

“The finite-volume time-domain method for 3-D solutions of Maxwell’s equations in complex geometries: a review”, pp. 136-146

Christophe Fumeaux, Dirk Baumann, Krishnaswamy Sankaran, Klaus Krohne, Rüdiger Vahldieck and Erping Li

Abstract – This paper reviews the recent advances of finite-volume techniques applied to the solutions of Maxwell’s equations, placing emphasis on the microwave engineering perspective. The theoretical foundations, as well as variations of cell centered finite-volume algorithms are described together with the modules necessary for the practical application of the method. The main advantage of finite-volume algorithms is their applicability to unstructured meshes, which provides great geometrical flexibility for modeling complex electromagnetic problems. As a 3-D simulation example, the coupling between two Archimedean spiral antennas is presented, illustrating the outstanding capabilities of the method but also addressing the associated computational costs. Weighing the strengths and drawbacks of the finite volume time-domain method, a summary of its potential is given in the conclusion of the paper.