

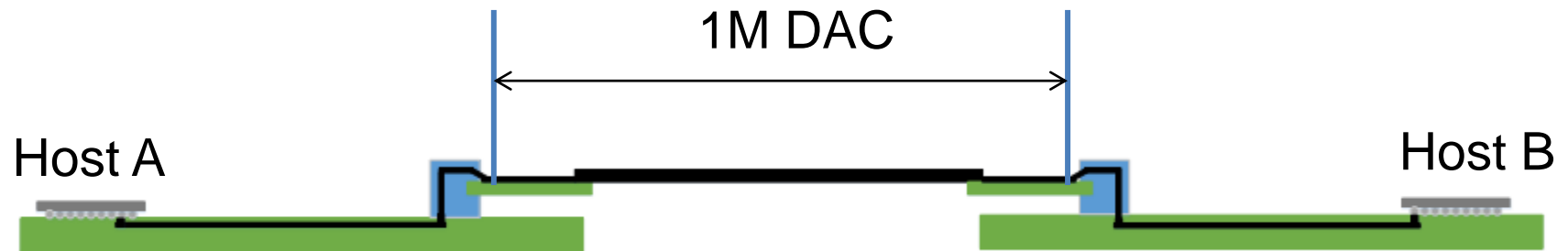
# **A 212.5 Gbps-PAM4 1 Meter DAC Long Reach Channel and Its Characteristics: Design A**

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# Background and Introduction (I)

- An important use case of 212.5 Gbps-PAM4 is the cable reach (CR) with a 1 Meter DAC.

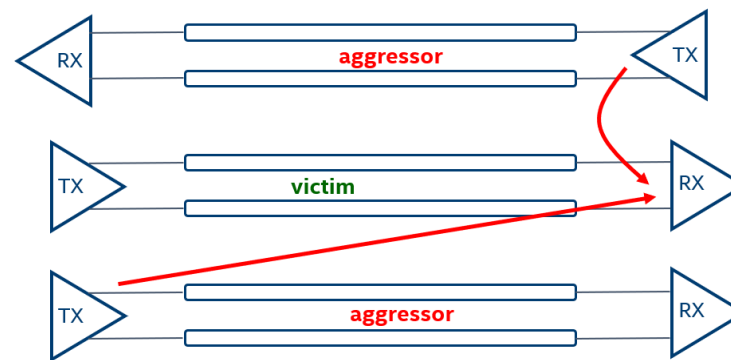
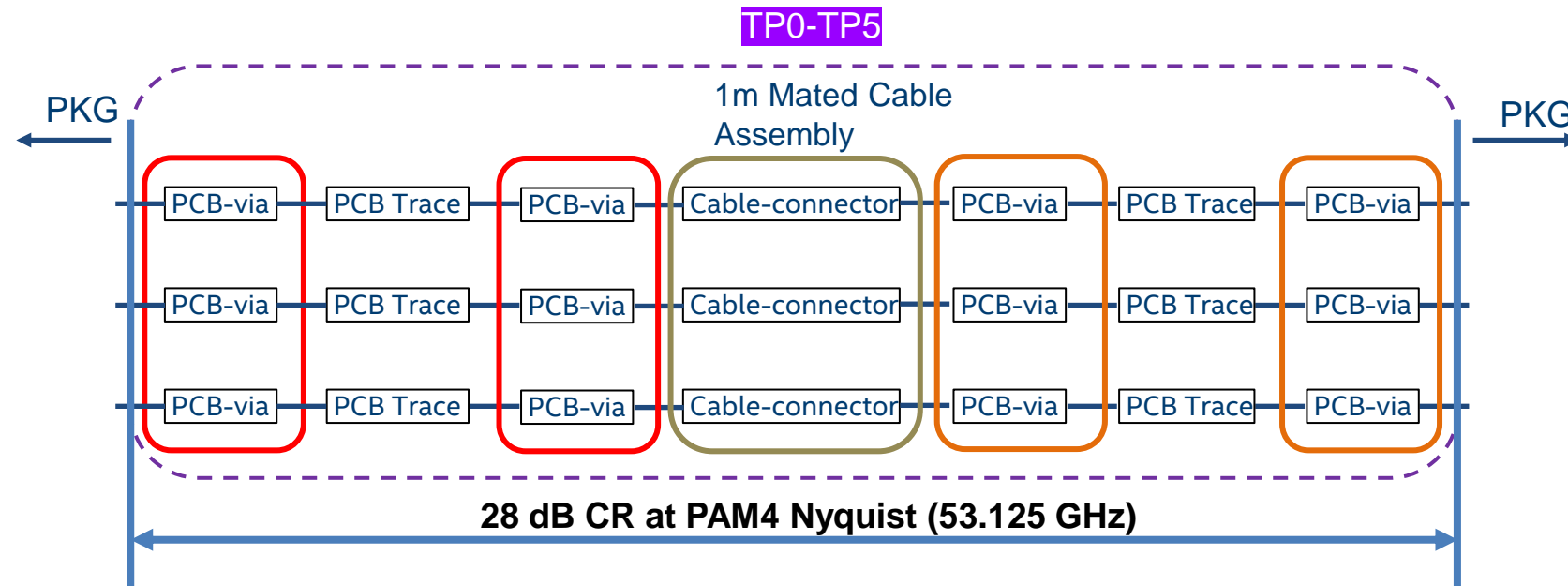


- The channel loss budget between the host bump-to-bump (or TP0d-TP5d) is determined/bounded by the SERDES technology and capability, which is trending  $\leq 40$  dB, for 212.5 Gbps-PAM4 signaling.

# Background and Introduction (II)

- We leveraged our established/validated CR channel design tool-flow-methodology (TFM) (e.g., oif2022.066.00) and the latest connector and DAC technologies to create this CR ball-to-ball channel Design A to support 1 Meter DAC with 212.5 Gbps-PAM4 signaling.

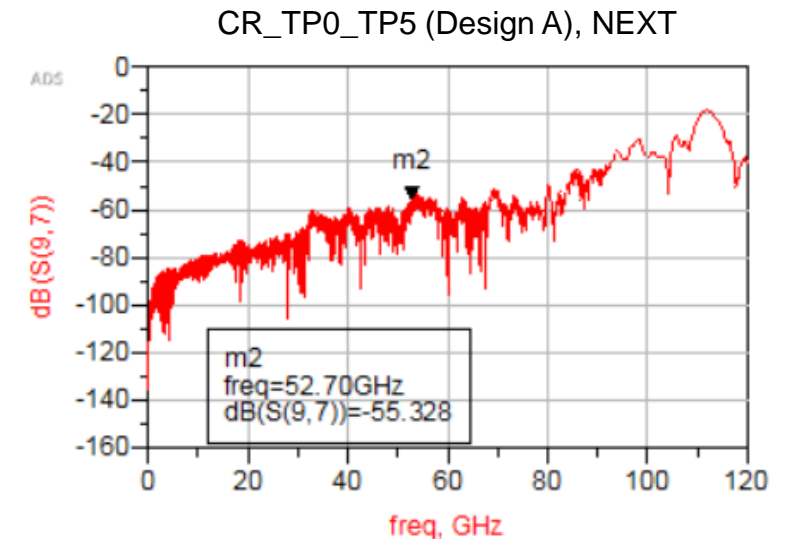
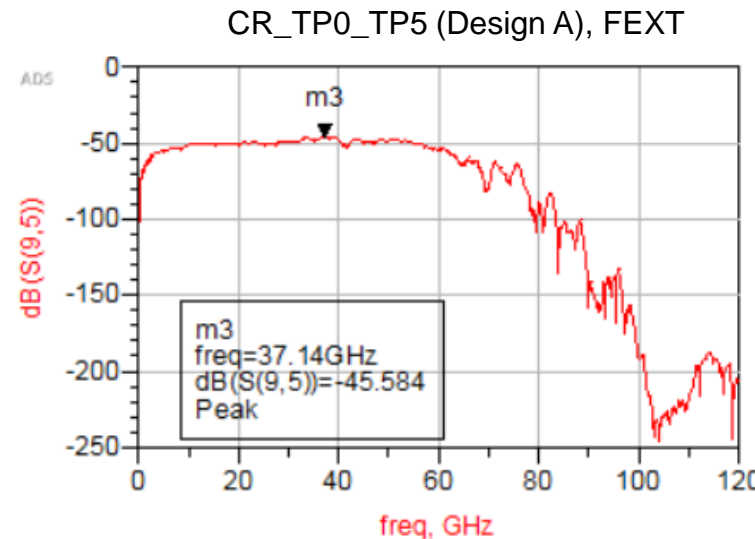
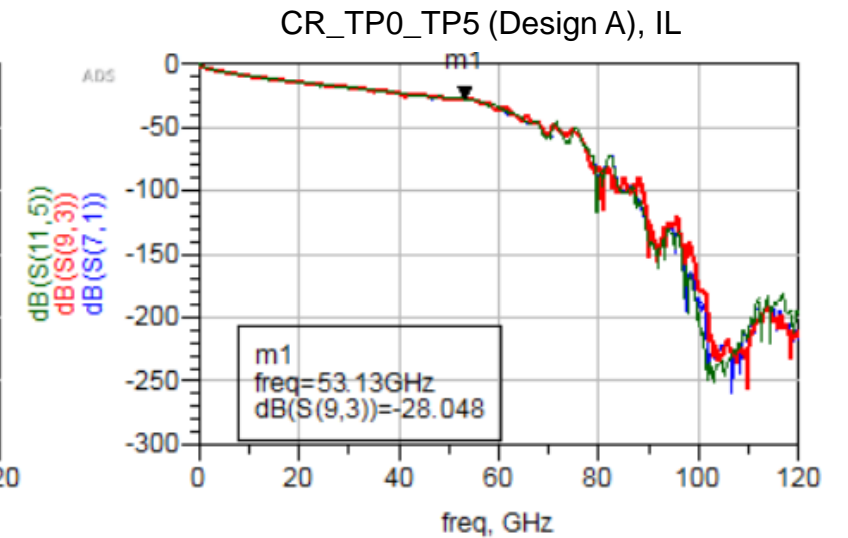
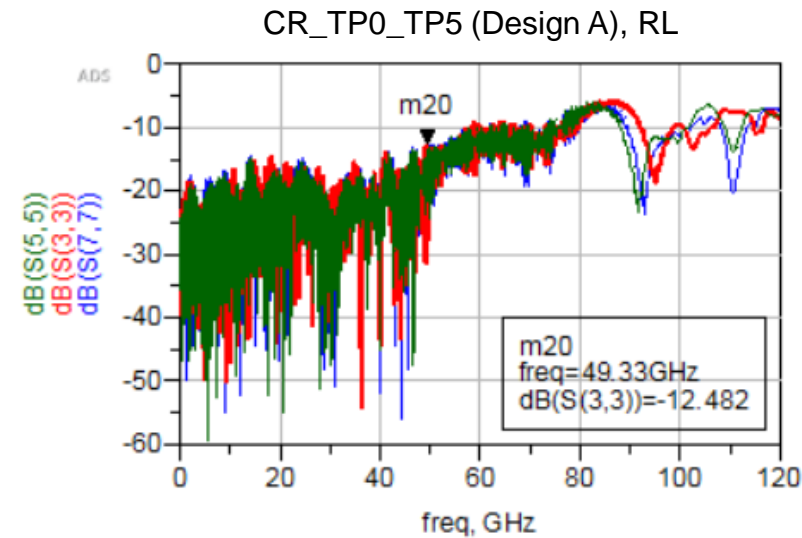
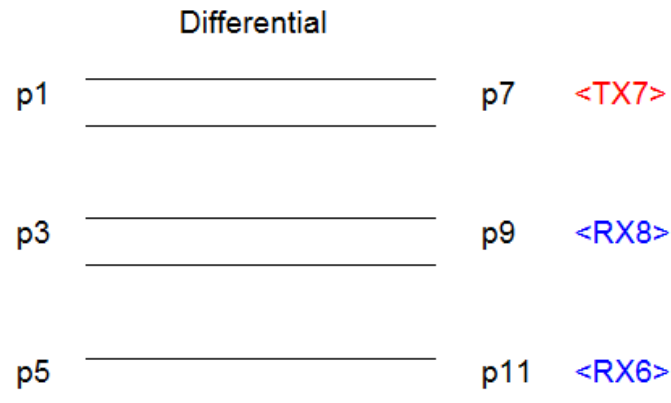
# 212.5 Gbps-PAM4 CR Channel Structure



Component	TP0-TP5 Insertion Loss (dB) @ 53.125GHz
	<i>Design A</i>
PCB via	1.5 dB
PCB Trace	8.5 inch (TX+RX, 1.27 dB/inch)
Cable Assembly	15.7 dB
Total *	28.0 dB

\* Not lineally added

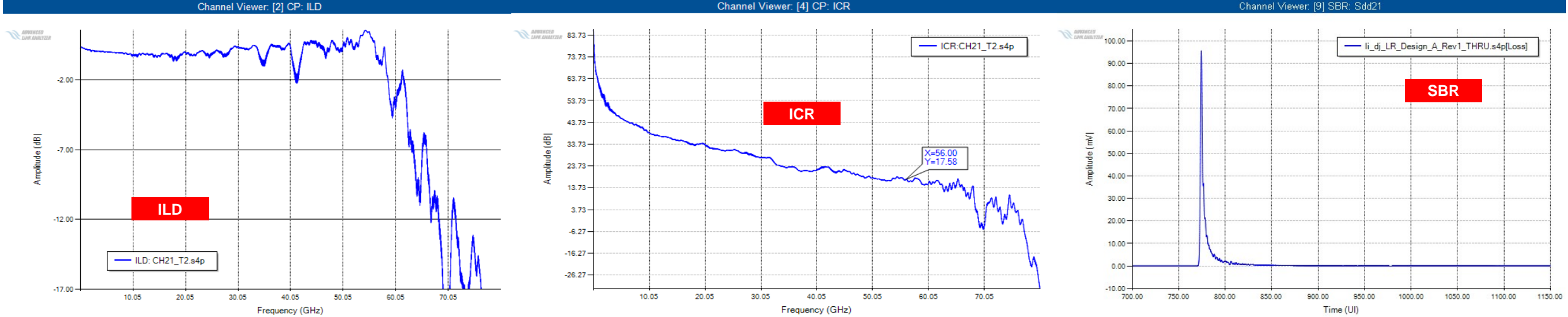
# 212.5 Gbps-PAM4 CR Channel Characteristics (I)



## TP0-TP5 Characteristics (DC-53.125GHz)

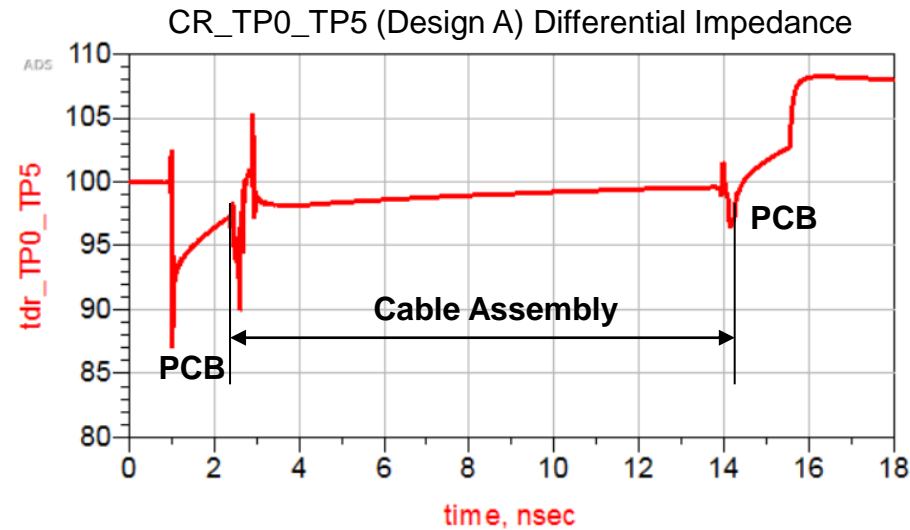
- IL: 28.05dB @ 53.125GHz
- RL  $\sim$  12dB (<53.125GHz)
- FEXT < 45.5dB (<53.125GHz)
- NEXT < 55.0dB (<53.125GHz)

# 212.5 Gbps-PAM4 CR Channel Characteristics (II)

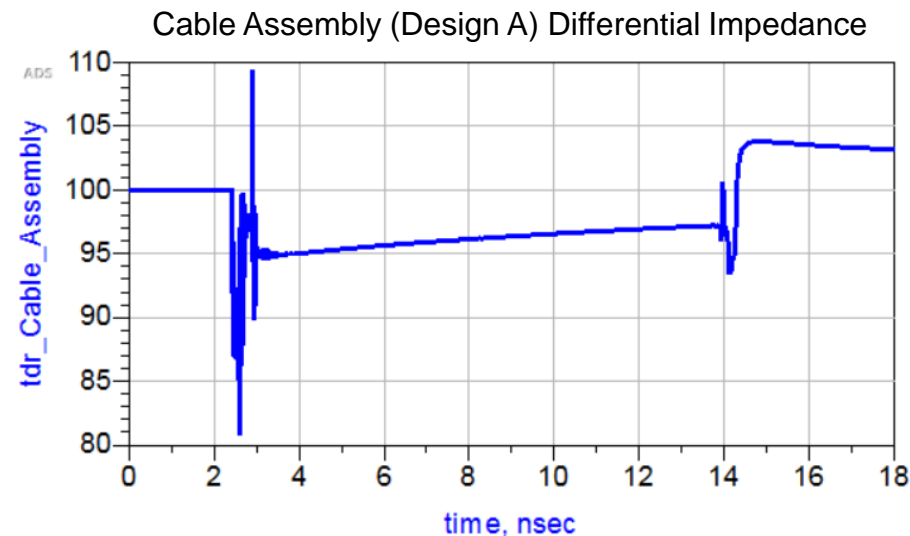


- ILD  $\sim < \pm 2$  dB ( $< 53.125$  GHz)
- ICR  $> 17.6$  dB ( $< 53.125$  GHz) (2FEXT+1NEXT used)

# 212.5 Gbps-PAM4 CR Channel Characteristics (III)



- Cable Assembly p-p discontinuity  $29\ \Omega$
- PCB p-p discontinuity  $16\ \Omega$



*[S] parameter BW DC-120GHz*

# Summary

- We have created a CR channel Design A supporting 1 Meter DAC at 212.5 Gbps-PAM4
- This CR channel includes PCB-Vias, PCBs traces, connectors, and 1 Meter DAC.
- This CR channel has:
  - An IL (TP0-TP5) of 28 dB at 53.125 GHz
  - RL  $< \sim 12$  dB at  $\leq 53.125$  GHz
  - FEXT  $< 45.5$  dB, NEXT  $< 55.0$  dB, at  $\leq 53.125$  GHz