# Electromagnetic Scattering by a Metallic Quarter-Cylinder Located Inside a Trihedral Metal Reflector

Baker Al-Bahri, Piergiorgio L. E. Uslenghi*
Department of Electrical and Computer Engineering
University of Illinois at Chicago, USA
balbah2@uic.edu , uslenghi@uic.edu

The metallic trihedral reflector consists of three quarter-planes occupying the surfaces (x,y>0, z=0), (y,z>0, x=0) and (x,z>0, y=0) of a rectangular coordinate system (x,y,z). A metallic quarter-cylinder of radius *a* has its axis coincident with the positive z axis. The space inside the octant (x,y,z>0) is filled with a linear, homogeneous and isotropic medium (e.g., air). The primary field is an obliquely incident and arbitrarily polarized plane wave. This boundary-value problem is solved exactly in the phasor domain, with a time-dependent factor *exp(+jωt)* that is omitted throughout.

The solution is implemented in three steps. In the first step, a plane wave incident normally to the axis z of the quarter-cylinder in the absence of the truncating plane z=0 is considered. The solution to this two-dimensional problem is found explicitly in terms of the electric and magnetic fields everywhere by combining the scattering by an infinitely long cylinder with the method of images. In the second step, the solution is extended to the case of oblique incidence of the primary wave by utilizing a technique for going from two-dimensional to three-dimensional scattering and finally, in the third step, the introduction of the truncating plane z=0 is dealt with by again using the method of images. These three steps follow the general procedure developed by Uslenghi (*IEEE Trans. Antennas Propag.*, vol. 63, no. 5, pp. 2228-2236, May 2015).

In particular, exact formulas for the surface electric current density on the structure are given and discussed. The behavior of the fields for electrically large and small radii of the quarter-cylinder is examined in detail.