

ANALYTICAL AND NUMERICAL STUDY OF MULTILAYERED
PARABOLOIDAL RADOMES.

Liang, J., Uslenghi, P. L. E.

Department of Electrical and Computer Engineering, University of Illinois at Chicago

A paraboloidal radome made of several layers of materials isorefractive to free space is considered. The primary field is a plane electromagnetic wave axially incident on the convex side of the structure. The analysis is conducted in the frequency domain. This scattering problem is amenable to an exact solution by geometrical optics. Such a solution was recently presented by Liang and Uslenghi (IEEE-APS Intl. Symposium and URSI Meeting, Washington, D.C., July 2005), and is based on an extension of the exact geometrical optics solution for axial scattering by an isorefractive paraboloid previously obtained by Roy and Uslenghi (IEEE Trans. Antennas Propagat., vol. 45, p. 1563, October 1997). For a radome consisting of one or two layers, the solution is obtained explicitly, whereas for multiple layers a chain-matrix algorithm is employed.

The purpose of the present work is to conduct a comparison between the exact solution outlined above and purely numerical approaches to the same problem, based on either the Method of Moments or an FDTD formulation. In numerical approaches, as well as in practice, the extent of the paraboloidal surface of the radome is finite. Therefore, an important result of our comparisons is to establish how far from the nose of the paraboloid (in terms of wavelengths) one has to extend the surface considered in the numerical analysis in order to obtain sufficiently accurate results, both for surface fields (in amplitude and phase) and for far fields, the latter especially for backscattering and for small bistatic angles.

A similar analytical-numerical comparison is performed for a metallic paraboloid coated by layers of different isorefractive materials. This second study is important for the validation of general-purpose codes developed for radar-absorbing materials on curved surfaces.

Abstract Submission Form

2006 National Radio Science Meeting

Abstract: uslenghi3633

Date Received: September 8, 2005

1. (a) Piergiorgio Uslenghi
Dept. of ECE (MC 154)
University of Illinois at Chicago
851 South Morgan Street
Chicago, IL
60607-7053 USA
uslenghi@uic.edu
(b) 312-996-6059
(c) 312-996-8664
2. B - Fields and Waves
3. (a) B/E1
4. C - Contributed Paper, Program chair: D. Erricolo
5. No special instructions