Microstrip Band Pass Filters

This application note presents S-parameters obtained with effective usage of WIPL-D *Fitter*, number of unknowns, computer memory required and simulation time per frequency obtained after simulation of two passive, microstrip, band pass filters (further, BPF). The first simulated filter is interdigital filter, while the second simulated filter is filter with coupled resonators. The two BPFs are modeled above infinitesimally large PEC plane. The software tool used for simulations is WIPL-D Pro, a full wave 3D EM Method-of-Moments based solver.

WIPL-D Models

The interdigital band pass filter is shown in Fig. 1, while filter with coupled resonators is shown in Fig. 2. Relative dielectric permittivity of the substrate is $\varepsilon_r = 3.38$.

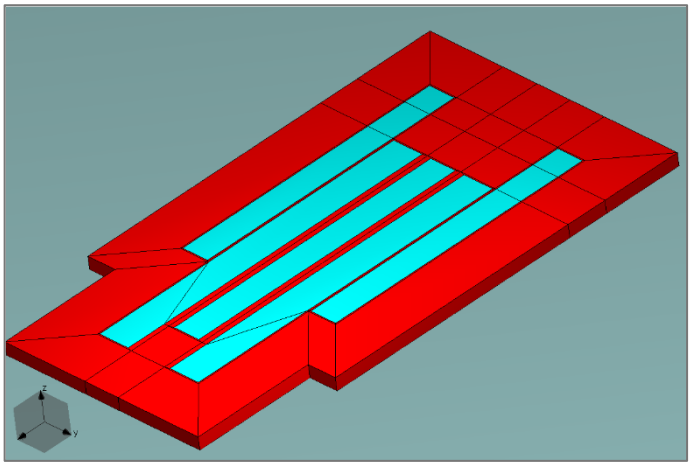

Figure 1. Interdigital band pass filter.

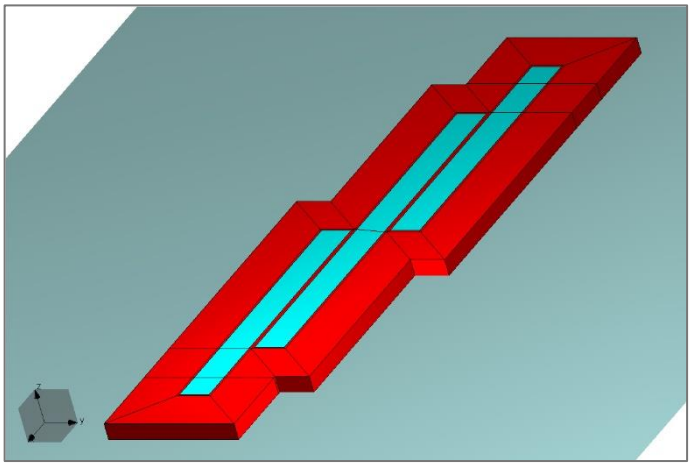

Figure 2. Band pass filter with coupled resonators

Results and Simulations

Interdigital BPF was simulated from 1900 MHz to 2600 MHz, while coupled resonator filter was simulated from 2000 MHz to 2700 MHz. Both simulations were performed in 9 frequency points, each. Obtained S-parameters are presented in Fig. 3 and Fig. 4. The S_{11}-parameter curve shown in Fig. 3 is very smooth, although the simulations were performed in only 9 points. This means that WIPL-D *Fitter*, with properly set parameters, efficiently interpolates the frequency response of a curve obtained with relatively low number of points.

Number of unknowns, computer memory requirement and simulation time per frequency are shown in Table. 1. Computer used for these simulations is Intel® Core™ i7-7700 CPU @ 3.60 GHz.

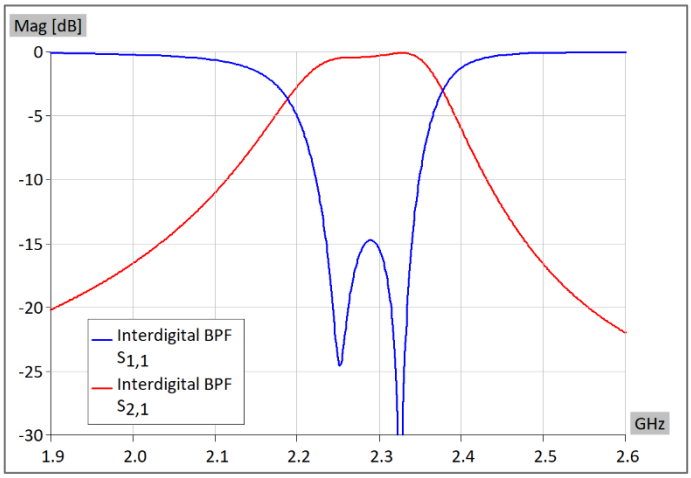

Figure 3. S-parameters-interdigital filter.

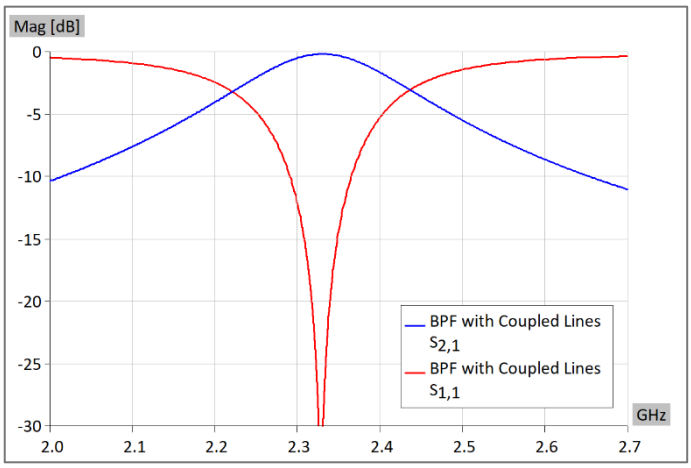

Figure 4. S-parameters-filter with coupled resonators

Table 1. Number of unknowns, computer memory requirement and simulation time per frequency

Model	Number of unknowns	Memory [MB]	Simulation time per frequency [sec]
Interdigital BPF	847	5.47	2.55
BPF with coupled lines	674	3.46	1.1