Hybrid collocated-staggered and implicit-explicit FDTD techniques for the electromagnetic modeling of complex materials

Arne Van Londersele, Ghent University - Intec - IDLab - imec

The conventional finite-difference time-domain method does not perform well for electromagnetic problems with disparate geometric scales, as both space and time are typically oversampled in most of the computational domain. Part one of this presentation discusses how the combination of a nonuniform spatial discretization together with the local application of hybrid implicit-explicit time integration is able to overcome this limitation in an efficient, stable and accurate way.

Although the staggered Yee grid has many computational advantages, it is often desired to have all electric and magnetic field components defined in the same points in space, e.g. for anistropic media and multiphysics problems. Therefore, part two of this presentation elaborates on the hybridization of staggered and collocated grids to get "the best of both worlds