**Exact scattering for an elliptic metal cylinder at the interface between anti-isorefractive half-spaces**

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The geometry of this two-dimensional problem consists of an elliptic metal cylinder located at the interface between two half-spaces. The major axis of the cross section of the cylinder is either parallel or perpendicular 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.

A plane wave with either TE or TM polarization and arbitrary direction of incidence is assumed to illuminate the structure. The analytic solution is obtained by expressing the incident plane wave in terms of in terms of series of functions containing Mathieu functions (see Erricolo and G. Carluccio, "Algorithm 934: Fortran 90 subroutines to compute Mathieu functions for complex values of the parameter," Association for Computing Machinery Transactions on Mathematical Software, Volume 40 Issue 1, Sept. 2013 and references therein). Then, the scattered fields are also expressed in terms of series containing products of unknown coefficients and Mathieu 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 $e^{(i\omega t)}$ is assumed and suppressed throughout. Numerical results will be presented.

A related geometry was investigated in (Erricolo, P.L.E. Uslenghi, "Exact radiation and scattering for an elliptic metal cylinder at the interface between isorefractive half-spaces," IEEE Transactions on Antennas and Propagation, Vol. 52, No. 9, Sept. 2004 pp. 2214-2225.)