



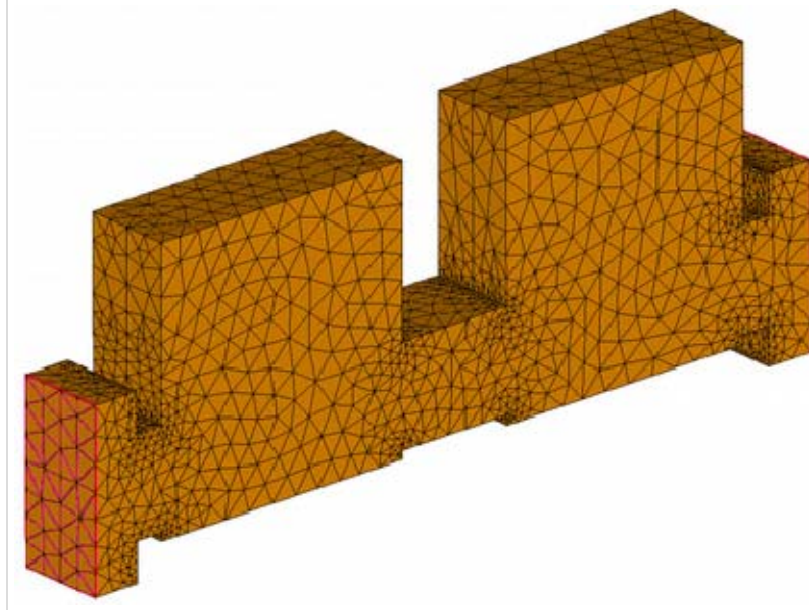
## Ku-Band Waveguide Filter

### **A Ku-band waveguide filter is modeled in FEKO to determine its frequency response**

Waveguide transmission lines are used in communications systems to feed horn or slotted waveguide antennas. A filter is usually required to remove unwanted signal content and realizing a filter in waveguide form is required to integrate it with the rest of the system. A design for a two-resonator waveguide filter for the Ku-band is given in [1]. Here such a filter is modeled in FEKO to determine the filter response.

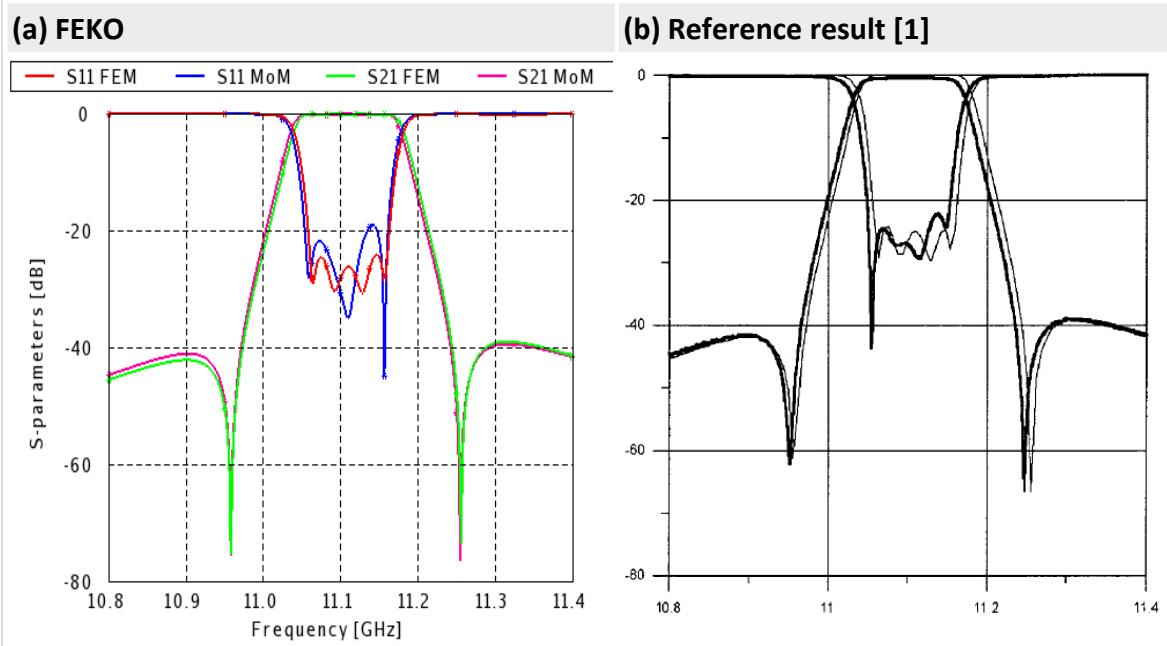
Figure 1 shows the FEKO model for the filter where the FEM modal ports are excited with the fundamental mode. Notice the fine mesh near the corners of the waveguide discontinuities to account for a rapidly varying field in these regions.

**Figure 1: FEKO model of Ku-band waveguide filter**



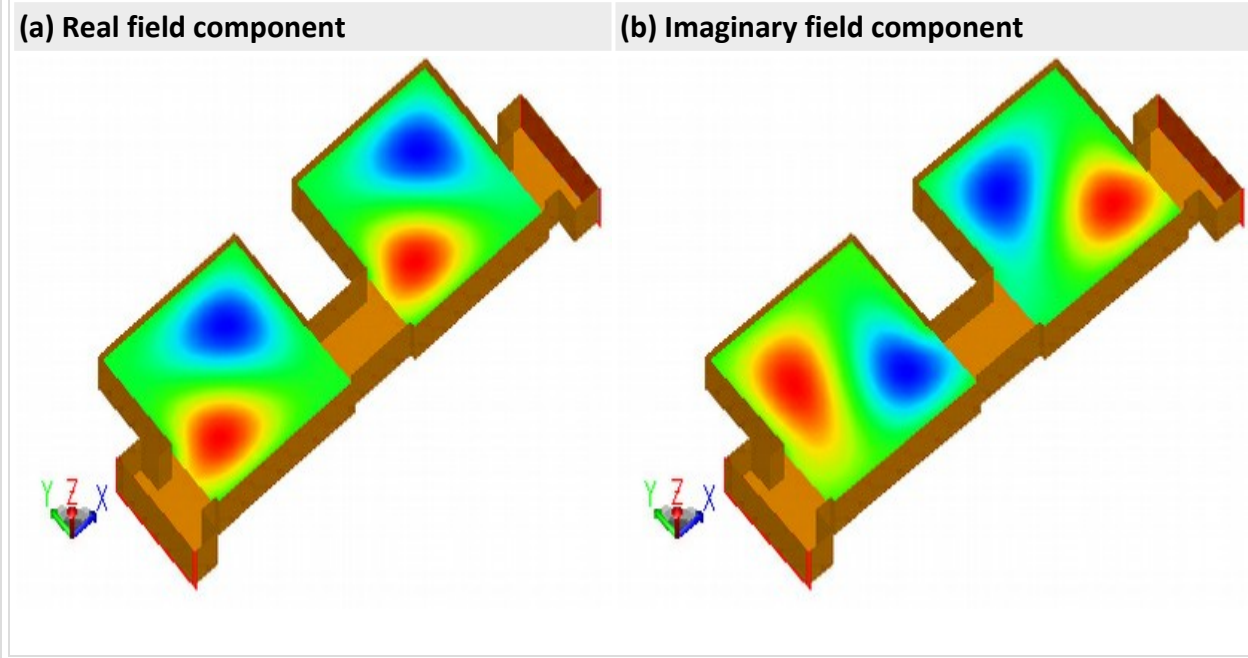
An S-parameter calculation is performed and the results shown in Figure 2. The passband is roughly 11.0 ~ 11.2 GHz with reflections mostly below -20 dB in this band. Also clearly visible are the transmission zeros on either side of the pass band. Because the electric fields inside the structure are mainly y-directed electric symmetry exists in the xz-plane. By exploiting this symmetry computation time and memory requirements are greatly reduced. The frequency response shown in Figure 2 (a) depicts both FEM and MoM solutions to the problem.

**Figure 2: Frequency response of Ku-band waveguide filter**



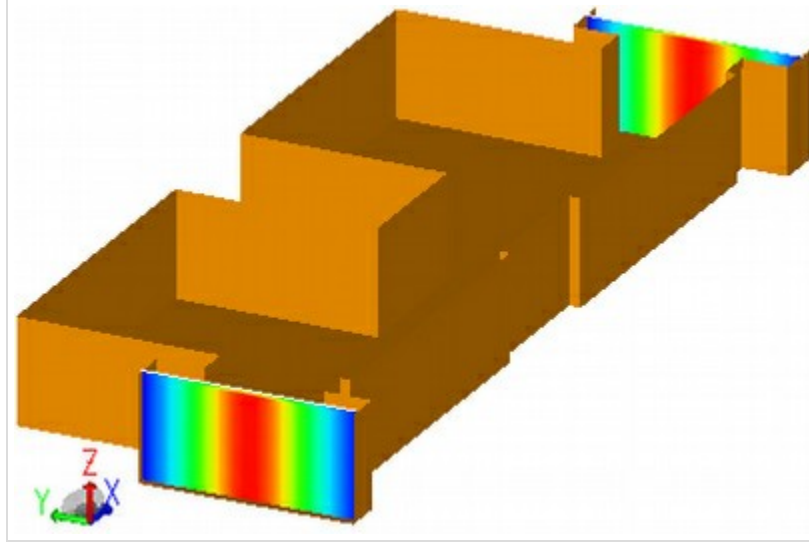
Electric near-fields are calculated in the resonating cavities at 11.1 GHz. A section in the xy-plane through the filter structure shows the  $E_z$  fields in Figure 3. Figure 3(a) shows the real field components and Figure 3(b) shows the imaginary field components.

**Figure 3: Electric near-fields in resonating cavities at 11.1GHz**



Finally the electric field is calculated on the inside of the two ports. Figure 4 shows the magnitude of the  $E_z$  field component when the system is excited with the fundamental propagating mode.

Figure 4: Magnitude of  $E_y$  component near filter ports



## References

- [1] M. Guglielmi, P. Jarry, E. Kerherve, O. Roquebrun, D. Schmitt, "A New Family of All-Inductive Dual-Mode Filter", IEEE Transactions on Microwave Theory and Techniques, Vol. 49, No. 10, Oct. 2001, pp. 1764-1769.



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