ELS-XV-2015 Abstracts
ELS-XV-2015-145-1
Electromagnetic & Light Scattering XV 2015, Leipzig

Unstructured 3D leapfrog Solver for Electromagnetic Modelling and Simulation of Arbitrary Shaped Anisotropic Objects

A. Gansen (1), M. El Hachemi (1), O. Hassan (2), and K. Morgan (2)

(1) Luxembourg Institute of Science and Technology (List), Esch sur Alzette, Luxembourg (alex.gansen@list.lu), (2) Swansea University, College of Engineering, Swansea, Wales, UK

There has been an increasing usage of anisotropic materials in society over the past decade in the design of sub-wavelength antennas and as absorbing coatings for aircraft. A thin anisotropic coating may, for example, significantly change the radar cross section (RCS) signature of an aircraft or ship. Here, we present an efficient method for modelling anisotropic dielectric conducting materials. In our method, we employ the integral formulation of Maxwell's equations for a three dimensional lossy dielectric medium, of permittivity $\overline{\overline{\epsilon}}$, permeability $\overline{\overline{\mu}}$, electric conductivity $\overline{\overline{\sigma}}$ and magnetic conductivity $\overline{\overline{\sigma}}_m$, where all the material parameters are second order tensors. In contrast to the standard Yee algorithm, we use a generalized leap-frog algorithm on unstructured meshes in conjunction with a dual Delaunay-Voronoi conforming mesh generator. Due to the orthogonality of the electric and magnetic field vectors, we choose the Delaunay mesh as primal for storing the electric field projections and its dual Voronoi diagram for storing the magnetic field projections. The successful implementation of this method has been demonstrated by modelling the RCS of an anisotropic coated dielectric lossy sphere. In all the cases, the numerical results are in excellent agreement with available analytical solutions.