Abstracts

A Comparison of Numerical Techniques for Modeling Electromagnetic Dispersive Media

A comparison of various time domain numerical techniques to model material dispersion is presented. Methods that model the material dispersion via a convolution integral as well as those that use a differential equation representation are considered. We have shown how the convolution integral arising in the electromagnetic constitutive relation can be approximated by the trapezoidal rule of numerical integration and implemented using a newly derived one-time-step recursion relation. The superiority of the new method, in terms of accuracy and computer resources, over four previously published techniques is demonstrated on the problem of a transient electromagnetic plane wave propagating in a dispersive media. All of the methods considered are easily incorporated into 3-D codes where the requirement for efficiency is very important.

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