Scattering from a cylindrical array antenna coated with a dielectric layer.

*Björn Thors[1], Lars Josefsson[1,2] and Roberto G. Rojas[3]

[1]Royal Institute of Technology, SE-100 44 Stockholm, Sweden, thors@tet.kth.se
[2]Ericsson Microwave Systems AB, SE-431 84 Mölndal, Sweden,
lars.josefsson@emw.ericsson.se
[3]The Ohio State University, Dept. of Electrical Engineering, The ElectroScience Laboratory, Columbus, OH 43212, USA, rojas-teran.1@osu.edu

In this paper the scattering properties of a dielectric coated conformal array antenna are investigated. The array antenna consists of 4×32 rectangular apertures placed in a rectangular grid on the surface of an infinitely long circular cylinder (See Figure 1).

The problem is formulated in terms of an integral equation for the aperture fields which is solved with the method of moments using rectangular waveguide modes both as basis and test functions. An efficient uniform asymptotic technique is used to calculate both the excitation vector and the backscattered far-field. The asymptotic solution is valid for large cylinders, coated with thin dielectric layers, away from the paraxial (*i.e.* near axial) region. A similar asymptotic solution is used to calculate the mutual coupling in the non-paraxial region. For the self coupling terms and for the mutual coupling in the paraxial region a planar approximation is used with a corresponding spectral domain technique. The planar approximation is very accurate for large cylinders coated with thin dielectric layers if the distance between the source and field points is not too large.

Numerical results are presented as a function of frequency, angle of incidence, cylinder radius and electrical thickness of the coating. Of particular interest is how the dielectric coating will affect the backscattered field. The results are verified against an independent numerical technique valid for non-coated arrays. The individual subroutines that calculate the mutual coupling, the excitation vector and the backscattered far field have all been verified against results found in the literature and/or using other numerical techniques.

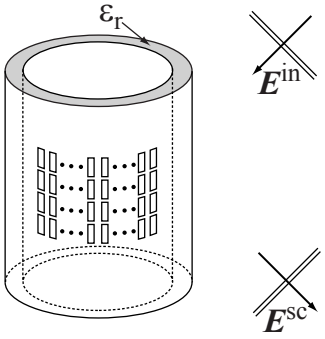

Figure 1: The geometry.