

WIPL-D Microwave Pro: What is New in v5.0?

New features/improvements introduced in v5.0 are:

1. Active linear circuit analysis – To extend the application area of linear circuit simulator several features have been introduced to include the analysis of active microwave circuits. The new analysis options include:
 - a. Noise analysis
 - b. Stability analysis
 - c. Gain analysis
2. Adding explicit ground connection for 2-port imported data files.
3. De-embedding of imported 3D EM components has been improved so that a component can now be a part of a more complex circuit.
4. Stripline library has been added.
5. Coupled microstrip and striplines are introduced in Impedance calculator.
6. Dielectric material other than air is now supported with waveguide analytical components (calculated using mode matching).
7. One generator at a time - enables calculation of radiation pattern and near field while using global ports.
8. Other options/improvements
 - a. Silent run
 - b. Import EM components with results
 - c. Microstrip frequency dispersion calculation improved
 - d. Analytical component of coupled microstrip lines

1. Active Linear Circuit Analysis

Several new analysis features have been introduced in WIPL-D Microwave version 5.0 addressing the analysis of two-port active microwave circuits. In particular, graphical and computational tools regarding noise, gain and the stability are now available.

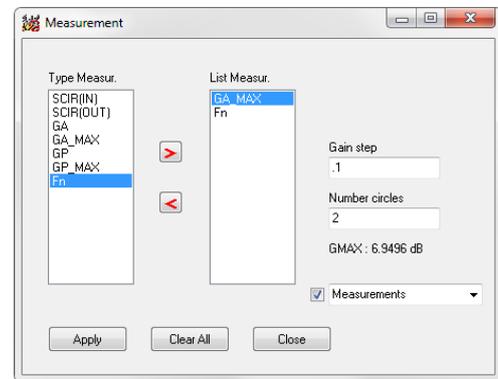
Smith chart functionality has been increased as measurements list in version 5.0 includes:

- Input Stability Circles
- Output Stability Circles

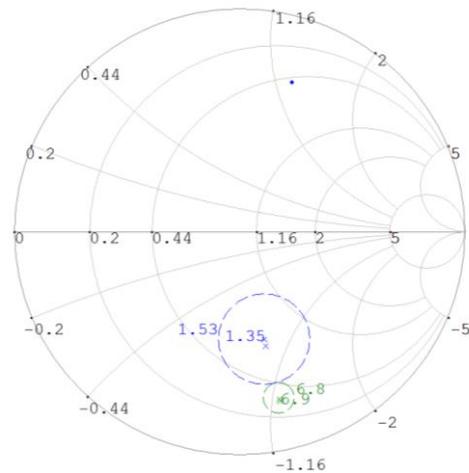
- Constant Available Gain Circles
- Constant Operating Gain Circles
- Constant Noise Figure Circles

The setup used to define constant available gain and constant noise figure circles is shown in Fig. 1 a), while the circles themselves are displayed in Fig. 1 b).

Input stability circles are shown in Fig. 2.



a)



b)

Fig. 1 Specifying the Smith Chart measurements: a) Defining constant available gain and constant noise figure circles; b) circles plotted in a Smith chart

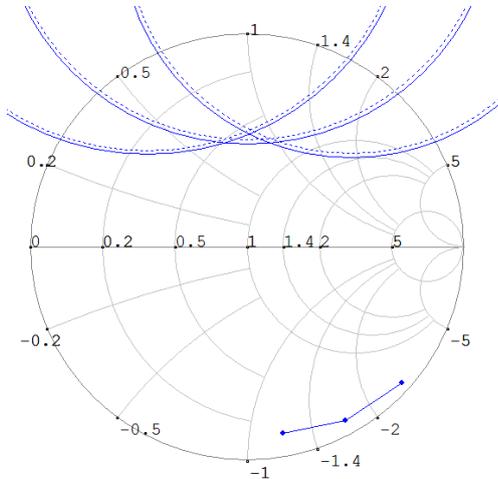


Fig. 2 Input stability circles and the impedance Smith chart.

a) Noise

When noise analysis is performed, user can plot calculated noise figure, as shown in Fig. 3. The following options are available :

- Mg – Noise Figure magnitude
- dB – Noise Figure, in logarithmic units.

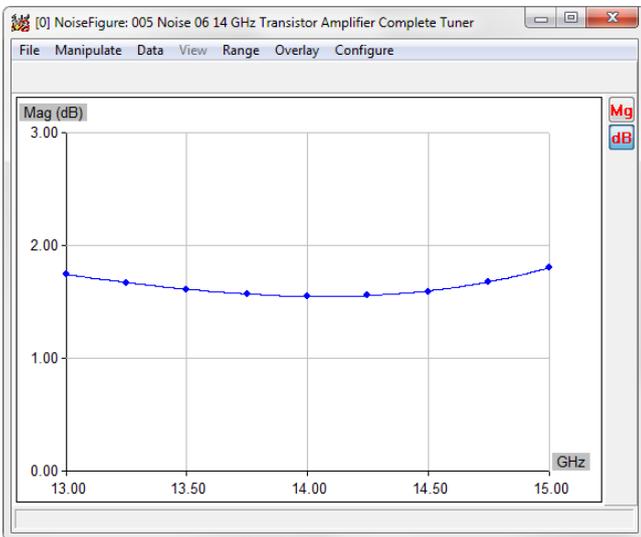


Fig. 3. Noise figure plot.

b) Stability

When stability factors are calculated, the following options are available (Fig. 4.):

- Mu – μ Stability Factor
- K – k Stability Factor
- B1 – b1 Stability Factor,

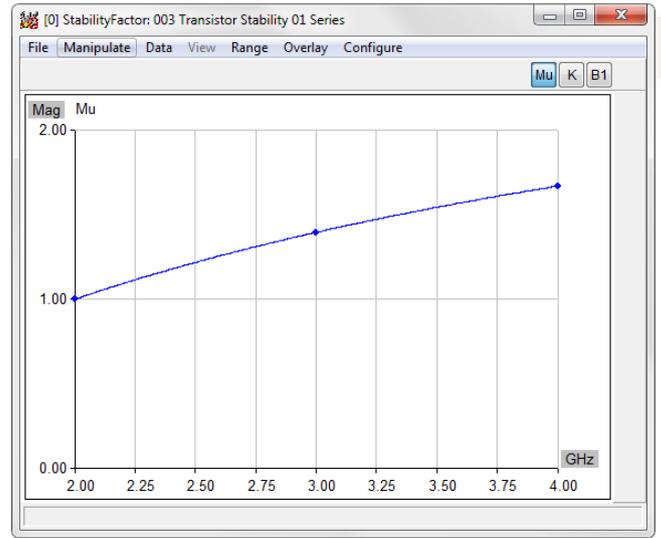


Fig. 4. Plot of the stability factor μ (Mu).

2. Adding Explicit Ground Connection

Exposing explicit ground connection for two-port imported data files allows introduction of feedback elements when designing amplifier and oscillator circuits, or analyzing the influence of the non-ideal active element grounding. Illustration for the addition of the explicit ground connection is provided in Fig. 5.

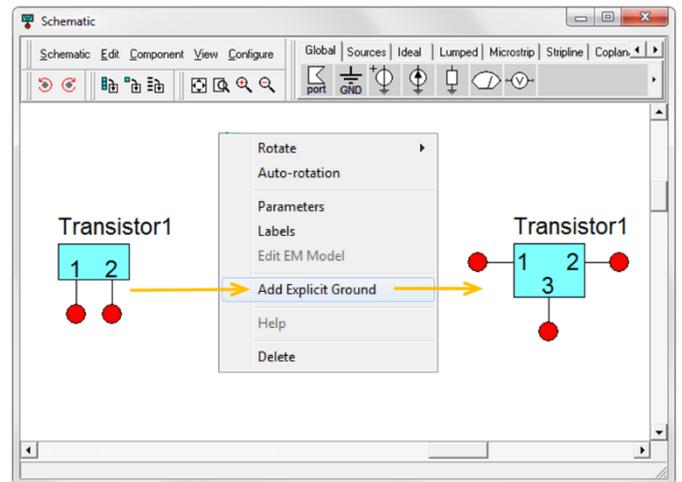


Fig. 5. Adding explicit ground.

3. De-embedding of Imported 3D EM Components

A complex microwave circuit schematic can include one or several EM components together with a number of additional circuit elements. S parameters of the whole circuit are calculated based on S parameters calculated for each of the elements. Therefore, de-embedded S parameters of imported EM components must be available

during the simulation, not obtained using post-processing after the simulation ends. The later approach is adequate for the case of graphic-based de-embedding where circuit comprises a single EM component. Version 5.0 introduces schematic-based de-embedding that provides more flexible de-embedding options suitable for complex microwave circuits.

The feeders for all of the ports of an imported EM component can be configured and set up to adjust themselves with any relevant change of the EM component. The required number of feeders is determined automatically from the number of ports of the imported EM structure.

Import dialog box is shown in Fig. 6 while an EM component schematic with configured feeders is shown in Fig. 7.

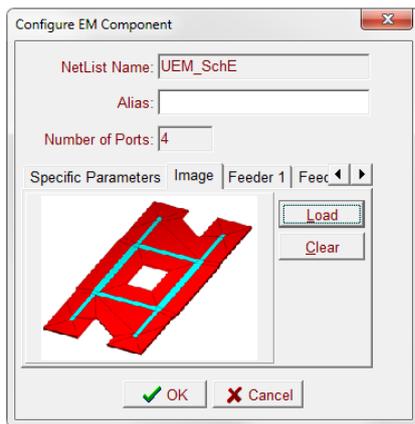


Fig. 6. Configure EM Component dialog box.

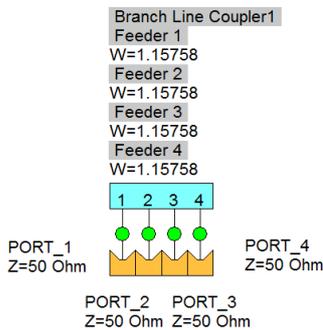


Fig. 7. Circuit schematic after import.

4. Stripline Library

A library containing stripline elements have been added in version 5.0 to increase the number of technologies available with WIPL-D Microwave Pro. The palette includes following elements: Open End, Short, Line, Tapered Line,

Bend, Step, Gap, Round Hole, T-junction, Edge Coupled lines and Broadside Coupled lines.

The example of end coupled stripline filter obtained by combining gap elements from the palette is shown in Fig. 8. Schematic of wideband broadside coupled line stripline coupler is presented in Fig. 9.

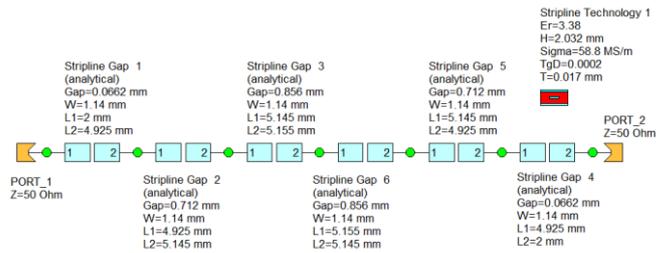


Fig. 8. Stripline end-coupled filter schematic.

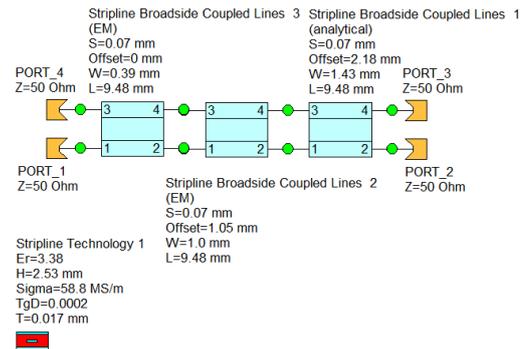


Fig. 9. Stripline wideband broadside coupled line coupler.

5. Coupled Microstrip and Striplines Entries in Impedance Calculator

Calculation of characteristic impedance and electrical length of coupled lines, microstrip and stripline, is available in impedance calculator in version 5.0, as illustrated in Fig. 10.

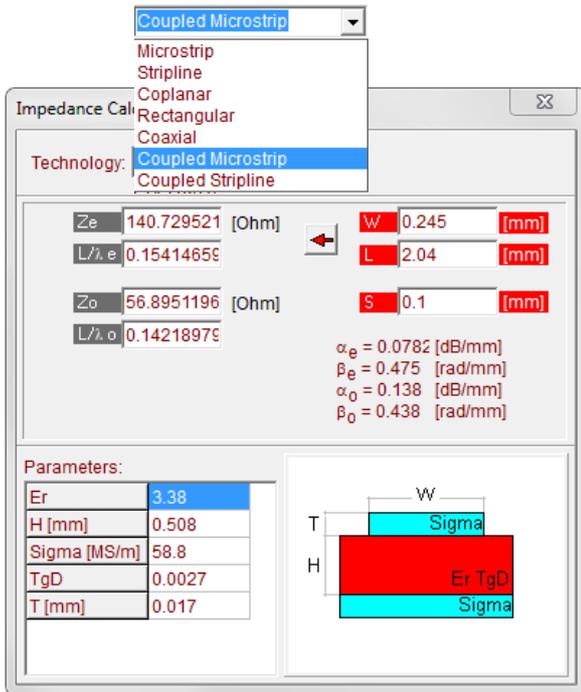


Fig. 10. Impedance calculator in WIPL-D Microwave Pro v5.

6. Waveguide Dielectric Other Than Air

Dielectric material other than air is now supported with waveguide analytical components that are calculated using built-in mode matching code.

7. One Generator At Time Mode

In previous versions one was not able to calculate the results for radiation pattern and near field when Global/Ports are connected in circuit scheme, but only using voltage or current generators – “All Generators” mode. In version 5.0, WIPL-D Microwave Pro enables calculations of radiation pattern and near field using global ports. Namely, these results are calculated for each port separately, so the name “One Generator at Time” actually means one port at a time, while other ports are either all short-circuited to ground or are all connected to matched terminations, depending on the user preference.

8. Other Options/Improvements

a) Silent Run

During the simulation of a model a DOS window with information about the simulated model and simulation progress is shown by default. In the case when a large

number of short simulations are run successively the frequent appearance of this window can be frustrating. The Silent Run option enables the user to opt out displaying this window.

b) Import EM Components with Results

This option allows using of the results that are already calculated, for the imported EM component, in order to avoid 3D EM simulation of components which have been already simulated in 3D solver.

c) Microstrip Frequency Dispersion Calculation Improved

Accuracy of the calculations of frequency dispersion effects when evaluating impedance for microstrip technology is improved.

d) Analytical Component of Coupled Microstrip Lines

A new analytical component of coupled microstrip lines has been introduced.