



CEI-28G-VSR Channel Simulations, Validation, & Next Steps

Nathan Tracy and Mike Fogg

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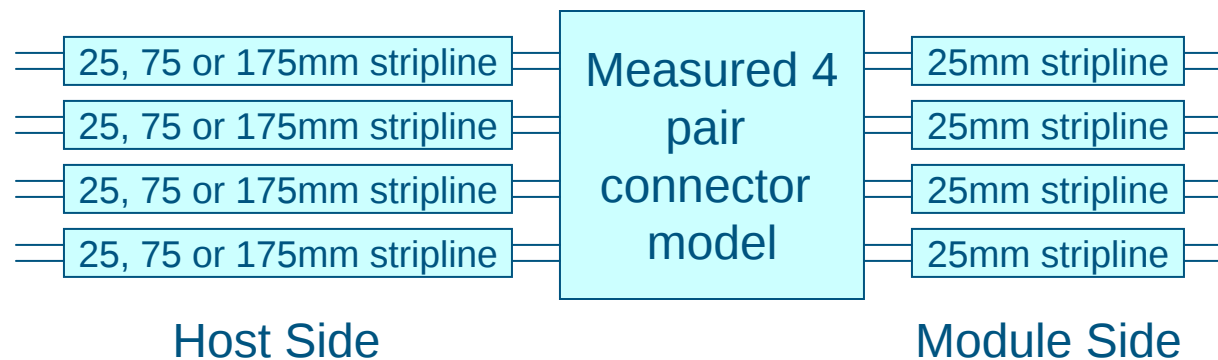
Summary of Contribution

- Updated information showing Tyco Electronics 25/28Gbps *first generation* modular interconnect technology demonstrator
 - Model of interconnect has been replaced with measured test data
 - 100mm combined channel length
 - 200mm combined channel length
- Market Feedback
- Latest Development Activity
 - *Second generation* design approach
 - Connector performance simulation
- Channel models

Channel Description



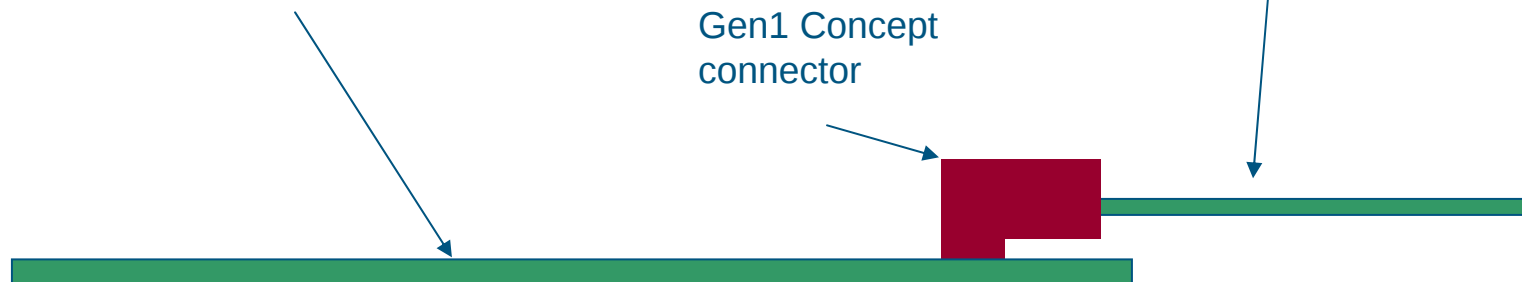
- 4 pair test derived model of connector and various length channels:
- 25mm, 75mm or 175mm long, Nelco 4000-13SI on host side (x4)
 - 25mm long, Nelco 4000-13SI on module side (x4)



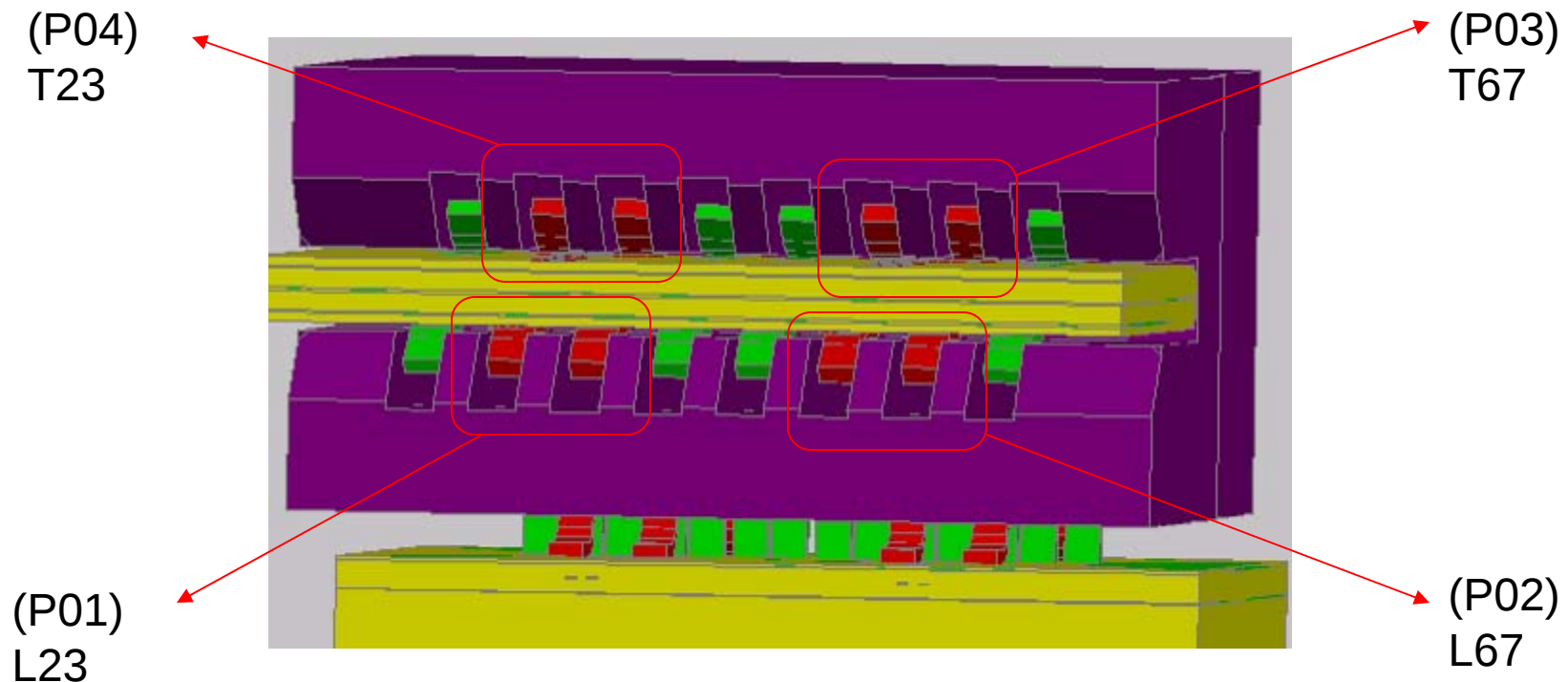
Channel Details

- 25, 75 or 175mm of trace
- 100 Ohm differential traces (5-6-5 mil)
- 4000-13SI dielectric material
- 0.039" thickness
- Layer 2 or layer 5 connect (top inner or bottom inner layer)
- 1 microvia

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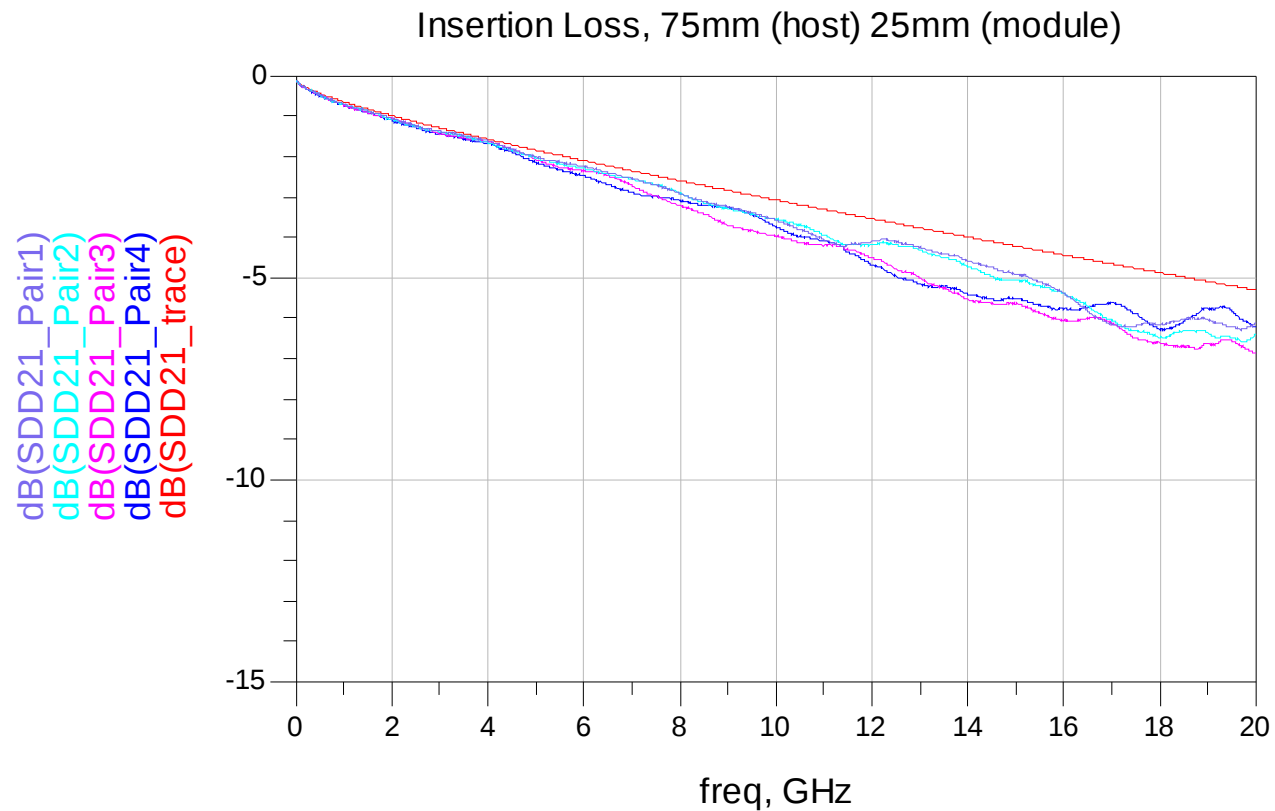


1st Generation Concept Pin Numbering



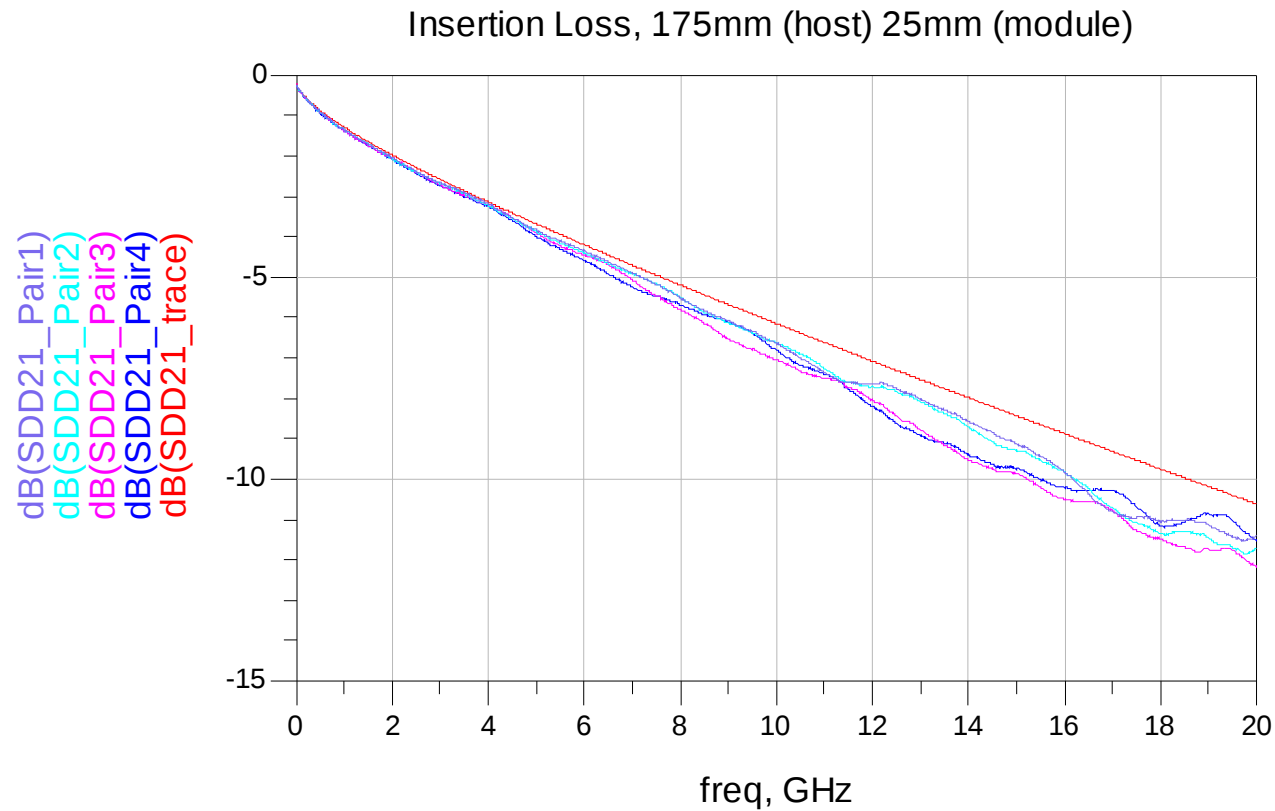
Channel Performance, 100mm Trace Length

- S_{DD21} (Insertion Loss)



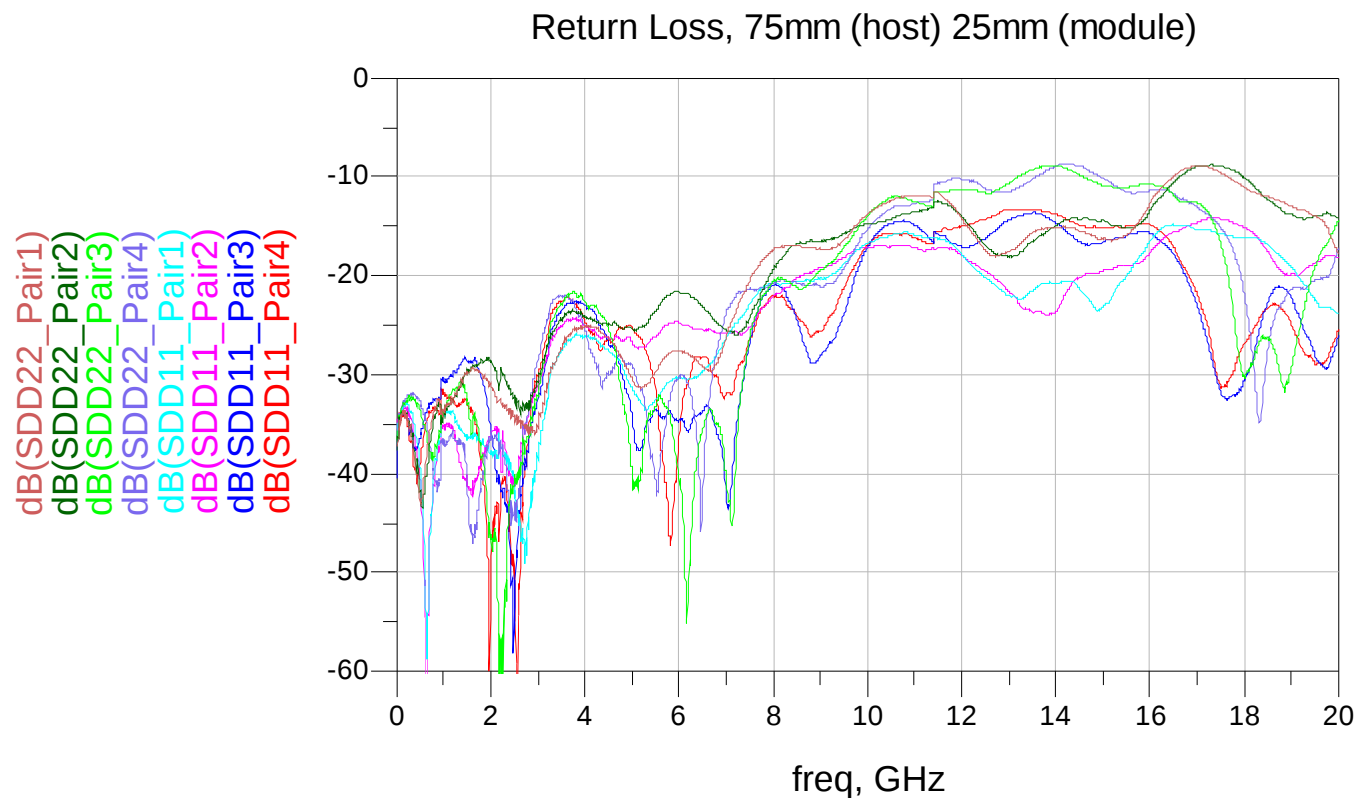
Channel Performance, 200mm Trace Length

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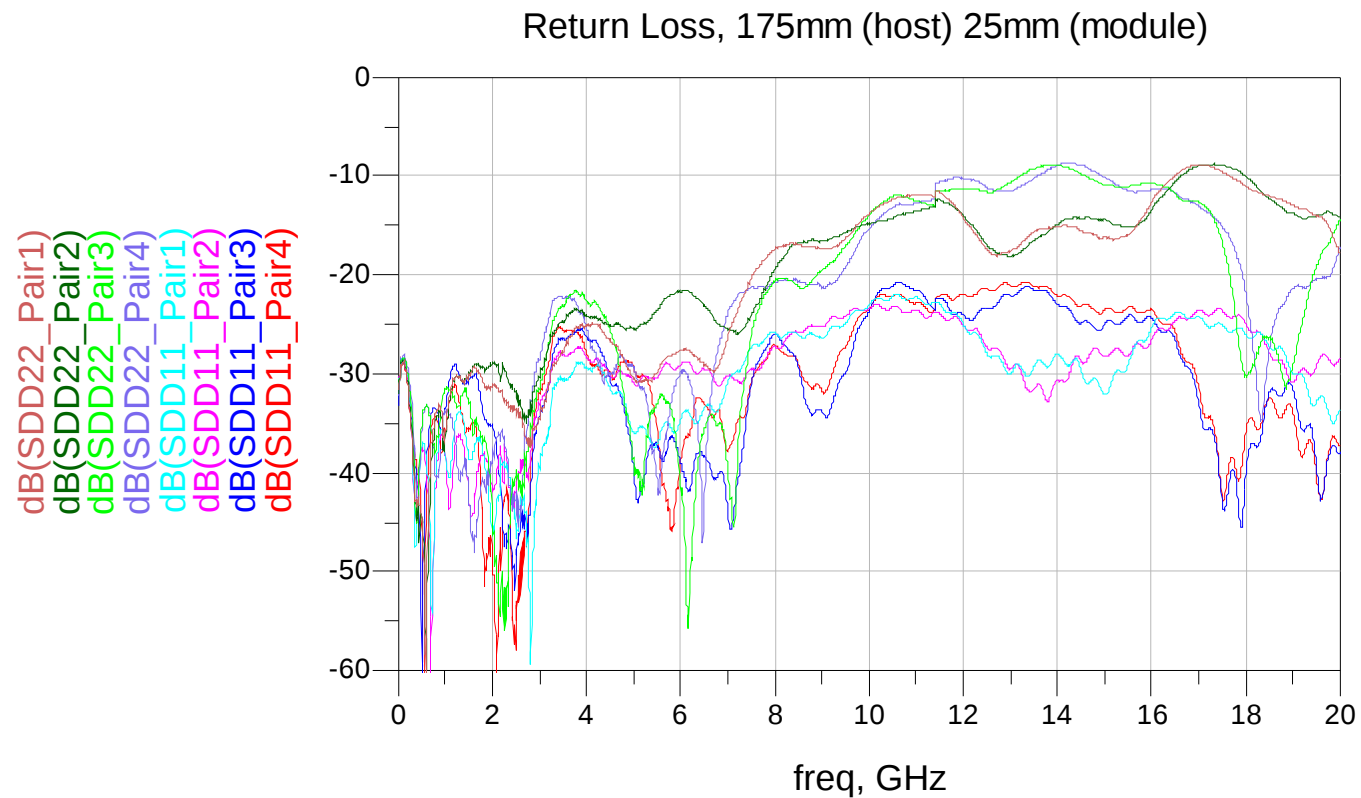
Channel Performance, 100mm Trace Length

- S_{DD11}/S_{DD22} (Return Loss)
 - S_{DD11} driven from host side
 - S_{DD22} driven from module side



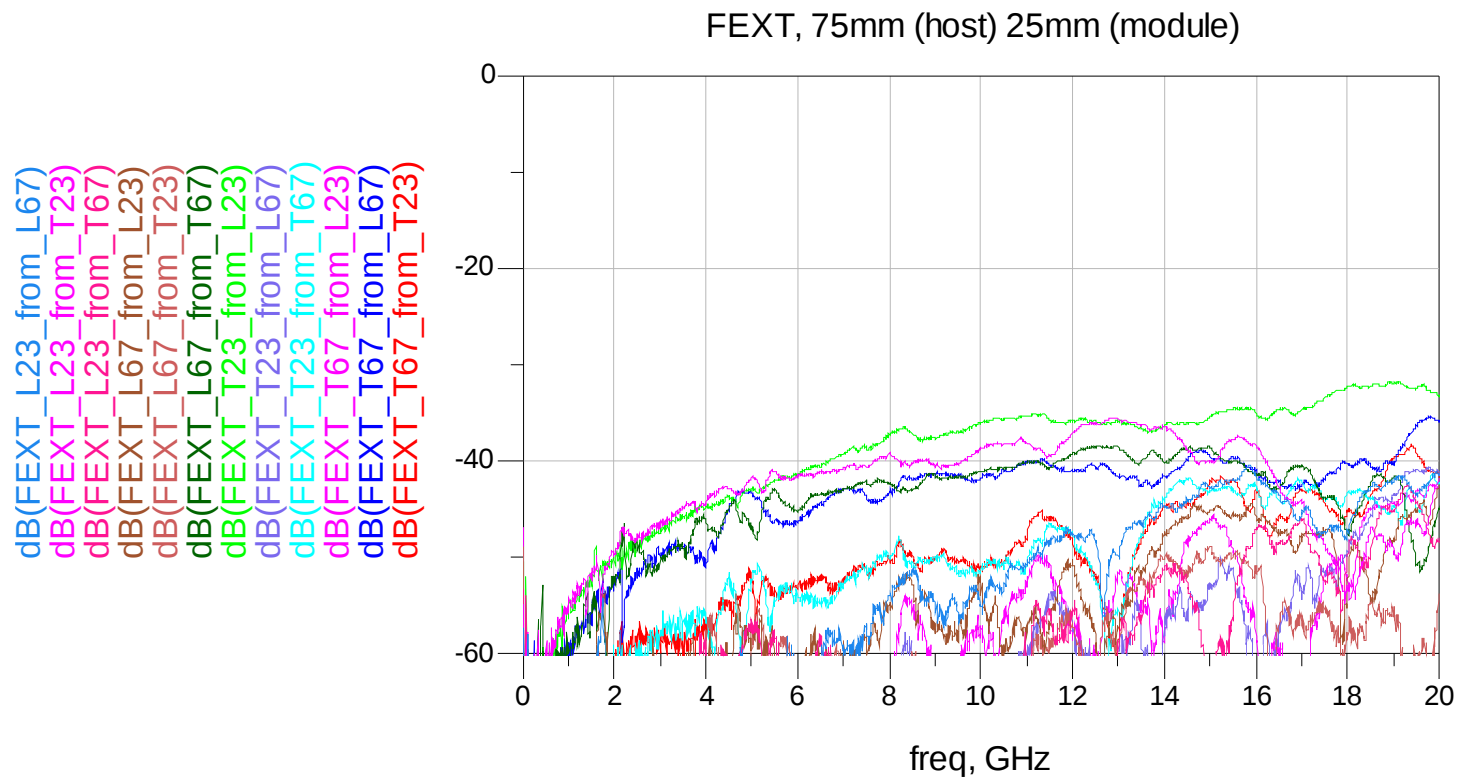
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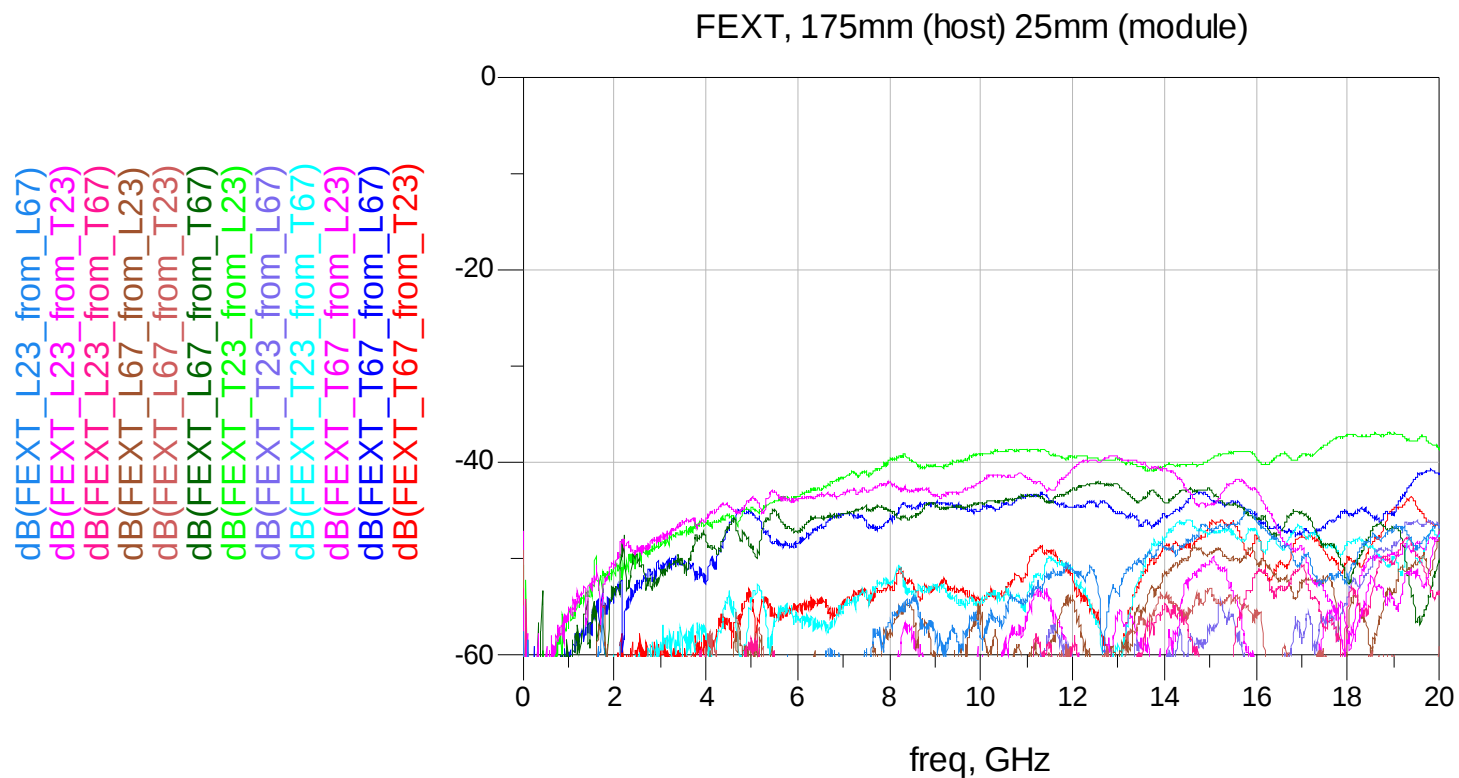
Channel Performance, 100mm Trace Length

- FEXT: All pair combinations shown



Channel Performance, 200mm Trace Length

- FEXT: All pair combinations shown



Market Feedback From Gen1 Concept/Demo

- General Market Feedback:
 - Connector electrical performance seems to be acceptable for SR and VSR channels
 - General comment that concept doesn't meet port density requirements

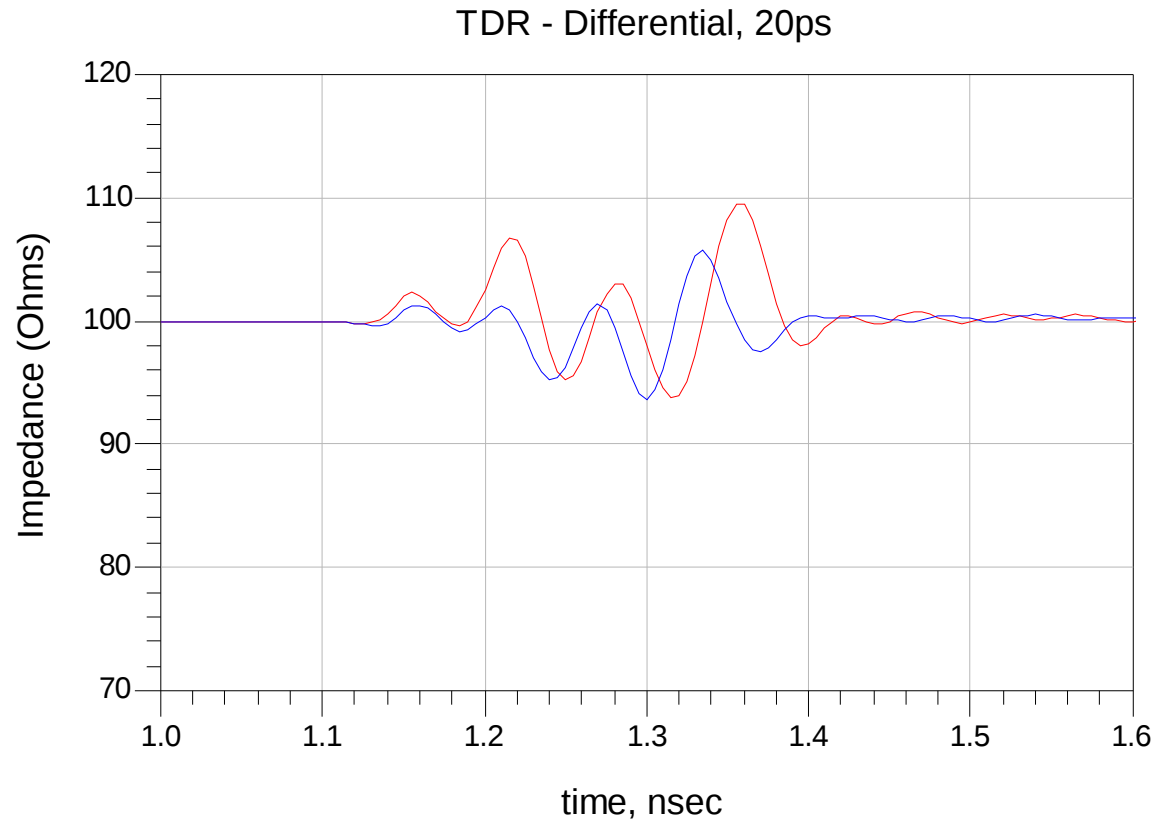
Second Generation Concept

Connector Detail

- Design accommodates Belly to Belly application
- Enables 18/36 ports in a 19" rack
- New generation connector

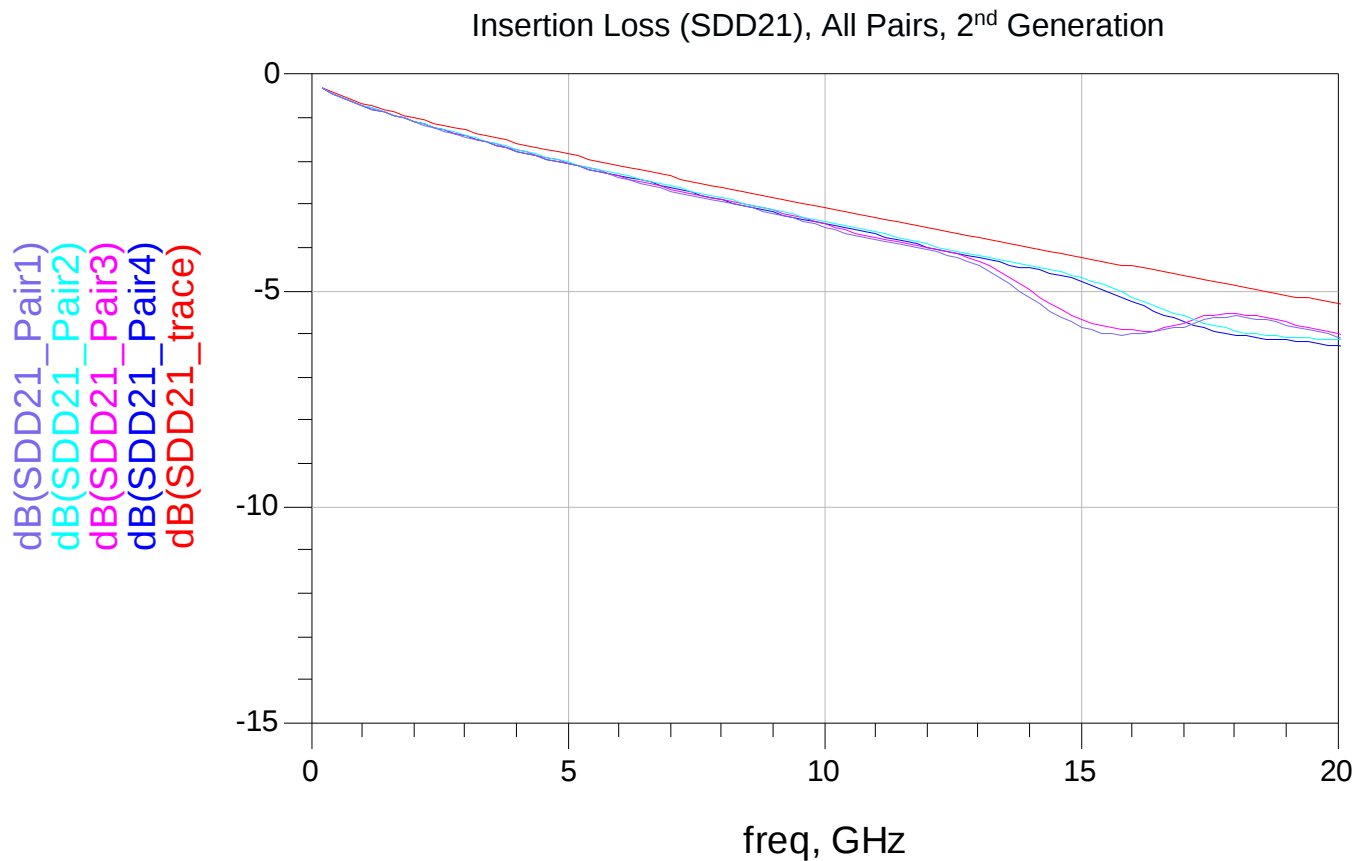
All modeling includes any vias, antipads and solder pads for necessary connector application

2nd Generation Concept Differential Impedance

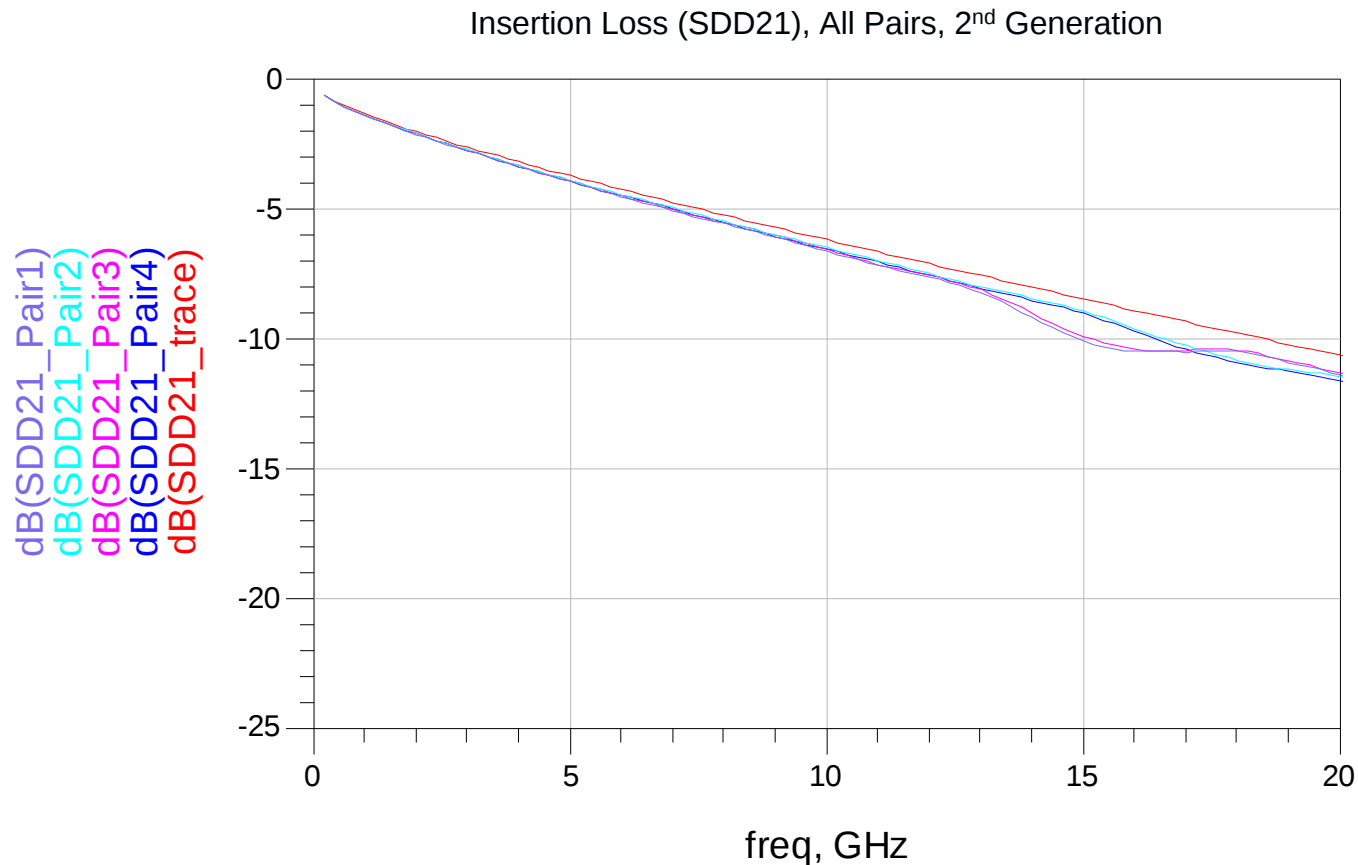


Red – Pair style “A”
Blue – Pair style “B”

2nd Generation Concept, 100mm Channel Insertion Loss

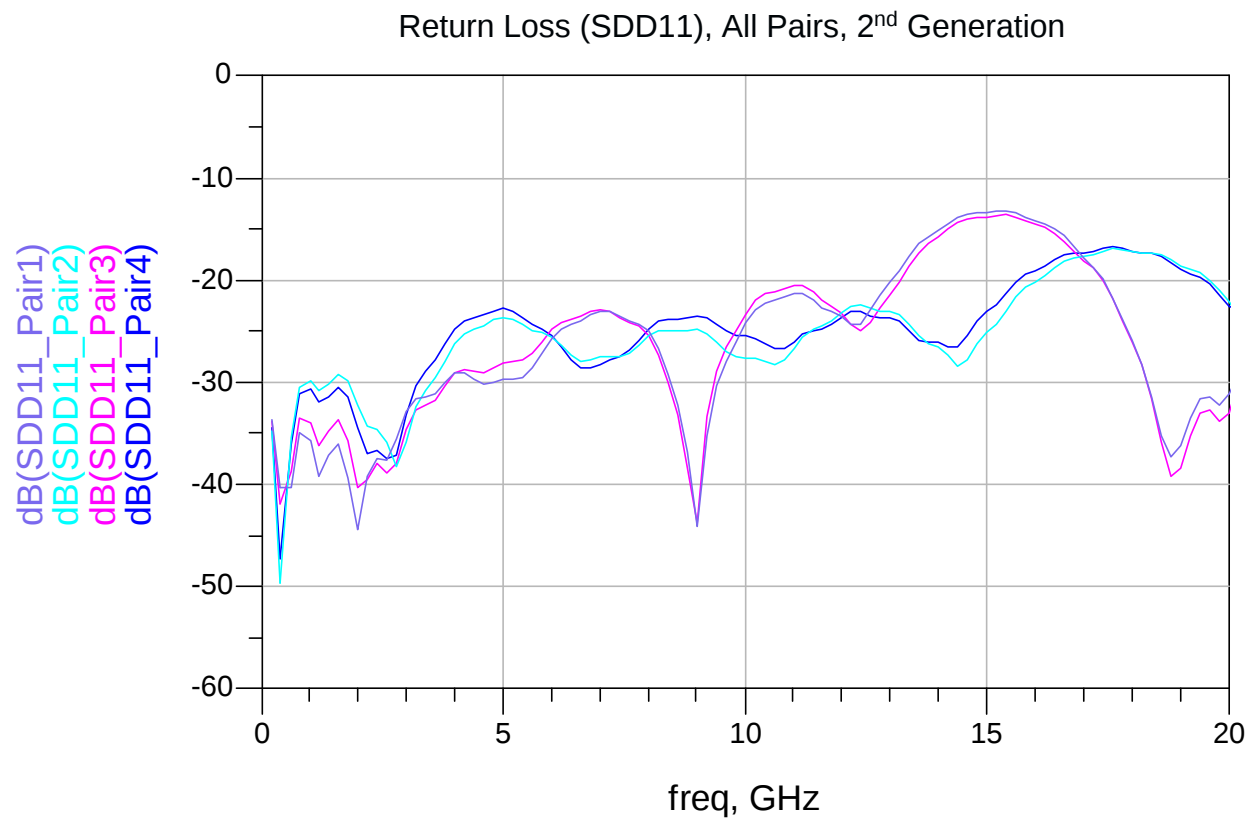


2nd Generation Concept, 200mm Channel Insertion Loss



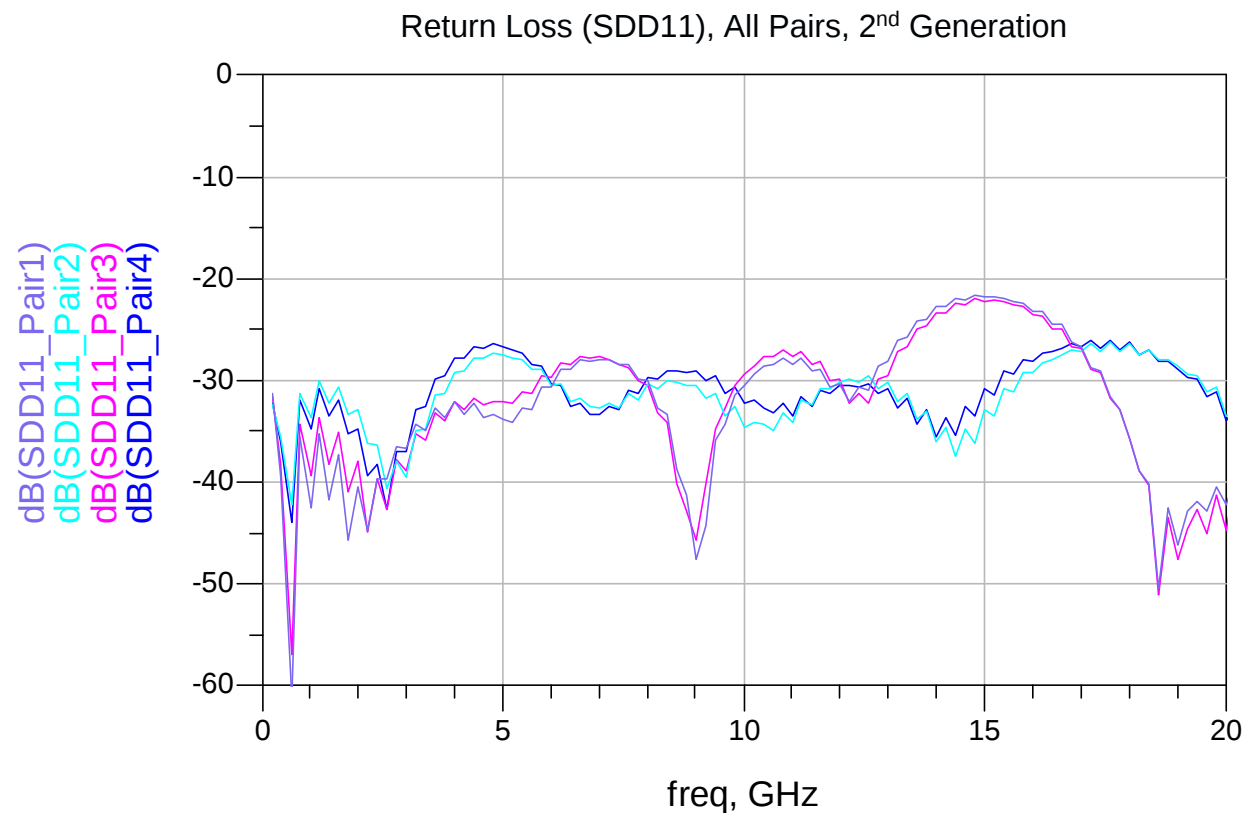
2nd Generation Concept, 100mm Channel Return Loss

- S_{DD11} (Return Loss)

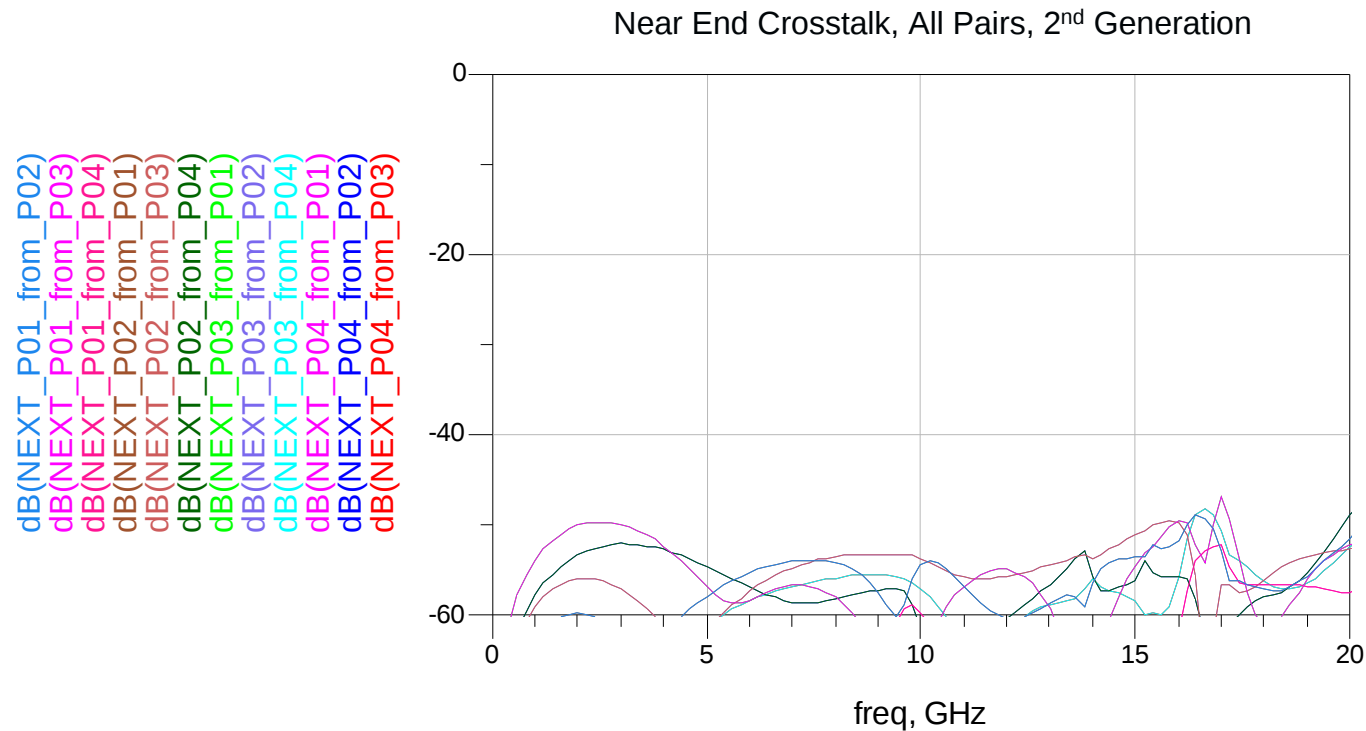


2nd Generation Concept, 200mm Channel Return Loss

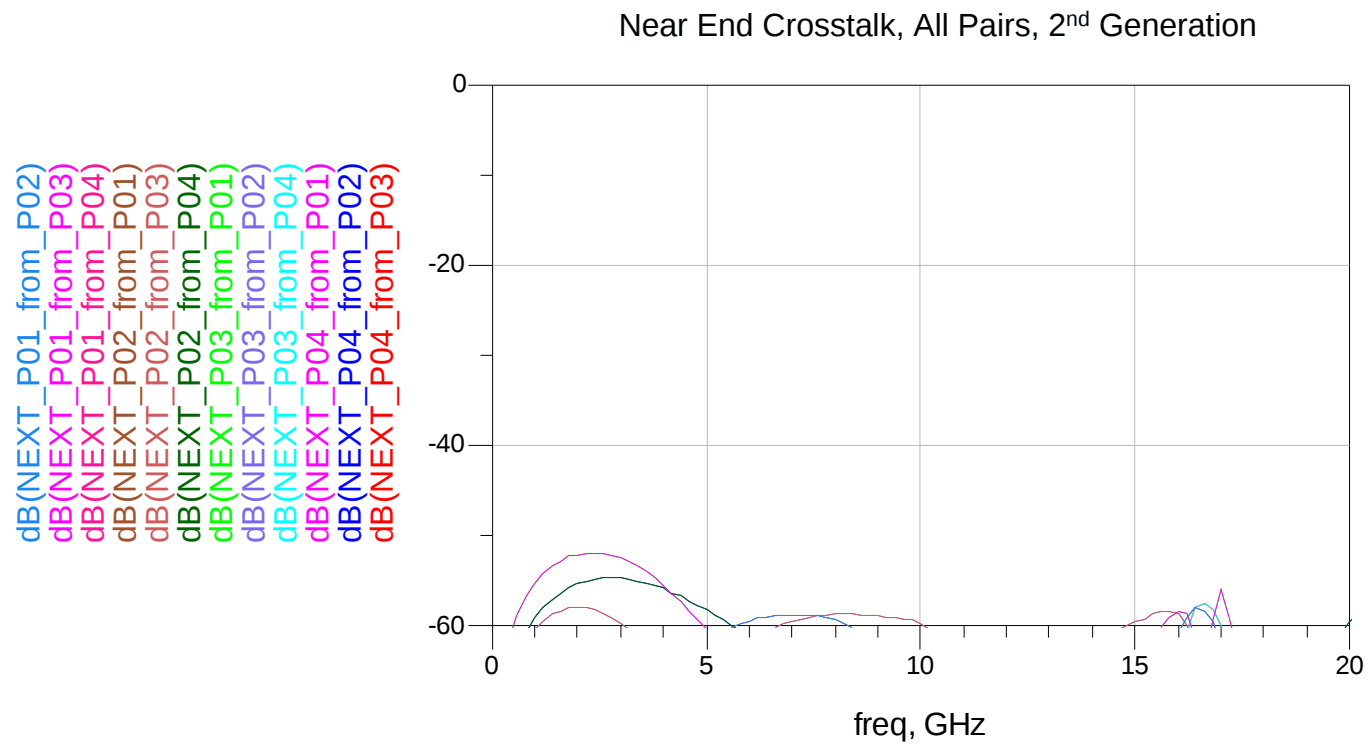
- S_{DD11} (Return Loss)



2nd Generation Concept 100mm Channel NEXT

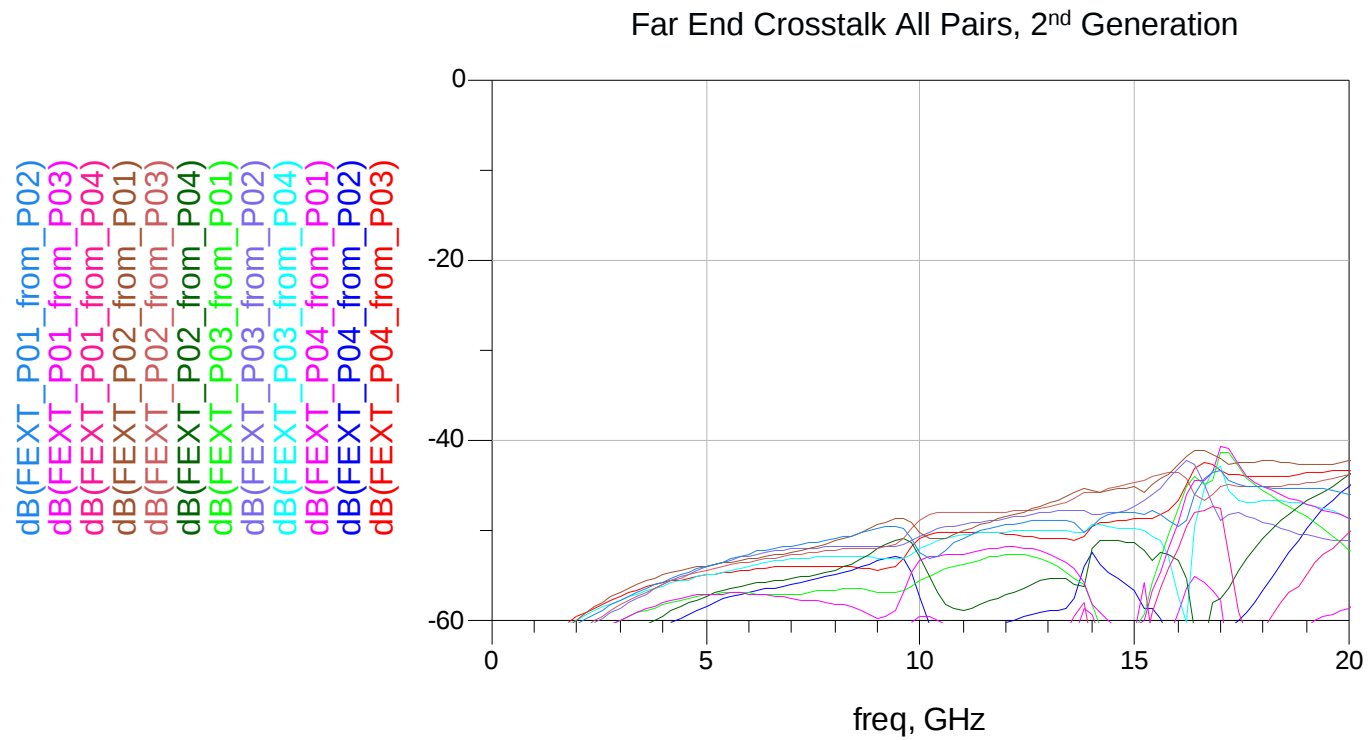


2nd Generation Concept 200mm Channel NEXT

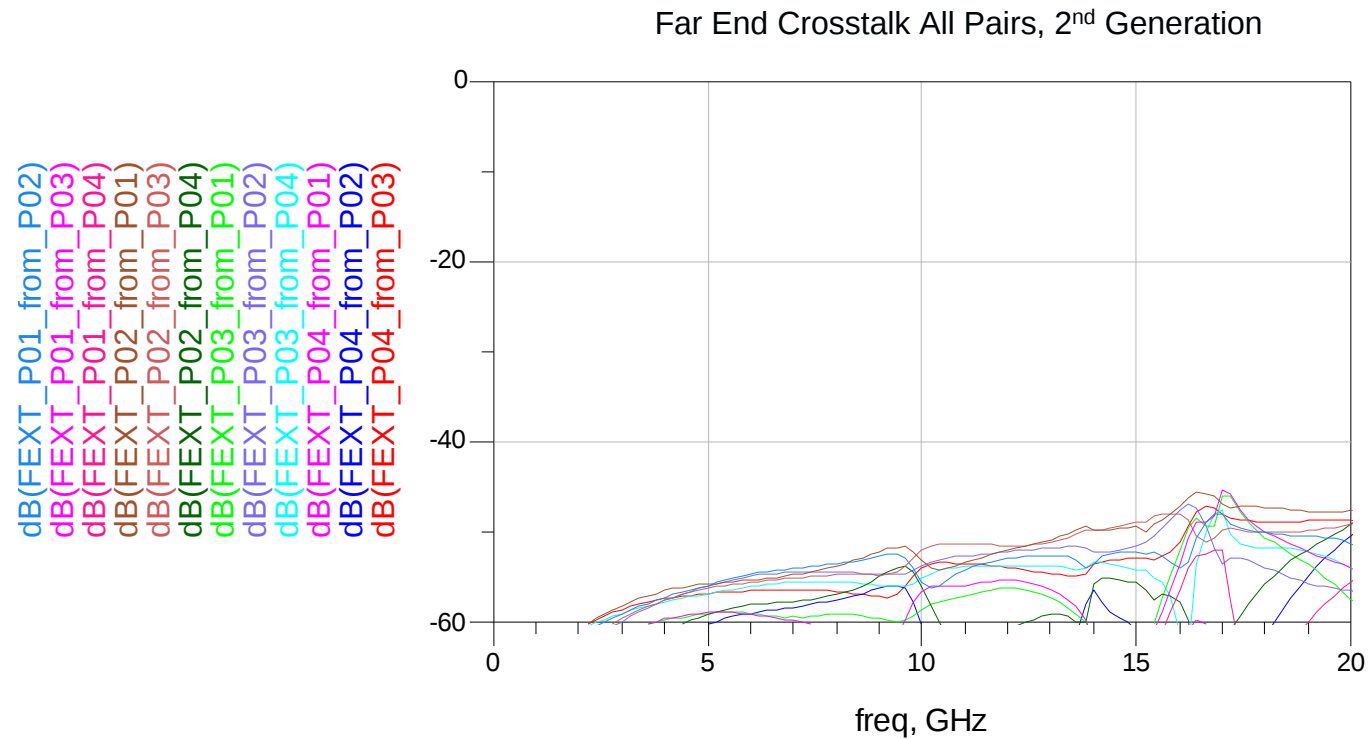


Near End Crosstalk, All Pair, 2nd Generation

2nd Generation Concept 100mm FEXT

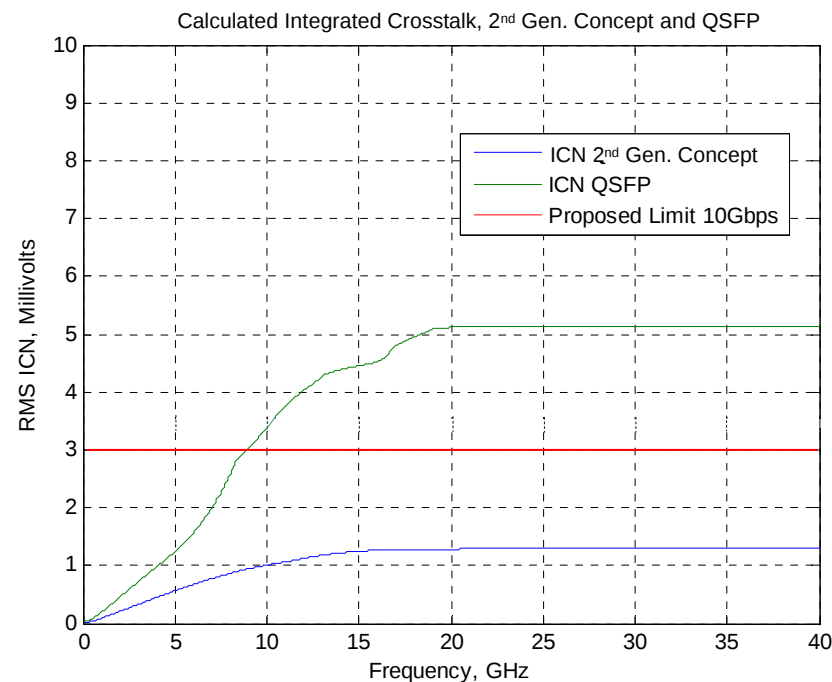


2nd Generation Concept 200mm Channel FEXT



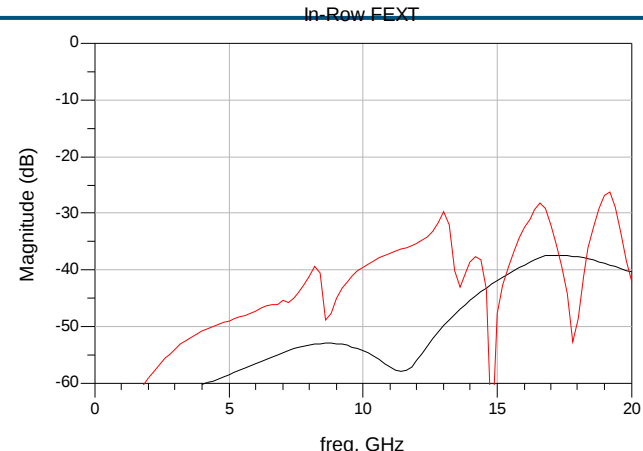
Integrated Crosstalk Noise (ICN)

- Completed investigation into ICN
 - Matlab .m file is complete
 - Calculates ICN, ICR, MDFEXT, MDNEXT
 - Results have been checked against Adam Healey's Excel File



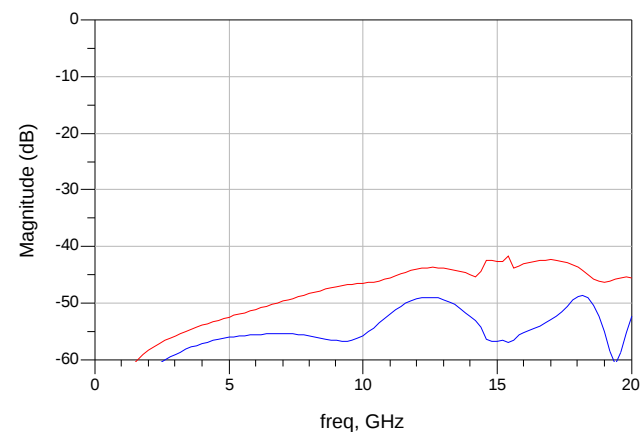
ICN Calculations – comparison between products including 4000-13si trace effects

- Initial QSFP with 200mm of trace
 - 3.8mV(rms, 10.3Gbps)
 - 5.2mV(rms, 24Gbps)
 - 5.2mV(rms, 28Gbps)
- 1st Gen. Concept with 200mm of trace
 - 2.2mV(rms, 10.3Gbps)
 - 2.7mV(rms, 24Gbps)
 - 3.3mV(rms, 28Gbps)
- 2nd Gen. Concept with 200mm of trace
 - 0.8mV(rms, 10.3Gbps)
 - 1.2mV(rms, 24Gbps)
 - 1.3mV(rms, 28Gbps)
- 2nd Gen. Concept with 100mm of trace
 - 1.6mV(rms, 28Gbps)



QSFP, 1st Gen. Concept

In-Row FEXT



2nd Gen. Concept

Summary

- A first generation technology demonstrator 28Gb/s connector has been simulated, built and tested
 - 28Gb/s “modeled-to-measured performance” has been validated
- A second generation connector concept has been developed
 - Performance shows improvement over first generation demonstrator
 - Port to port density allows 18/36 ports in a 19” rack
 - Prototypes in process