Calculation of electromagnetic scattering by non-spherical particles by means of the generalized metric sources

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Accurate simulation of electromagnetic scattering by non-spherical particles is important for different applications, such as biomedical optical tweezing or lazer induced melting. To widen the capabilities of modern numerical methods used for such simulations, this work aims at developing an idea of introducing volume metric sources. This idea was previously proposed in our group for corrugated grating diffraction simulation and consists of the introduction of a curvilinear coordinate system in a grating region so as to make a curved grating corrugation to become a plane in new coordinates. Owing to such coordinates, the problem of diffraction by the curved corrugation is replaced by a problem of diffraction by an inhomogeneous volume grating near a plane interface. This approach allowed one to dramatically improve the efficiency of metallic structure simulations. The current work focuses on the investigation of ways of application of the mentioned approach in the 3D spherical basis. In this case a complex particle shape is transformed into a sphere inside some bounded spherical shell. The scattering problem for the resulting inhomogeneous volume scatterer can be solved with an integral, differential, or modal formulation related to the well-known invariant imbedding method.

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