Q_Measurement

Where To Find This Example

AWR Version 15

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AWR Version 14

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Design Notes

Q Measurement

This example shows how to measure Q factor in AWRDE.

Overview

This project illustrates how to use output equations to calculate Q in a very direct manner. It includes three different schematics, one with capacitor, and another with inductor and last one with spiral inductor. We are measuring Q factor for each schematic.

Using Measurements for Q

Several measurements for Q are availble to be used for inductors. Please see the the graphs "Inductor" and "Spiral Inductor" for comparisons of the built in measurements and the equations.

Using Output Equations to Measure Q

This example illustrates how to use equations to measure Q.

Q is a measure of the "purity" of a reactive device. Its definition is:

Q = (Energy Stored) / (Energy Dissipated)

Therefore, for and ideal capacitor or inductor, Q is infinite. The more lossy the component is, the lower Q will be.

The equation above can be easily rewritten in the following form:

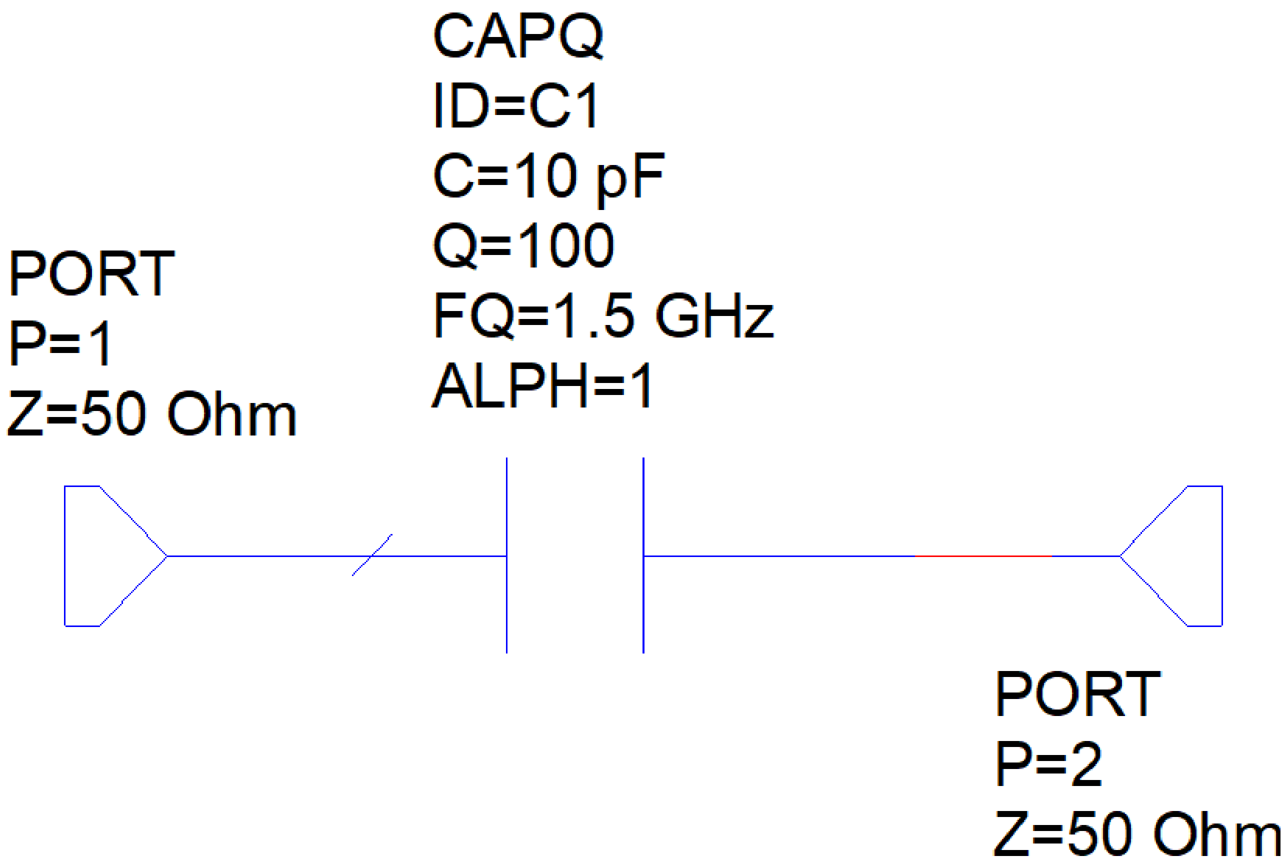
Q = Im(Y[1,1]) / Re(Y[1,1])

Here, stored energy is indicated by the imaginary part of Y[1,1] and energy dissipated is indicated by the real part of Y[1,1]. The advantage of this representation is that Y[1,1] is an available measurement in MWO, and it leads directly to the desired quantity, Q.

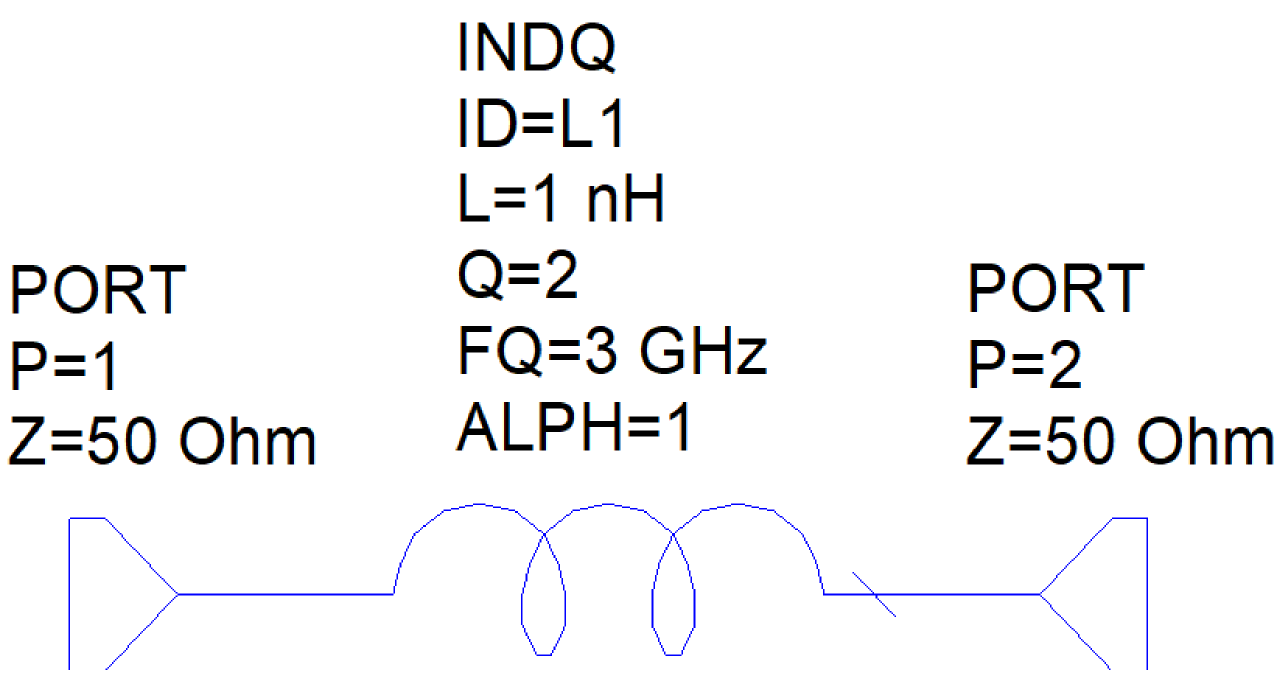
Output Equations are created for each of the two quantities, Re(Y[1,1]) and Im(Y[1,1]). Finally, a regular equation is used to calculate the quotient for Q.

All the equations for this project is included in "Output Equations". To view these, simply double click on **Output Equations** under **Project** tab.

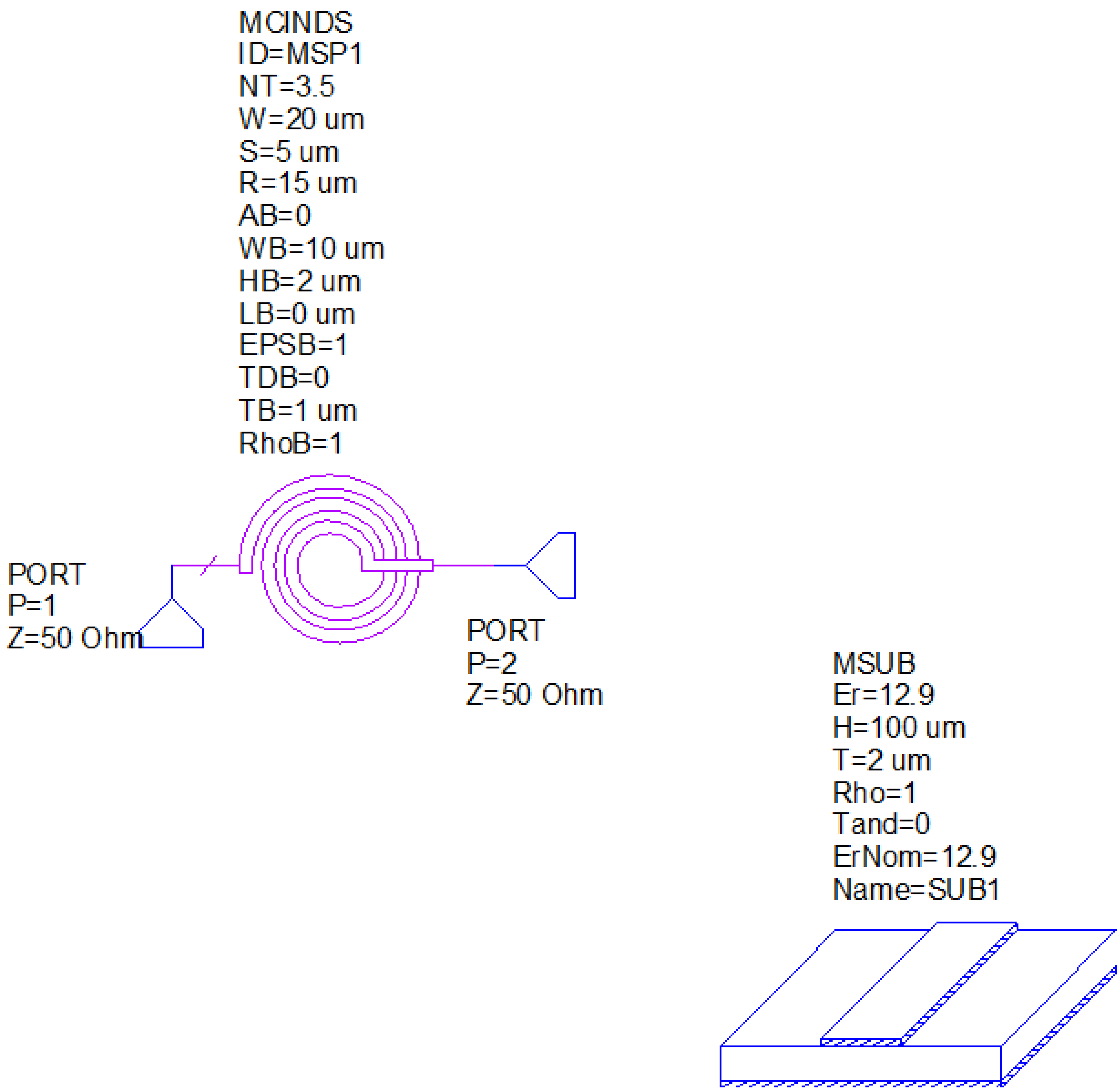
Schematic - Lossy_Capacitor



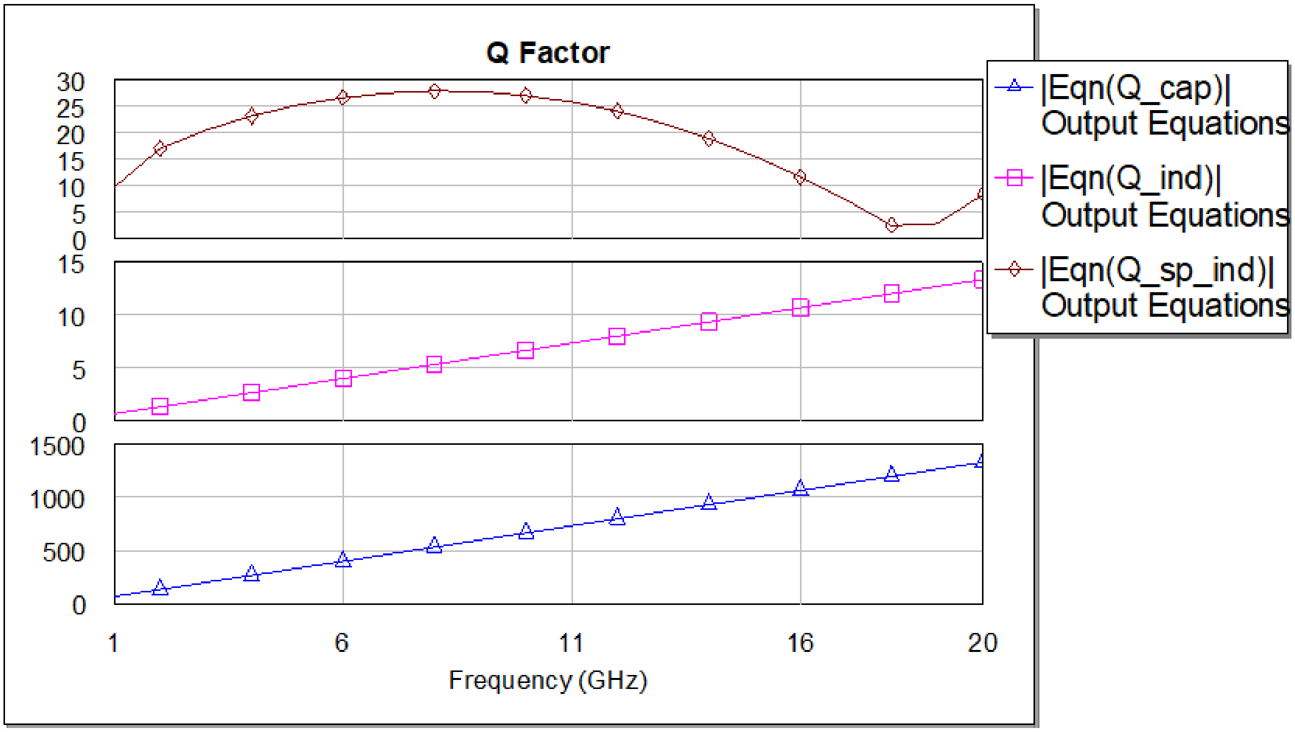
Schematic - Lossy_Inductor



Schematic - Lossy_Spiral_Inductor



Graph - Q Factor


Q Factor
30
25
20
15
10
5
0
15
10
5
0
1500
1000
500
0
1
6
11
16
20
Frequency (GHz)
|Eqn(Q_cap)|
Output Equations
|Eqn(Q_ind)|
Output Equations
|Eqn(Q_sp_ind)|
Output Equations