Characteristics of a Passive Direct Attach Copper Cable (DAC) Assembly in CR Channels with Various Host Architectures

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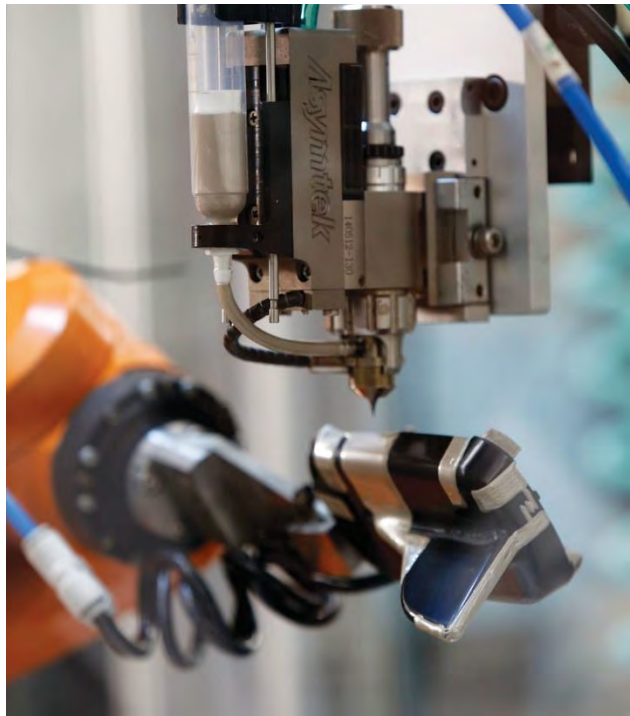
July Plenary 2022

EVERY CONNECTION COUNTS



Contributors

Regee Petaja, Broadcom

Adam Healey, Broadcom

Vivek Telang, Broadcom

David Helster, TE Connectivity

Overview

A preliminary investigation into passive copper cable assembly channels, based on conventional and unconventional architecture concepts, is presented to help guide P802.3df architecture discussions.

Development work is on-going, updates and refinements are anticipated in future contributions

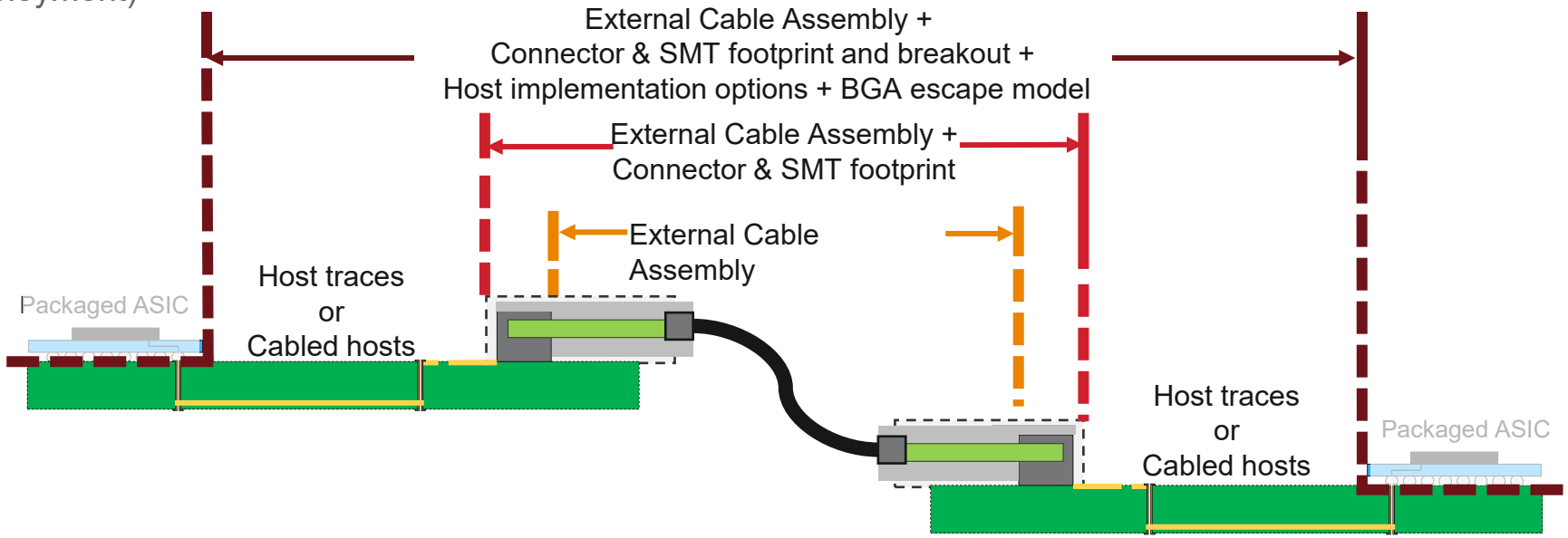
This is not intended to be a final position or a proposal on a copper cable assembly channel performance

The intent of this presentation is to provide directional input at this early stage of the project and promote discussion among the participants

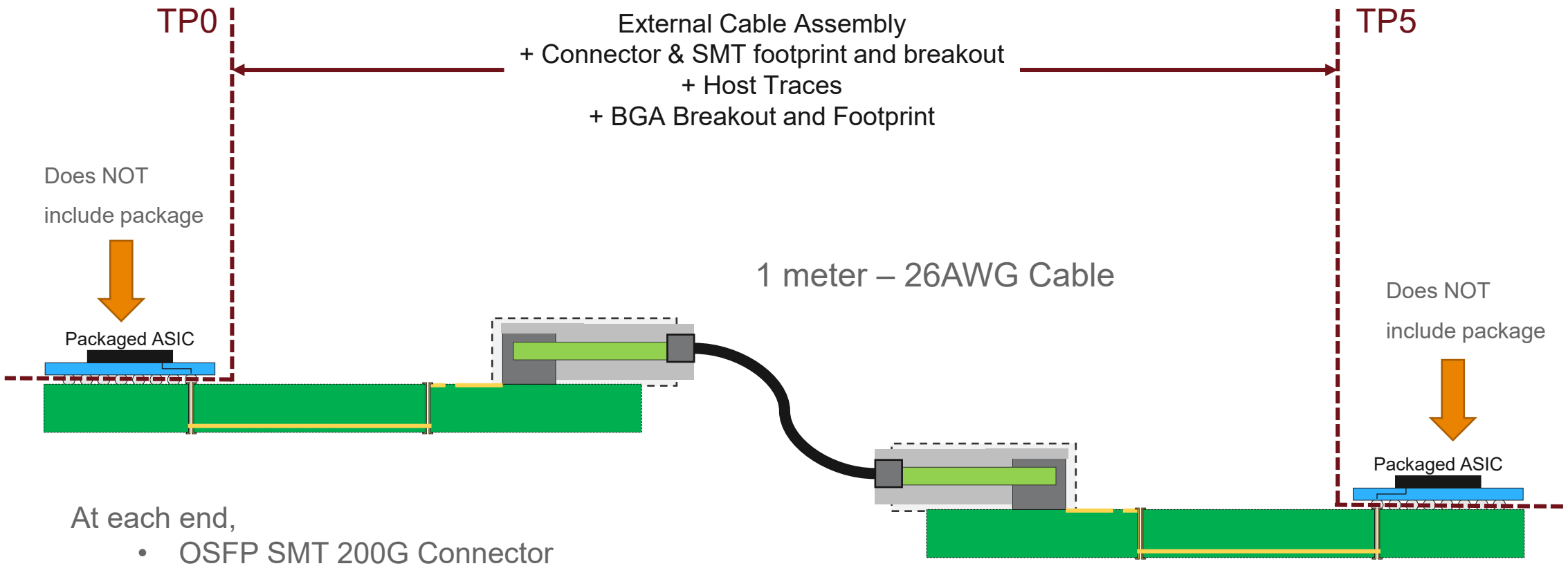
Additional development is in process on the connector, paddle card, wire termination and bulk cable.

Description

- Simulation for 200G CR channel using concept connector and cable assembly with various host architecture options
- Includes BGA escape model provided by Regee Petaja of Broadcom
- Does NOT include silicon package
- Current view of passive cable assembly performance in various host implementations
- What this presentation is NOT:
  - Modulation proposal
  - Channel or Cable Assembly loss proposal
  - A specific host architecture proposal;
    - comparative performance options are presented, i.e., traces vs. cabled host to “near ASIC” vs. co-package copper
  - Asymmetric architectures (managed deployment)



Copper Cable Assembly + Conventional Host

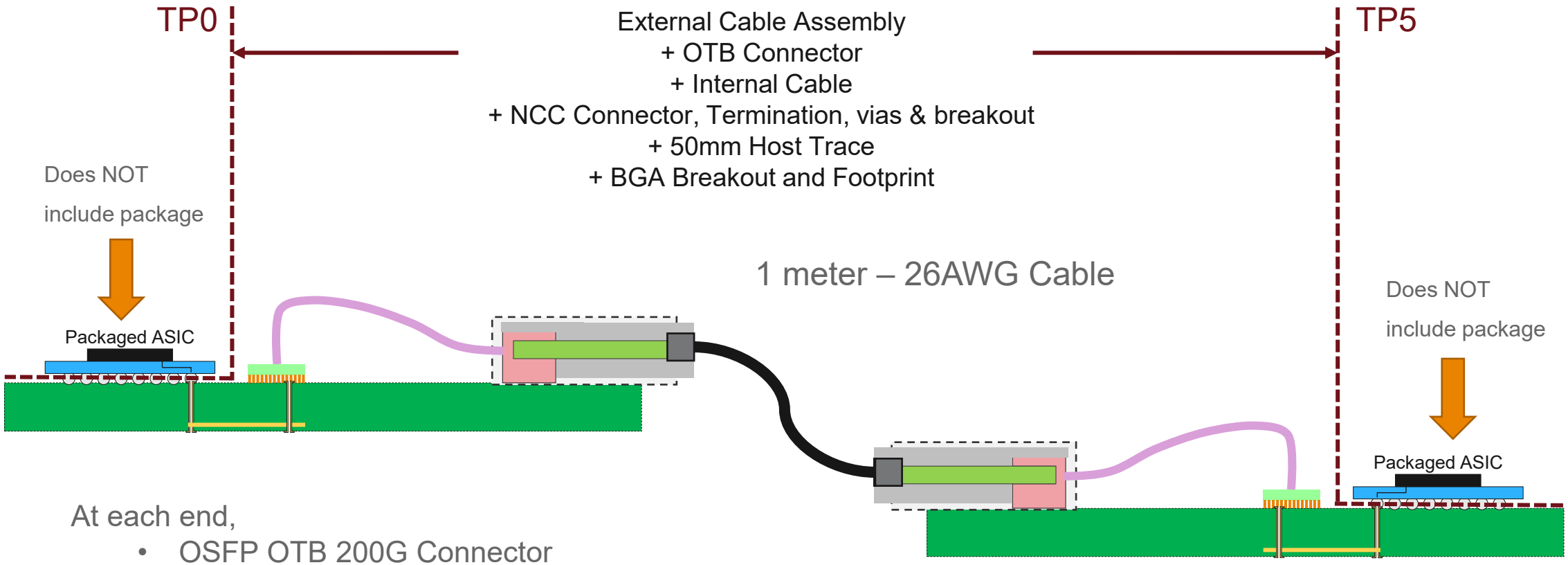


At each end,

- OSFP SMT 200G Connector
- Host Footprint and via transition, ~5mil stub included
- Host Traces, 7” long*, ~1.08dB/in loss at 53.125GHz
- BGA footprint + breakout

* 7” host trace per side as proposed by Leesa Noujeim (Google) on Slide 8 in:
<https://www.ieee802.org/3/B400G/public/21_07/tracy_b400g_01a_210729.pdf>

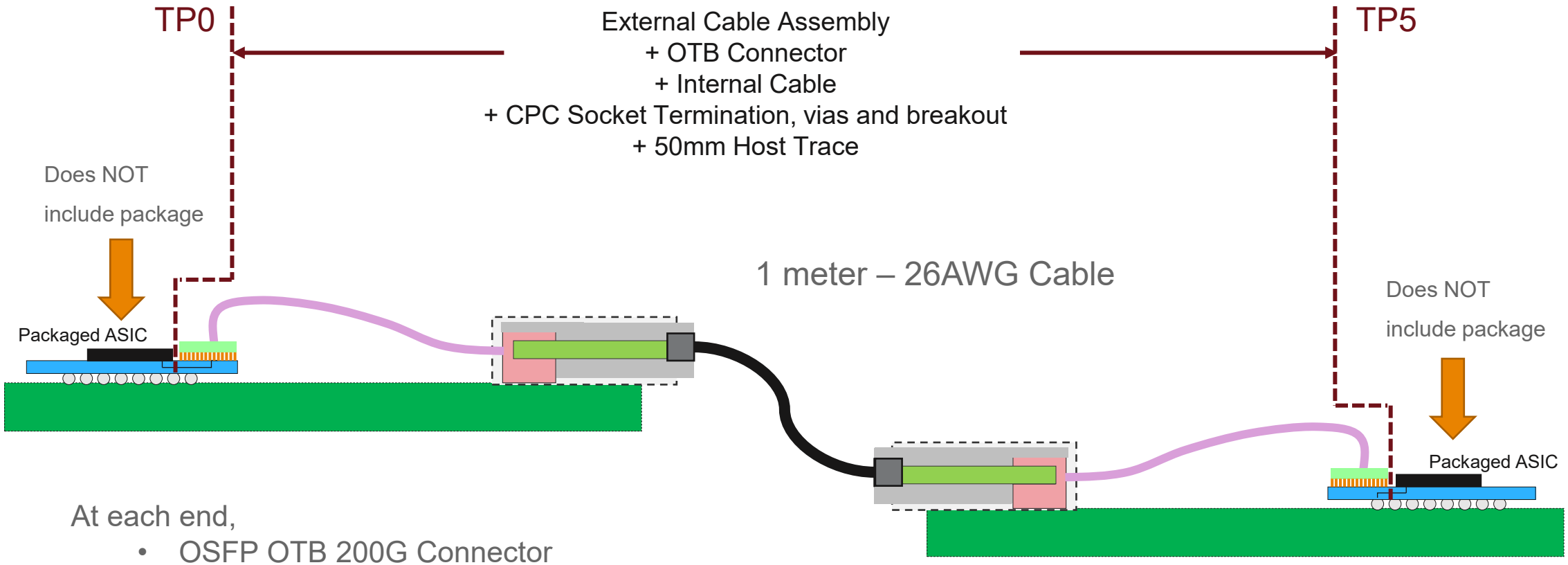
Copper Cable Assembly + Near Chip Copper [NCC] Host



At each end,

- OSFP OTB 200G Connector
- Cable Termination to OTB Connector
- 10”, 30AWG Cable
- Cable termination to NCC connector
- NCC connector
- NCC transition via and breakout traces
- Host Traces, 50mm long, ~1.08dB/in loss at 53.125GHz
- BGA footprint + breakout

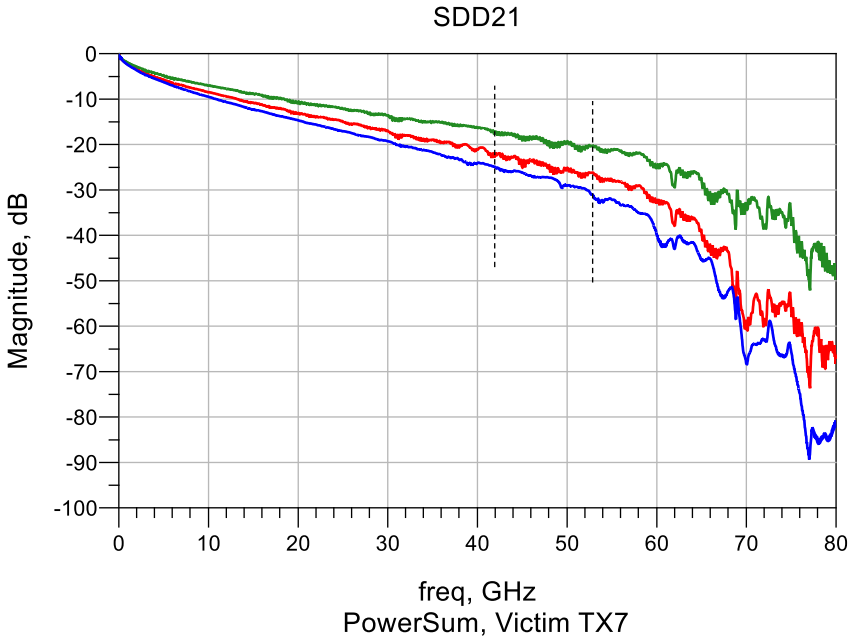
Copper Cable Assembly + CoPackage Copper [CPC] Host

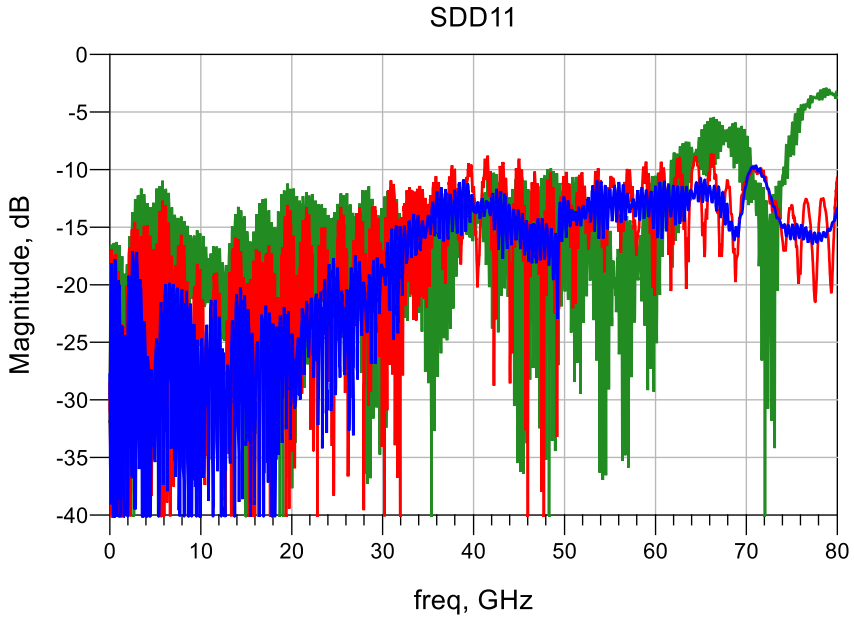


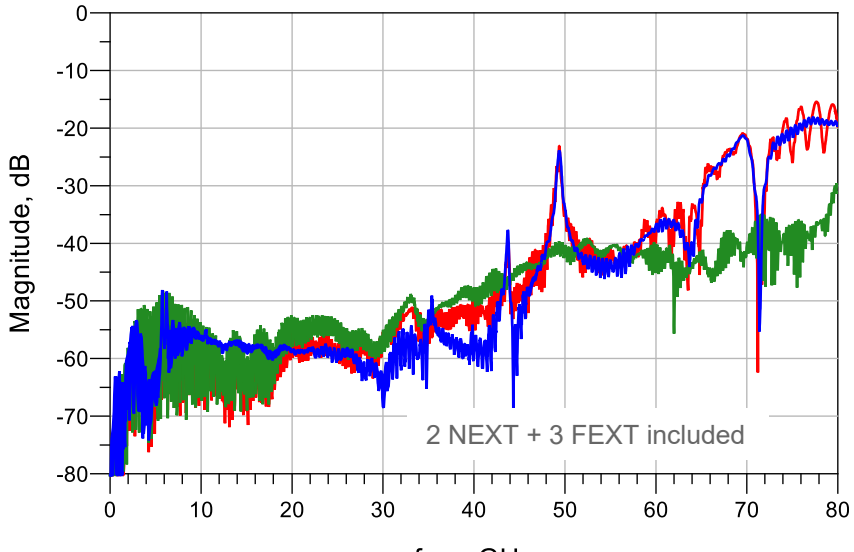
At each end,

- OSFP OTB 200G Connector
- Cable Termination to OTB Connector
- 10”, 30AWG Cable
- Cable termination to CPC Socket
- CPC Socket
- CPC transition

Performance Comparison

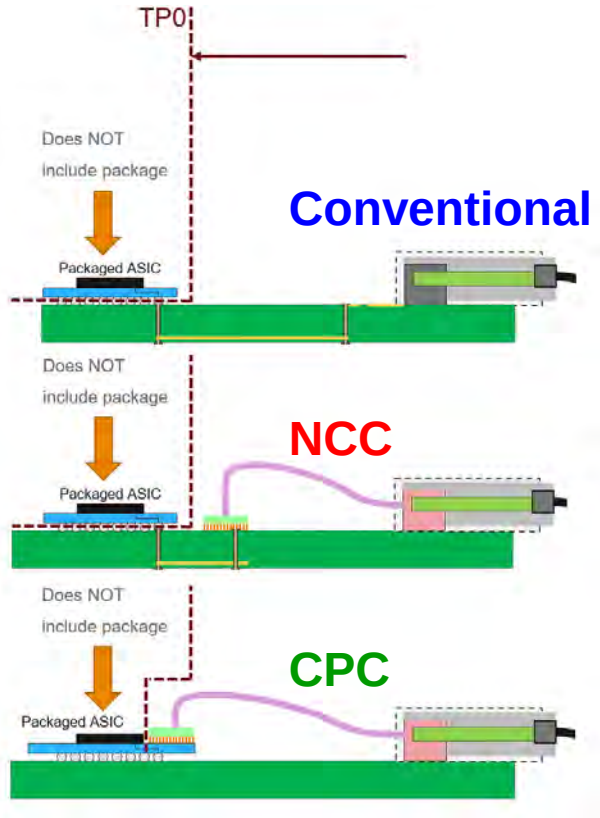






G : Ground Contact
S : High Speed Contact
L : Low Speed Contact
□ : Victim Pair

	TP0 – TP5 IL, dB @42.5GHz	TP0 – TP5 IL, dB @53.125GHz
Conv.	25.5	31.9
NCC	22.1	26.8
CPC	17.8	20.5



System reference impedance is 100 ohms

Summary

- Simulation results have been provided for 200G channels consisting of:
  - 1m DAC 200G concept cable assembly
  - OSFP 200G concept connector (x 2), Both conventional SMT and cabled OTB versions
  - Host connector footprint and via (x 2)
  - 7 inches of host trace (x 2)
  - 10 inches of OTB internal cable assembly to NCC host connector (x 2)
  - 10 inches of OTB internal cable assembly to CPC socket (x 2)
  - BGA footprint and breakout model (x 2)
- Not a final position on component or channel performance, further development is in process
- No position has been taken on modulation scheme for CR applications
- Intent is to provide meaningful input for 802.3df architecture discussions
- A range of host implementation architectures/technologies may be useful to enable 200G based systems
  - Internal cables (OTB) can provide meaningful channel improvement and reach