

Predicting the Performance of Sort Tooling to 40 Gb/s

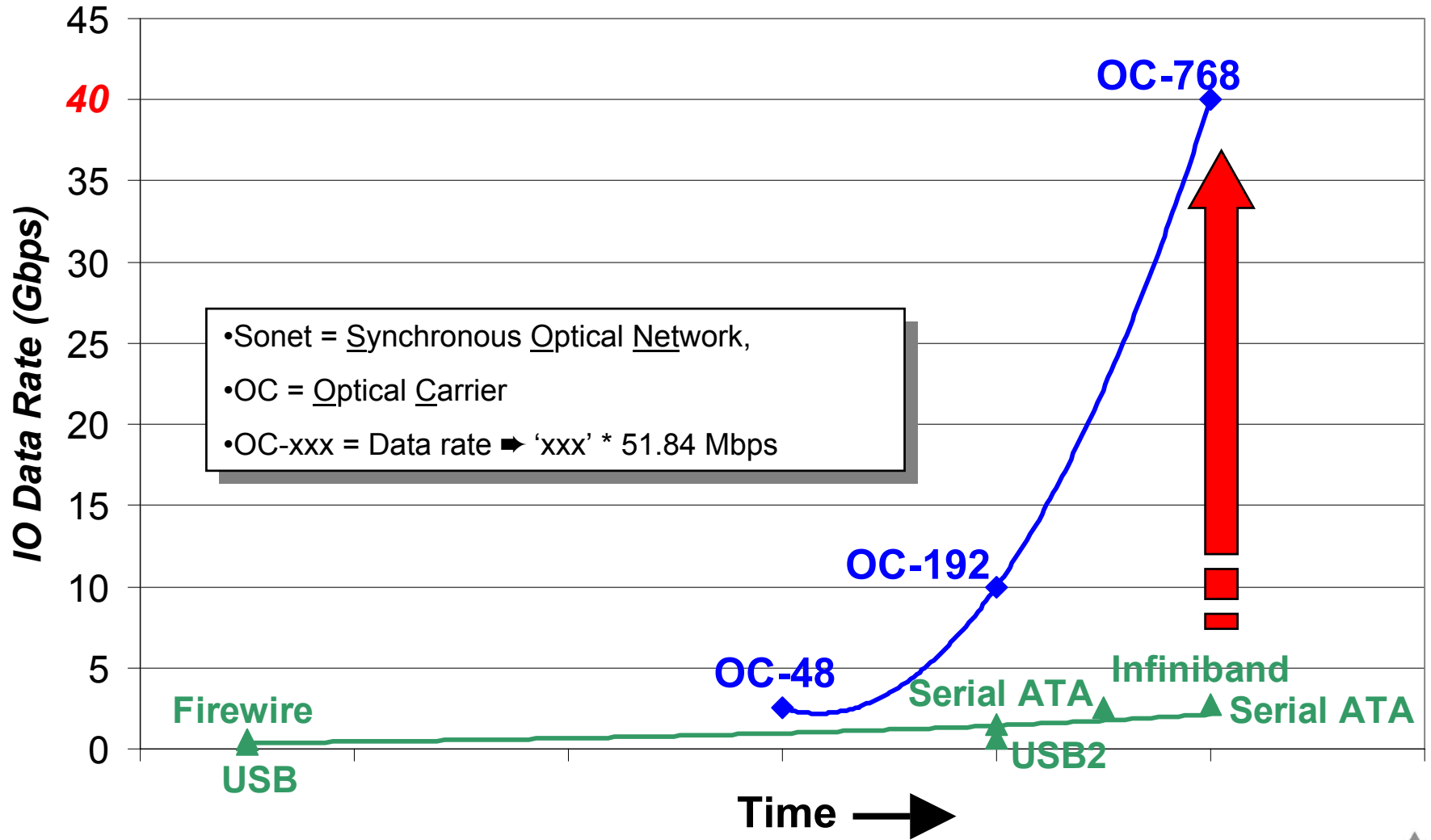
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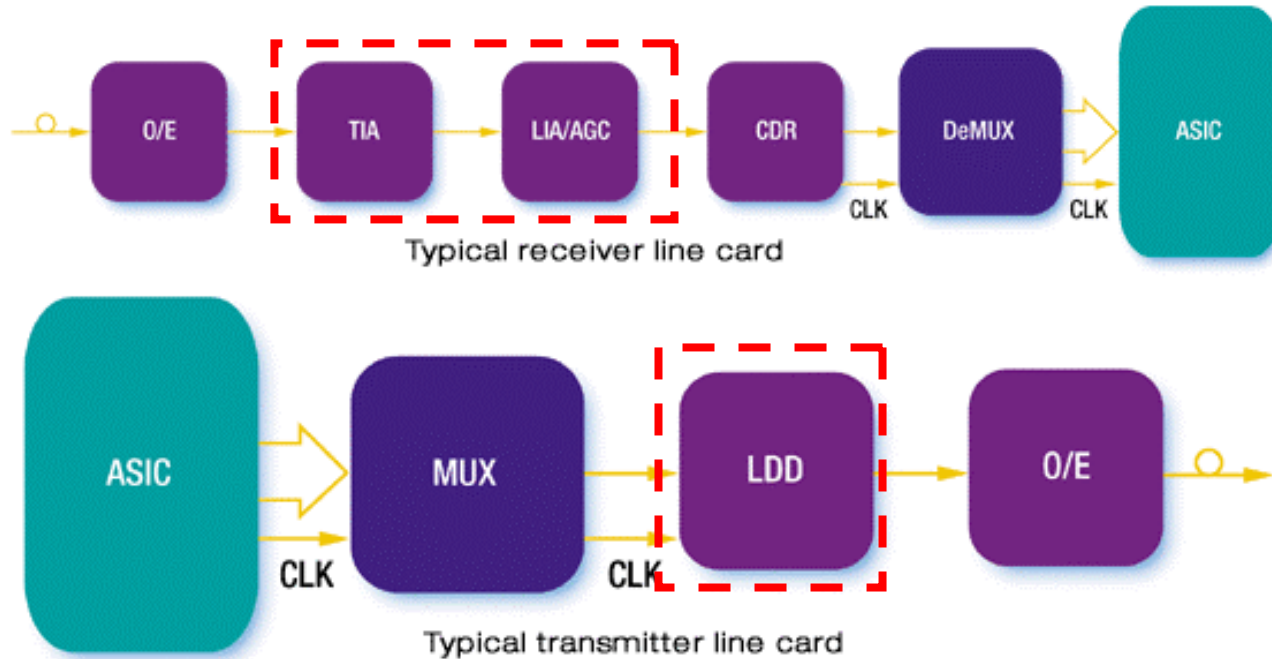
Outline

- Background
- Problem Statement
- Model creation process
- Model correlation
- Sensitivity analysis
- Summary
- Acknowledgements

Telecom Datarate Trend



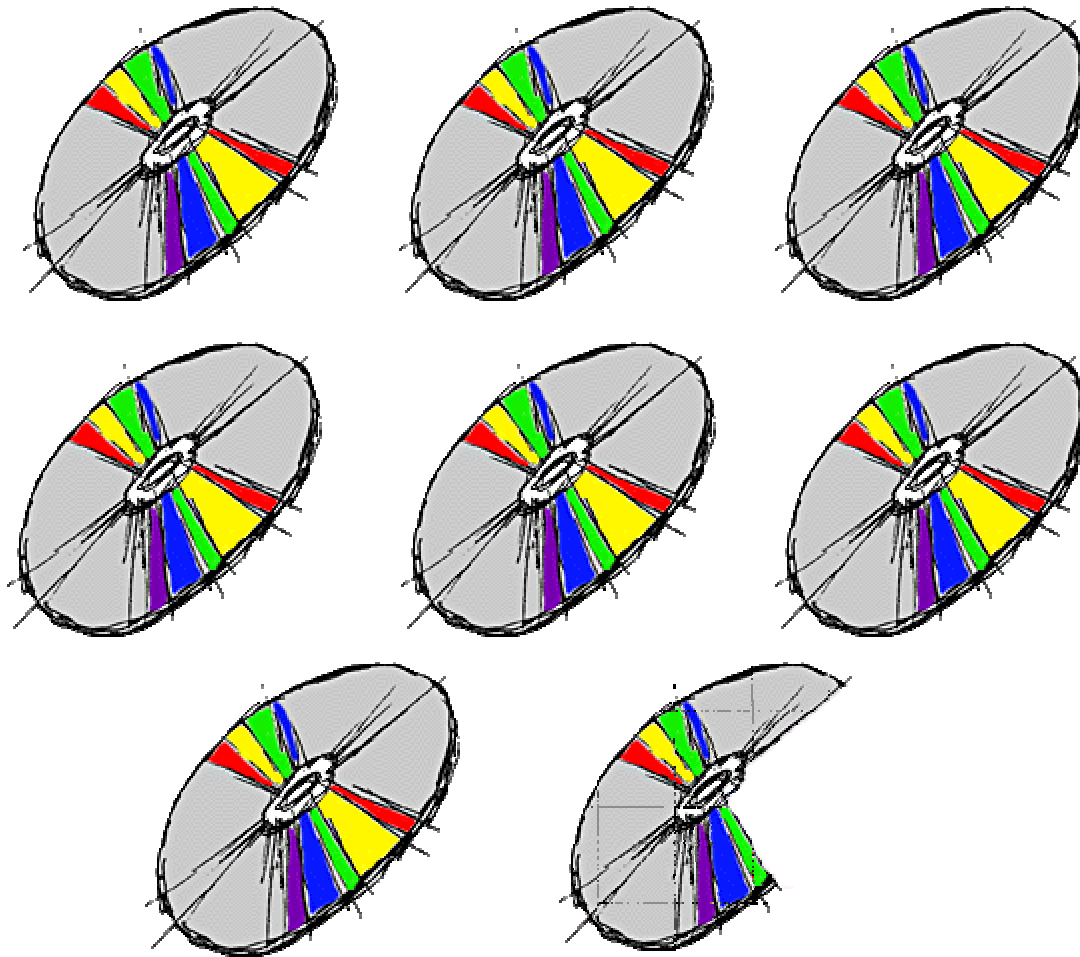
What is 40 Gb/s?



- PMD devices
 - PMD – Physical Media Dependent
- 40 Gb/s devices characterized by:
 - Very small risetime (~10ps)
 - Very small amplitude (~10mV)
 - Very small die size (~1.0 mm)

40 Gb/s - another view

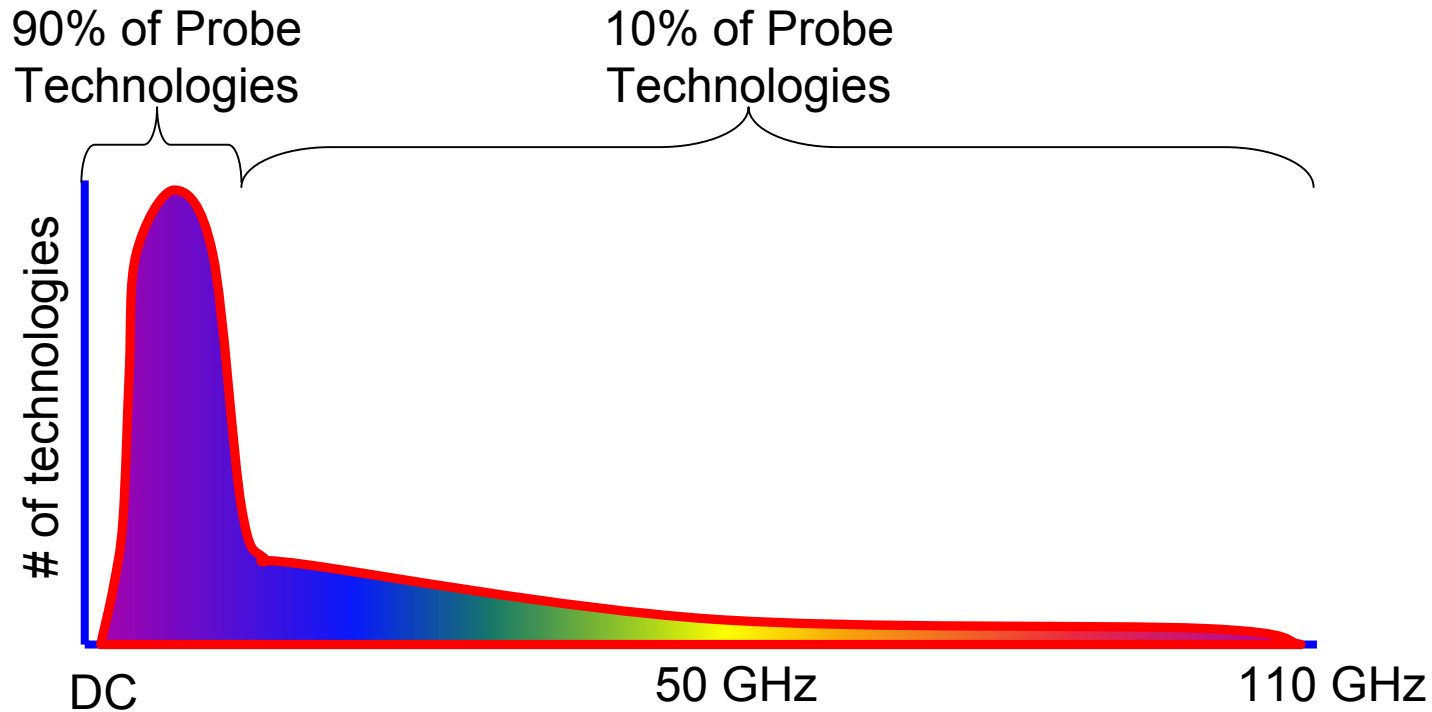
Equivalent to transmitting more than 7 CD-ROM's of data every second



40 Gb/s – yet, another view



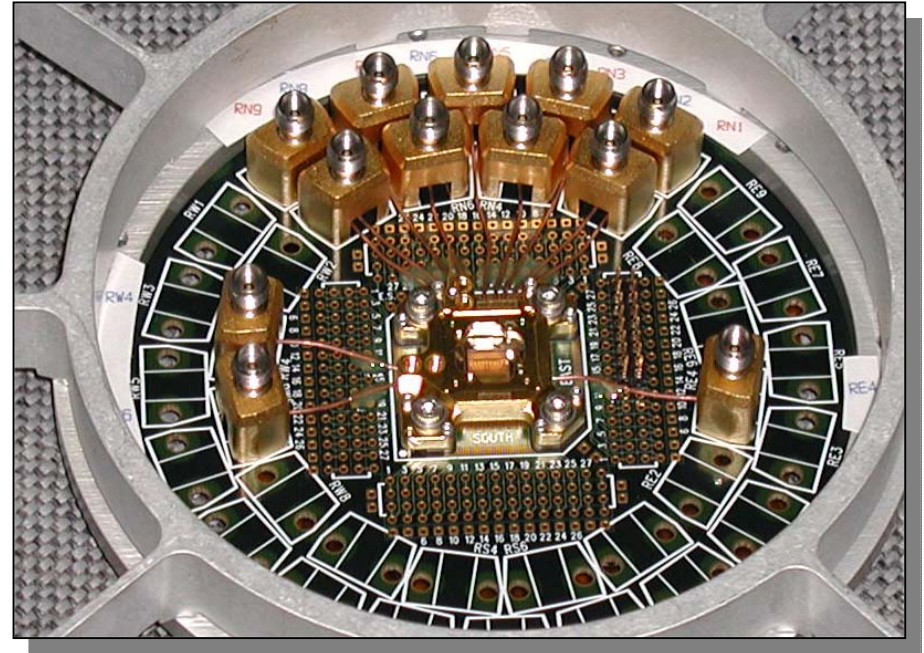
Probe Technology Continuum



- **> 90% of probe technologies currently address 10% of this spectrum**
- **Illustration based on response to RFI submitted to 35 probe technology companies**

Probe Evaluation

- Test vehicle designed
 - For the typical battery of tests
 - Lifetime
 - Cres
 - ...
- But, high frequency performance was critical



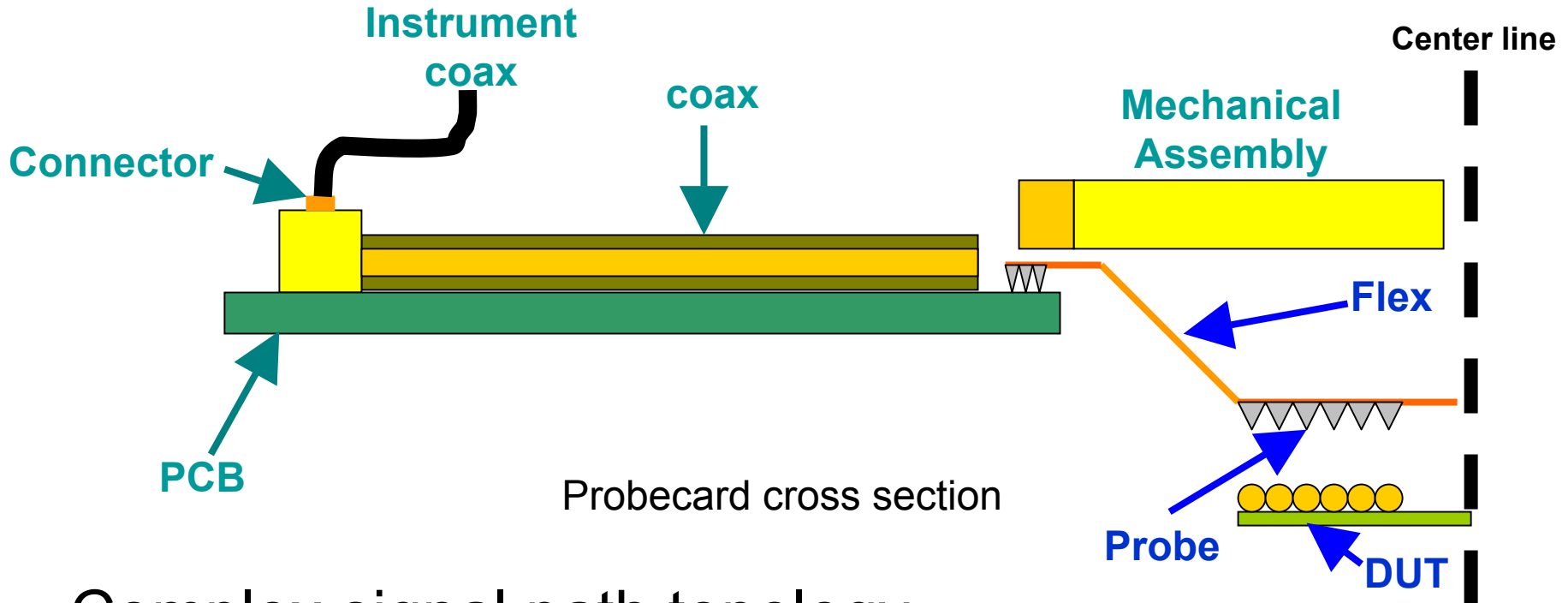
Top view of evaluation vehicle

How could we evaluate the impact of design trade-offs on high frequency performance?

Problem Statement

- Need to quantify performance tradeoffs
 - Performance = f (suppliers experience)
- Desired robust process where some iterations could be ‘virtual’
- Current tools/methods had not demonstrated capability to support this complexity

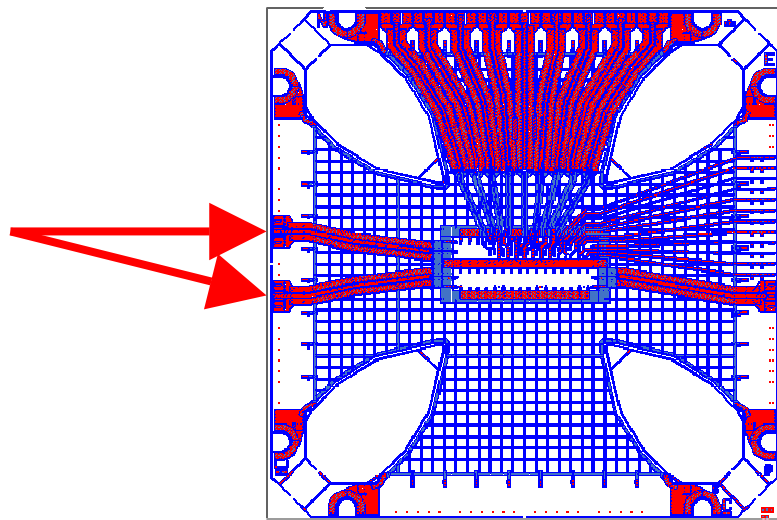
Model Topology



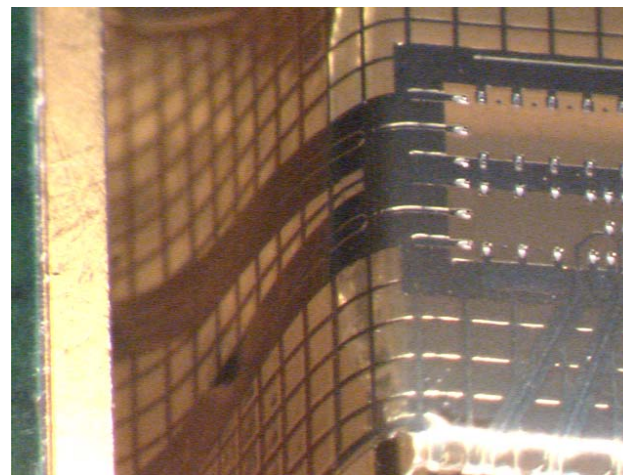
- Complex signal path topology
 - Multiple substrates (cable, PCB, PI flex)
 - Multiple guide structures (Coax, CPW, microstrip)
- Physically small, Electrically large features

Model Creation

- Two high speed channels selected
- Signal paths segmented into 3 logical blocks
 1. Flex block
 2. Coax block
 3. Transition block



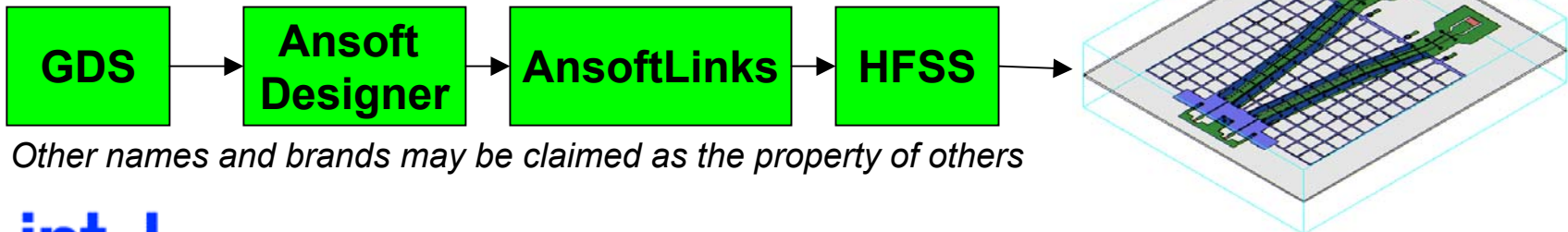
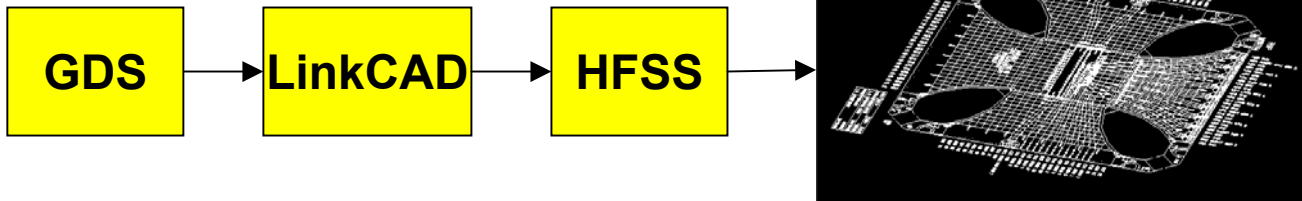
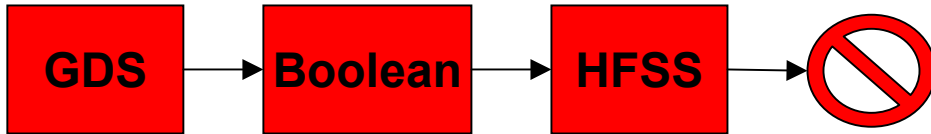
Layout for flex component



High speed channels on flex

Model Creation (flex block)

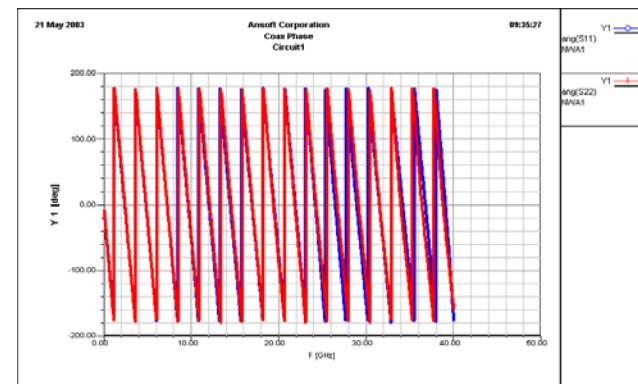
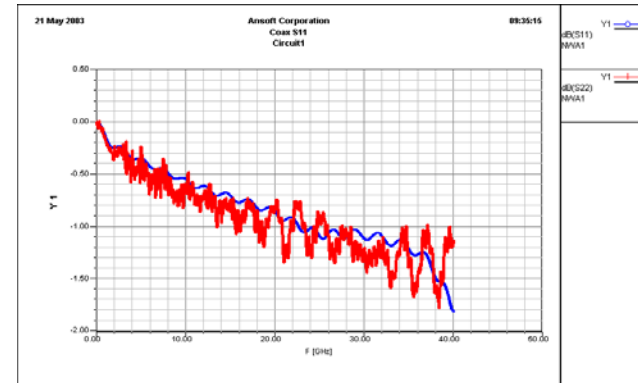
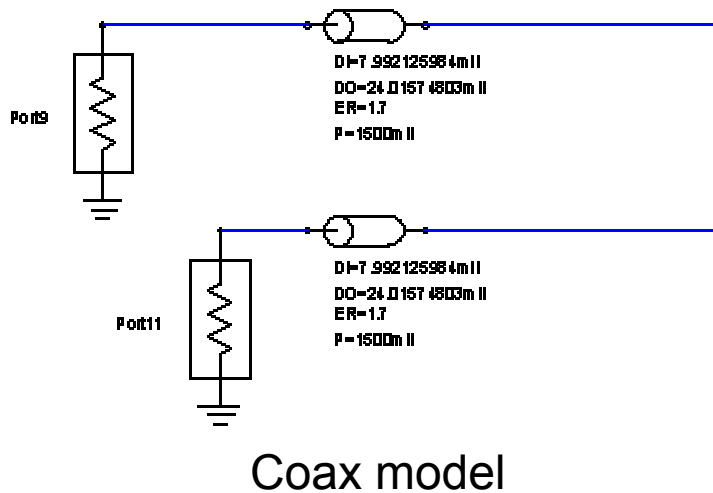
- Need to translate directly from physical layout



Other names and brands may be claimed as the property of others

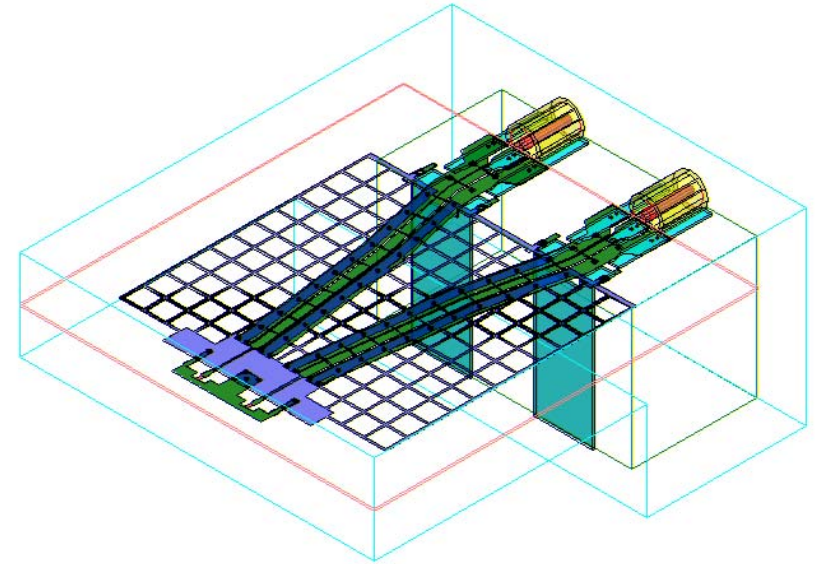
Model Creation (coax block)

- Model for connector and coax built from coax structure and data sheet parameters
- Model parameters (blue) fit to measurements (red)

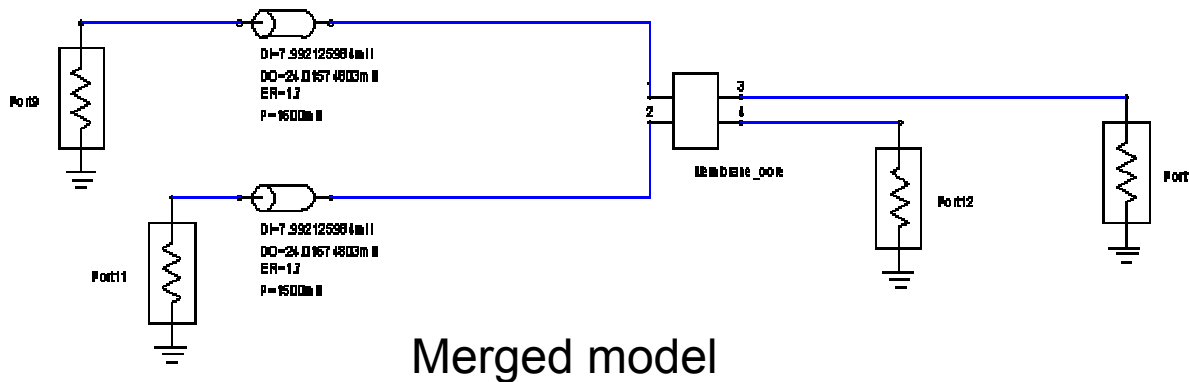


Model Creation (transition block)

- The transition elements were created manually in HFSS



Simulation where two HFSS models are merged into c



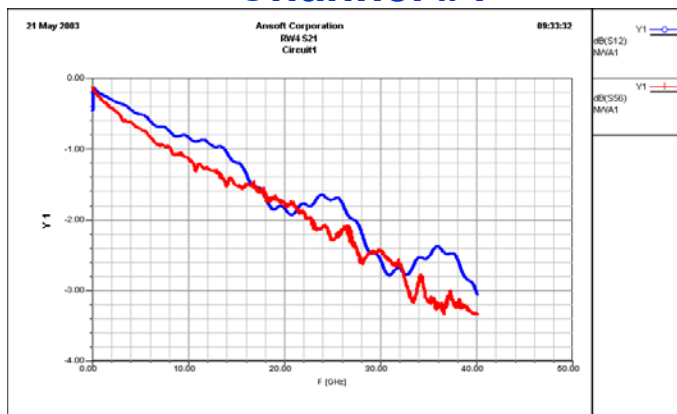
Merged model

- The individual elements are assembled for simulation

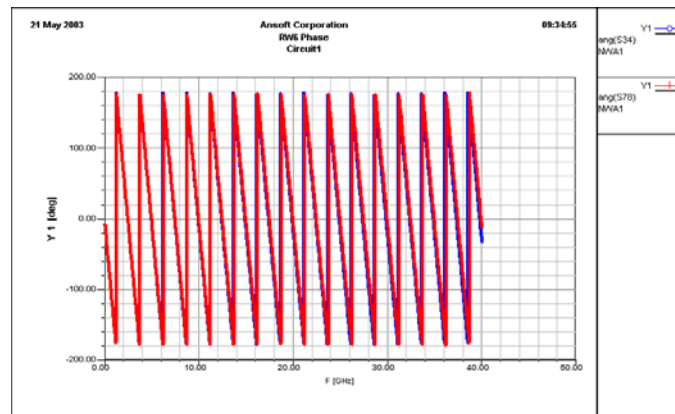
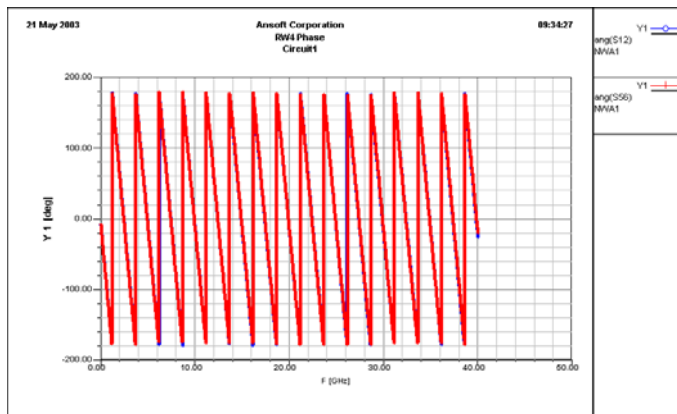
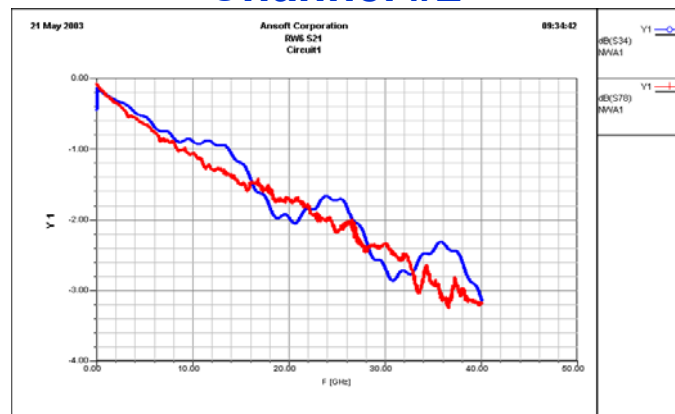
Model Correlation

Thru measurement (red) to model (blue) correlation shown from 0.05-40.05 GHz

Channel #1

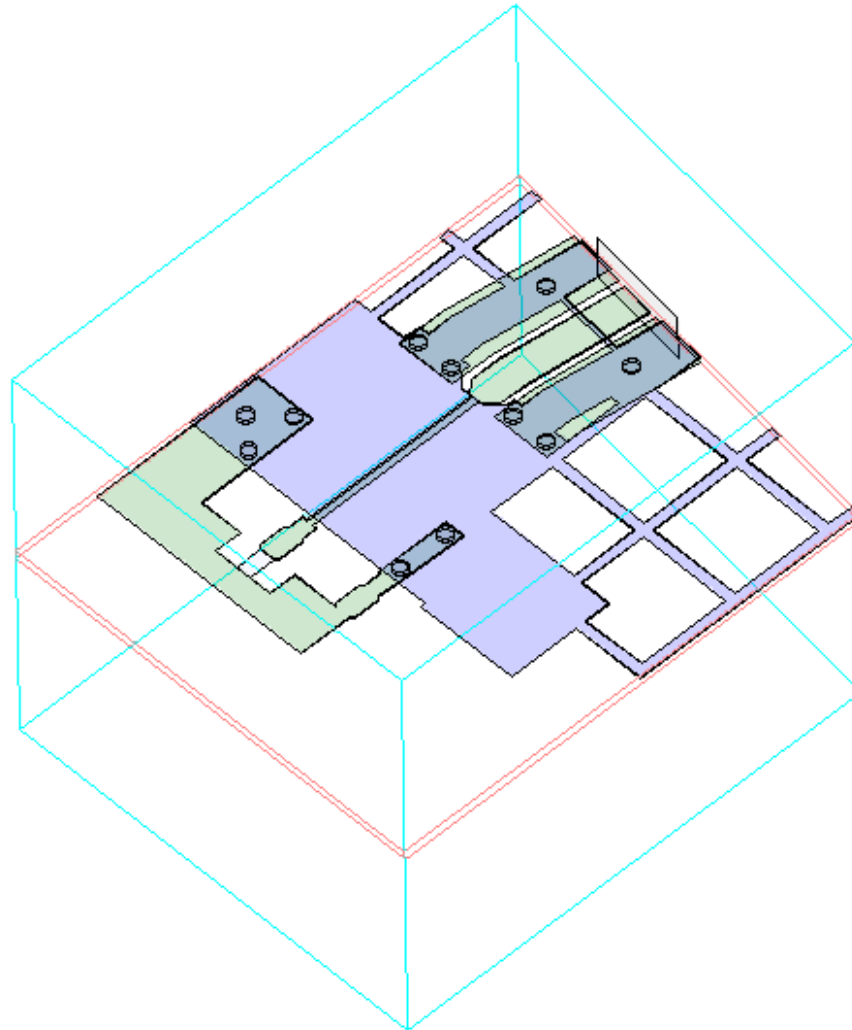


Channel #2



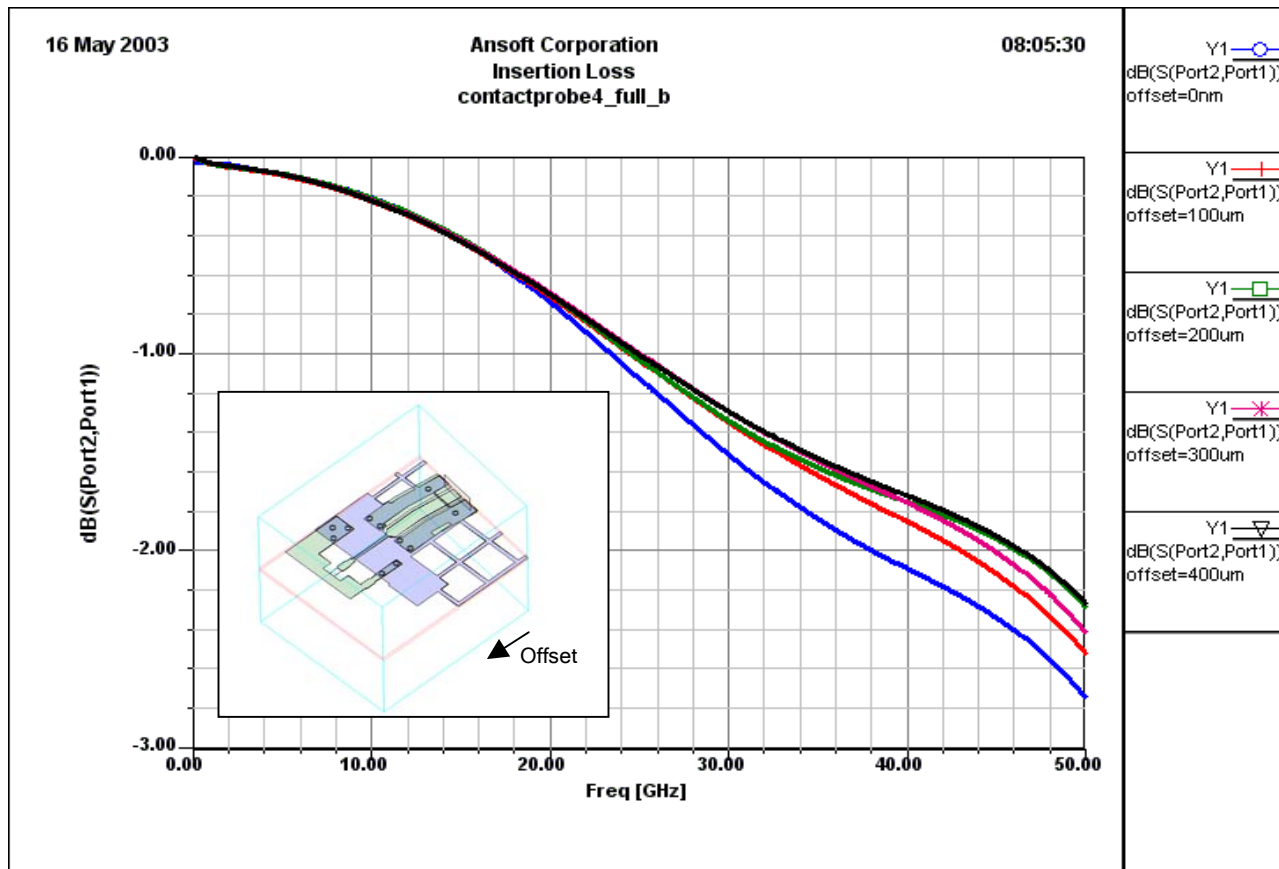
Sensitivity Analysis

– Microstrip vs. CPW length

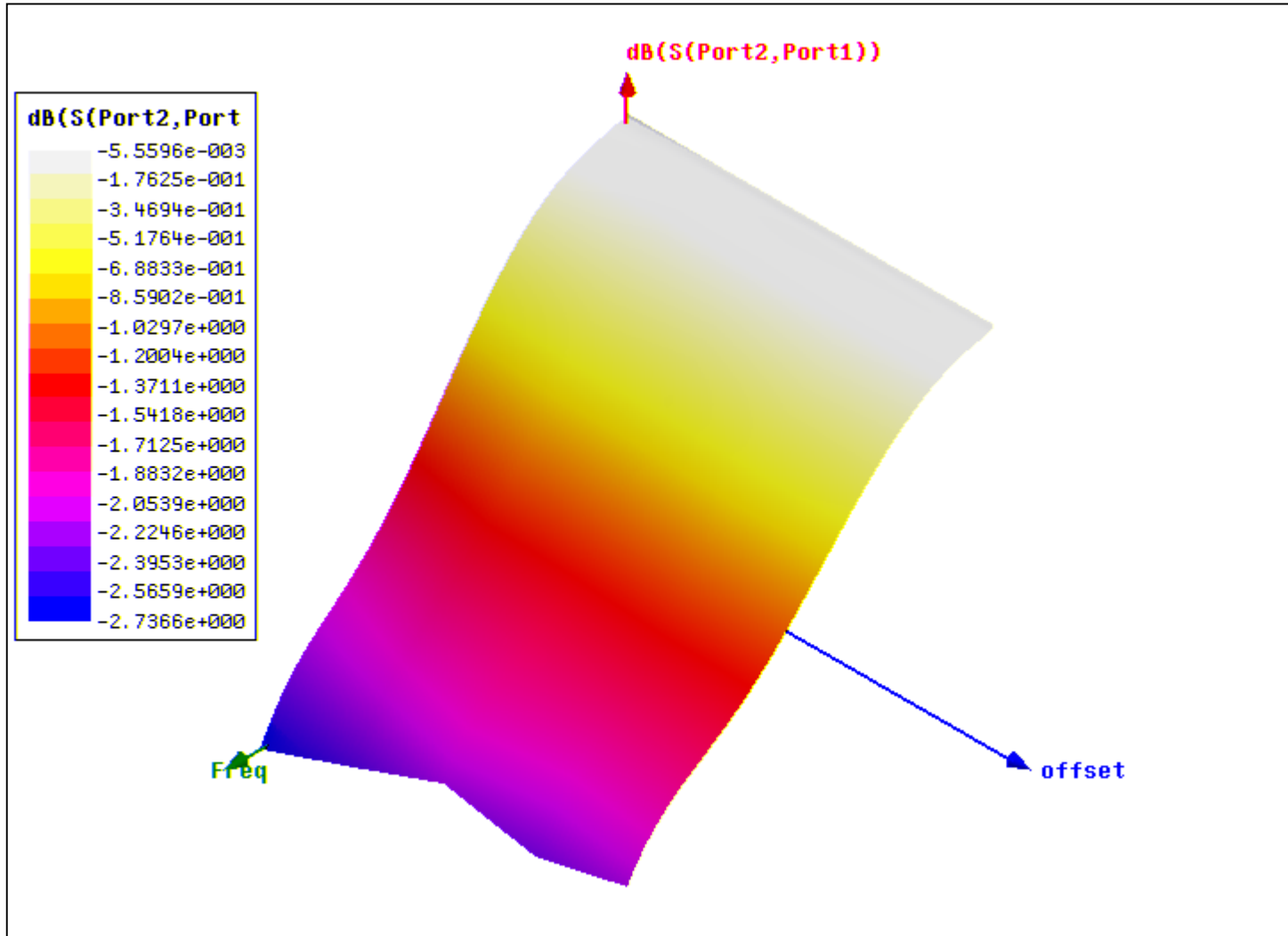


Sensitivity Analysis

- Impact on insertion loss



Sensitivity Analysis



Summary

- HFSS Learning curve, creating a robust modeling 'process'
- Ended up successfully modeling the path based on physical geometry
- Can continue to use this model for what-if type analysis to assess design trade-offs

Acknowledgements

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- We would also like to thank Cascade Microtech for their contributions and open discussions.

References

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