A 212.5 Gbps-PAM4 Chip-to-Module Channel for "Universal Port" and Its Characteristics: Design C

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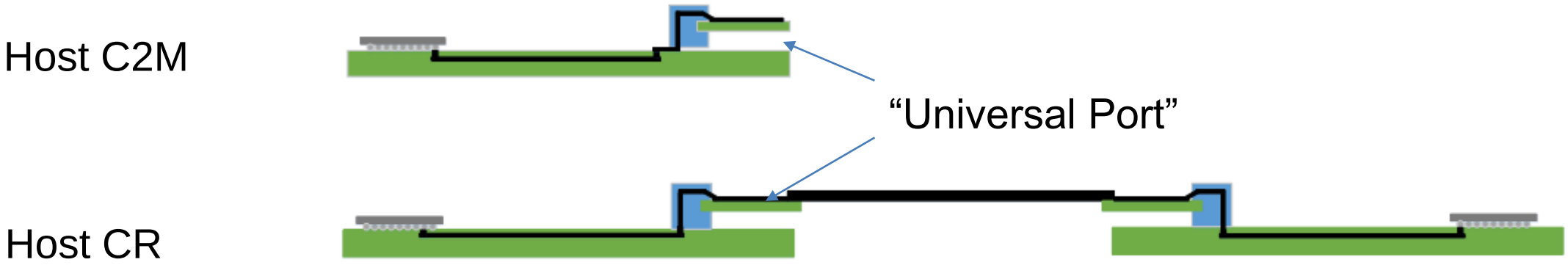
Sept., 2023

Background and Introduction (I)

- An important and common Chip-to-Module (C2M) Channel is the so-called “Universal Port” C2M, as shown in the following diagram

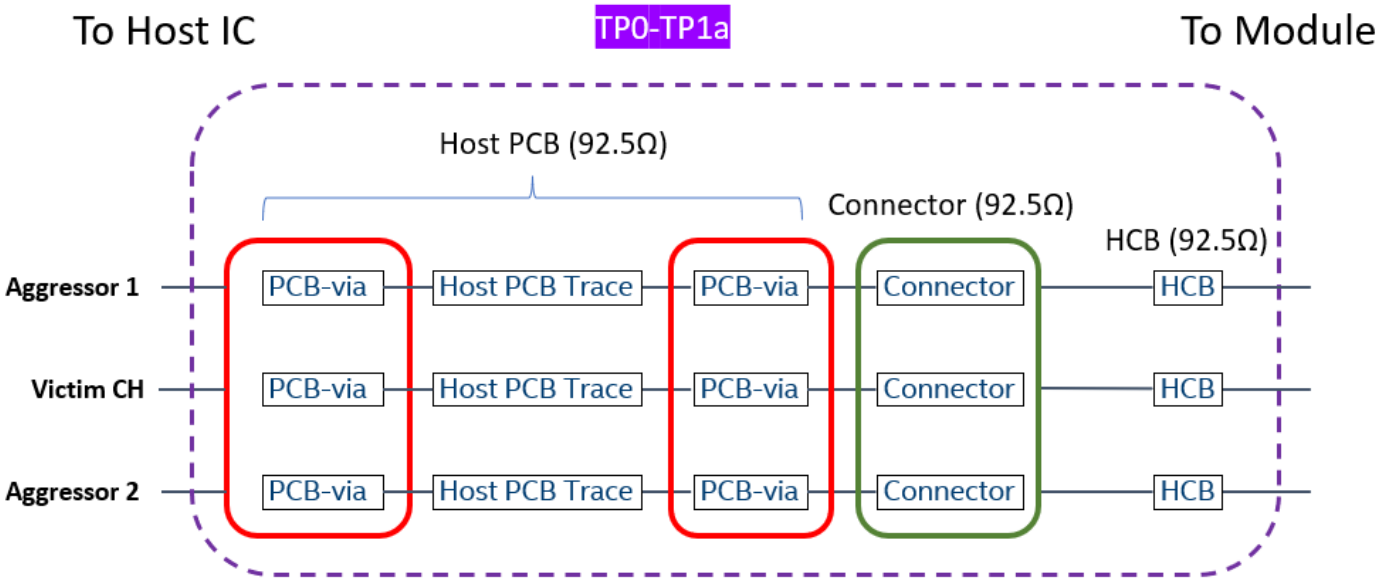


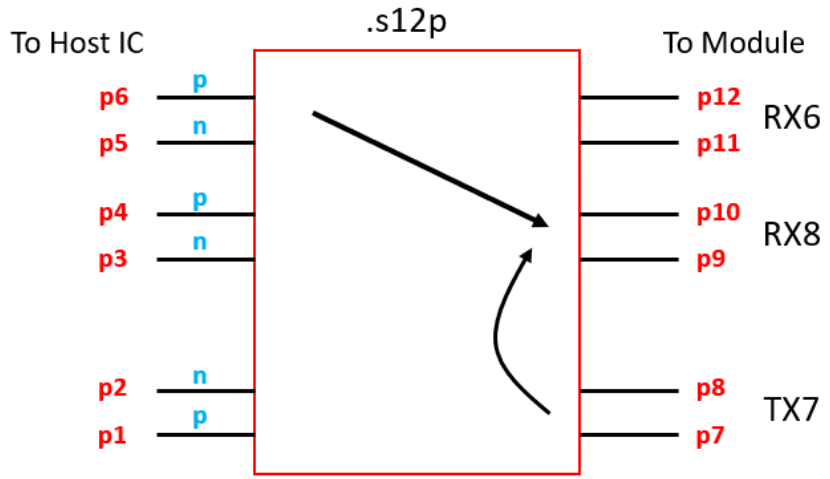
- The loss of the C2M channel (TP0-TP1A) budge is determined/bounded by the bump-to-bump, ref PKG, and DAC loss budget, which are trending <=40 dB, ~6 dB (IL optimized), ~16 dB, for 212.5 Gbps-PAM4 signaling.

Background and Introduction (II)

- We leveraged our established/validated C2M channel design tool-flow-methodology (TFM) (e.g., [1], [2]) to create this C2M channel design C to support 212.5 Gbps-PAM4 “Universal Port”.

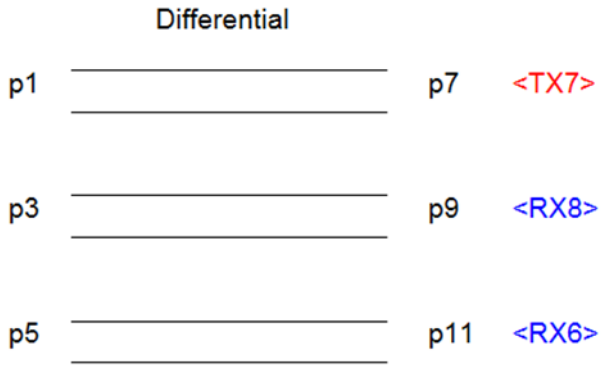
C2M Channel Design C for “Universal Port”

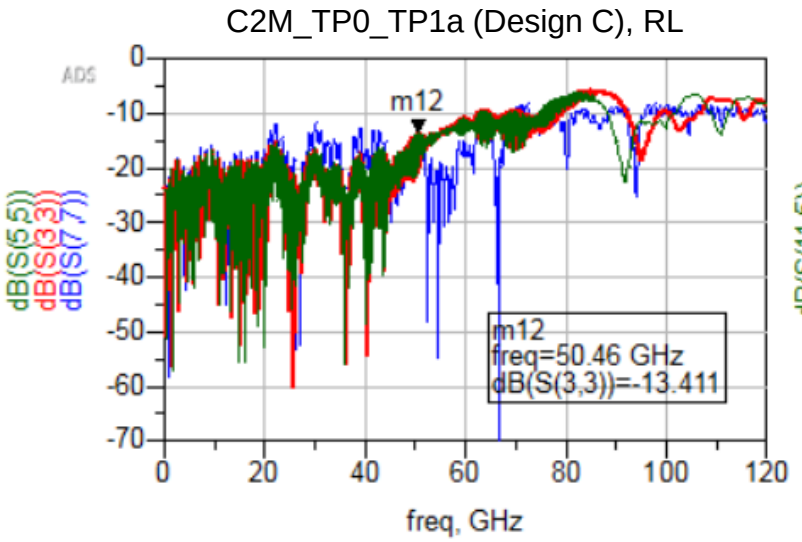


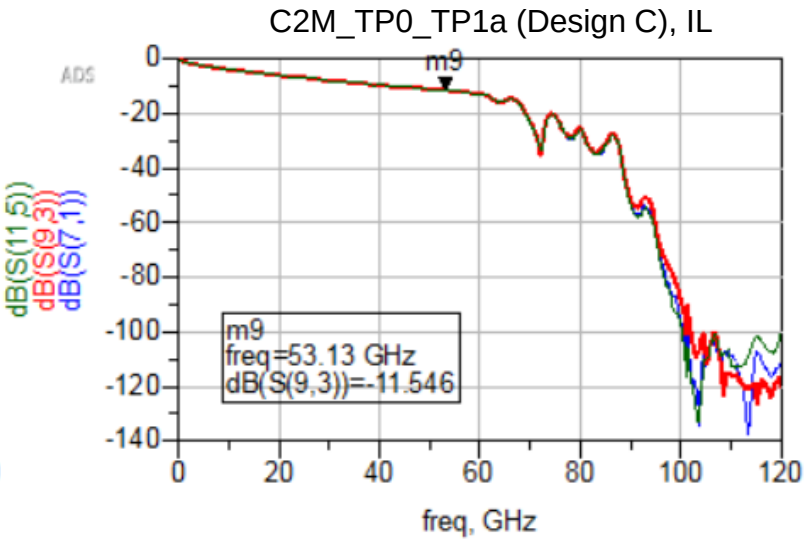


Component	Insertion Loss TP0-TP1a (dB) @ 53.125GHz
	Design C
Host PCB via	0.75 dB
Host PCB Trace	5.0 inch (1.27 dB/inch)
Connector	1.03 dB
HCB	3.42 dB
Total	11.55 dB

C2M Channel Design C Characteristics (I)

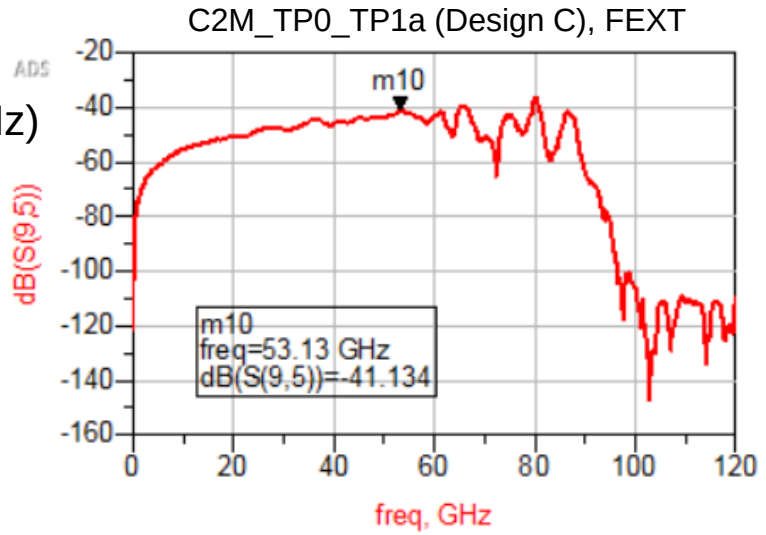


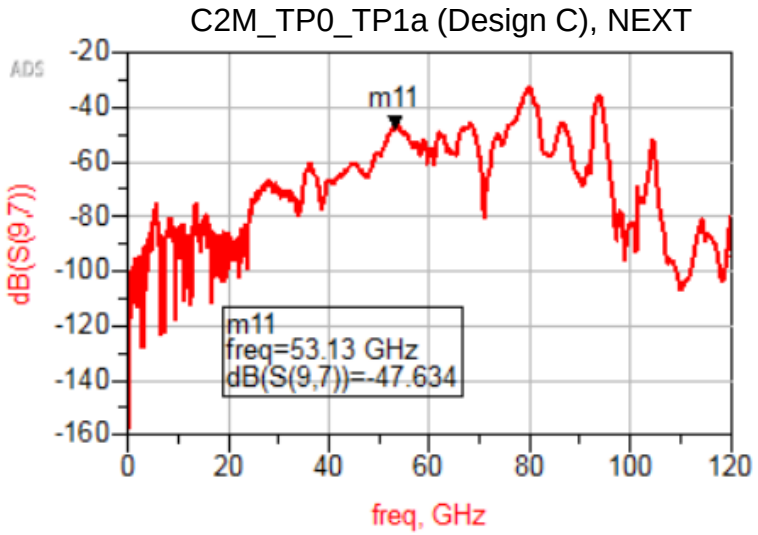




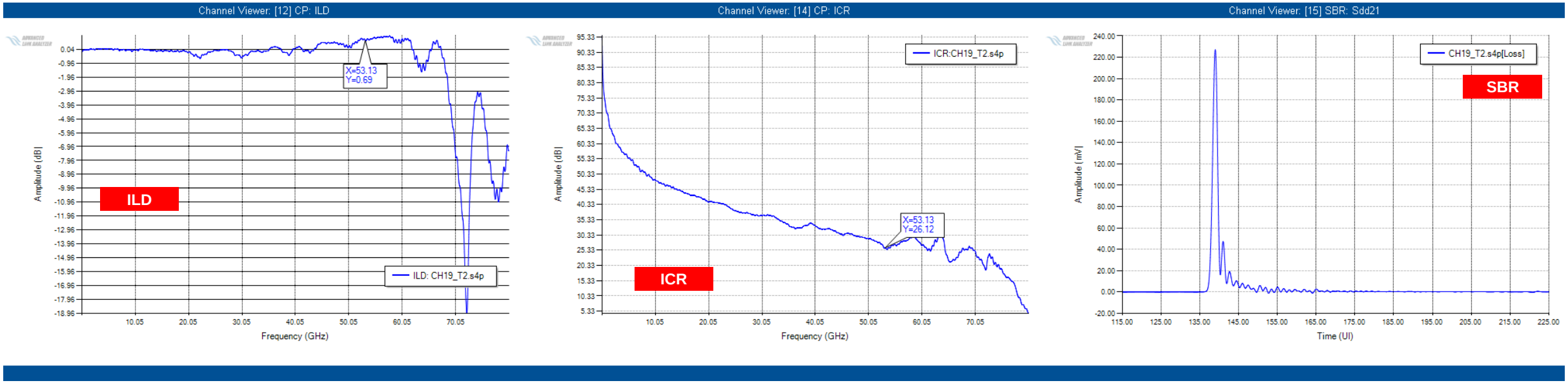
TP0-TP1a Characteristics (DC-53.125GHz)

- **IL: 11.55dB @ 53.125GHz**
- RL ~= 13.4dB (<53.125GHz)
- FEXT < 41.1dB (<53.125GHz)
- NEXT < 47.6dB (<53.125GHz)





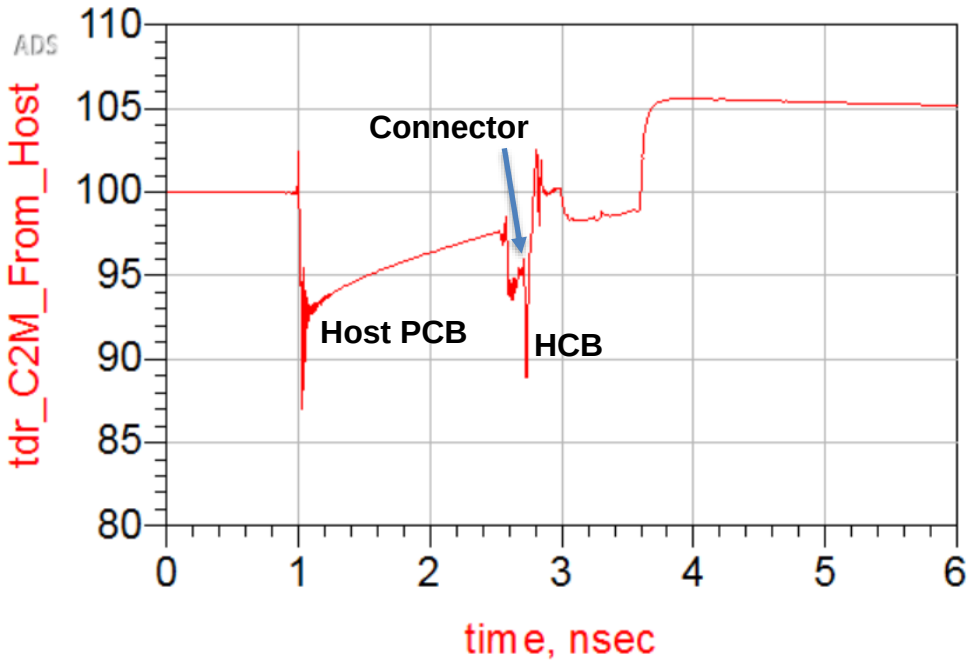
C2M Channel Design C Characteristics (II)



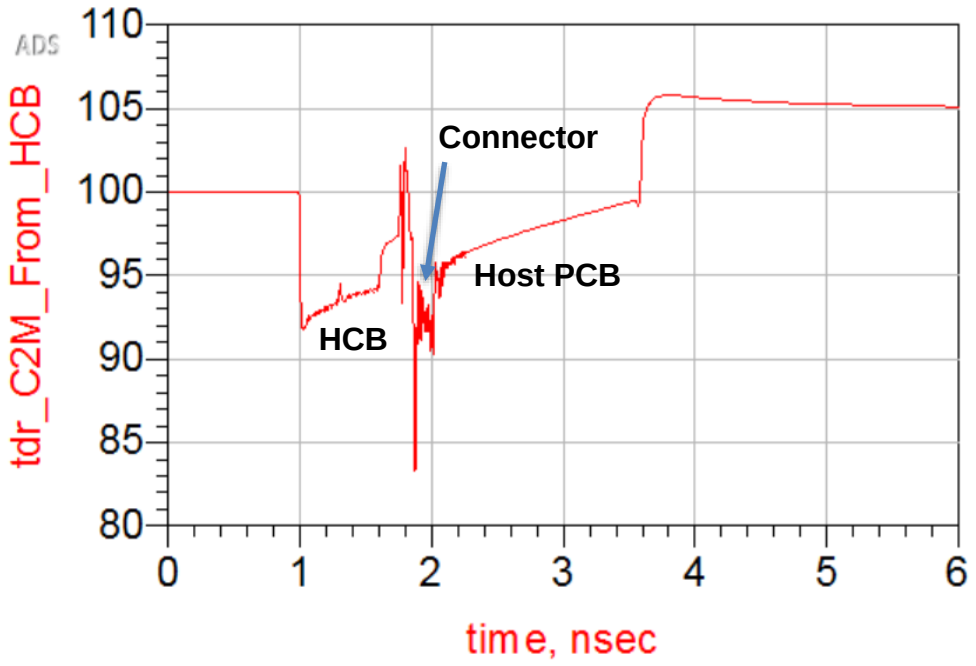
- **ILD < +- 1 dB (<53.125 GHz)**
- **ICR > 26 dB (<53.125 GHz)**

C2M Channel Design C Characteristics (III)

C2M_TP0_TP1a (Design C) TDR From Host PCB



C2M_TP0_TP1a (Design C) TDR From HCB



[S] parameter BW DC-120GHz

Summary

- We have created a C2M channel Design C supporting “Universal Port” at 212.5 Gbps-PAM4
- This C2M channel includes PCB-Via, PCB, connector, and HCB
- This C2M channel has:
  - An IL (TP0-TP1A) of ~11.55 dB at 53.125 GHz
  - RL <~ 13.4dB at <= 53.125 GHz
  - FEXT < 41.1dB, NEXT < 47.6dB, at <= 53.125 GHz
  - PCB IL of ~6.35 dB/reach of 5 inch (with 1.27 dB/inch) at 53.125 GHz

References

[1] https://www.ieee802.org/3/dj/public/23_05/li_3dj_03a_2305.pdf
[2] https://www.ieee802.org/3/dj/public/23_05/li_3dj_05a_2305.pdf