Towards a Stable Two-Dimensional Time-Domain Source-Model Solution by Use of a Combined Source Formulation

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***Abstract*—The application of the source-model technique to the solution of two-dimensional (2-D) transient scattering problems directly in the time domain is described. Special attention is given to the accuracy and the stability of the numerical solution scheme. A detailed comparison is made between the more often used single-type-source solution scheme and a newly proposed combined-source solution scheme. It is found that the combined-source scheme can offer a significant advantage in terms of stability, without any appreciable loss in accuracy, over the single-type-source scheme.**

***Index Terms*—Electromagnetic transient scattering, integral equations, numerical stability, time-domain analysis.**

function [14], [15]. However, simply increasing the spatial discretization mesh or the temporal discretization resolution for a given scheme does not guarantee improved stability, and in many cases may even acts to destabilize the scheme. In recent years, a considerable effort has been devoted to rigorously analyze the stability of different schemes by means of Fourier stability analysis methods [16], [17]. Due to their complexity, these methods are often used to analyze simplified schemes for which they can give an exact prediction of stability and help in the development of reliable techniques to improve the stability. Other techniques to rectify the instability problem are based on a few common observations that were made throughout