Development and Measurement of Ultra-Thin Antennas in the VHF/UHF Band

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This advent of engineered Magnetodielectric materials has made it possible to realize antennas of thicknesses approaching $1/50^{th}$ of a wavelength while maintaining performance. Although electrically thin, such antennas are not classified as electrically small as the cross-sectional dimensions are on the order of $1/4^{th}$ of a wavelength or greater at the lowest frequency of operation. That is, the radius of the smallest sphere enclosing the antenna multiplied by the wavenumber is generally greater than one indicating the antenna is not small from the standpoint of the Chu limit.

This presentation will describe the development of such antennas from the standpoint of simulations and measurement of actual performance. The realization of such antennas is generally comprised of a shallow conductive cavity with Magnetodielectric materials sandwiched between the bottom (ground plane) and the upper planar radiating elements. Using an iterative simulation process, it is possible to realize first-cut designs that approach performance goals relative to commercial products of significantly higher profile.

The presentation concludes with a discussion of the measured performance for all of the antennas studied from the standpoint of their in-situ performance as well as other factors such as the physical protrusion from the side (or top) of the platform. Comparison to commercially available equivalent antennas of higher profile will be given.