



RF Board S-Parameter Simulation Report

Introduction:

The RF board has got impedance requirement of 50 Ohms. This was achieved with a four layer stackup. The chip on the board operates at a frequency of 3.5GHz. The final board thickness is 0.1 inch and the stackup was finalized as follows, in order to achieve 50 Ohms impedance.

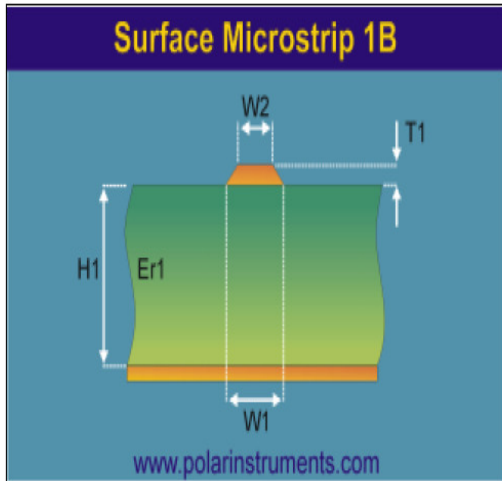
| | Core/prepreg | Dielectrics thickness (inches) | Copper (Oz) |
|----|--------------|--------------------------------|-------------|
| L1 | | ----- | 0.5 |
| | Core | 0.0166 | |
| L2 | | ===== | 1 |
| | fill | 0.0580 | |
| L3 | | ===== | 1 |
| | Core | 0.0160 | |
| L4 | | ----- | 0.5 |

The impedance was calculated using Polar Si8000 quick solver. Plating thickness of .0012 inches is added to the base copper. The impedance report is shown below.



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Si8000 - Multiple Dielectric Controlled Impedance Design System

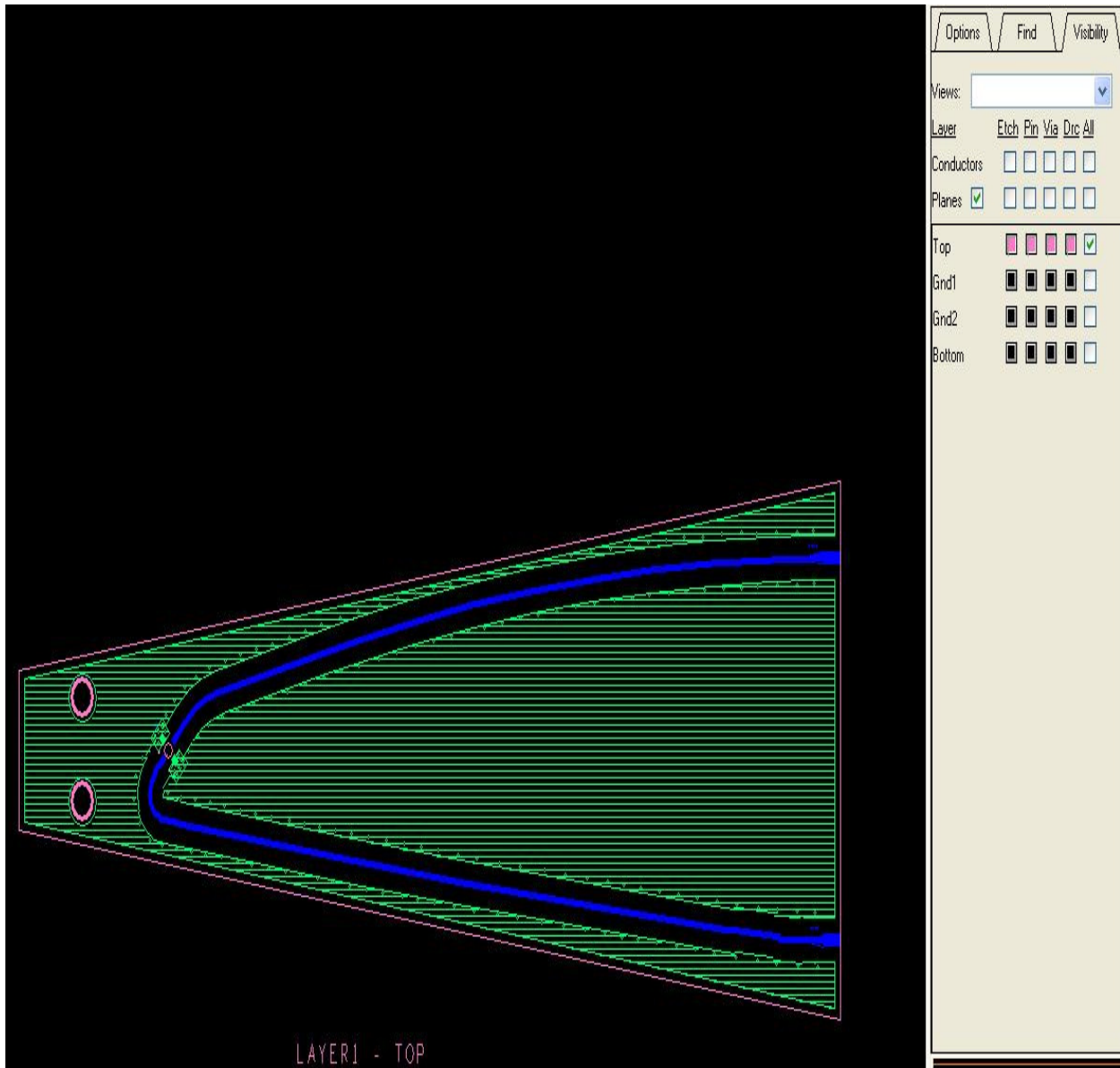


| | | <u>Value</u> | <u>Tolerance</u> | <u>Minimum</u> | <u>Maximum</u> |
|------------------------|-----|--------------|------------------|----------------|----------------|
| Substrate 1 Height | H1 | 0.0166 | +/- 0.0000 | 0.0166 | 0.0166 |
| Substrate 1 Dielectric | Er1 | 3.4800 | +/- 0.0000 | 3.4800 | 3.4800 |
| Lower Trace Width | W1 | 0.0350 | +/- 0.0000 | 0.0350 | 0.0350 |
| Upper Trace Width | W2 | 0.0350 | +/- 0.0000 | 0.0350 | 0.0350 |
| Trace Thickness | T1 | 0.0019 | +/- 0.0000 | 0.0019 | 0.0019 |
| <hr/> | | | | | |
| Impedance | Zo | 50.59 | ----- | 50.59 | 50.59 |
| Delay (ps/in) | D | 138.495 | ----- | 138.495 | 138.495 |
| Inductance (nH/in) | L | 7.006 | ----- | 7.006 | 7.006 |
| Capacitance (pF/in) | C | 2.738 | ----- | 2.738 | 2.738 |

Once the Stackup was finalized, routing was done and the final completed board was given for S-parameter generation. The completed board file is shown below.



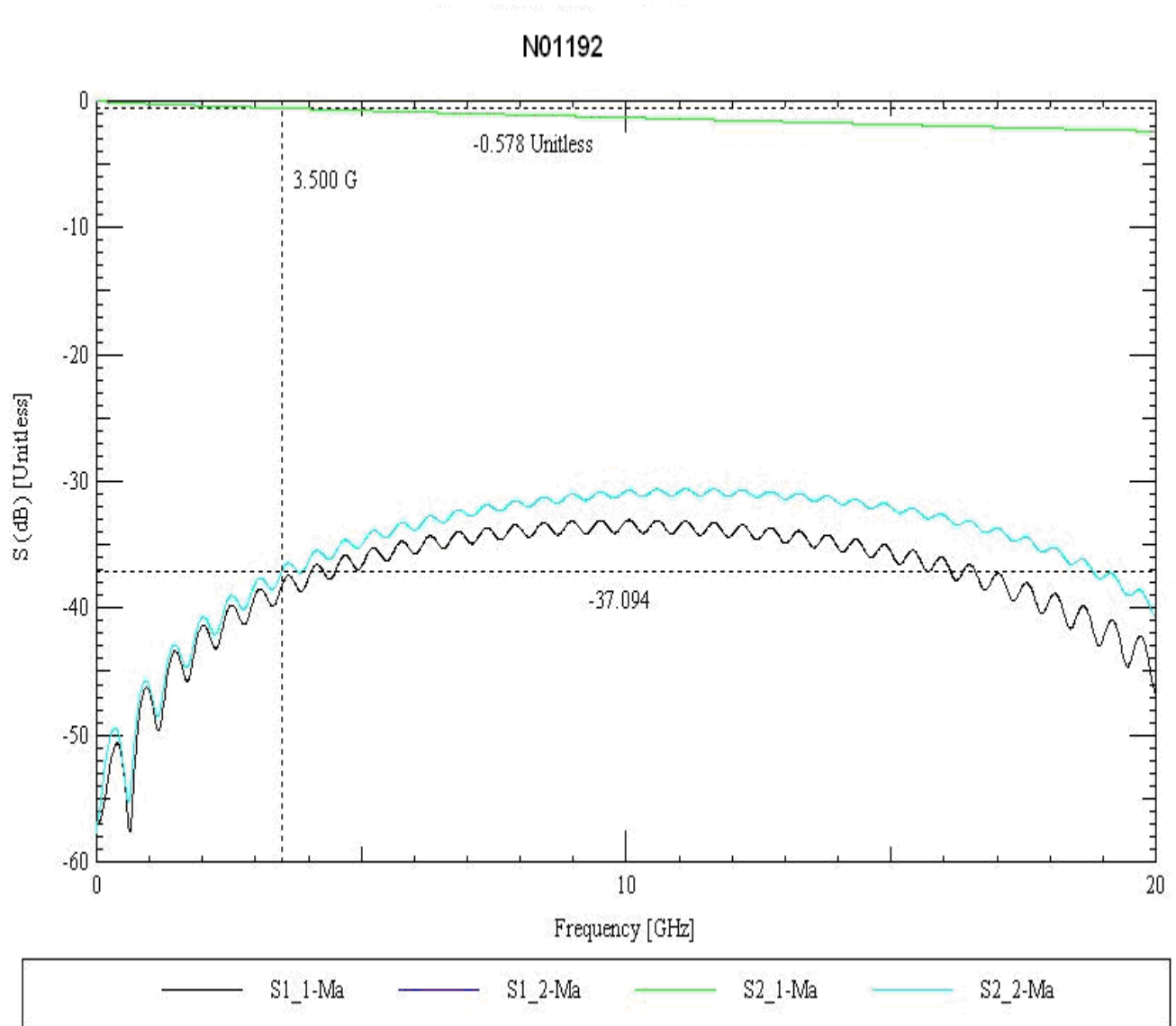
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The S-parameter was generated using **Sigxplorer** as the simulation tool. Two port S-parameter of the individual nets and also two port S-parameter of the two combined nets were simulated and reported. Following are the waveforms of the S-parameter report.

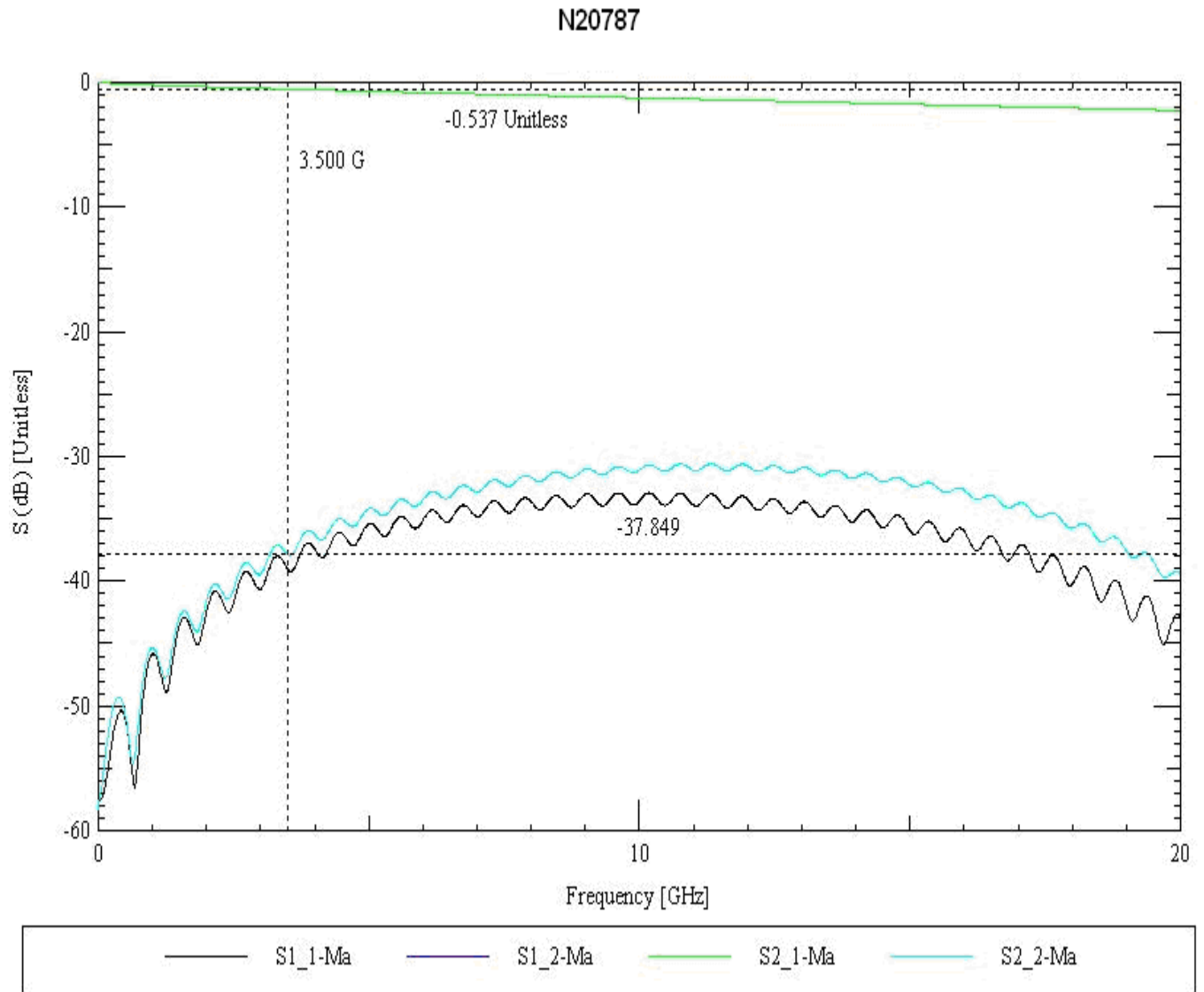


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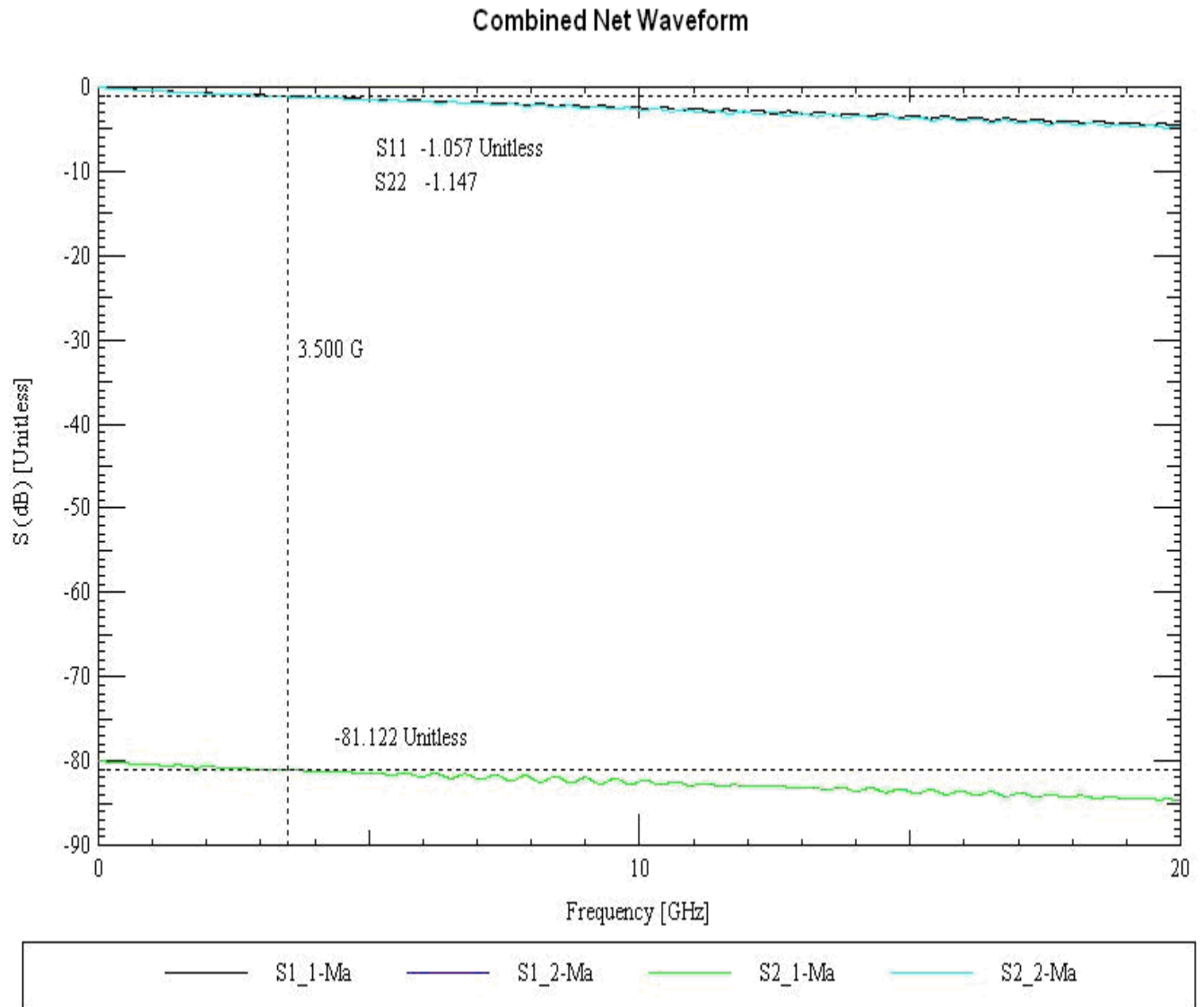


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RF Board S-Parameter Simulation Report

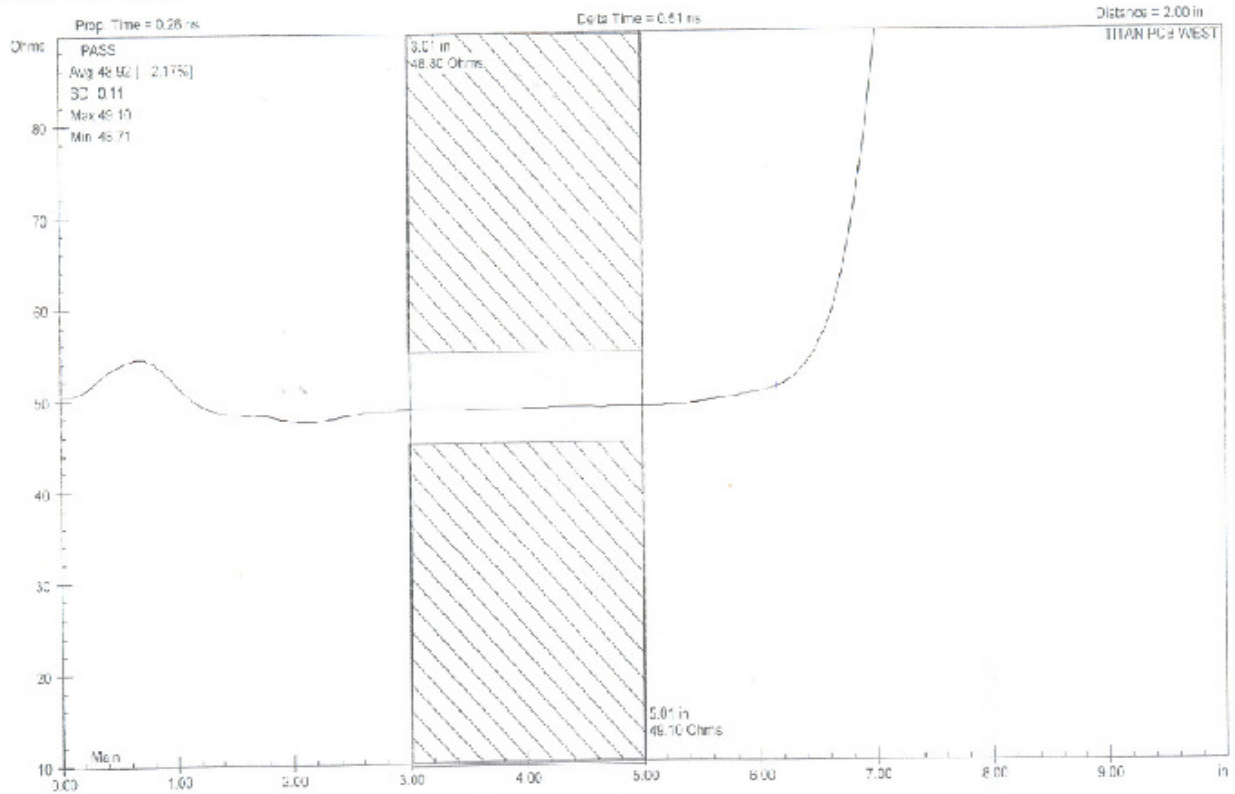




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TDR Report from PCB Manufacturer

Board Type: LAYER 1 TOP 50 OHM
Part Number: Z1428EA
Revision Number: N/A
Testfile Date: Thursday, May 31, 2007 15:25:26
Print Date: Friday, June 15, 2007 11:55:31
Station ID: TFS1 STATION 1
Testfile Path: C:\Program Files\Polar\CIT500s\Testfiles\STANDARD.cdf
Catalog File Path: C:\Program Files\Polar\CIT500s\Testfiles\STANDARD.cdf



Measurement System: Polar CIT500s - Serial No. 14651
CIT500s (S2 B1) 3x3 (5.20, 5.20)
License to - TITAN PCB WEST
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Observations:

The two nets reported in the simulation are N20787 and N01192. The maximum loss allowed in the board is 1dB. At the Operating frequency of 3.5 GHz, insertion and return losses are observed as follows.

For net N01192

Insertion Loss = -0.578 dB

Return Loss = -37 dB

For net N20787

Insertion Loss = -0.537 dB

Return Loss = -37.8 dB



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The S-parameters of two nets were combined with 1M Ohm series resistor, and simulated. The simulation waveform is shown above.

Conclusion:

In the Operating frequency of 3.5 GHz, the signal nets have full signal transparency. From the above simulation results, the RF board can be operated up to 5 GHz, within the allowed limit of 1dB loss.