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A review of a Universal Coaxial Test Socket's Performance

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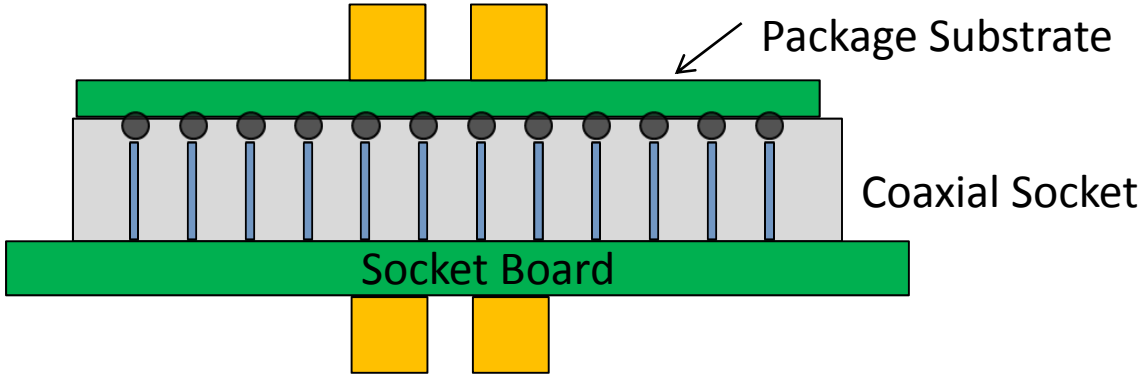
Universal Coaxial Test Socket

- The Semi-Universal Coaxial Socket has benefits as it allows for compatibility between different package pin outs for the same package.
- Our goal was to determine if a semi-universal Coaxial Socket can be used for packages that have different pin assignments versus a fully pin-map specific coaxial contactor.

- Working with Yamaichi we developed a coaxial socket to measure the difference in electrical performance between a typical, pin-map specific coaxial contactor and a semi-universal coaxial contactor.

Setup for Measurement



- We have designed a package substrate that uses two Rosenberger SMP connectors to interface the socket.
- Below the Socket Board there are two identical SMP connectors enabling a 4 Port S-Parameter Measurement.

Rosenberger SMP Interface

RPC-2.92 ADAPTOR - 02K119-K00E3

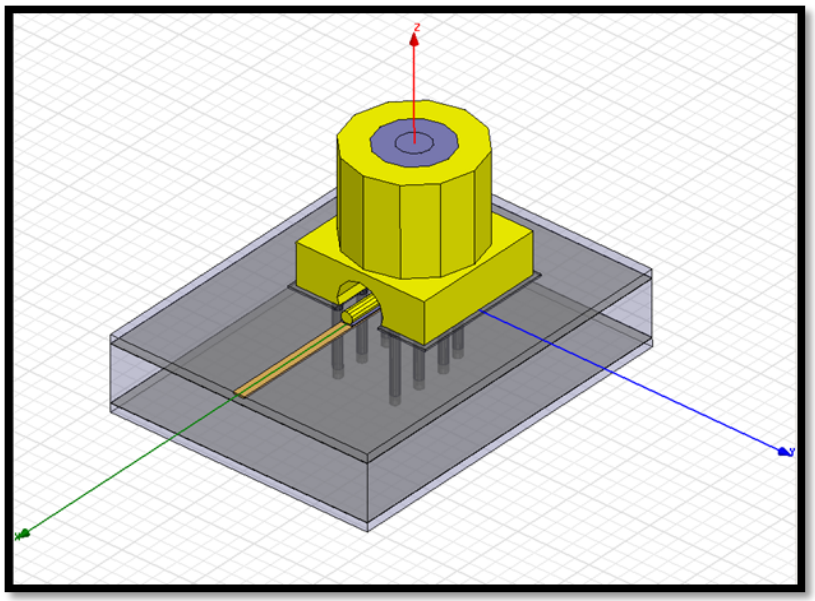
- Impedance 50 Ω
- Frequency DC to 40 GHz
- Return loss:
  - ≥ 32 dB, DC to 12 GHz
  - ≥ 26 dB, 12 GHz to 26.5 GHz
  - ≥ 21 dB, 26.5 GHz to 40 GHz
- Insertion loss
  - ≤ 0.05 x √f(GHz) dB

SMP STRAIGHT PLUG PCB CONNECTOR - 19S102-40ML5

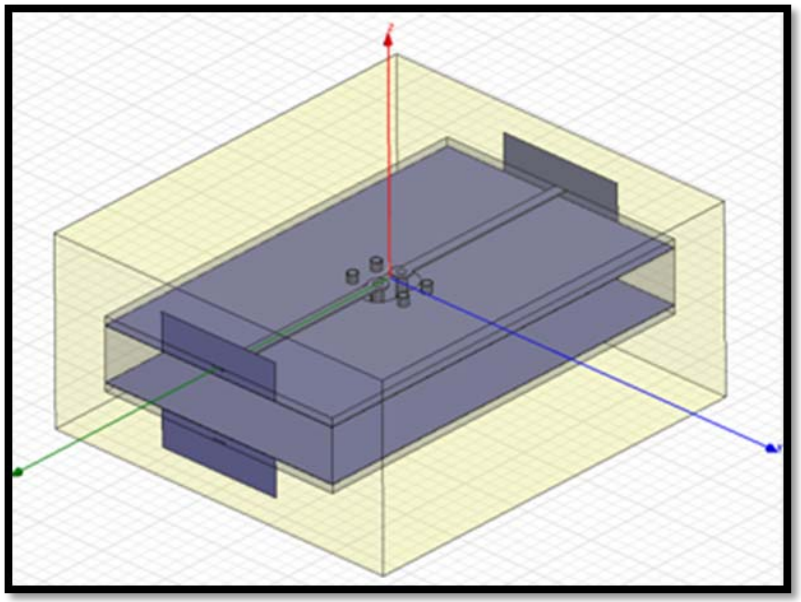
- Impedance 50 Ω
- Frequency DC to 40 GHz
- Return loss:
  - ≥ 26 dB, DC to 12 GHz
  - ≥ 17 dB, 12 to 40 GHz
- Insertion loss
  - ≤ 0.05 x √f(GHz) dB

Rosenberger SMP Launch Simulation

- Two Separate Models were developed to analyze launch of SMP
  - SMP Mounted on Boards (Package and Socket Base)
  - Differential Via Transition on Boards (Package and Socket Base)

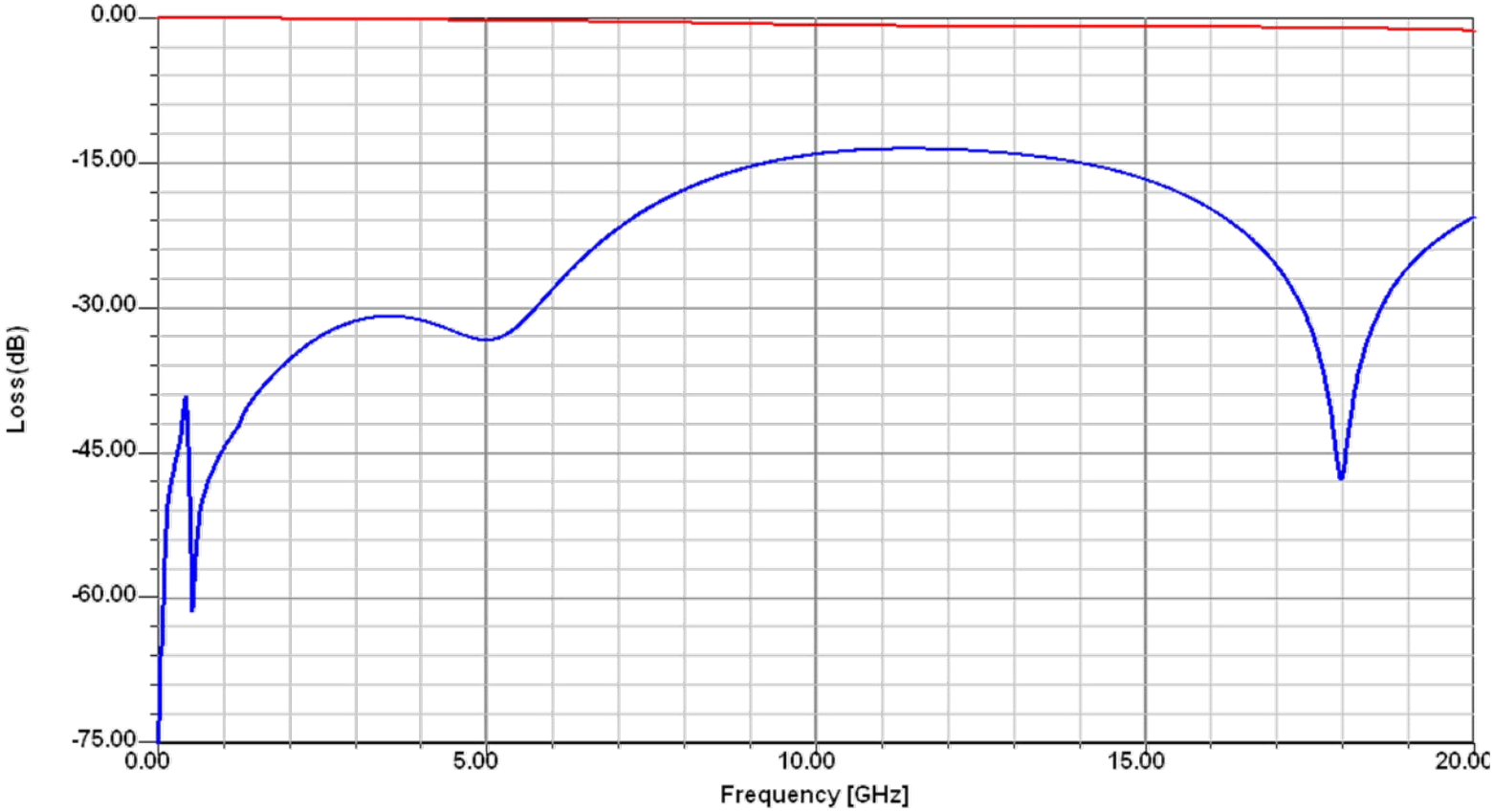


3-D Model for SMP on PCB



3-D Model for Differential Via Transition

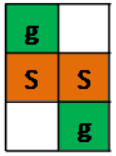
Rosenberger SMP Launch Simulation



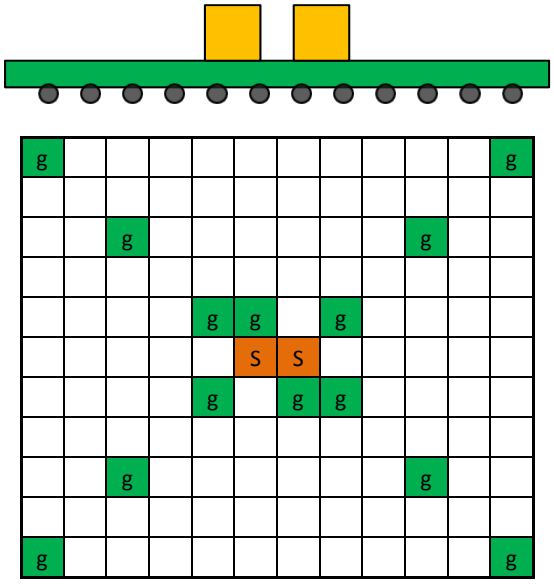
- The simulated Differential S-Parameter results of our Launch into the socket.

Package Substrate Design

- The package substrate that we designed for our experiment has a specific pin out in the middle that would be similar to a differential Pair.



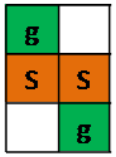
- The Ground pins are available to test our theory of creating a semi-coaxial socket environment.



S Signal Pin
g Ground Pin

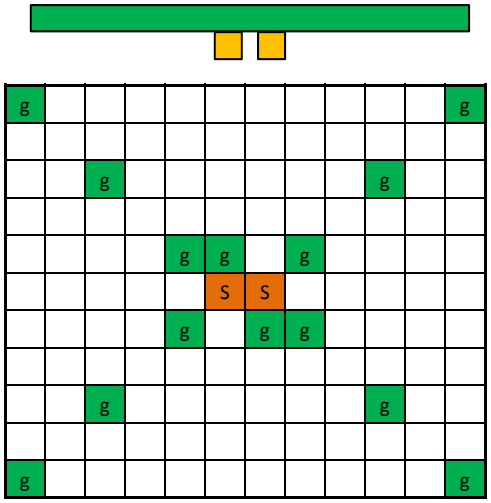
Socket Board Design

- The configuration of the socket board design is consistent with our approach to the package substrate.



- Both the Package Substrate and Socket Board share the same design for the SMP launch.

Socket Board



S Signal Pin

g Ground Pin

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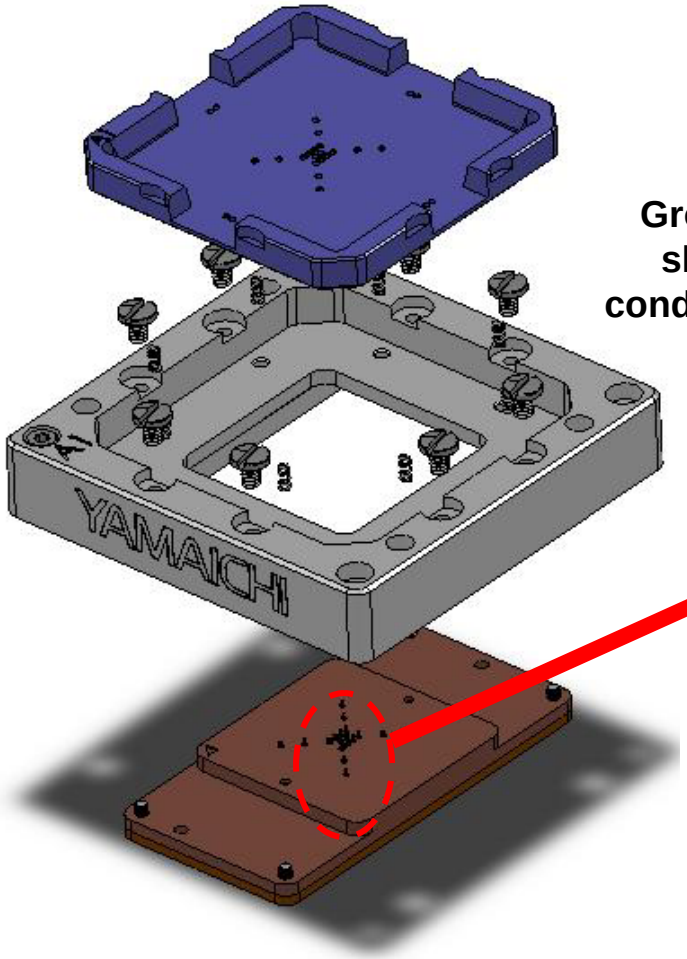
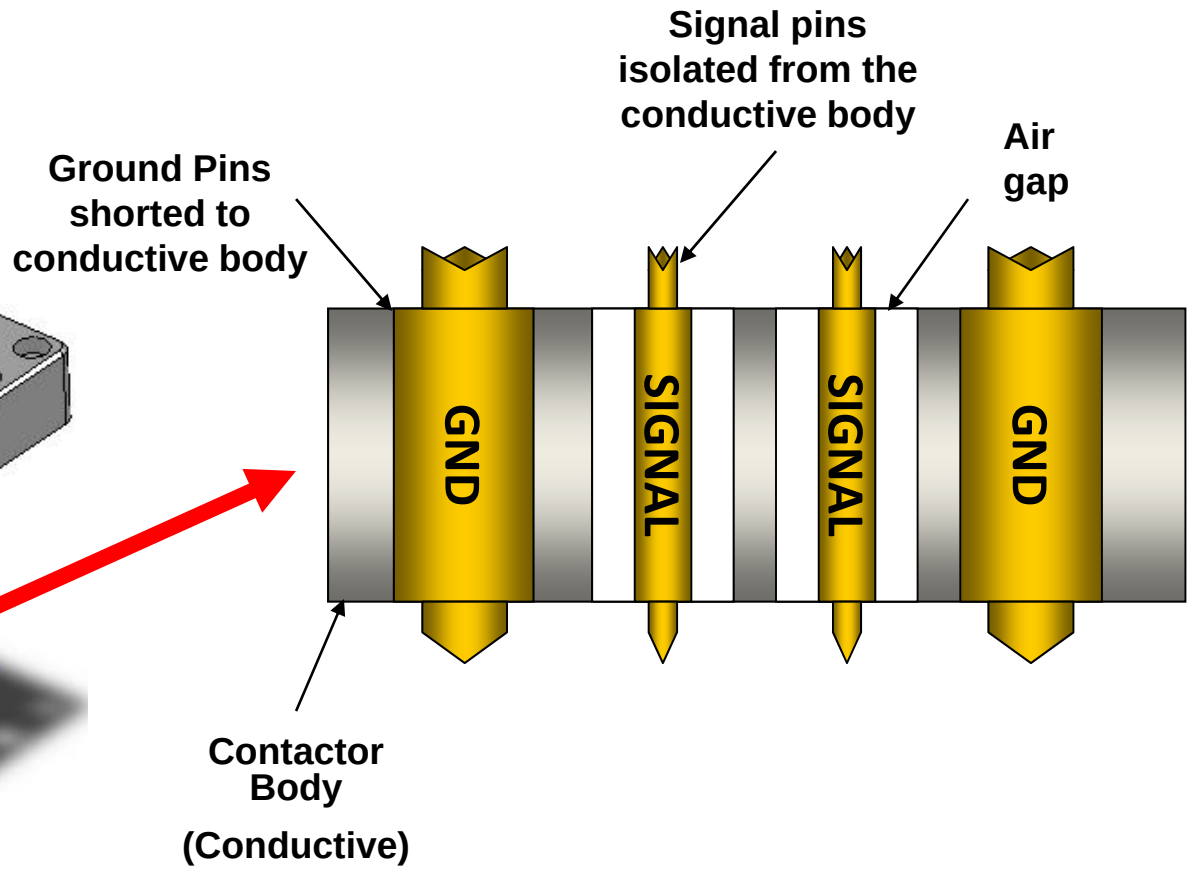
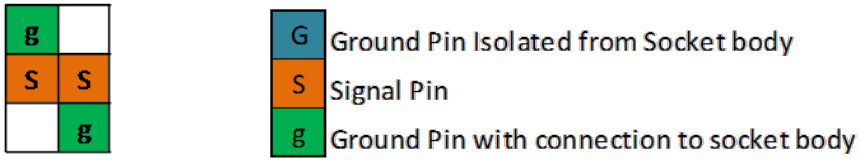
Yamaichi Coaxial Socket Design



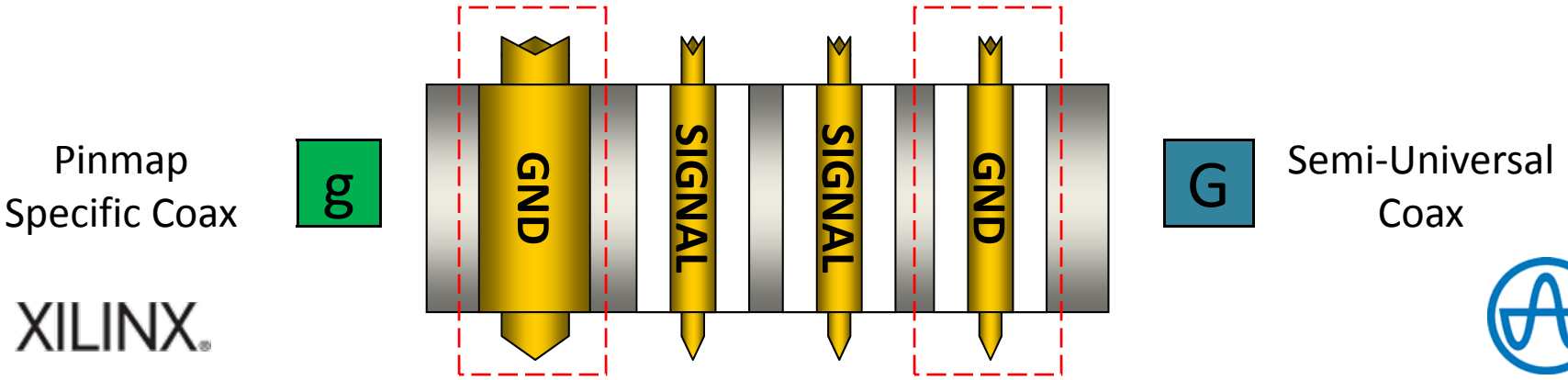


Yamaichi Coaxial Socket

- The Signal Pins are always isolated from the conductive socket body and do not change positions.

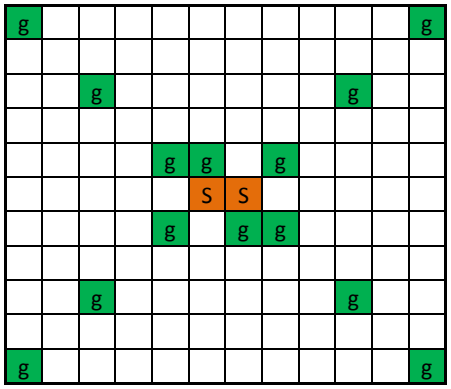


- By varying the isolation of the ground pins with respect to the socket body we can measure the impact of our test conditions.

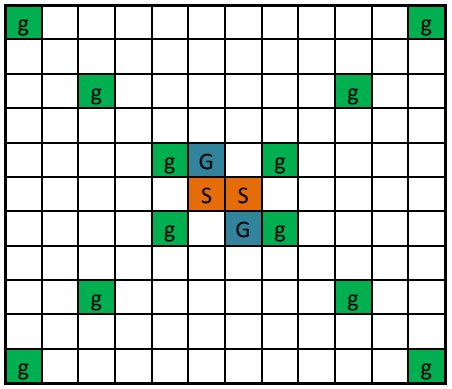


Socket Test Conditions

Coaxial Socket



Semi-Universal Coaxial Socket



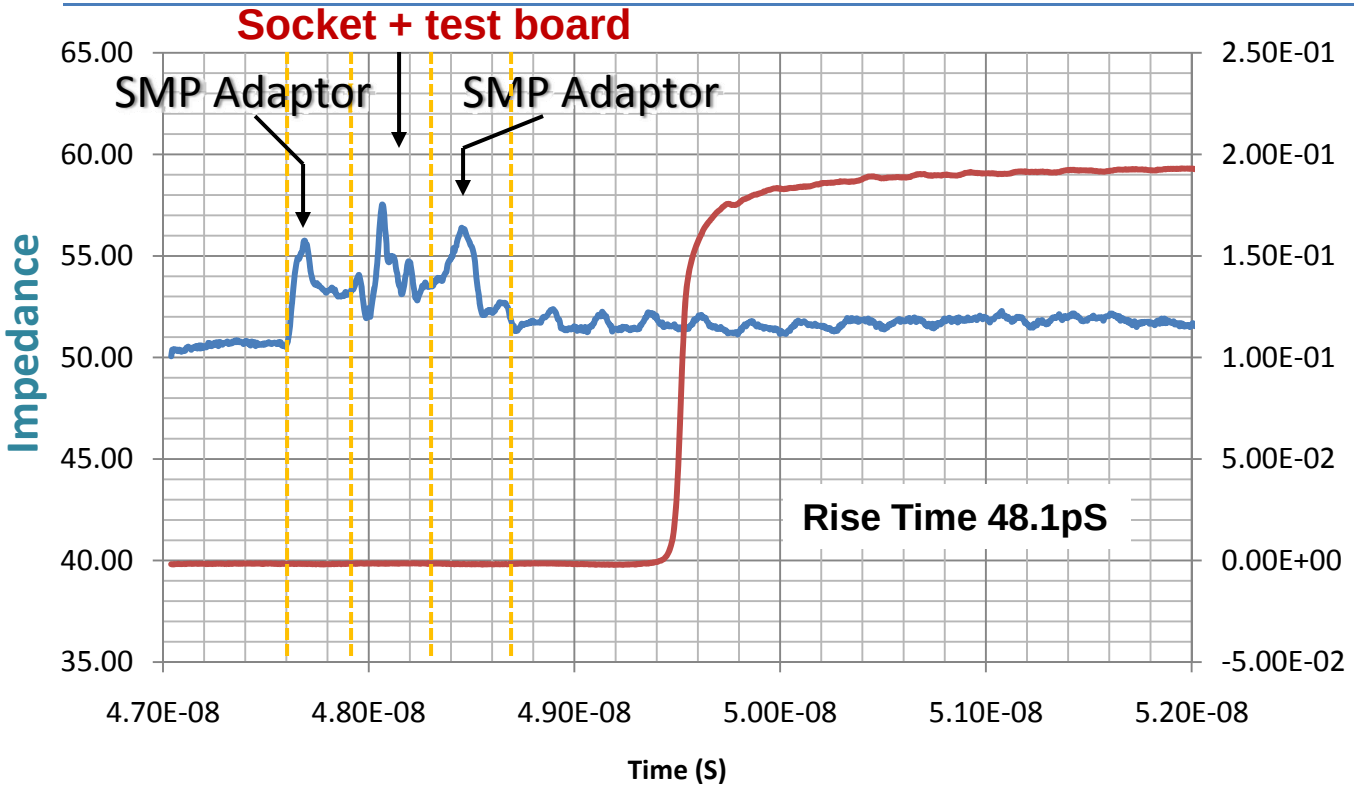
G Ground Pin Isolated from Socket body

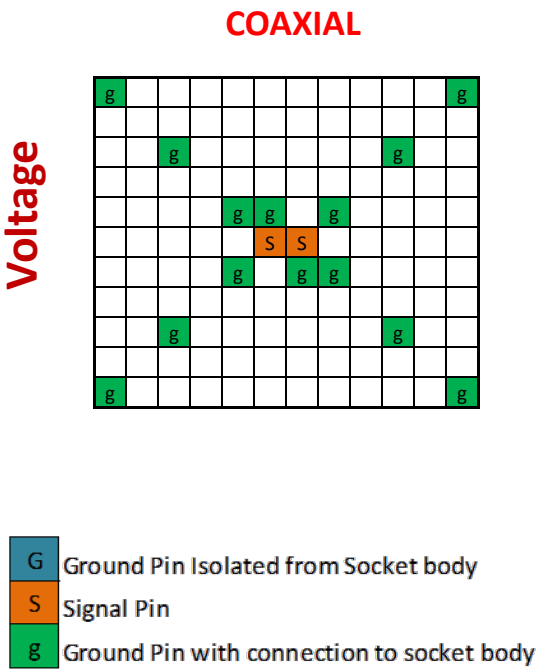
S Signal Pin

g Ground Pin with connection to socket body

- The Coaxial Socket has all the ground pins connected to the conductive socket body.
- The semi-universal Coaxial Socket has two ground pins isolated from the socket body, and the rest connected.

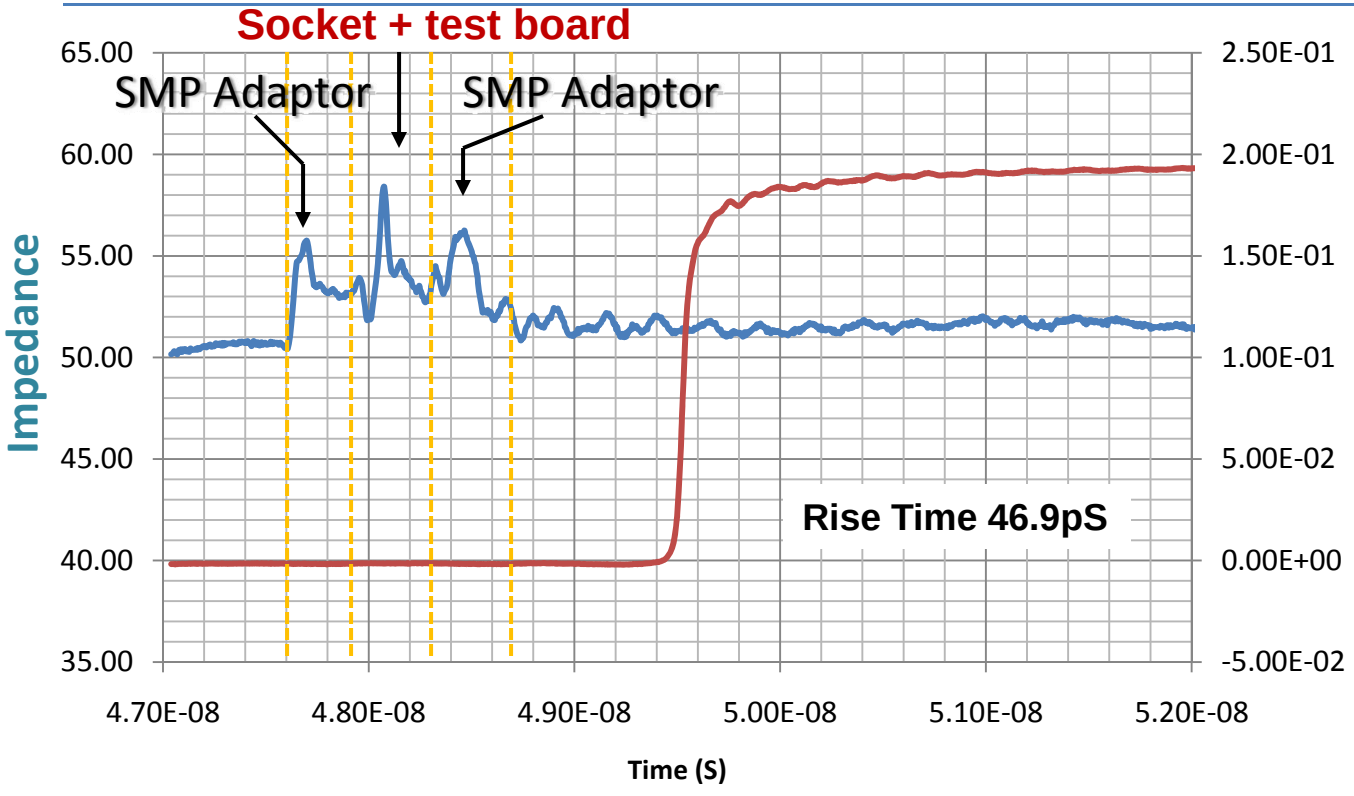
TDR Measurements of Coaxial Socket

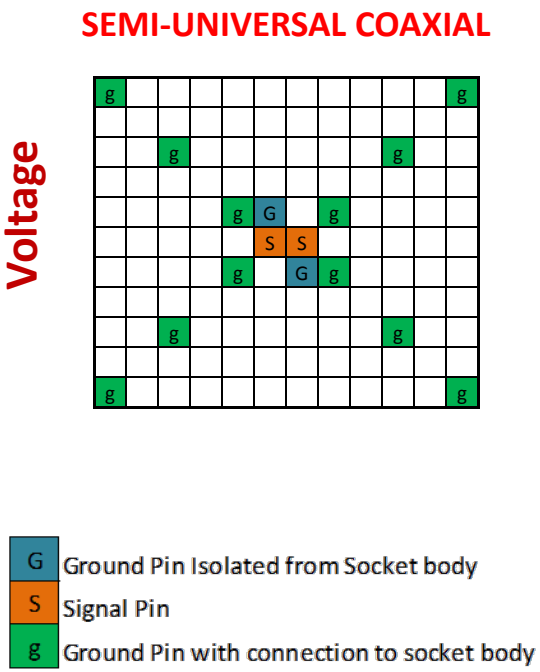




- The measured Impedance of the Coaxial Socket peaks at 57.5 Ohms.

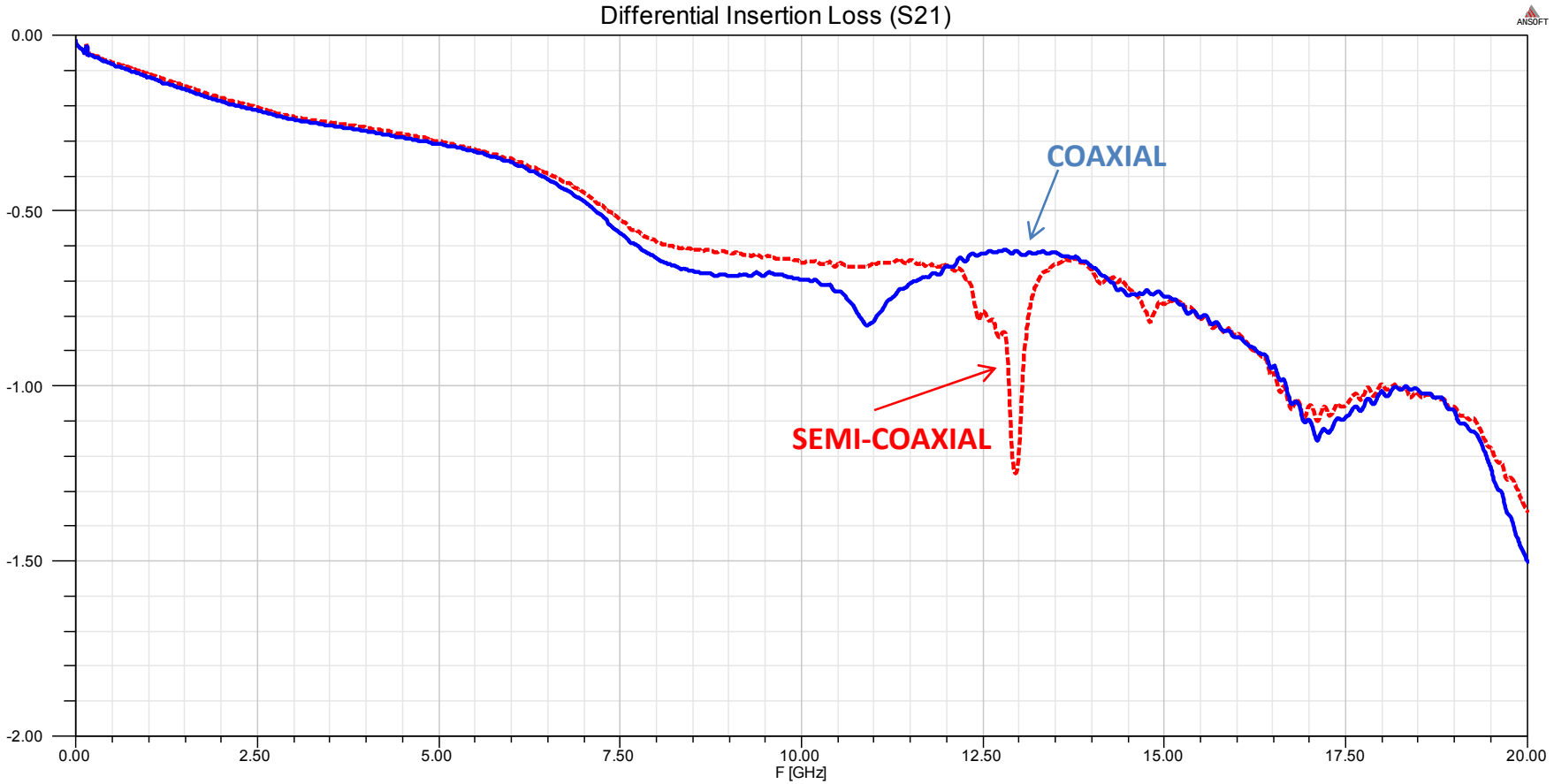
TDR Measurements of Semi-Universal Coaxial Socket





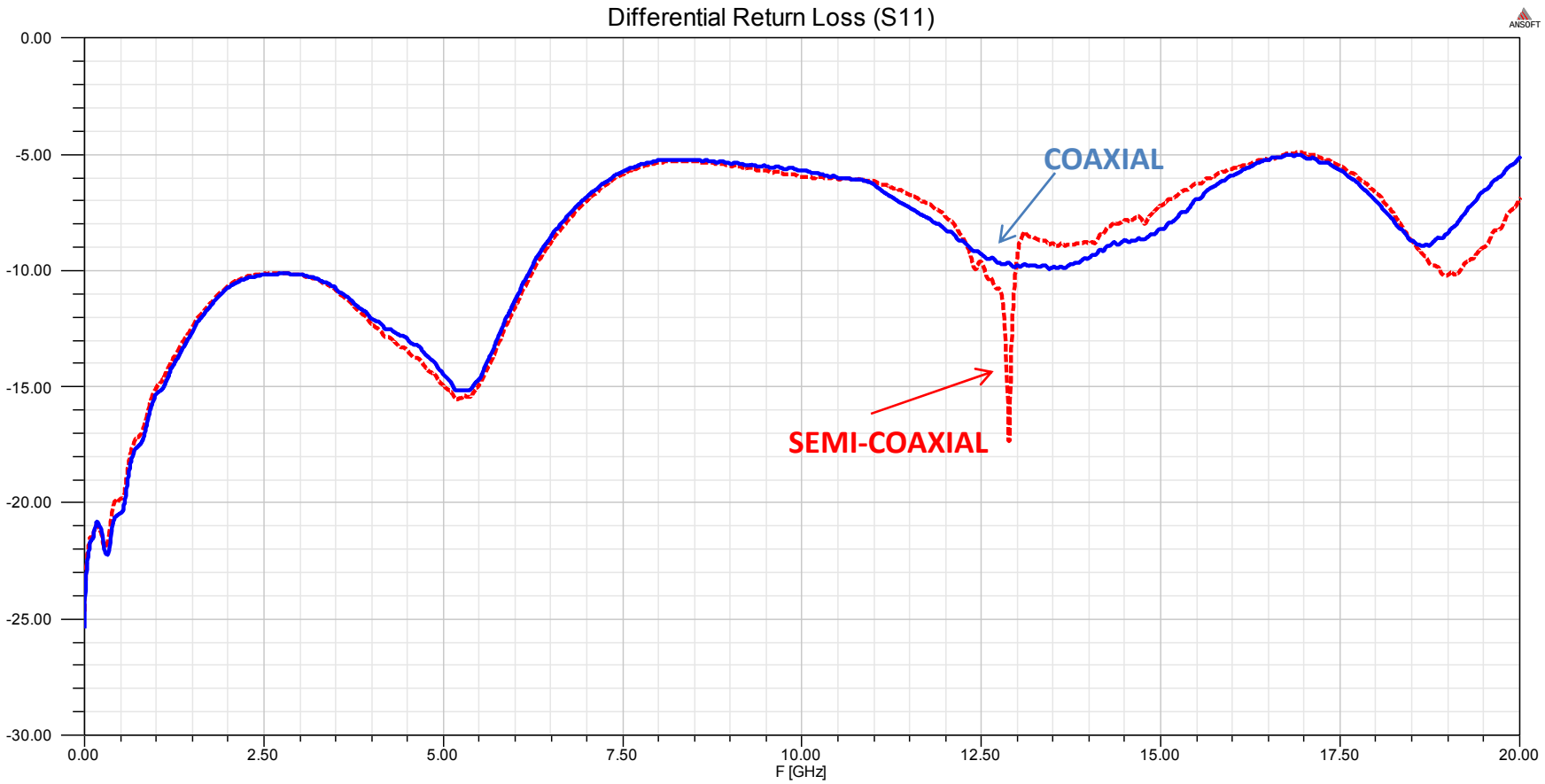
- The measured Impedance of the Semi-Universal Coaxial Socket peaks at 58.5 Ohms.

Differential Insertion Loss Measurements of Coaxial Vs. Semi-Universal Coaxial Socket



- The Semi-Universal Coaxial socket is the dashed line in red and the Coaxial in solid blue.

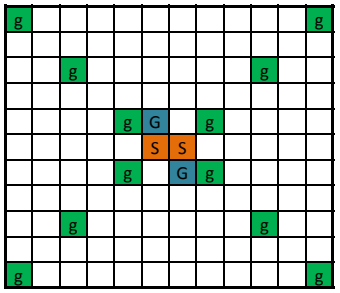
Differential Return Loss Measurements of Coaxial Vs. Semi-Universal Coaxial Socket



- The Semi-Universal Coaxial socket is the dashed line in red and the Coaxial in solid blue.

Semi-Universal Coaxial Socket Findings

- The S-Parameter results of the Semi-Universal Coaxial Socket showed a 0.75dB resonance at 13GHz in the insertion loss with the isolation of the inner ground spring probes from the socket body.



- The TDR results of the Semi-Universal Coaxial Socket a slight increase of 1 ohm in impedance as compared to Coaxial Socket.

Summary

- The data shows the selection of isolated grounds is critical to obtaining similar electrical performance between the Semi-universal Socket and the coaxial Socket.
- The Semi-Universal Coaxial socket can be a viable solution provided the losses are acceptable to your performance requirements.

Future:

- We plan to measure a traditional non-coaxial socket using our same setup to compare the results.