Modelithics Model Improvements in Keysight PathWave RF Synthesis (Genesys)

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If you're a user of Keysight PathWave RF Synthesis (Genesys), you may be interested to know about some performance improvements offered in the latest release (version 21.2) of the Modelithics COMPLETE Library™ for Keysight Genesys. This library contains an extensive selection of models that represents thousands of components in total. To take advantage of the new performance enhancements, you'll need to use version 21.2 within Keysight Genesys 2022.

So just what exactly has improved? To answer that, we'll turn our attention to the various models for conical inductors and ferrite beads included in the Modelithics COMPLETE Library for Keysight Genesys. In the past, a significant amount of time was needed to simulate some of these models. But fortunately, thanks to recent enhancements, these conical-inductor and ferrite-bead models can now simulate in a fraction of the time it once took. These enhancements were made possible by an update in Genesys 2022 at the request of a Modelithics library user.

As a designer, one of the more frustrating parts of the job is when you're struggling with very slow simulation times. You know the feeling when you're trying to get something accomplished, but your simulations seem to take forever to run. Truth be told, the Modelithics COMPLETE Library for Keysight Genesys includes models for conical inductors and ferrite beads that did need pretty substantial amounts of time to simulate. If you have ever used any of these models in a design, you may have encountered this frustrating scenario. However, the good news here is that the Modelithics team worked together with Keysight to improve this slow performance.

To show in practical terms how the simulation speed has improved, let's look at a design example. Figure 1 shows a schematic of a bias-tee circuit in Keysight Genesys. This design includes several component models from version 21.2 of the Modelithics COMPLETE Library for Keysight Genesys. Among them is the IND-PIC-CONE-SERS-101 model for the Piconics CC19T40K240G5-C conical inductor. Here, we're using the 0.220-µH part, which is rated for a maximum current of 700 mA. The DC path of the bias tee also includes the FBD-WTH-0402-002 model for the Würth Elektronik WE-CBA 0402-size ferrite bead.

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Chris DeMartino is a Sales and Applications Engineer at Modelithics. His experience includes developing and testing RF/microwave components and assemblies for various applications. In addition, Chris spent several years working as a technical editor for an industry publication, making him well equipped to create useful technical content. Some of his roles at Modelithics include designing application circuits, writing technical articles and application notes, and creating demonstration and tutorial videos. Chris has a B.S. in Electrical Engineering from the State University of New York at Binghamton and an M.S. in Electrical Engineering from Polytechnic University.

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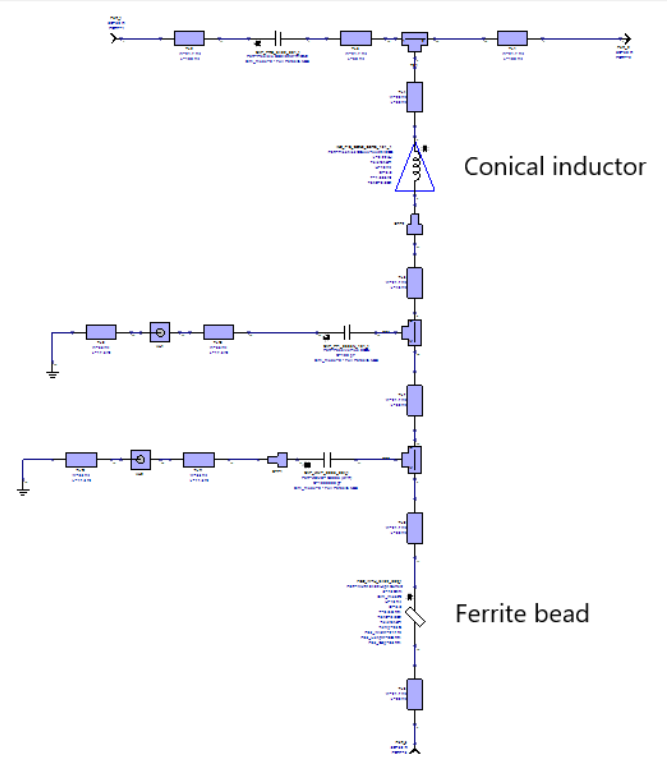

Figure 1. Bias-tee schematic in Keysight Genesys.

As a test, let's first simulate this circuit using Genesys 2020. We'll perform a linear simulation from 100 MHz to 10 GHz with 151 points. Running this simulation takes a little over 24 seconds with a laptop that has an Intel Core i7-8565u processor. We can blame this long simulation time on the two models we just mentioned. Figure 2 shows the simulated S-parameter results.

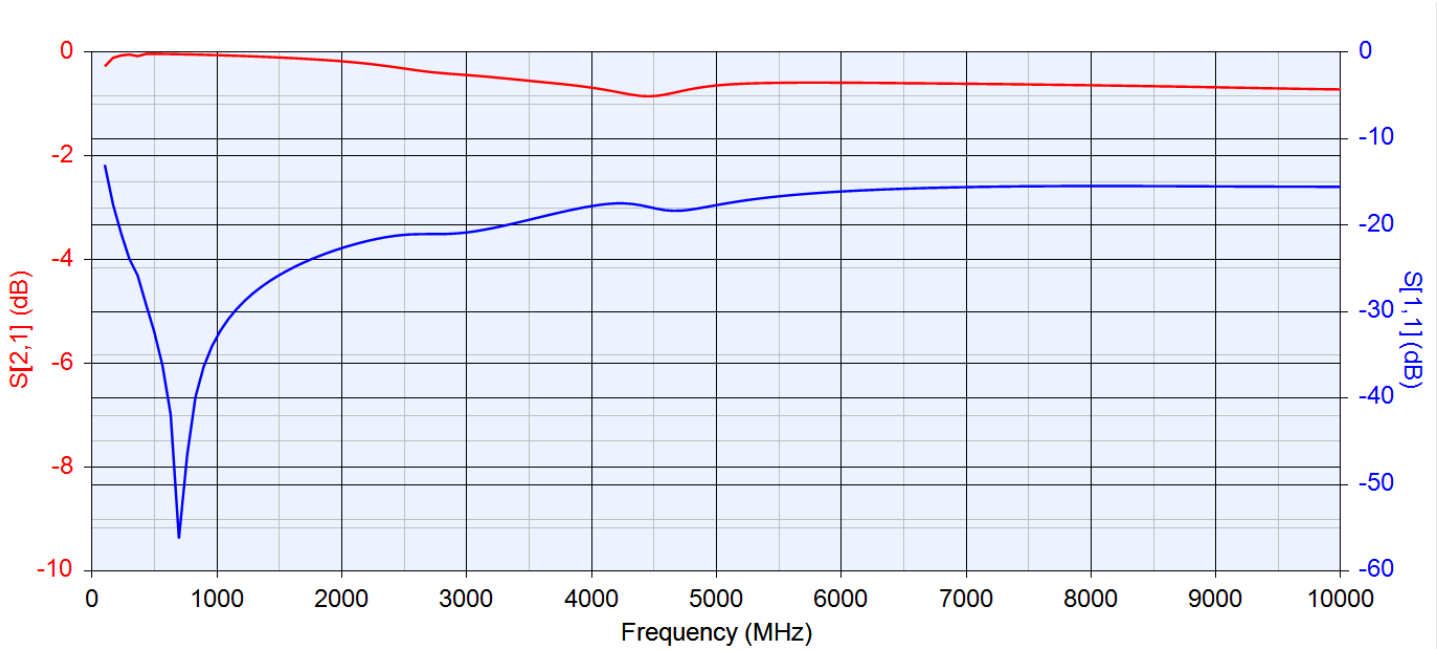

Figure 2. Simulated S_{21} (red) and S_{11} (blue).

Now, let's simulate this same circuit using Genesys 2022. Again, we'll perform a linear simulation from 100 MHz to 10 GHz with 151 points. This time, running the simulation with the same laptop takes just less than one-third of the amount of time it took when simulating with Genesys 2020. Of course, the simulation results are the same as the results we just saw.

For further comparison, let's perform a Monte Carlo simulation of this bias-tee design with both Genesys 2020 and 2022. To do this, we'll utilize the "Tolerance" parameter of each Modelithics model in the design. Also, we'll set the number of iterations to 100 for this analysis. With Genesys 2020, this Monte Carlo simulation completes in about 42 minutes. But with Genesys 2022, the same simulation takes about 12 minutes 30 seconds to run with the same laptop. Figure 3 shows the simulated results of the Monte Carlo analysis. Finally, Table 1 compares the simulation time for each scenario presented here.

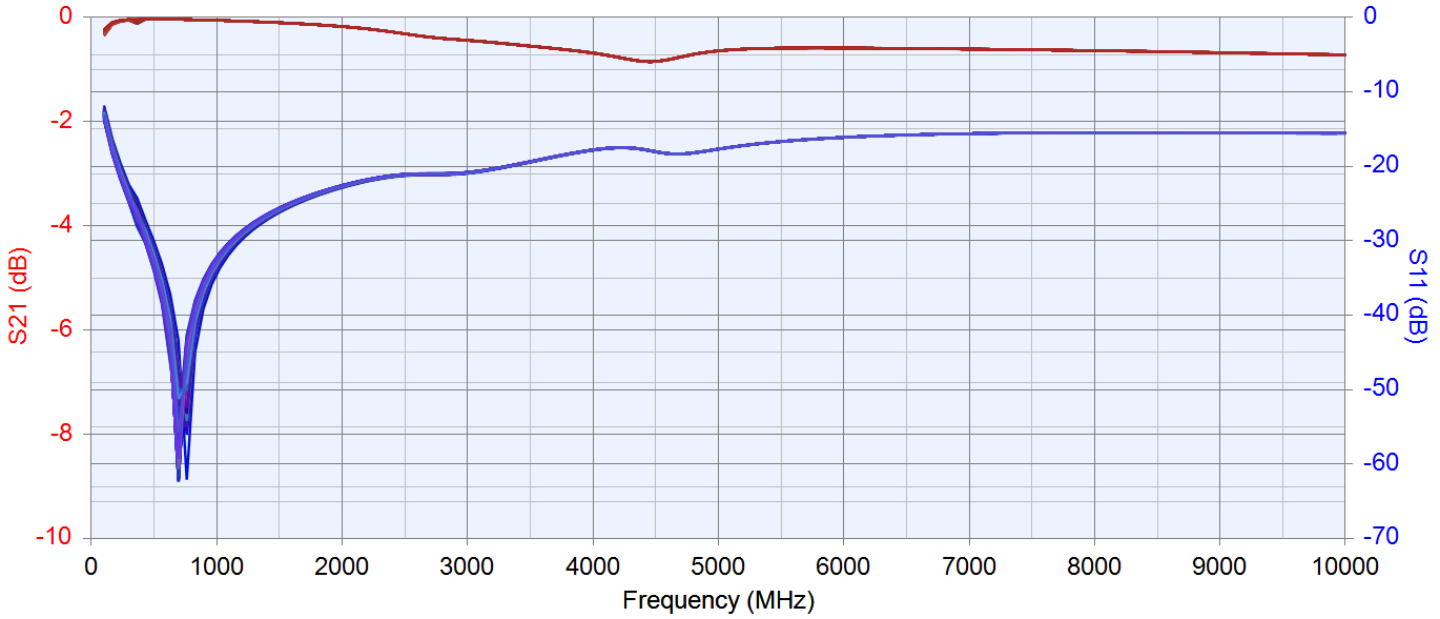

Figure 3. Monte Carlo simulation results. Shown are S_{21} (red) and S_{11} (blue).

Table 1. Simulation time of the bias-tee design for all scenarios.

	Single linear simulation	Monte Carlo total simulation time (100 iterations)	Average time per iteration (Monte Carlo simulation)
Genesys 2020	24 sec.	2520 sec.	25.2 sec.
Genesys 2022	<8 sec.	750 sec.	7.5 sec.

In this blog post, we quickly demonstrated the improved simulation times that come with using version 21.2 of the Modelithics COMPLETE Library for Keysight Genesys. These improvements are only seen when using the library with Genesys 2022. As we saw, using version 21.2 of the Modelithics COMPLETE Library with Genesys 2020 results in longer

simulation times for certain models. Of course, using older versions of the library with Genesys 2020 and earlier will also result in longer simulation times for the same models.

On a final note, Keysight Genesys users should also be aware of a feature called Vendor Parts Synthesis, or VPS, that can help you quickly design circuits using Modelithics models for capacitors, inductors, and resistors. For more information on the VPS feature, be sure to check out Application Note 76 from the Modelithics website. Lastly, the Modelithics team encourages all users to suggest updates and new features. Suggestions for additional models and even additional compatibility with other simulators are also encouraged.