CEI-28G-VSR Project
Initial Thoughts

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Contribution Number:
Working Group: PLL
TITLE: CEI-28G-VSR Project – Initial Thoughts
SOURCE: John D'Ambrosia, Force10
DATE: March 4, 2010

Abstract: Initial Thoughts on issues associated with CEI-28G-VSR Project

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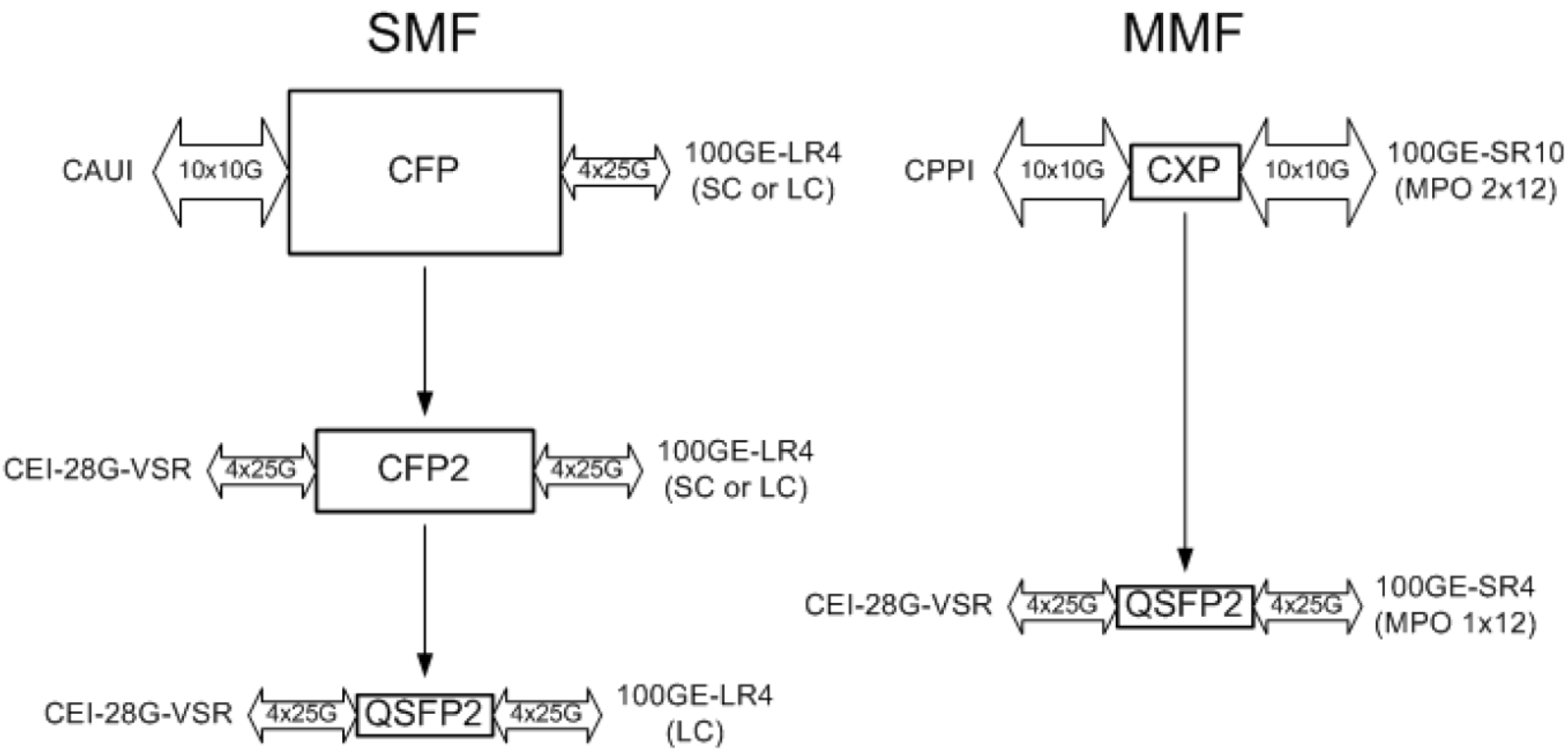
Introduction

- This presentation considers a number of issues to be addressed for CEI-28G-VSR
- CEI-28G-VSR will define an electrical specification for future 25/28G I/O interfaces for potential common use by multiple applications:
  - Ethernet: 26G (4x26G => 103G)
  - Telecom: 28G (4x28G => 112G)
  - InfiniBand: 25G (4x25G, 12x25G)
  - Fibre Channel: 28G (N x 28G)
- This presentation doesn't make any recommendations at this time.

Industry Bodies Need to Work Together

- **It is desirable to define a new 25/28G connector technology for potential common use by multiple applications and multiple form factors:**
  - **Enables common CEI-28G-VSR channel models**
  - **Minimizes connector R&D**
  - **Minimizes cost**
- **Beneficial if any group making a connector selection process considers needs all applications**

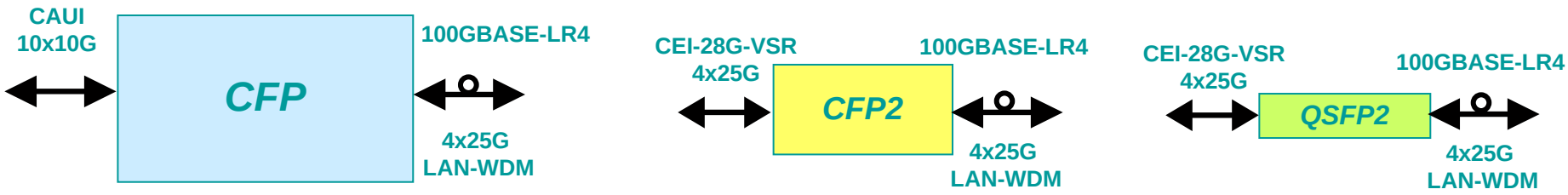
An Optics Roadmap



CFP supports 100GE-SR10, and CFP2 will support 100GE-SR4

100G SMF Optical Module Roadmap

Current Gen → Next Gen → Next Next Gen



Module Characteristics	*CFP*	*Next Gen CFP2*	*Next Gen QSFP2*
Optics	**Discrete or Integrated**	**Integrated**	**Integrated**
Electrical I/O	**Re-timed**	**Re-timed or Asymmetric**	**Re-timed, Asymmetric or un-retimed**
Data Rates	▪ **10 x 10.3 (103.125 Gb/s)** ▪ **10 x 11.2 (111.81 Gb/s)**	▪ **4 x 25.78 (103.125 Gb/s)** ▪ **4 x 27.95 (111.81 Gb/s)**	▪ **4 x 25Gb/s (100Gb/s)** ▪ **4 x 25.78 (103.125 Gb/s** ▪ **4 x 27.95 (111.81 Gb/s)** ▪ **4 x 28Gb/s (112Gb/s)**

* Preliminary

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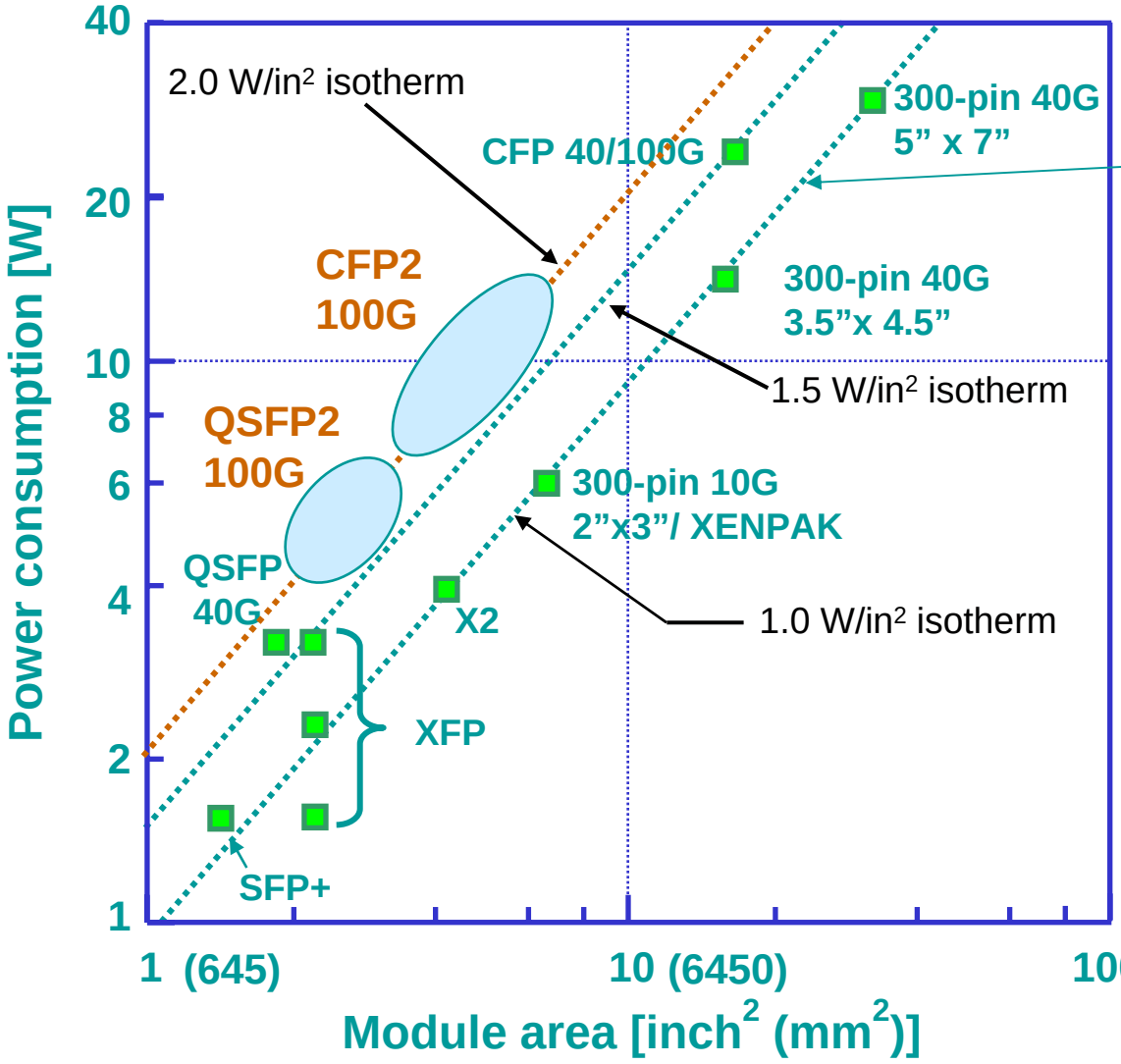
Next Gen 100G SMF Optical Module Power Dissipation



These lines approximate “Isotherms”

The position of these lines are a result of:

- Ambient Temperatures
- Heatsink Efficiency / Size
- Module Case Temperature

Suggested power consumption and module area ranges of next gen CFP2 and QSFP2 pluggable form factors based on CFP and QSFP isotherms

MSA spec (10/40G)

SOURCE: MSA public web-page

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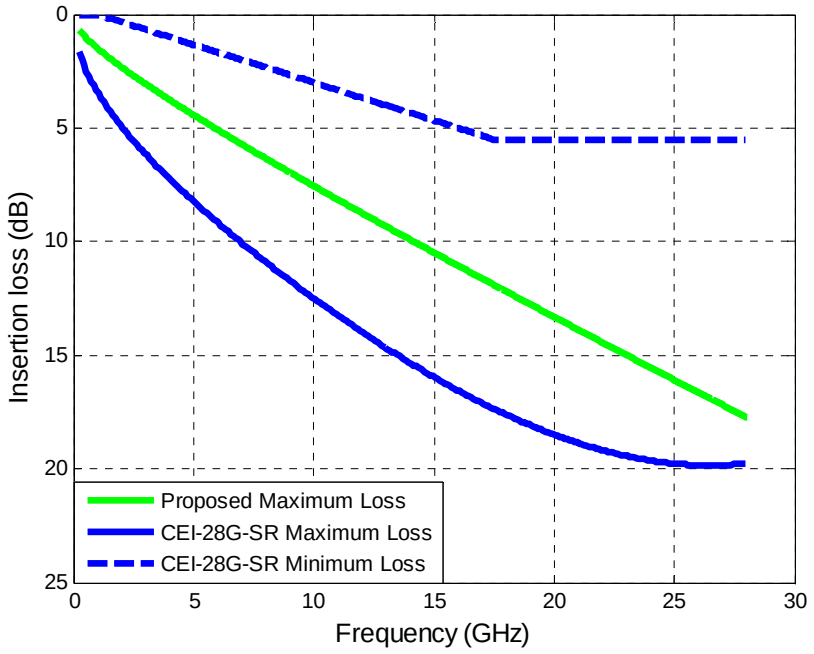
Starting Point: Channel Budget

- **Max connector loss: <1.4 dB from 10 MHz-14 GHz**
- **Max connector ripple: <0.05 + 0.025*f where is in GHz, per SFF-8431 A.4, fitted from 0.25GHz to 14 GHz**



Traces	FR4-6	N4000-13	Megtron 6
Loss at 14 GHz /in	2	1.5	1
Connector loss at 14 GHz	1.4		
Loss allocation for 2 Vias in the channel	1		
Max Module PCB Loss	2.1		
PCB Trace Length Assuming 10 dB Loss Budget	2.7500	3.6667	5.5000
PCB Trace Length Assuming 12 dB Loss Budget	4.2500	5.6667	8.5000

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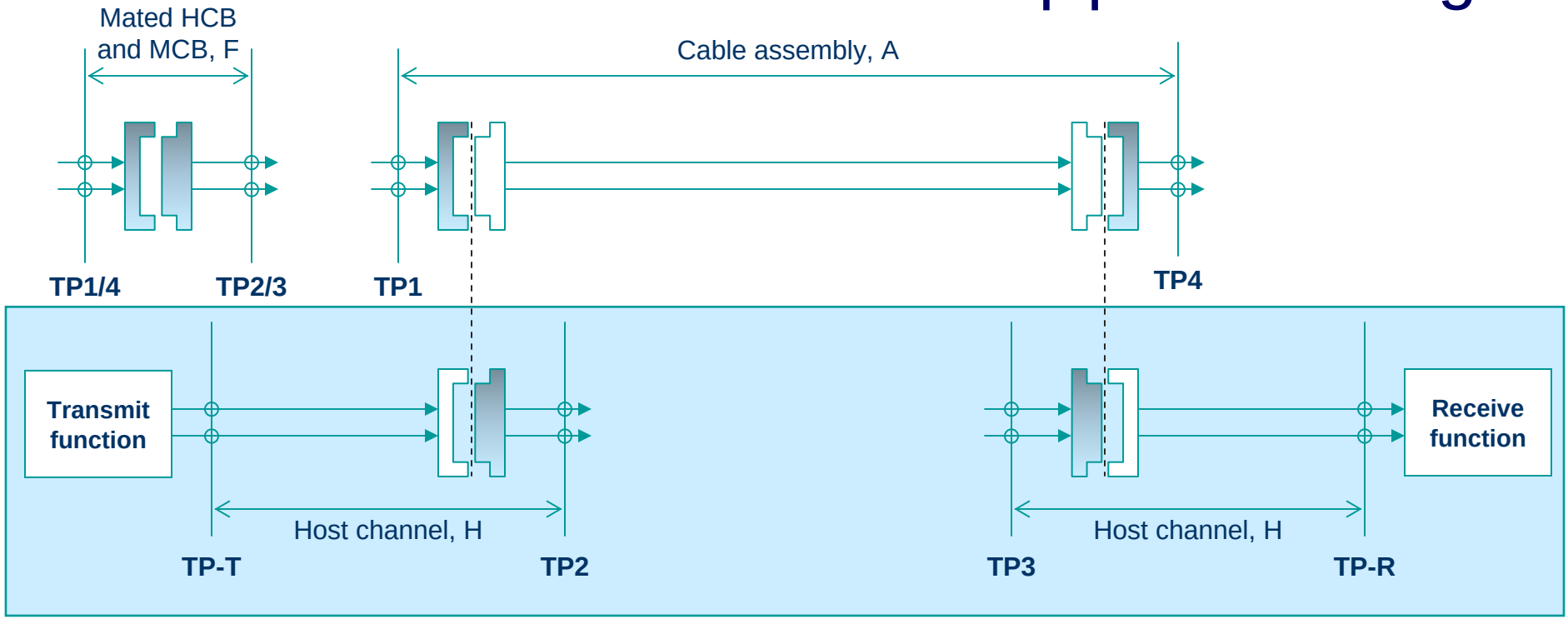
Connector Crosstalk Target

- **ICN defined same as 802.3ba CL85.10.7 when measured with mated HCB and MCB, except:**
  - **ICN receiver BW increased from 7.5 GHz to 18 GHz**
  - **HCB PCB loss at 14 GHz is 2.1 dB**
  - **MCB PCB loss at 14 GHz is 1 dB**
  - **802.3ba Eq 86A-4 loss can be scaled for the MCB and HCB loss**
- **MDNEXT=1 mV (RMS)**
- **MDFEXT=2.8 (RMS)**
- **ICN=3 mV (RMS)**

Remembering: Passive Direct-attach copper cabling



NOTE 1 – Only one direction of transmission shown
NOTE 2 – Channel insertion loss is C = A + 2 × (H – F)

CEI-28G-VSR Focus

- **Host channel insertion loss allotment also has a direct impact on cable reach**
- **Consider the CEI-25G-LR loss budget of 25.4 dB, a 3 dB/m bulk cable attenuation, and paddle card losses on the order the HCB PCB loss**
  - **For H = 8 dB, the cable reach R is (25.4 – 2 × 8)/3 = 3.1 m**
  - **For H = 10 dB, the cable reach R is (25.4 – 2 × 10)/3 = 1.8 m**

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Manual Tuning of Tx?

- **10G SFP+ issues in an un-retimed Tx module interface**
  - **Currently host Tx de-emphasis filter settings needs to be manually tuned**
  - **Stacked SFP+ connectors requires a different pre-emphasis optimization**
  - **Different channel lengths require different optimization**
  - **Cannot accommodate manufacturing and temperature variations**
- **Is this manual method scalable for 25G?**

Summary

- **Areas of further investigation**
  - **Industry Efforts**
  - **Module Power / form factor**
  - **Channel**
    - **Crosstalk**
    - **Connector**
    - **Consideration for impact on Cu Twin-ax solutions**
  - **Is manual tuning acceptable in the future?**