Numerical Studies of a Broadband Antenna Array

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In this talk, we conduct detail studies using numerical methods to understand in depth the performance of a broadband antenna array described in the book by B. Munk (Ben A. Munk, *Finite Antenna Array*, Wiley-Interscience). The array conceptually is an array of dipoles with a ground plane and essentially a single dielectric slab. It has been analyzed by PMM code and the fundamentals of how it works have also been well documented in the above mentioned book. However, some real-life realization of such an array includes tapering in the feed structures and finger capacitors to provide necessary strong couplings between array elements. These real-life modifications, their effects on the array performance are not very well understood yet. Our main objective in conducting this study is not necessary to design a better performance antenna array, but simply to understand in more depth the physics of such a structure.

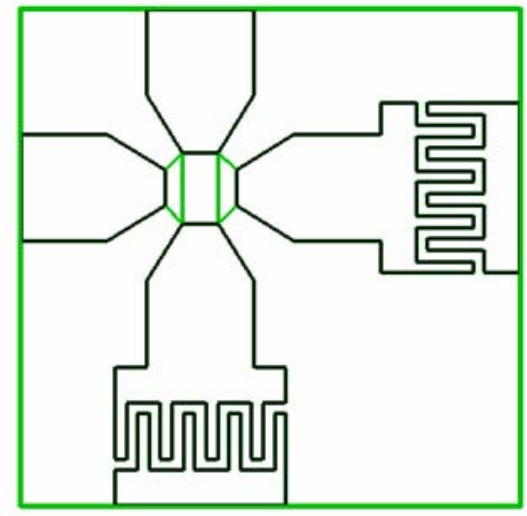

Figure 1: The antenna element for a broadband antenna array.

The antenna element that we study is shown in Figure 1. We shall employ the infinite periodic code first to analyze the antenna array performance as an infinite antenna array. The effects of the base capacitance of the feed structures will be presented and explained in detail. Moreover, the importance of a small matching transmission line will also be examined. To a smaller degree, we shall further study the tuning of the resonant frequencies by changing the dipole width, length and the finger capacitances.

The final performance of the finite antenna array will then be analyzed using a recent developed domain decomposition method by the authors (S. C. Lee*, M. Vouvakis*, and J. F. Lee, *J. Comput. Phys.*, vol. 203, pp. 1-21, Feb. 2005).