Exact Scattering for a Metallic Spheroid at the Interface between Anti-Isorefractive Half-Spaces

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Two geometries are considered. In one, a metallic prolate spheroid is located at the interface between two half-spaces, with its major axis perpendicular to the interface. In the other one, a metallic oblate spheroid is located at the interface between two half spaces, with its major axis parallel to the interface.

One of the half-spaces is made of ordinary double positive (DPS) material, with positive dielectric permittivity and magnetic permeability. The other half-space is made of double negative (DNG) metamaterial, with negative dielectric permittivity and negative magnetic permeability. Both half-spaces are anti-isorefractive to each other.

In both cases, the metallic spheroids are illuminated by an electric dipole, which is located along the normal to the interface and passing by the center of spheroids, with the dipole oriented parallel to the normal to the interface. The analytic solution is obtained by expressing the incident wave in terms of series of functions containing spheroidal functions, according to the notation of Flammer (C. Flammer, *Spheroidal Wave Functions*. Stanford, CA, USA: Stanford Univ. Press, 1957). Then, the scattered fields are also expressed in terms of series containing products of unknown coefficients and spheroidal functions. The unknown coefficients are determined by application of the boundary conditions and mode-matching. The analytical solution is expressed in the phasor-domain, where the time dependence $\exp(i\ \omega\ t)$ is assumed and suppressed throughout. Numerical results will be presented.

A related geometry was investigated in (Erricolo, P.L.E. Uslenghi, ”Exact radiation for dipoles on metallic spheroids at the interface between isorefractive half-spaces,” *IEEE Transactions on Antennas and Propagation*, Vol. 53, No. 12, Dec. 2005, pp. 3974-3981).