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# **10Gb/s on FDDI-grade MM Fiber Study Group**

## **Building the Business Case**

**Chet Babla  
Phyworks Ltd.**

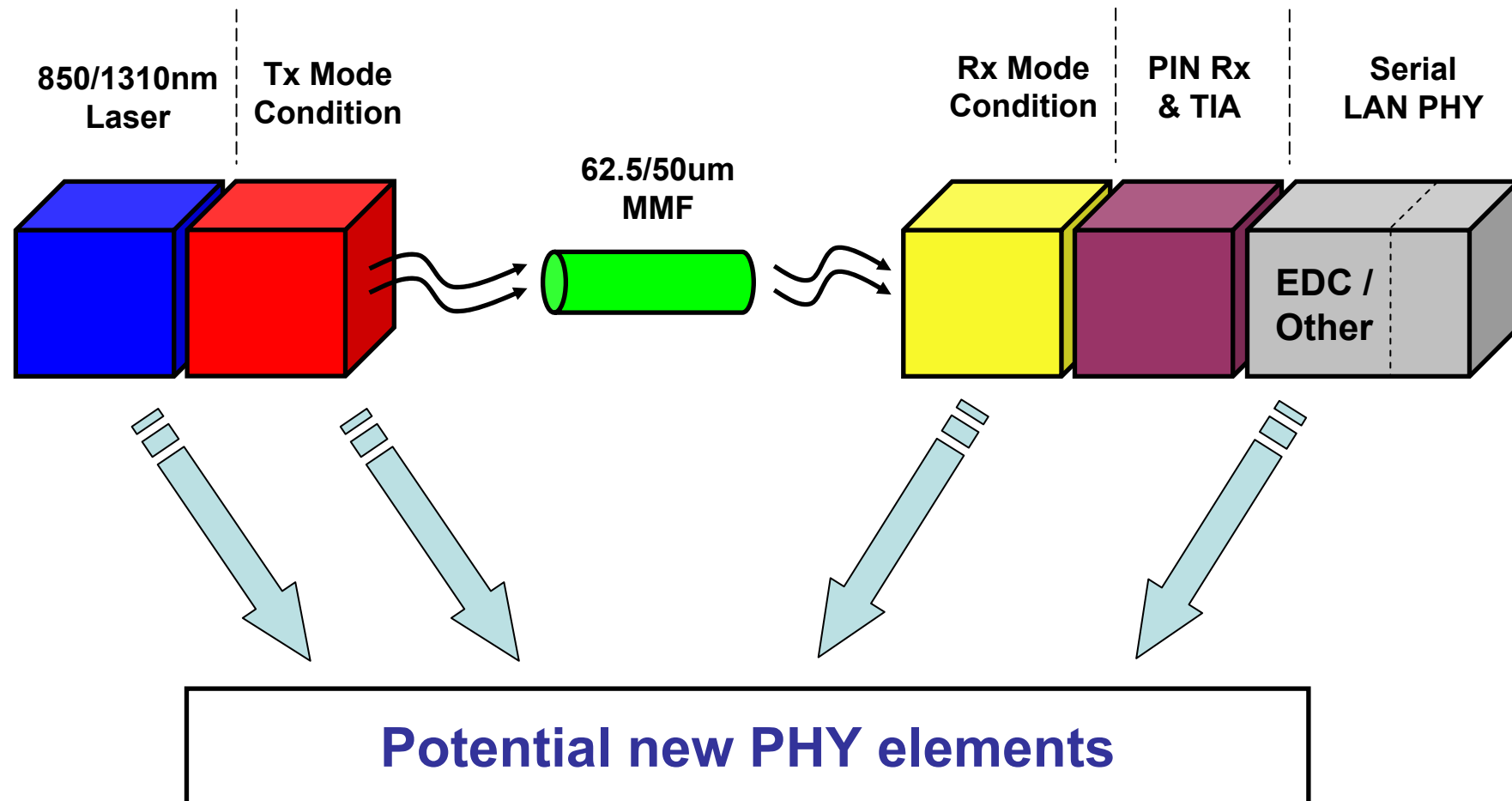
## The 5 PAR Criteria

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- **Compatibility with IEEE 802.3**
- **Distinct Identity**
- **Technical Feasibility**
- **Broad Market Potential (BMP)**
- **Economic Feasibility (EF)**

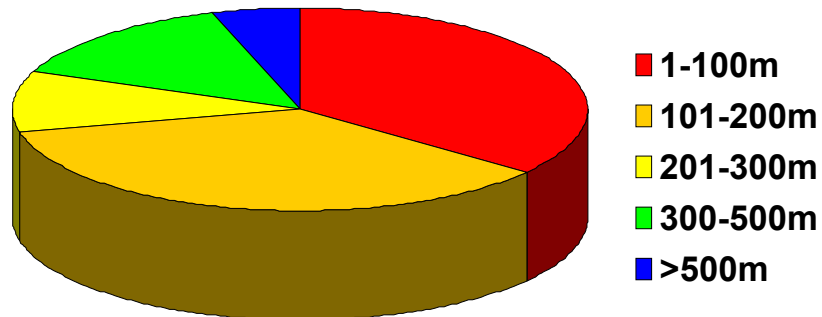
**This presentation aims to highlight important - solution agnostic - considerations that must be addressed by the Study Group (SG) to satisfy the BMP & EF PAR criteria.**

# The New PHY (10GBASE-X\*)



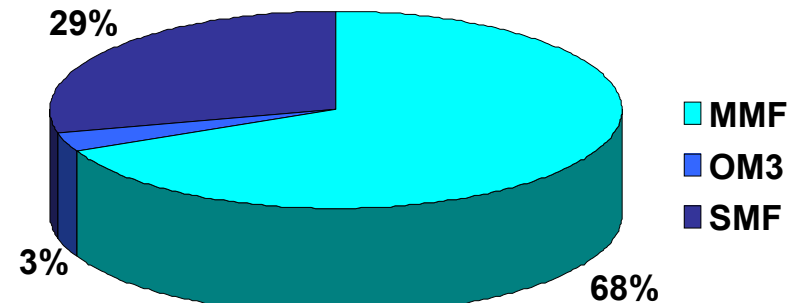
## Recap – Why support the installed MMF fiber?

Length Distribution of Intra-building Backbone



Chris Dominico, IEEE Fiber Optic Cabling Survey, 1997

Installed Backbone Survey



Sytime SCS™ Cabling Infrastructure Report, Avaya, 2002

- Links up to 300m represent ~75% of the installed base of the intra-building backbone & MMF is the installed base
- Enterprise customers are reluctant to pull new fiber to deploy 10GbE
- To date, LX4 has not met its BMP: a new 'plug & play' -X\* PHY that enables 10G over installed MMF will stimulate [lower cost] 10GbE deployment

**These form the basis of Broad Market Potential, BUT.....**

## Broad Market Potential

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- **Technical Feasibility** alone will not ensure the success of -X\*
- The **Business case** rests on :
  - **Cost** - **[-SR Cost] ≤ [-X\* Cost] ≤ [-LR Cost]**
  - **Vendors** - Multiple vendor support, particularly the module vendors.
  - **'Similarity'** - to existing 1GbE/10GbE solutions which already have demonstrated BMP success (e.g. encoding scheme, single  $\lambda$ , test gear).
  - **Applicability** - coverage in terms of customers with links up to 300m on MMF, and who aren't covered by 10GBASE-SR / SMF

## **-X\* Economics - New PHY vs New Fiber**

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- Does the SG need to address the question :

**“Is -X\* more cost effective than pulling new fiber ?”**

### **Yes :**

**Because the fiber guys may argue that they have deployed X metres of OM3 at small incremental cost to 10GbE port deployment, and the SG must pre-empt this.**

### **No:**

**Because we should leave the fiber guys to make their own case for not giving the customer the choice.**

## **-X\* Economics - Choosing the Right PHY Solution**

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- **Future cost target** - [3x - 4x 1GbE]
- **Known costs**
  - All solutions may not be equally cost effective, even in high volume.
  - The economics of 1GbE are well understood (i.e. optics, electronics & package/test costs) and -X\* should leverage this.
- **Module 'agnostic'** - Competition between MSAs has driven down costs; the -X\* PHY should not preclude this.
- **New technology** - -X\* should *allow* the benefits of future cost saving technologies but not *depend* on these (e.g. 1310nm VCSELs)
- **Economic 'laws'** - -X\* should leverage existing industry 'laws' (e.g. Moore's law, Metcalfe's law)

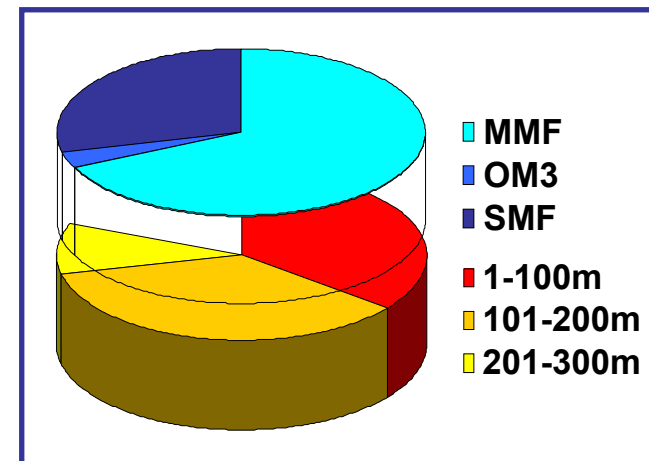
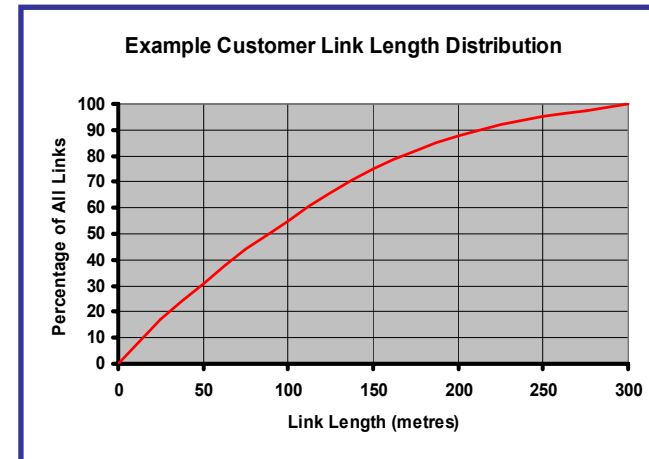
## -X\* Economics - PHY Comparison Checklist

	LX4	LR	-X*
Laser	4 x 3.125G 1310nm	1 x 10G 1310nm	<p style="color: red; text-align: center;"><b>We Decide</b></p> <p style="text-align: center;">(but leverage -LR, -SR &amp; 1000BASE-SX)</p>
Passive Optics	Tx combiner, Rx CWDM splitter	Single mode lensed launch	
Electronics	4 x 3.125G TIAs 4 x 3.125G LA / re-timer 4 x 3.125G LD μProcessor	1 x 10G TIA 1 x 10G LAN PHY 1 x 10G LD μProcessor	
MSA amenable	?	All	
Test Equipment	PRBS, BERT, Stressed eye ?, Comms analyser, OSA	PRBS, BERT, Stressed eye, Comms analyser	
Vendor support (IC, Module, Fiber)	Currently limited	Wide	Hopefully wide



## -X\* Applicability

- The -X\* solution should achieve acceptable Yield in terms of **customer** link length distribution
- Is 300m the right number?
- What is the *actual* link length distribution and how does the deployed fiber (50u / 62.5u / SMF / OM3) *map* to this ?



## Possible SG investigations to validate BMP / EF

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- **Customer link yield :**

- Agreed channel model
- PHY yield [simulations / measurement]
- Link lengths & distribution      - updated survey?

- **Economic factors :**

- Module, Optics & IC costs      - compare -X\* with LR & LX4?
- New fiber deployment costs      - new pull vs new PHY cost?
- 10GbE deployment      - quantify affect on 10GbE uptake if 300m on installed MMF is not supported by a new 5 PAR compliant PHY?

- **Other ?**