Exact Electromagnetic Scattering by a Metal Strip Located Inside a Dihedral Corner Reflector

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A metallic strip is connected to one of the faces of a dihedral corner reflector and is perpendicular to it; it is intersected perpendicularly by the other face of the reflector. A primary plane wave with arbitrary polarization is obliquely incident on this metallic structure, which is surrounded by free space. The scattered field is determined exactly by separation of variables. The analysis is conducted in the phasor domain with a time-dependence factor *exp(jωt)* that is omitted throughout.

The solution of the boundary-value problem is obtained in two steps. First, the two-dimensional solution to the scattering of a plane wave normally incident on the edge of a metal strip that is perpendicular to an infinite metal plane and connected to it (D. Erricolo, F. Mioc, P.L.E. Uslenghi and B. Elnour, "Scattering by a blade on a metallic plane", *Electromagnetics*, vol.26, pp. 57-71, Jan. 2006) is generalized to oblique incidence on the edge, by implementing a well-known technique (J.J. Bowman, T.B.A. Senior and P.L.E. Uslenghi, *Electromagnetic and Acoustic Scattering by Simple Shapes*, chapter 1. Amsterdam: North-Holland, 1969; reprinted by Hemisphere, New York, 1987). Second, the field reflected by the other face of the corner reflector (that is oriented perpendicularly to the edge of the strip) is added to the field obtained in the first step, to yield the exact solution to the problem. The analysis is performed separately for E and H polarizations.

An elliptic-cylinder coordinate system is chosen for the analysis, with the z axis coincident with the straight junction between the strip and a face of the reflector, and the origin of coordinates at the point where the z axis intersects the other face of the reflector. The height of the strip is equal to half the interfocal distance in the coordinate system. All field components are expressed as infinite series of Mathieu functions. Particular attention is given to the surface current densities on the metal structure, and to the far field. The obtained exact solutions are simplified when the height of the strip is either small or large compared to the wavelength.