Finite difference time domain methods as applied to electromagnetic waveguide problems and numerical stability analysis

Nihit Saigal

Tata Institute of Fundamental Research, Mumbai (India)

Finite difference time domain (FDTD) and related space-grid time domain techniques are direct solution methods for Maxwell's curl equations. These methods employ no potentials. Rather, they are based upon volumetric sampling of the unknown electric field ($\overrightarrow{E}$) and magnetic field ($\overrightarrow{H}$) within and surrounding the structure of interest, and over a period of time. The sampling resolution in time is selected to ensure numerical stability of the algorithm.

In this project, I shall demonstrate the application of FDTD techniques to obtain the numerical solution for the propagation of electromagnetic waves in the waveguide structures. The various issues associated with stability of the solutions will also be described as a part of this project.