Bowtie Antenna

This article illustrates that FEKO can be applied to the simulation of planar antennas with bowtie antennas as an example.

Antenna on a Dielectric Halfspace

The first example is of a bowtie antenna that was simulated by placing the structure on a dielectric halfspace. For the sake of validation against open literature the model is based on an antenna presented in [1] for the analysis of gain vs. angle on incidence on the antenna. Figure 1 shows this antenna with the currents on it simulated at 94 GHz, while Figure 2 shows the comparison between the published data [1] and the result generated with FEKO. The FEKO result is in excellent agreement with the result published by Compton [1].

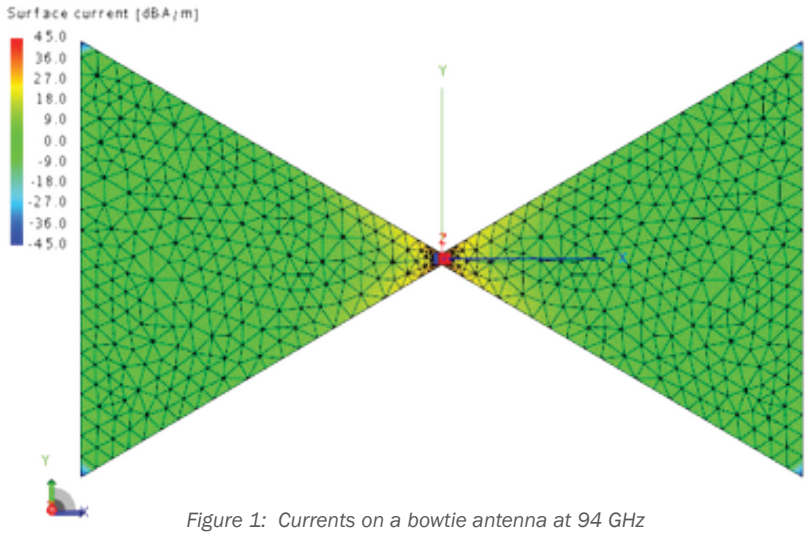

Figure 1: Currents on a bowtie antenna at 94 GHz

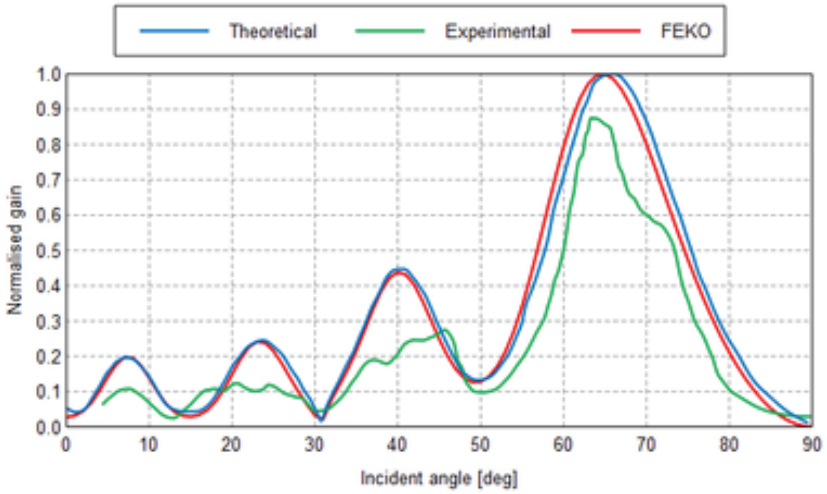

Figure 2: Normalised gain vs incidence for bowtie antenna at 94 GHz

Figure 3 presents an input impedance comparison of a bowtie antenna at 2 GHz, as the length of one half of the bowtie varies from 0.05 λ_0 to 0.5 λ_0. The input impedance is presented on a Smith chart with the length of the half bowtie labeling the plot points. All impedance values were normalised to 152 Ω.

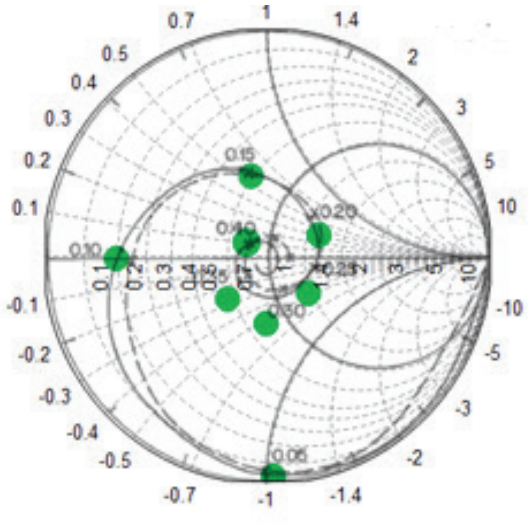

Figure 3: Normalised impedance with varying length for bowtie antenna at 2 GHz

Antenna Raised Above Real Ground

Leat [2] analyzed the same bowtie antenna configuration depicted in Figure 1 as it is raised over a real ground. Figure 4 presents an input impedance comparison as the antenna is raised higher above ground. Agreement is good across the entire frequency range, from 50 MHz to 500 MHz.

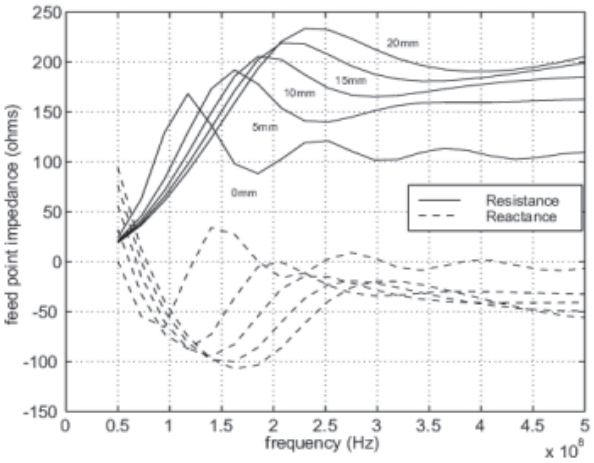

Figure 4: Results computed in FEKO. Input impedance as a function of height above real ground. The FEKO results agree very well with those published in [2]

References

[1] R. C. Compton, R. C. McPhedran, Z. Popovic, G. M. Rebeiz, P. P. Tong, and D. B. Rutledge, "Bow-tie antennas on a dielectric half-space: theory and experiment," IEEE Trans. on Antennas and Propagation, vol. 35, pp. 622–631, June 1987.

[2] C. J. Leat, "Modelling and design of GPR antennas," PhD dissertation, University of Queensland, 1998.