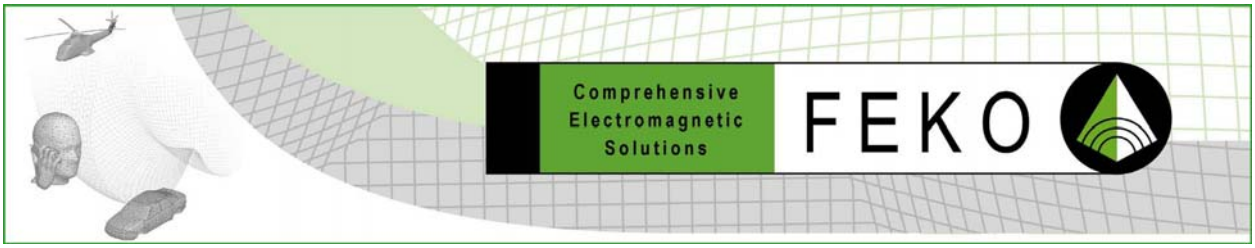


Dielectric Resonator Waveguide Filter

An evanescent-mode waveguide filter consisting of two parallel cutoff waveguide paths with dielectrics is modeled in FEKO and compared with results from the open literature.

The authors of [1] describe an evanescent-mode waveguide filter consisting of two parallel cut-off waveguide paths with dielectrics. The proposed filter is modeled in FEKO with the FEM enclosed regions technique that allows the filter to be modeled with only tetrahedra and a FEM solution. The metallic waveguide forms the boundary condition for the FEM region, so no MoM boundary solution is required.

Note: To set the metallic waveguide as the boundary condition for the FEM region, the coupling between the FEM and MOM must be deactivated. This can be done by going to the Solution menu, Solution settings, FEM, and tick the box "Decouple from MOM (use FEM absorbing boundary condition)". In addition, note that if the waveguide contains any (radiating) slots, this coupling must remain activated.

Figure 1 shows a lateral cut-plane view of the model with dielectric regions in green and free-space (air) regions in orange. All outside surfaces are metallic, except for the ports which are dielectric boundary surfaces. The ports are modeled with FEKO's FEM modal port which automatically computes the fundamental mode that propagates into the filter.
As this filter is designed for a very wide band of frequencies, FEKO's AFS technology is applied to effectively select the minimum number of frequency points that will accurately characterize the filter's response.

Fig 1: Waveguide filter with dielectric blocks

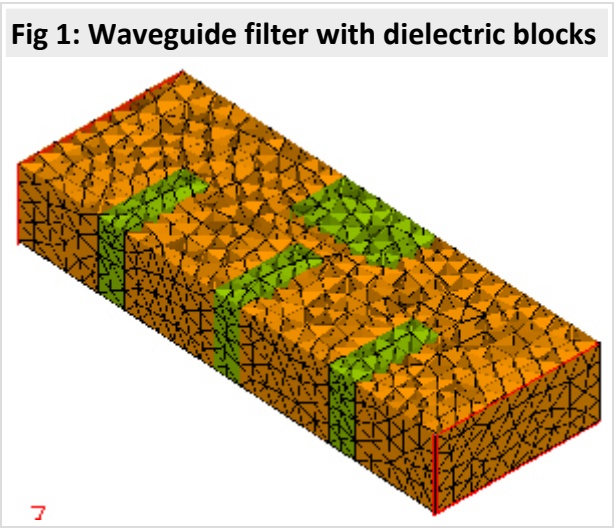
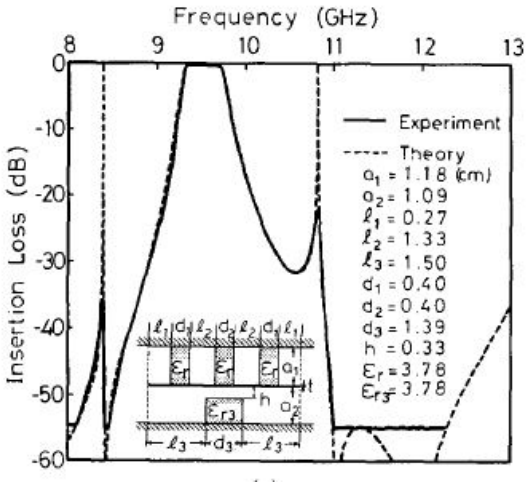


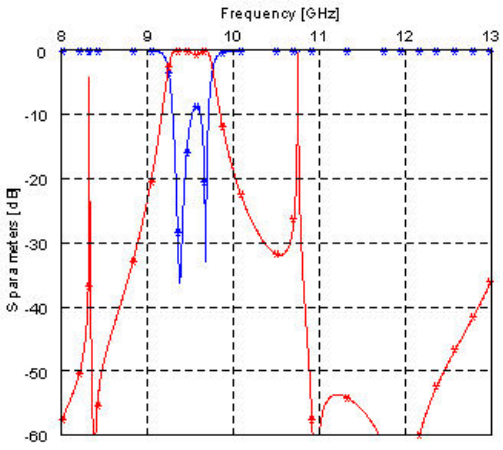
Figure 2 presents a comparison between the filter's measured insertion loss (from [1]) and the FEKO computed insertion loss. The comparison is excellent, validating the applicability of FEKO to problems including waveguides and dielectric elements.

Fig 2: Insertion loss comparison - Measured vs FEKO

(a) Measured [1]



(b) FEKO simulation



References

[1] H. Shigesawa, M. Tsuji, T. Nkao, K. Takiyama, "Two-Path Cutoff Waveguide Dielectric Resonator Filters," IEEE Transactions on Microwave Theory and Techniques, Vol. 37, No. 7, July 1989, pp. 1105 - 1112