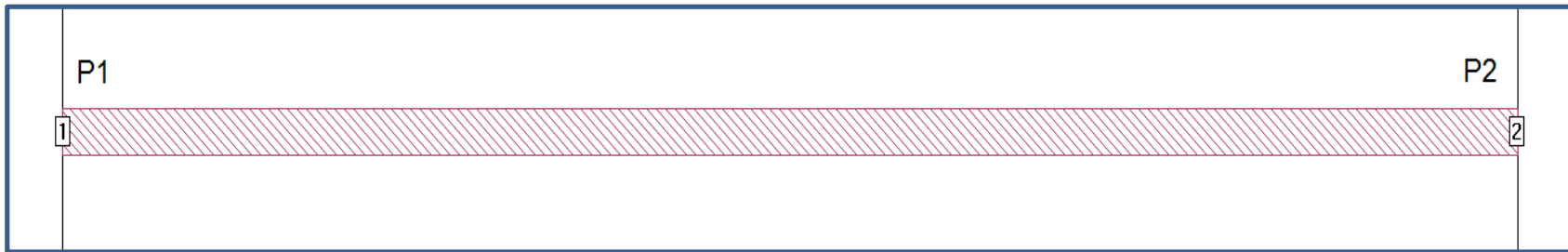


An example: a microstrip transmission line. Two ports: P1 and P2. S11=S22 and S12=S21.



Frequency: 1.5 GHZ

Frequency completed Tue Apr 02 10:46:12 2013.

De-embedded S-Parameters. 50.0 Ohm Port Terminations.

Magnitude/Angle. Touchstone Format. (S11 S21 S12 S22).

1.50000000 0.426708 8.9645 0.892183 -82.04 0.892183 -82.04 0.426708 8.9645

!< P1 F=1.5 Eeff=(3.13153293 -0.0571278) Z0=(79.7637175 0.67834017) R=50.99559 C=0.02629535

!< P2 F=1.5 Eeff=(3.13153293 -0.0571278) Z0=(79.7637175 0.67834017) R=50.99559 C=0.02629535

Frequency: 3.34 GHZ

Frequency completed Tue Apr 02 10:46:26 2013.

De-embedded S-Parameters. 50.0 Ohm Port Terminations.

Magnitude/Angle. Touchstone Format. (S11 S21 S12 S22).

3.34000000 0.013720 5.2011 0.968176 179.90 0.968176 179.90 0.013720 5.2011

!< P1 F=3.34 Eeff=(3.12603085 -0.0581439) Z0=(79.702263 0.64097293) R=31.9423719 C=0.02642551

!< P2 F=3.34 Eeff=(3.12603085 -0.0581439) Z0=(79.702263 0.64097293) R=31.9423719 C=0.02642551

# Touchstone Format

Frequency: 1.5 GHz

Frequency completed Tue Apr 02 10:46:12 2013.

De-embedded S-Parameters. 50.0 Ohm Port Terminations.

Magnitude Angle Touchstone Format. (S11 S21 S12 S22).

1.50000000	0.426708	8.9645	0.892183	-82.04	0.892183	-82.04	0.426708	8.9645
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Phase DEG

!< P1 F=1.5 Eeff=(3.13153293 -0.0571278) Z0=(79.7637175 0.67834017) R=50.99559 C=0.02629535

Real Imaginary  
Dierlectric Eeff

Real Imaginary  
Impedance of the transmission line connected to the port P1, in Ohms. Not whole impedance!

Equivalent series resistance of load's port (P2) discontinuity, in Ohms. (A transmission line is without a load!)

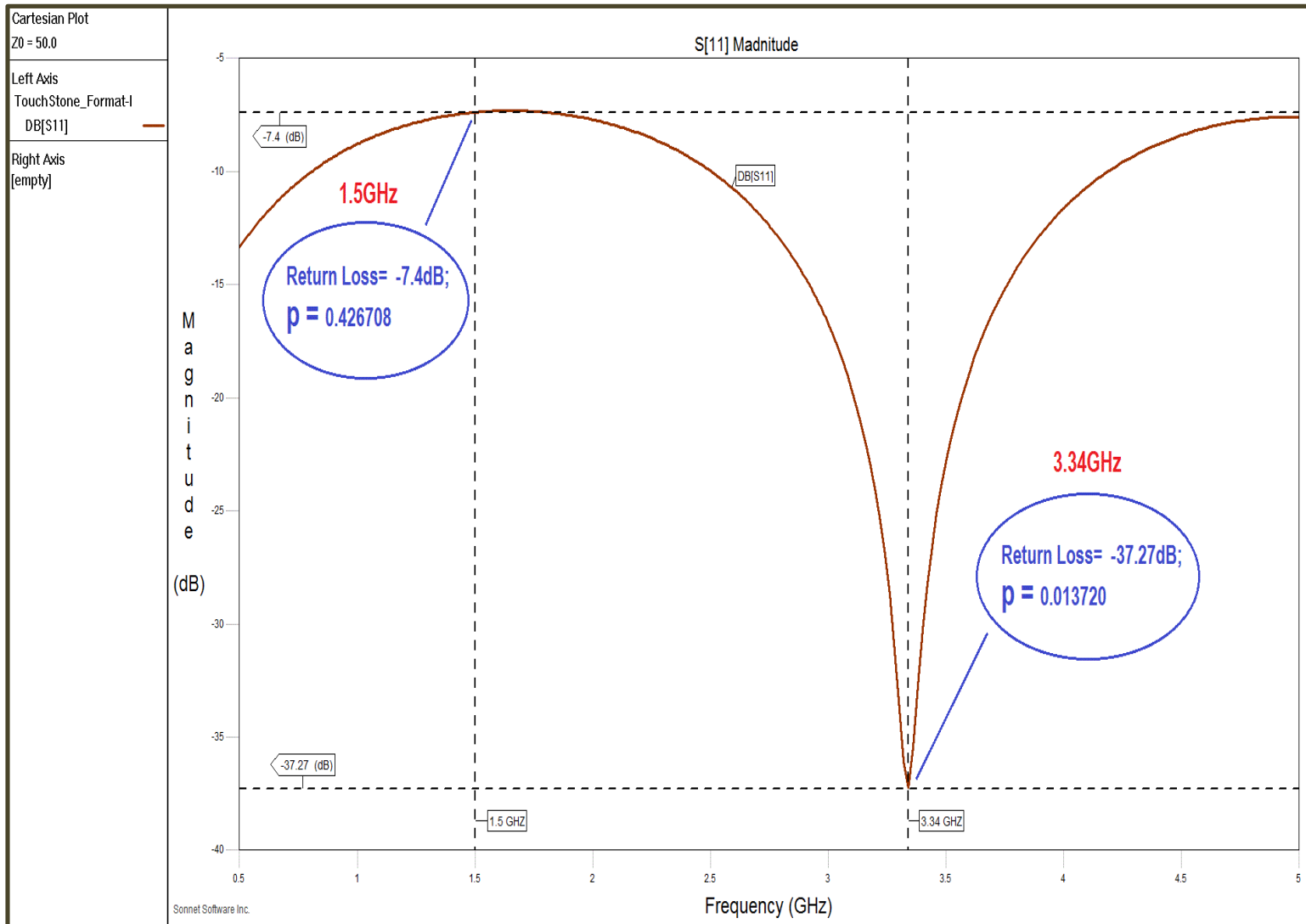
Equivalent series capacitance of load's port (P2) discontinuity, in pF. (A transmission line is without a load!)

$$\Gamma = \frac{(R_L - R_S)}{(R_L + R_S)} = \frac{V_{return}}{V_{forward}}$$

$$\rho = |\Gamma|$$

$$VSWR = \frac{(1 + \rho)}{(1 - \rho)}$$

Picture 1. SONNET Touchstone Format



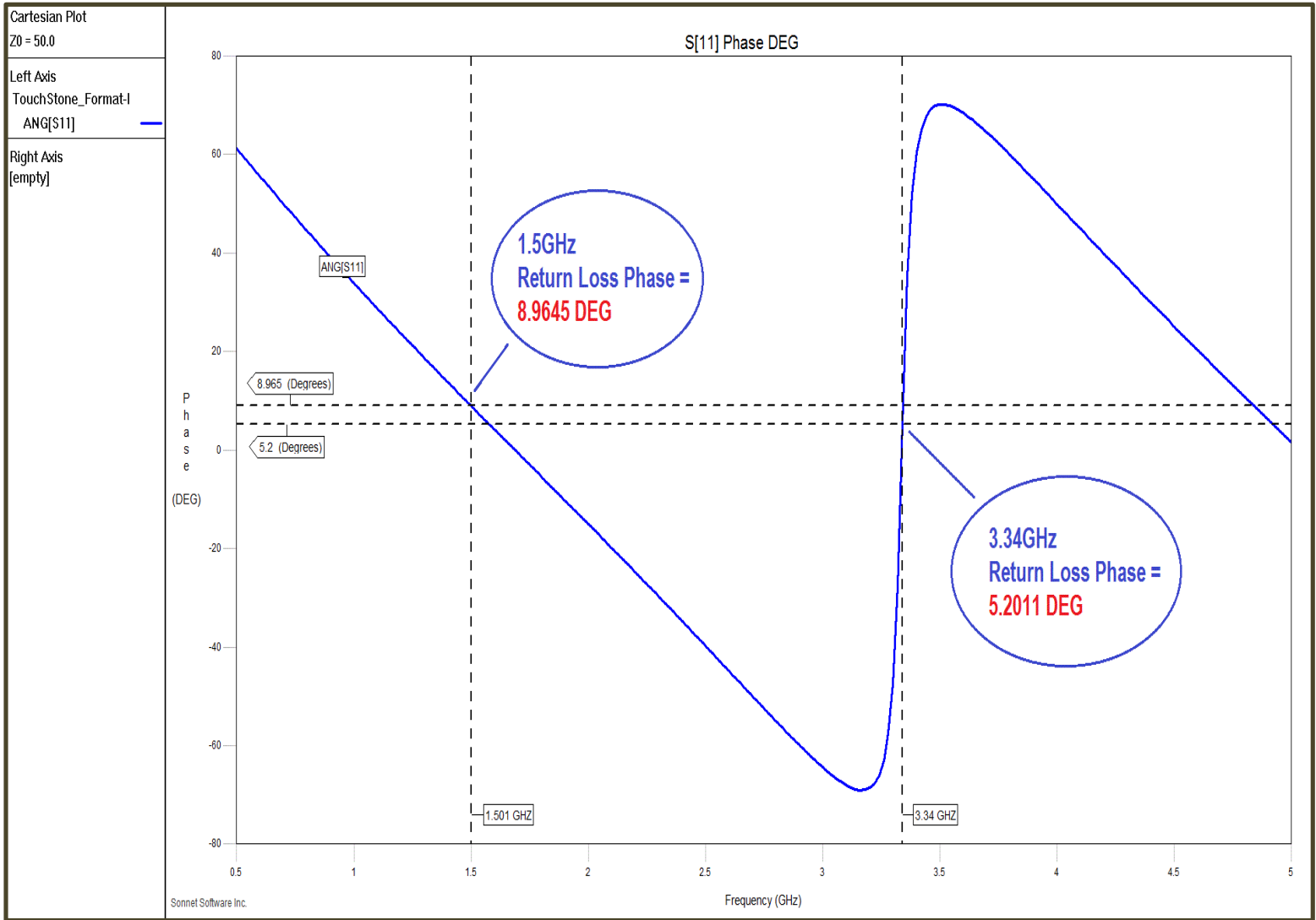
Picture 2. TouchStone Format: S11 Return Loss Magnitude (dB)

Enter the R Source impedance Rz S >		50		Ohms	
Enter the R Load impedance Rz L >		124.4		Ohms	
Rz load	$\rho$	VSWR	Return Loss (dB)	Voltage Loss (%)	Power Loss (%)
124.4	0.4266	2.488	7.4	42.66	18.197

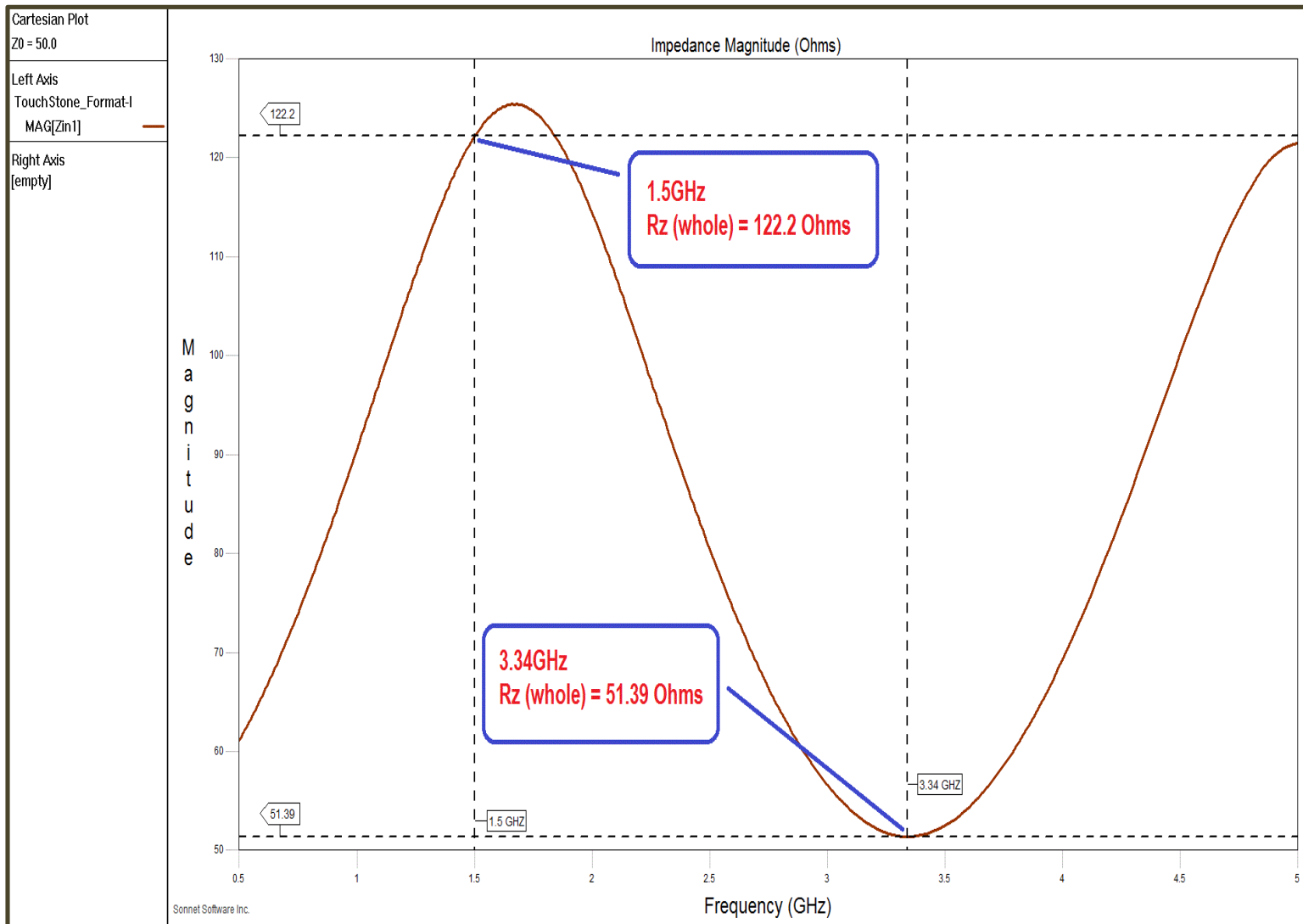
Picture 3. ToughStone Format: Return Loss parameters. 1.5 GHz

Enter the R Source impedance Rz S >		50		Ohms	
Enter the R Load impedance Rz L >		51.39		Ohms	
Rz load	$\rho$	VSWR	Return Loss (dB)	Voltage Loss (%)	Power Loss (%)
51.39	0.0137	1.0278	37.27	1.37	0.0187

Picture 4. ToughStone Format: Return Loss parameters. 3.34 GHz



Picture 5. ToughStone Format: S11 Return Loss Phase (DEG)



**Picture 6. TouchStone Format: Impedance Magnitude – whole (Ohms).**

**Interesting to compare with pictures 3 and 4: “Enter the R Load impedance Rz L” parameters.**

*Alex Lapayev Portland ME, April 2013*