cPPI-4 Channel and Compliance Boards

IEEE 802.3 100GCU

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Basic Assumption on MCB-HCB and Host Construction

- Connectors could be either based on Quattro or zQSFP
- MCB constructed from striplines with short blind via
- HCB constructed from striplines with short blind via or could be constructed from Microstrip

Acknowledgment: To TE (Formerly Tyco Electronics) for providing model and boards for this effort.
HCB/MCB Instantiation

- HCB/MCB mated loss at 14 GHz will be 4.15 dB
  - HCB loss of 1.7 dB account for 0.5 dB loss for DC block
  - Actual HCB implementation will not incorporate DC blocks in order not to degrade the return loss and visibility into host

![Diagram showing HCB/MCB instantiation with losses labeled 1.2 dB, 1.25 dB, and 1.7 dB]
Host PCB + connector has loss of 5.3 dB

- With majority of implementation based on SMT connector the host can use the extra margin
- All MCB implementations assumes short blind vias
- All host implementations assumes full length vias with short stub

Host PCB Budget 4.1 dB

Connector
Up to 1.2 dB

Mod PCB + Cap 1.7 dB

Chip Compliance Point
Propose 1.25 dB@14GHz

Module Compliance Point
Propose 1.25 dB@14GHz

Host Compliance Point
1.7 dB@14GHz
**cPPI-4 Proposed Channel Loss Budget**

- Attach cPPI-4 with 7 dB loss budget can support unretimed optical PMDs as well as 100GCU copper cables

<table>
<thead>
<tr>
<th>Traces</th>
<th>FR4-6</th>
<th>N4000-13</th>
<th>N4000-13SI</th>
<th>Megtron 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss at 12.85 GHz /in</td>
<td>2</td>
<td>1.5</td>
<td>1.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Connector loss at 14 GHz *</td>
<td></td>
<td></td>
<td></td>
<td>1.2</td>
</tr>
<tr>
<td>Loss allocation for 2 Vias in the channel</td>
<td></td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Module PCB Loss/DC Blocks at 14 GHz *</td>
<td></td>
<td></td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>PCB Trace Length Assuming 7 dB Loss Budget</td>
<td>1.8000</td>
<td>2.4000</td>
<td>3.0000</td>
<td>4.0000</td>
</tr>
</tbody>
</table>

* For 100 GbE operation since the HCB and connector are specified for operation up to 28GBd there will be 0.2-0.3 dB unallocated margin.
4” cPPI-4 Channel Based on TE Quattro II

- VSR mask also shown

Host PCB
Material = N4000-13SI
Trace Length = 4”
Traces = 5 mils stripline

Connector Quattro II

Plug PCB
Material = N4000-13SI
Trace Length = 1.5”
Traces = 5 mils Microstrip
Proposed MCB-HCB Return Loss Limit

- Also shown connector alone return loss
Proposed MCB-HCB Loss  Also Shown cPPI-4 Channel Loss

- MCB board has two short vias
Proposed MCB-HCB SCD/SDC

- MCB board has two short vias
Mated Board SCC Response

- Due to the nature of the SCC graph it does not make sense to define a -3 dB limit, instead SCD and SDC need to be tighter controlled.
Summary

- The MCB/HCB test methodology first developed in SFP+ then adopted in 802.3ba can be extend for operation at 25.78 GBd
  - The MCB/HCB response are specified for operation up to 28 GBd for possible FEC support
- The proposed cPPI-4 channel will meet both Cu objective as well as unretiemed optics objective
- The MCB/HCB limits provided here will meet both zQSFP as well as Quattro based designs
- As the connector differential response has improved its SCC response has degraded in place of SCC
  - SCD – differential to common mode conversion will limit common mode generation
  - SDC – common mode to differential conversion will control nuisance signal