

10 Gbps Data Transmission in FR408 and Nelco 4000-13SI GbX[®]Reference Backplane

Molex Incorporated
Connector Products Division
Signal Integrity Group, Lisle, IL



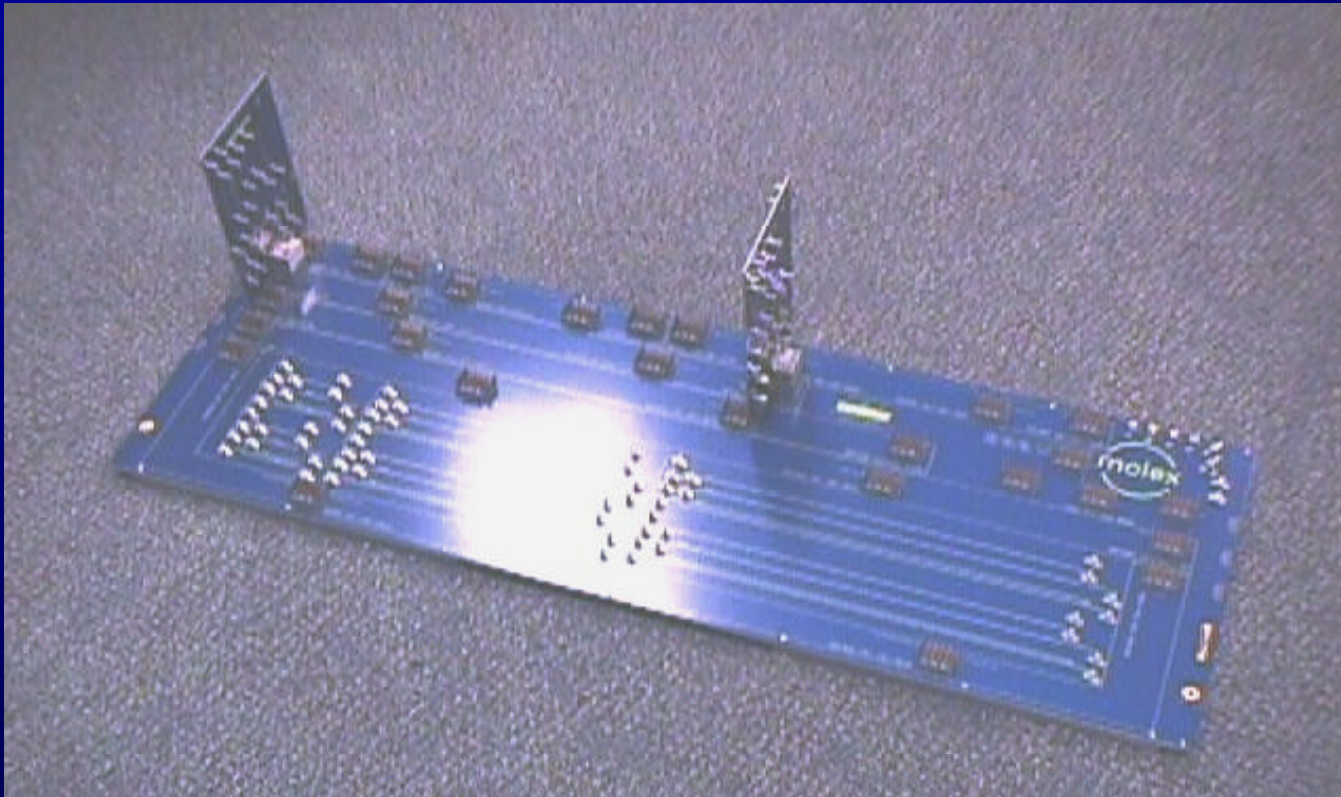
Introduction

- **Isola FR408 reference backplane**
 - Test and demonstration vehicle
 - Set of channels ranging from 8" to 1.25 m
 - GbX connectors
- **Extension of Nelco 4000-13SI work**
 - Performance comparison
 - Lower relative cost



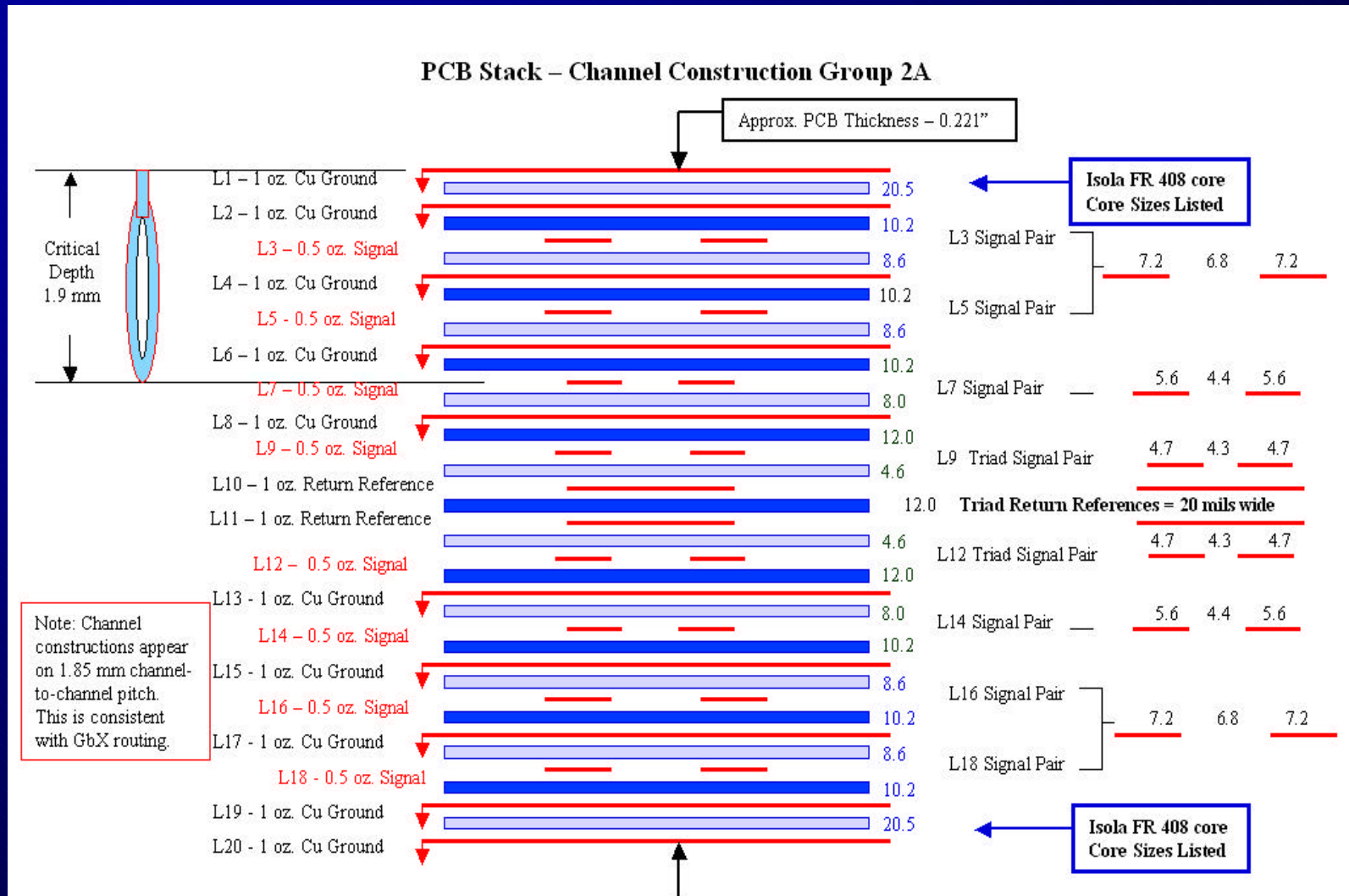
Backplane

- Overall length: 97 cm; overall width 33 cm
- Thickness: 5.7 mm
- 1.85 mm channel pitch progression maintained over length of channel

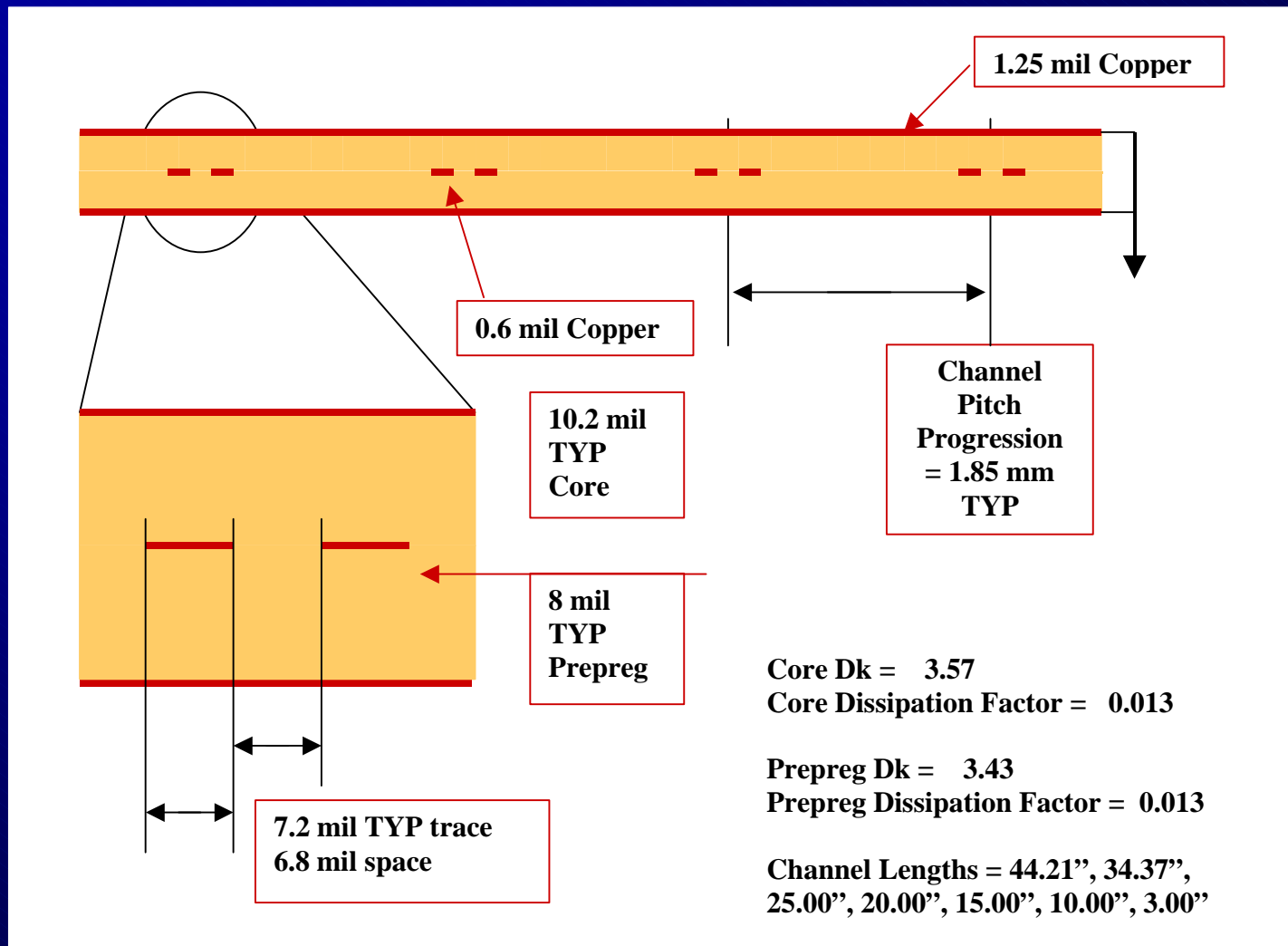


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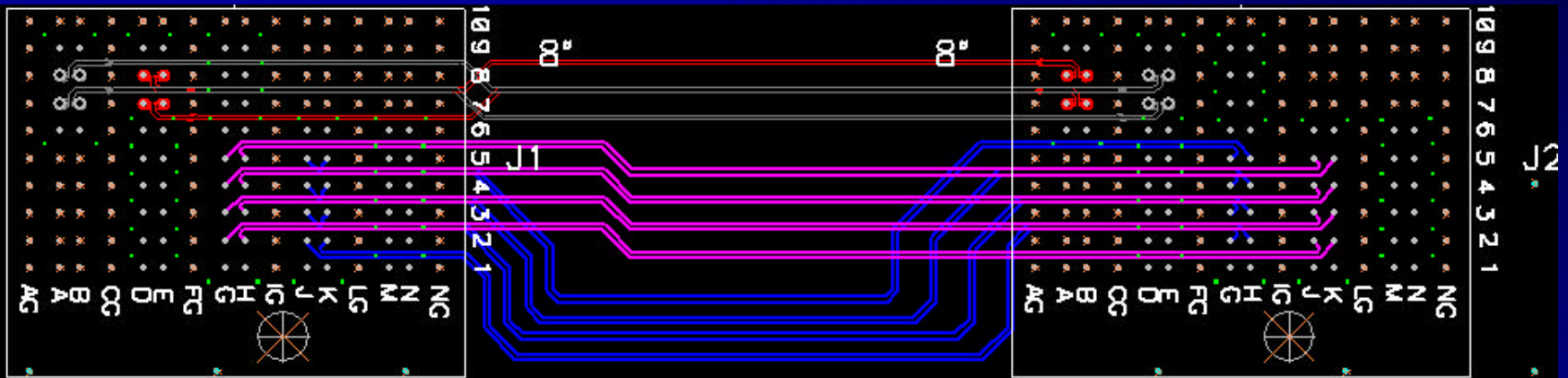
Backplane Construction



Backplane Construction



Channel Routing Example

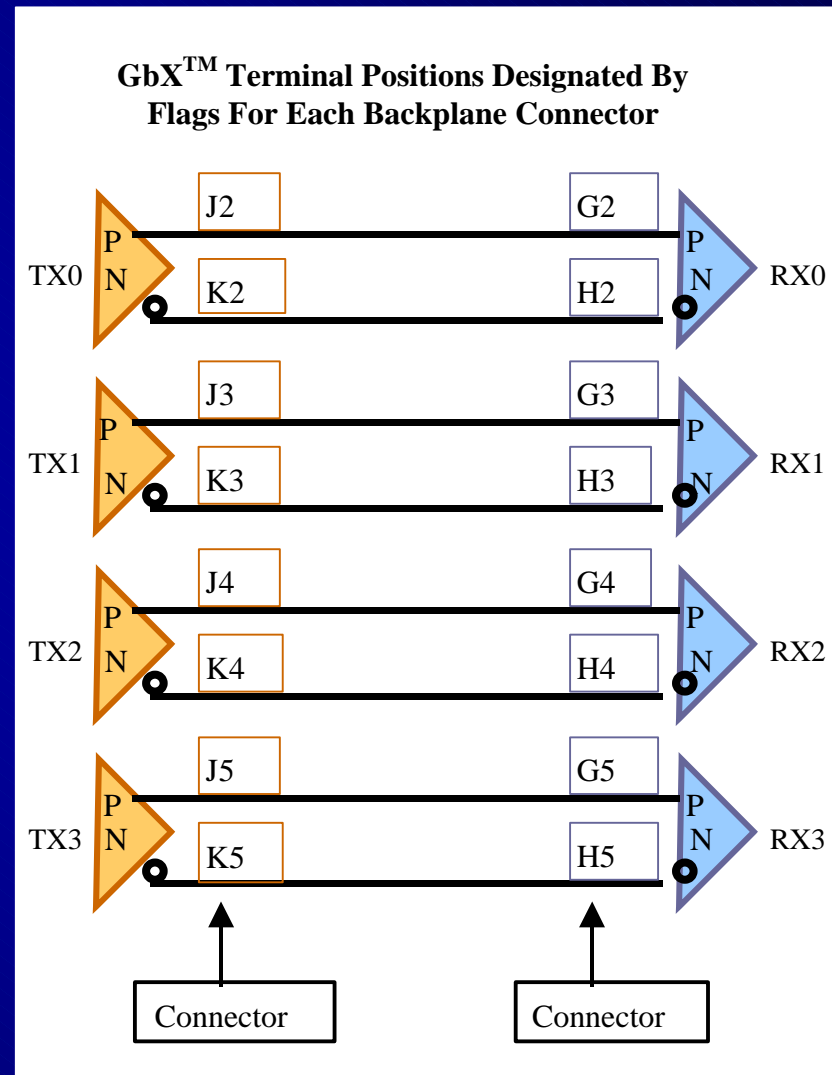


TRANSMIT — LAYER 3 — SIGNAL 1 — BACK DRILL
RECEIVE — LAYER 18 — SIGNAL 8

- Shows 8 inch channel
- 1 m channel is similar
- Channel nomenclature from connector pin locations

Channel Nomenclature

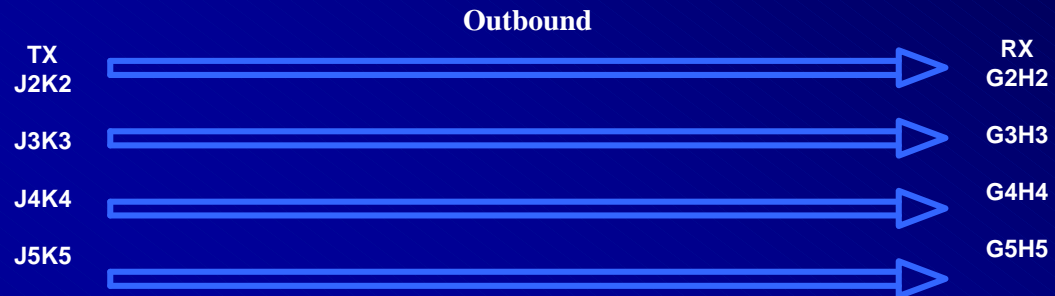
- Aids interpretation of posted data
- Description posted to Channel Model Library
- All FR408 channels discussed here are backdrilled or bottom-routed
- Nelco channels include worst-case via stub



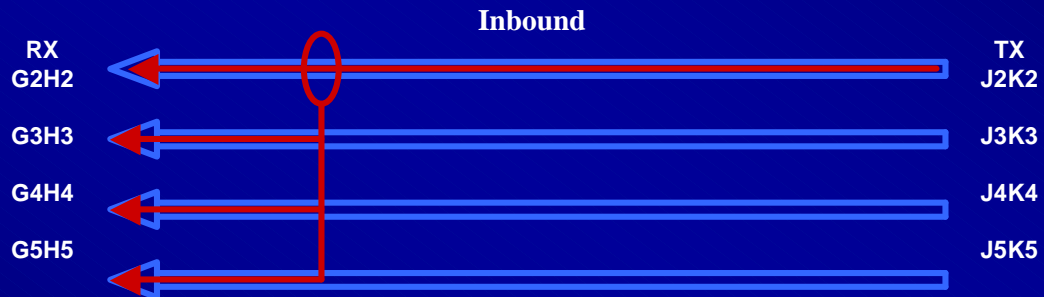
NEXT and FEXT Measurements

Inbound FEXT Example

Layer 3 (top)
backdrilled



Layer 18 (bottom)



Inbound Thru Channel → sj2k2g2h2

• Associated FEXT Channels → Located in Inbound FEXT Channel Folder

- sj2k2g3h3
- sj2k2g4h4
- sj2k2g5h5



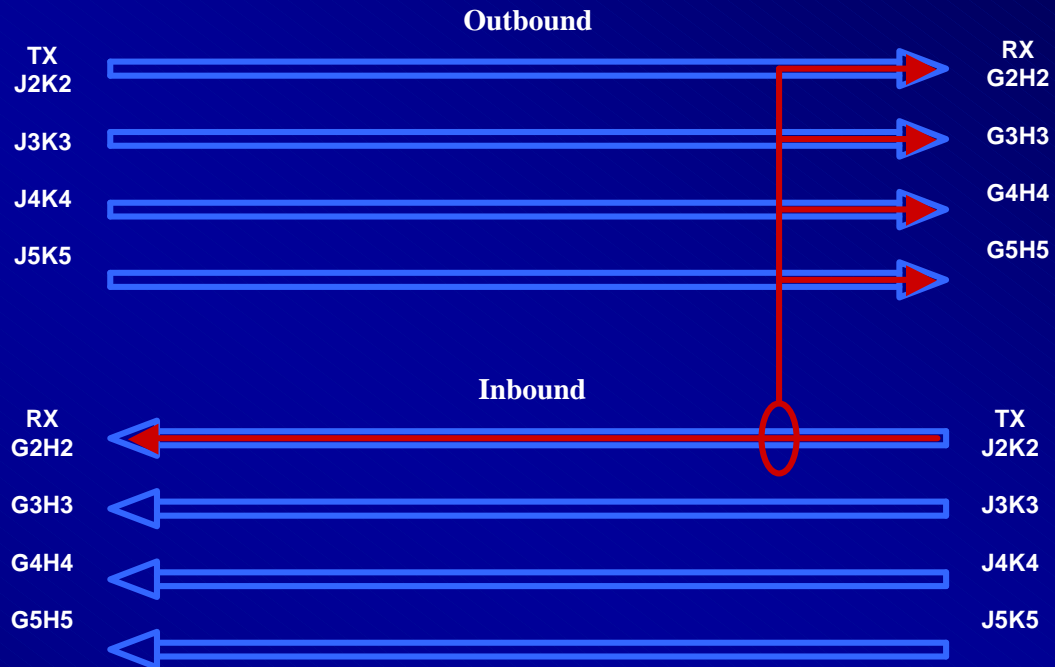
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NEXT and FEXT Measurements

Inbound NEXT Example

Layer 3 (top)
backdrilled

Layer 18 (bottom)
backdrilled



Inbound Thru Channel → sj2k2g2h2

• Associated NEXT Channels → Located in Inbound NEXT Channel Folder

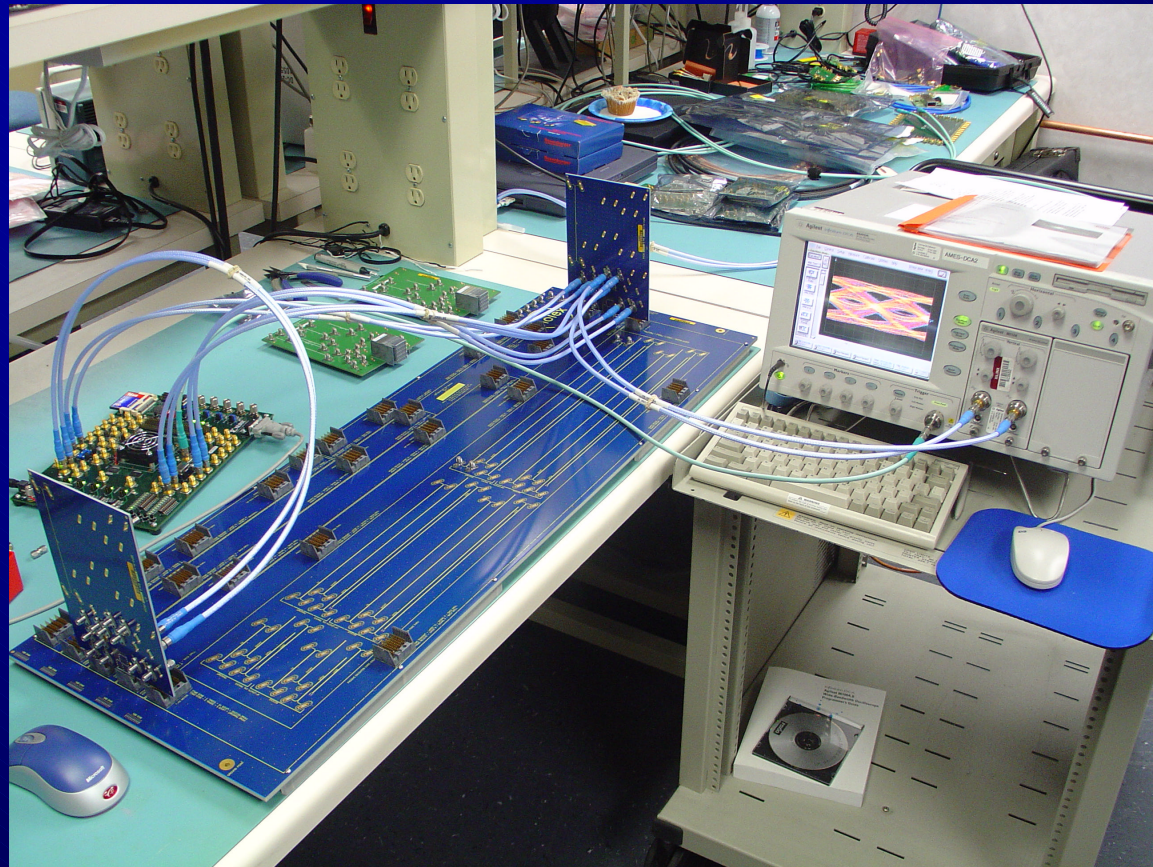
- sj2k2g2h2
- sj2k2g3h3
- sj2k2g4h4
- sj2k2g5h5



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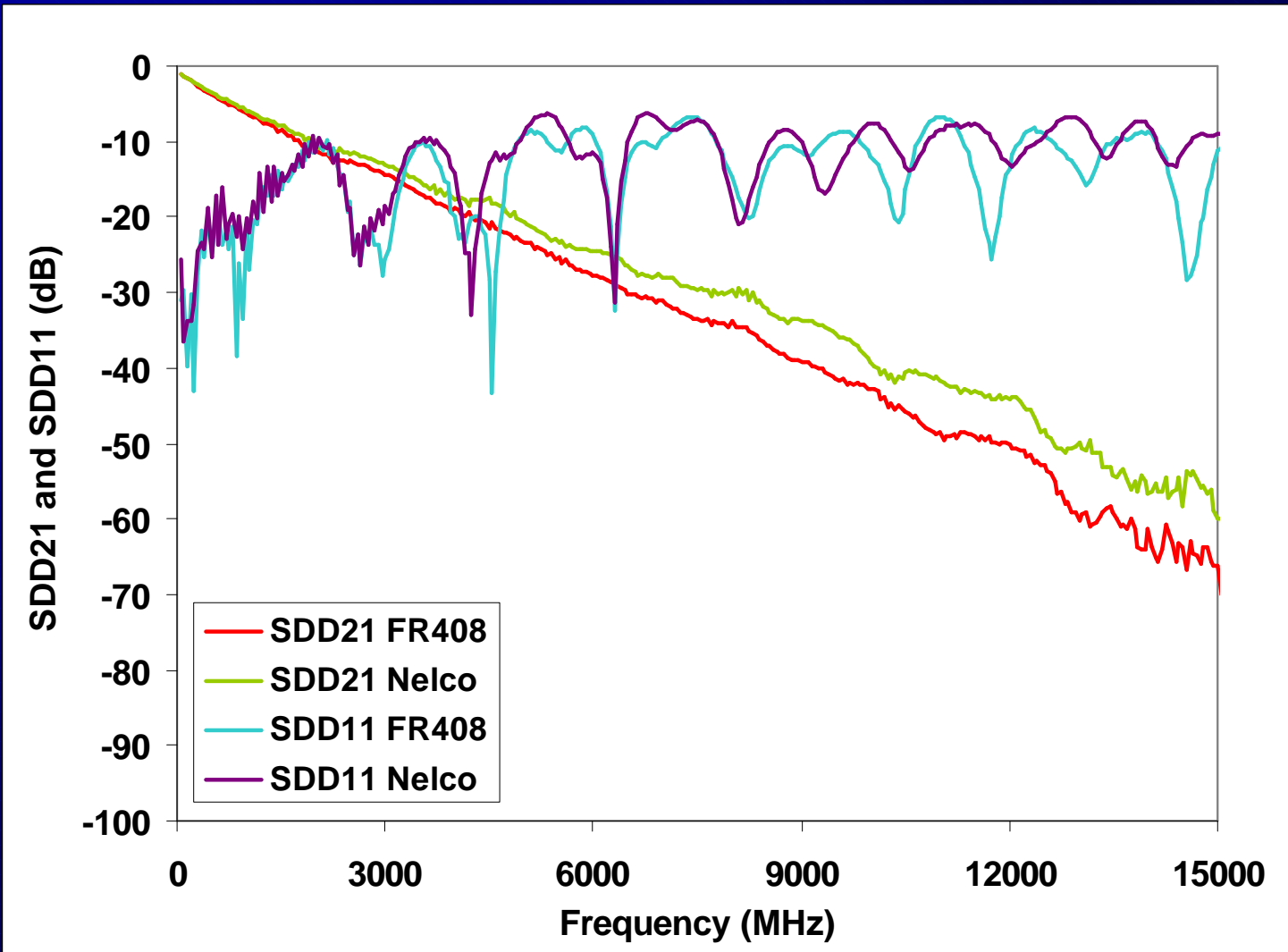
Measurement Results

- Test configuration
 - Xilinx silicon



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Compare to Nelco 4000-13SI Backplane



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BER Data @ 10 Gbps

Backplane Material	Channel length	Far end crosstalk?	Max pattern length	BER
N4000-13SI	1m	No	$2^{11}-1$	$<4e-13$
FR408	1m	No	$2^{11}-1$	$<2e-13$
FR408	1m	Yes	2^7-1	$<1.45e-15$

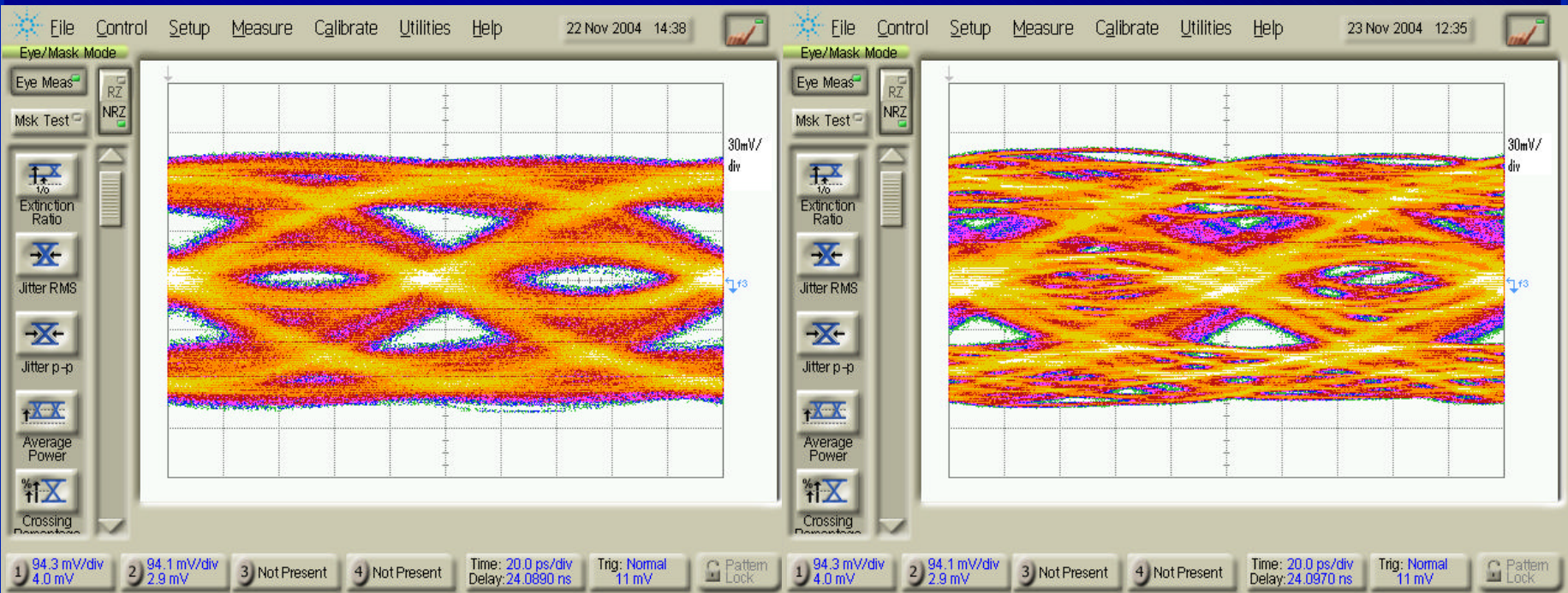
Measurements made by Xilinx



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Eye Diagrams

- FR408 backplane eyes with pre-emphasis, before receiver equalization



No crosstalk

With crosstalk



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Interoperability data

- Backplane included in OIF interoperability tests
- Tested with silicon from four providers
- Interoperability successfully demonstrated at 10 Gbps on the 1 m channel
- Complete documentation available at <http://www.oiforum.com/public/documents/CEIWP1.pdf>



Summary

- **Isola FR408 backplane**
 - GbX connectors
- **1m, 1.25m channels**
- **S-parameter measurements up to 15 GHz**
 - Posted to IEEE and OIF
- **Demonstrated data transmission at 10 Gbps**
 - Measured BER $\sim 1e-15$
- **Compared with Nelco 4000-13SI backplane**
 - Slight return loss decrease
 - Slight insertion loss increase
 - Comparable performance at lower cost



Thank You

