Abstracts

Absorbing boundary conditions in the frequency-domain TLM method and their application to planar circuits

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The frequency-domain transmission-line-matrix method is extended to include absorbing boundary conditions. Three different approaches are considered: zero-reflection termination (ZRT), Berenger's perfectly matched layer (PML), and anisotropic PML. The ZRT technique is the simplest one of the three. Its main advantage over the PML techniques is that it requires no additional nodes to model the boundary. However, when placed too close to an area with high field intensity, the ZRT boundary takes out substantial parts of the transmitted power, thus giving results on the "lossy side." The numerical losses can be reduced by moving the boundaries further away from the area of interest. The PML techniques are more difficult to implement and require additional nodes for their modeling. However, they offer more flexibility since the numerical reflections from the PML absorbers can be controlled by using several layers with conductivities gradually increasing with depth. The computer simulations show that Berenger's and anisotropic PMLs give virtually the same results. A detailed investigation regarding the optimal number of layers in the PML absorbers and distances between the absorbing boundaries and the structure under analysis is performed.

❑ Return to main document.