFI 5.2	SFI 5.2
E-MUX	None	4:1 MUX/ 1:4 DEMUX
O-MUX	CWDM MUX/DEMUX (Zig-zag)	None

Target for this slot

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Fujitsu considers that *"Serial solution"* should be the final target for this slot.

◆ Potential capability analysis

Item		Parallel	Serial
Dimensions		X2/ XENPAK compatible (Integration for Device elemnts is absolutely necessary)	X2/ XENPAK compatible
Power Consumption		> 8W	More potential to be reduced.(80% of Parallel)
Cost		Within a rational range.	More potential to be reduced, worthwhile considering. History of LX4 cost is one of the evidence. (traverso_04_0308)
Link budget		Almost available. Need a little bit modification for 10G LR. (cole_03_0308)	Challenging, but seems to be within target.
Device feasibility	LD	Feasible (10G 1.31u UC DML)	40G 1.31 EML is ready for application.
	PD	Feasible (10G PIN + TIA)	40G PIN is already used in 300pin.
	O-MUX	Feasible (Production for LX4)	Not necessary
	Elctr MUX	Not necessary	Feasible in the market (SiGe) Development Activities for CMOS in the industry.

History of LX4 cost

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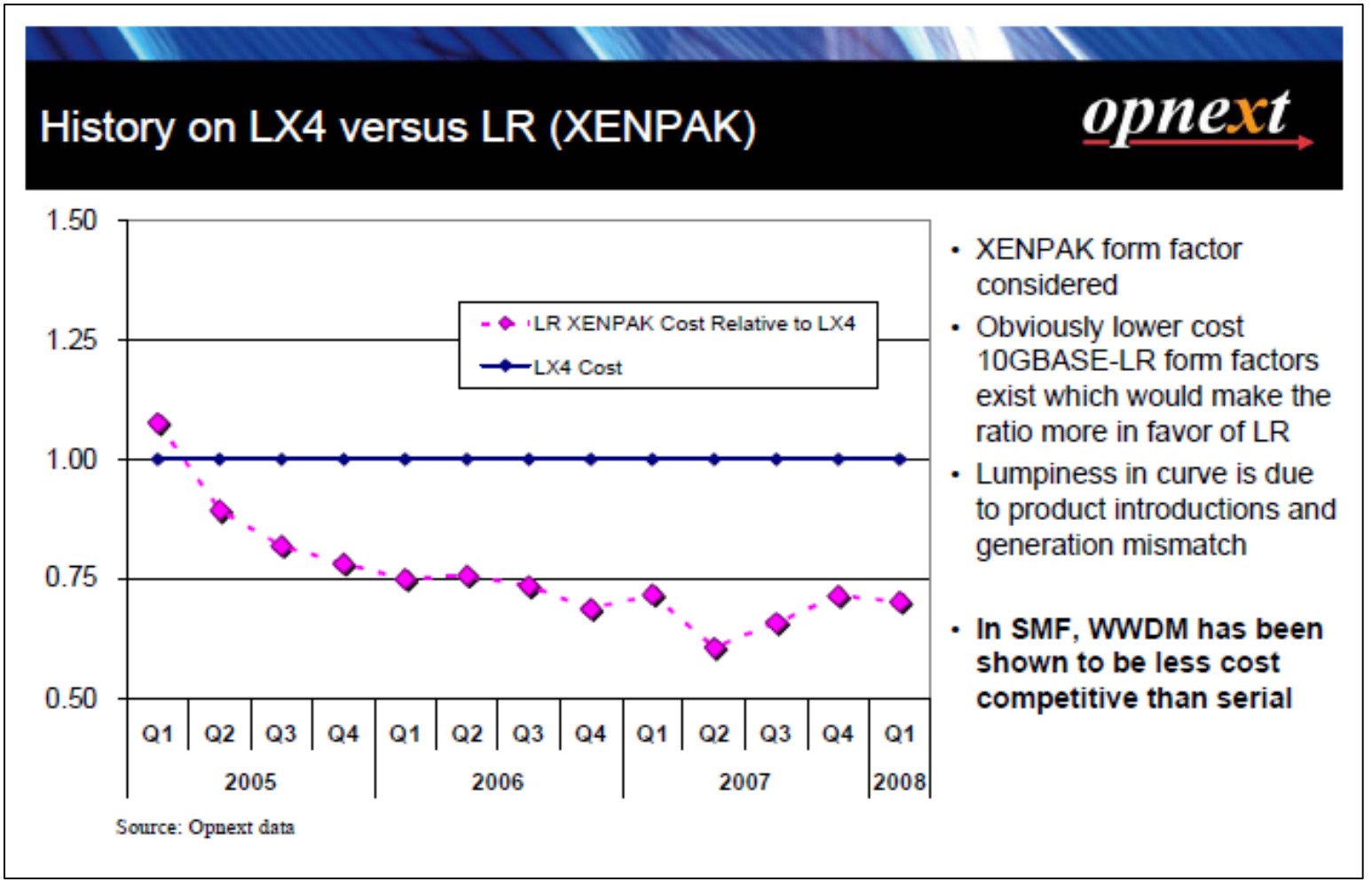
Parallel solution is proved to be less cost competitive until now. More breakthroughs are requisite.



Industry trends for supporting “Serial”

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- **ITU-T SG15 WP2 Q6/15**
  Feb,2008 Meeting, new application code (1.3um 40G, 10km/20km/40km) was added in the previous 1.5um application in G959.1, which is enhanced to serial solution.

- **XLMD 40G TOSA/ROSA (www.xlmdmsa.org)**
  XLMD supports 40G TOSA/ROSA optical interface basically specified in ITU-T G959.1/others and it is under development, which is enhanced to serial solution.
  XLMD consists of Eudyna, Mitsubishi, NEC, Oki, Opnext, and Sumitomo.

- **1:4 MUX/DEMUX CMOS development**
  The industry is under development and it will be realized *at the latest* within a year, which is enhanced to serial solution.
  – N.Nedovic, et. al., D12-2, ISSCC2007, Fujitsu Laboratories of America(40G CDR)
  - C.Liao, et.al, 5-2, ISSCC2008, National Taiwan University(40G Serial Receiver w/EQL&CDR)

Availability of 1.3um 40G EML

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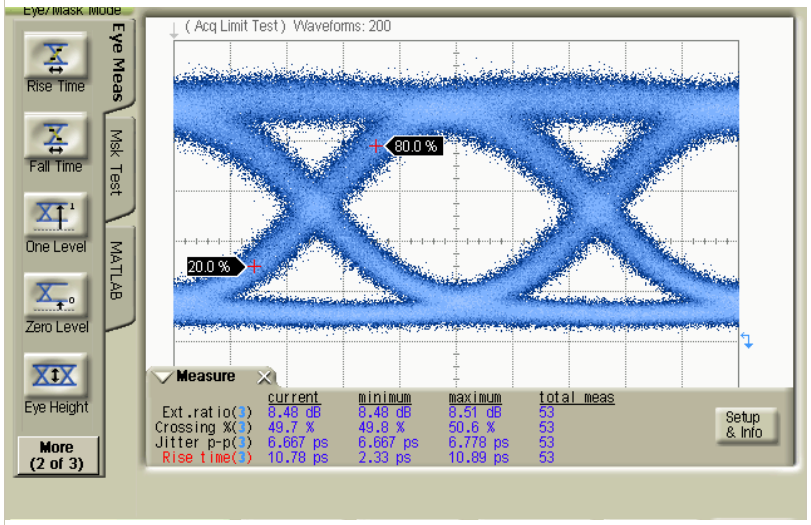
Performance of 1310nm 40G EML was already confirmed.
1310nm EML is ready for 40G serial application.

EML output waveform



40Gps
Lambda: 1310nm
Pf: +1.1dBm(Avg.)
ER: 8.8dB
Lambda: 1310nm

Thank you !