# A 224 Gbps-PAM4 1 Meter DAC Long Reach Channel and Its Characteristics: Design B

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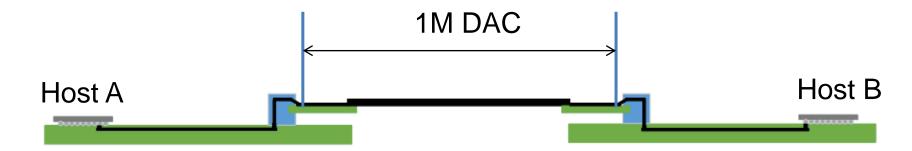
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# Background and Introduction (I)

 An important use case of 224 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 <=40 dB, for 224 Gbps-PAM4 signaling.</li>

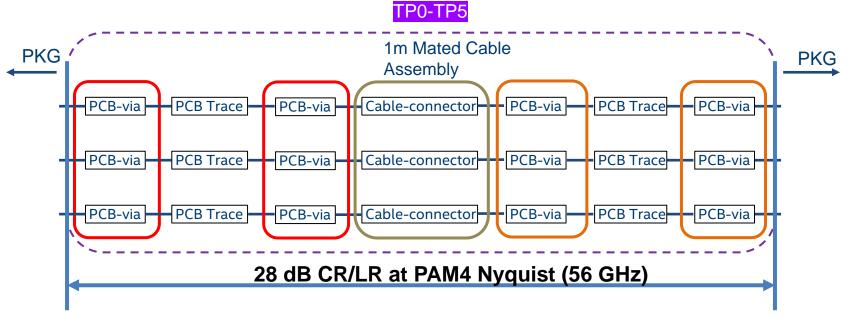
**IEEE** 

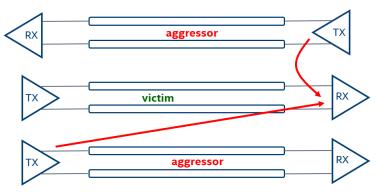
# Background and Introduction (II)

• 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 B to support 1 Meter DAC with 224Gbps-PAM4 signaling.



#### 224 Gbps-PAM4 CR Channel Structure



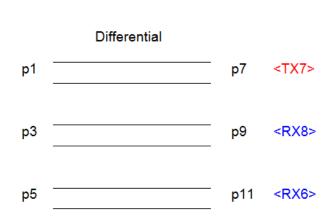


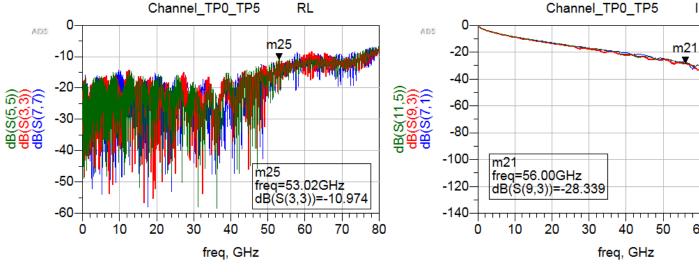
Component	TP0-TP5 Insertion Loss (dB) @ 56GHz
	Design B
PCB via	1.7 dB
PCB Trace	7.5 inch (TX+RX, 1.3 dB/inch)
Mated Cable Assembly	17.0 dB
Total	28.3 dB



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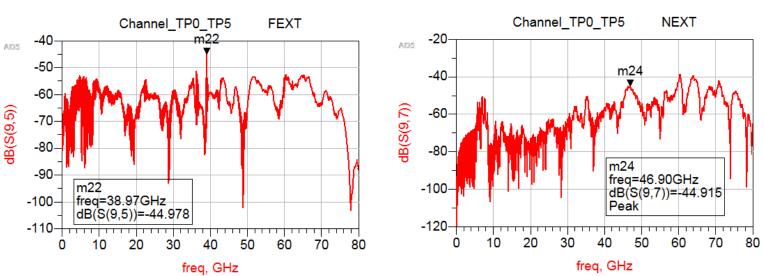
#### 224 Gbps-PAM4 CR Channel Characteristics (I)





#### TP0-TP5 Characteristics (DC-56GHz)

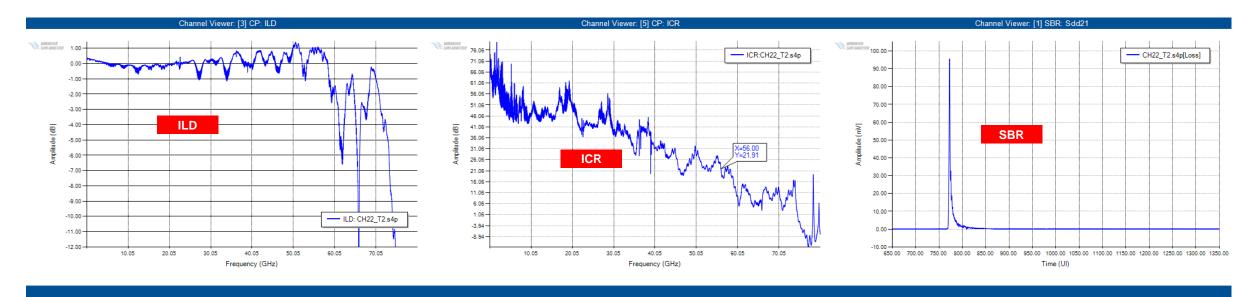
- IL: 28.3dB @ 56GHz
- RL <~ 11dB (<56GHz)</li>
- FEXT < 45dB (<56GHz)</li>
- NEXT < 45dB (<56GHz)</li>





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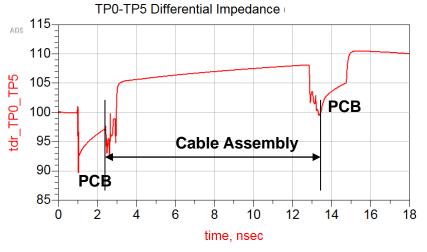
#### 224 Gbps-PAM4 CR Channel Characteristics (II)



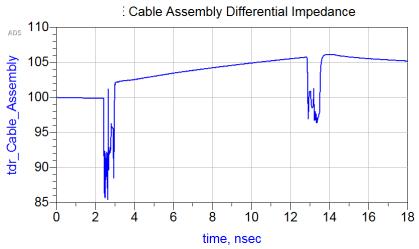
- ILD ~ +- 1 dB (<56GHz)
- ICR > 21.9 dB (<56GHz) (2FEXT+1NEXT used)



### 224 Gbps-PAM4 CR Channel Characteristics (III)



- > Cable p-p discontinuity 15.9 Ω
- $\triangleright$  PCB p-p discontinuity 11.5  $\Omega$



[S] parameter BW DC-80GHz



## Summary

- We have created a CR channel Design B supporting 1 Meter DAC.
- This CR channel includes PCB-Vias, PCB traces, connectors, and 1 Meter DAC.
- This CR channel has:
  - An IL (TP0-TP5) of 28.3 dB at 56 GHz
  - $RL <^{\sim} 11 dB at <= 56 GHz$
  - FEXT < 45 dB, NEXT < 45 dB, at <= 56 GHz</p>

