MEASUREMENTS AND THEORETICAL RESULTS FOR THE SCATTERING BY A RIDGE ON A METAL PLANE

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The geometry of the problem is two-dimensional and it consists of an infinite planar boundary separating the perfect electric conducting half space $x < 0$ from the penetrable half space $x > 0$. The quadrant $x > 0$, $y > 0$ is filled with material with dielectric conductivity and magnetic permeability . The quadrant $x > 0$, $y < 0$ is filled with material with dielectric and magnetic parameters ε_1 and μ_1, respectively. The media filling the two quadrant are isorefractive, i.e. $\varepsilon_1\mu_1 = \varepsilon_2\mu_2$. The metal plane $x = 0$ has a ridge represented by a semiellipse whose foci are located along the $y = 0$ axis and symmetrically positioned with respect to $x = 0$. The source is either a plane wave whose direction of propagation is perpendicular to the z axis or a line source parallel to the z axis. The solutions for the fields and induced currents are expressed using series expansions of Mathieu functions, where the unknown modal coefficients are determined by imposing the boundary conditions. Preliminary results for this problem were previously given in the case of E-polarization (D. Erricolo, F. Mioc, P.L.E. Uslenghi, "Exact scattering by a ridge on a metal plane with isorefractive quadrants", Digest of National Radio Science Meeting, p. 141, Salt Lake City, Utah, July 2000).

The new contributions consist in providing 1) analytical and numerical results for the H-polarization case and 2) measurement results when the penetrable media are free space ($\varepsilon_1 = \varepsilon_2 = \varepsilon_0$, $\mu_1 = \mu_2 = \mu_0$). Measurements are carried out for the limiting case of the semiellipse that shrinks to the half-focal segment; hence this geometry corresponds to a strip perpendicular to a perfectly conducting ground. A high-frequency solution to the problem is also obtained for the case of the strip, and compared to both the exact solution and the measurement results. This research is important because it presents exact solutions to a new boundary value problem, thus enriching the list of geometries for known canonical solutions.

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2. B - Fields and Waves
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4. I - Invited Paper, Program chair: Danilo Erricolo
5. Special session on EMI/EMC modeling and validation