Abstracts

Electromagnetic dyadic Green's functions for multilayered spheroidal structures. I: formulation

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Dyadic Green's functions (DGFs) and their scattering coefficients are formulated in this paper for defining the electromagnetic fields in multilayered spheroidal structures. The principle of scattering superposition is applied, in a similar form of the DGF in an unbounded medium under spheroidal coordinates, the scattering DGFs due to multiple spheroidal interfaces are expanded in terms of the spheroidal vector wave functions. For the lack of general orthogonality of the spheroidal radial and angular functions, the Green's dyadics are expressed in a different way where the coordinate unit vectors are also combined in the construction, as compared with the conventional form of vector wave eigenfunction expansion. The matrix equation systems satisfied by the coupled scattering (i.e., reflection and transmission) coefficients of the DGFs are obtained so that these coefficients can be solved uniquely. The DGFs can be employed to investigate effects of spheroidal radomes used to protect the airborne or satellite antenna systems and of handy phone radiation near the spheroid-shaped human head, and so forth. Numerical calculations about the applications of the formulated multilayered DGFs are presented in part II of this paper.

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