Probe-Fed Stacked Annular Ring Antenna

Introduction

This example illustrates how a probe fed stacked annular ring antenna may be simulated in FEKO. The structure has been analysed in [1], which provides reference data for the FEKO results. The basic model and dimensions are presented in Figure 1.

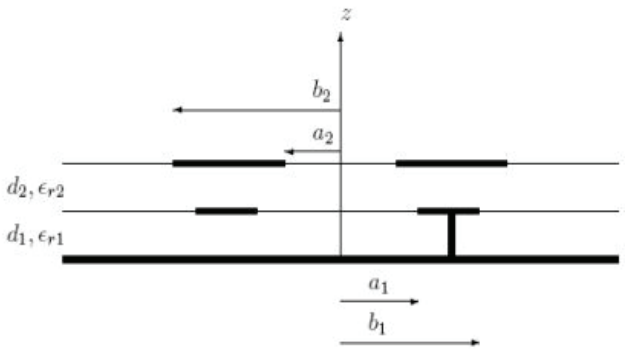
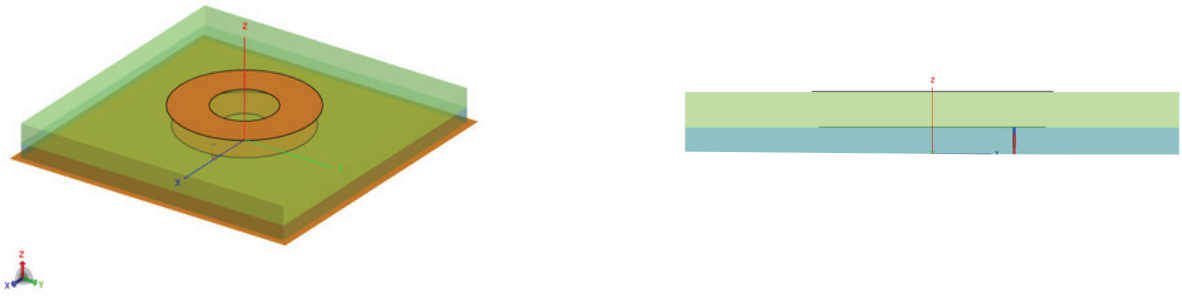


Figure 1: Model of a microstrip patch in a cavity

- $(a_1, b_1, d_1) = (10, 29, 6.096)$ mm.
- $\varepsilon_{r1} = 2.2$, $\tan \delta_1 = 0.001$.
- $(a_2, b_2, d_2) = (14, 31, 8)$ mm.
- $\varepsilon_{r2} = 1.07$, $\tan \delta_2 = 0.001$.
- Feed location: $(x_f, y_f) = (21, 0)$ mm.
- Pin diameter: 0.325 mm.

Dimensions: (patch and cavity centred on origin)

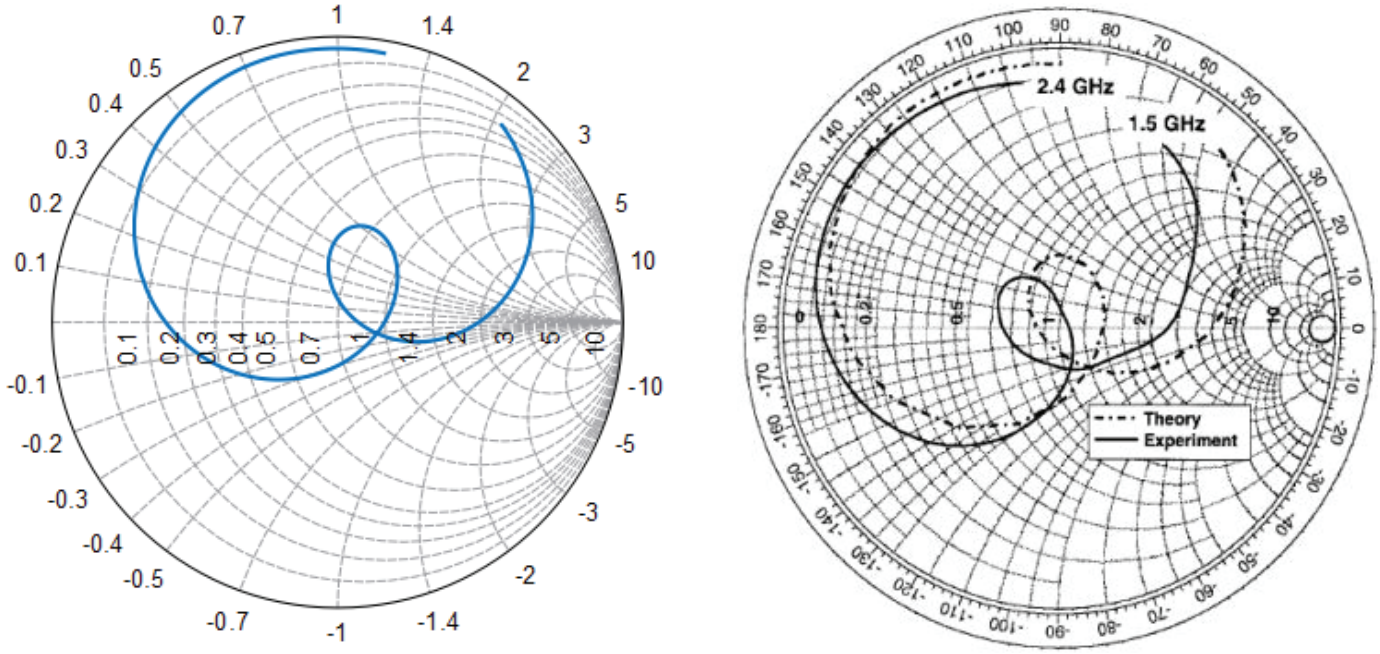
Planar multilayer substrates (also known as special Green's functions) are ideally suited to modeling the dielectric layers as infinite planes. The substrate layers were therefore set with an infinite ground plane at the bottom of the stack. Figure 2 presents the simulated model, with dielectric layers and feed point visible.



(a) 3D View *(b) Side View*

Figure 2: Annular ring antenna using planar multilayer substrates

The model shown in Figure 2 was used to compute the input impedance of the antenna. The computed result is presented in Figure 3 in comparison with the measurements and simulation data of [1]. The FEKO computation compares well with the published data. Note that the simulation results match up well with the theoretical results, indicating that the difference between theoretical and measured data may be due to the measurement setup.



(a) FEKO computation

Figure 3: Input impedance locus: FEKO simulated data in comparison with published data [1] agrees well

References

[1] D. M. Kokotoff, J. T. Aberle, and R. B. Waterhouse, “Rigorous analysis of probe-fed printed annular ring antennas,” IEEE Trans. on Antennas and Propagation, vol. 47, pp. 384–388, Feb. 1999.