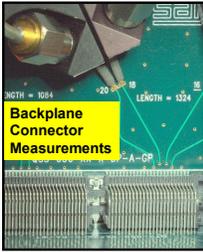


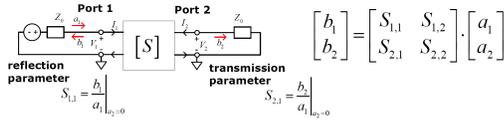
Quality of High Frequency Measurements: Practical Examples, Theoretical Foundations, and Successful Techniques that Work Past the 40GHz Realm

Hosted by Heidi Barnes of Verigy and Al Neves of Teraspeed Consulting Group, LLC

Multi-Port Measurements



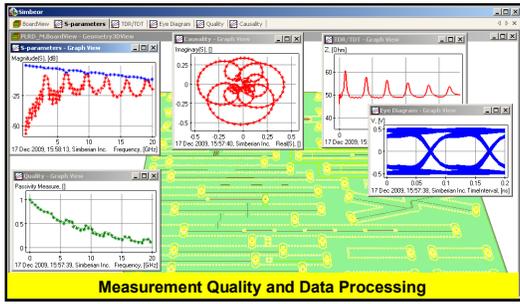
Backplane Connector Measurements



Port 1 reflection parameter $S_{11} = \frac{b_1}{a_1}|_{a_2=0}$

Port 2 transmission parameter $S_{21} = \frac{b_2}{a_1}|_{a_2=0}$

$$\begin{bmatrix} b_1 \\ b_2 \end{bmatrix} = \begin{bmatrix} S_{1,1} & S_{1,2} \\ S_{2,1} & S_{2,2} \end{bmatrix} \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$$



Measurement Quality and Data Processing



Test Fixture Removal Calibration

Part 1: Interconnect Measurement Example to Demonstrate High Frequency Challenges

9:00 am to 9:45

- Practical measurements on interconnect systems and the challenges faced by Samtec SI engineers when making very high frequency measurements.
- TRL calibration examples for material extraction.



Jim Nadolny
 Samtec
 Signal Integrity Specialist



Tom Dagostino
 Teraspeed Consulting, LLC
 Vice President
 Device Modeling Division

Part 2: Understanding the Frequency Domain and Time Domain Relations of High Speed, Wide Bandwidth Interconnect Systems: Stability, Causality and Passivity

9:45 am to 10:20

- Primer of matrix math to understand multiport theory
- Impedance, admittance and multiport scattering parameters
- Reciprocity, passivity and geometrical symmetry properties and quality metrics for S-parameters



Yuriy Shlepnev, Ph.D.
 Simberian Inc.
 President

Break 10:20 to 10:35

10:35am to 11:20am

- Time-domain characterization of multiport systems: causality, stability, and passivity
- Building causal, stable, and passive macro-models for time and frequency-domain analysis of multiport systems
- Global S-parameters quality metrics in frequency domain
- Practical examples of multiport parameters quality estimation and improvement

Part 3: S-Parameters for Model Extraction to 50GHZ:

Problems, pitfalls, and lessons learned....

11:20am to 12:00am

- How much bandwidth do you need for 15 Gbps models?
- The problems and pitfalls of transforming between frequency and time domains.
- Sharing "Black Magic" of getting 3D-EM solvers to agree with measurements.



Scott McMorrow
 Teraspeed Consulting, LLC
 President