Where To Find This Example

Select Help > Open Examples... from the menus and type either the example name listed above or one of the keywords below.

Or in Version 13 or higher you can open the project directly from this page using this button. Make sure to select the Enable Guided Help before clicking this button.

Open Install Example

Design Notes

IFILTER HAIRPIN

This project shows a hairpin bandpass filter, synthesized in iFilter and how different the results are between closed form and EM representation.

Description of iFilter

The AWR integrated filter synthesis module, iFilter, seamlessly runs within Microwave Office. Integrated as a wizard within the AWR Design Environment, iFilter keeps your filter designs and their evolution a part of the entire, managed circuit design project.

Overview

The filter is synthesized on 0.020" RO6006 (Er=6.15) material with 1/2 oz. copper.

Targeted performance is:

Center Frequency = 5800MHz
Bandwidth = 250MHz
Passband Return Loss = -15dB or better
Passband Insertion Loss = -3dB or better

To see the filter specification in iFilter, double-click the stored wizard state, "iFilter_Hairpin" under the Wizards node > iFilter Filter Wizard node in the Project browser. You can click the "Generate Design" button to see the filter synthesized. Note you must make sure the "Real" button is selected instead of "Ideal" before synthesizing to get microstrip elements.

EM Extraction and Simulation Results

Once synthesized, the filter is generated in Microwave Office with the schematic name "iFilter_Hairpin" and the graph name "iFilter_Hairpin IL RL".

This example renamed the schematics and graphs to compare answers and then was set up for EM extraction with AXIEM using the EXTRACT block and STACKUP element in schematic "iFilter_Hairpin_EM". These results are plotted in graphs in the project. Insertion loss shows excellent performance relative to the requirement, but return loss needs some further optimization.

It was noticed that the band response was quite different between the closed form models (_CF) schematic and the full EM schematic (_EM). The bend model was suspected so a parameterized EM model was created for the bend. This models leverages the pcells to create the parameterized layout but instead of using the circuit model use AXIEM to produce results for the bend model which gives us almost the same results as full EM simulation is much less time.

Additional Information

The project is set up to be optimized, but the primary goal is to illustrate that iFilter will deliver an excellent starting point for filter design and refinement.

Schematic - iFilter_Hairpin_EM
SUBCKT
PORT ID=S1
P=1 NET="iFilter_Hairpin_CF"
Z=50 Ohm

PORT
P=2
Z=50 Ohm

EXTRACT
ID=EX1
EM_Doc="EM_Extract_Doc"
Name="EM_Extract"
Simulator=AXIEM
X_Cell_Size=2 mil
Y_Cell_Size=2 mil
STACKUP="SUB2"
Override_Options=Yes
Hierarchy=Off
SweepVar_Names=""

Schematic - iFilter_Hairpin_EM UBend
While these looks the same as the schematic MUBEND model they are Parameterized EM Models

EM Structure - EM_Extract_Doc

Graph - S11 Filter Response
Graph - S21 Filter Response