Abstracts

Equivalent Circuits for Multiconductor Microstrip Bend Discontinuities

P.H. Harms and R. Mittra. "Equivalent Circuits for Multiconductor Microstrip Bend Discontinuities." 1993 Transactions on Microwave Theory and Techniques 41.1 (Jan. 1993 [T-MTT]): 62-69.

With the increasing density of digital circuit layouts and faster pulse edges, microstrip discontinuities, e.g., bends, that were previously considered insignificant have now been shown to introduce noticeable signal degradation for short risetime pulses. In this paper, the T-equivalent circuit previously used for single-line microstrip bends is extended to the variable-angle, multiconductor microstrip bend. A brief overview is given of the excess-charge and current approaches which are employed to obtain the capacitance and inductance matrices for the equivalent circuit. These techniques effectively avoid the majority of numerical difficulties that occur in accounting for the infinite extent of the microstrip lines making up bends with arbitrary bend angles. In addition, to accurately accommodate the oblique bend angles without requiring many unknowns, the charge and current distributions are modeled with a combination of rectangular and triangular patches. Comparisons with previously published results from the technical literature and with experimental data are used to validate the excess capacitance and inductance computations. The excess capacitance and inductance matrices of several three-line bends are presented, and the three-line bend model is used in a simulation of a high-speed digital circuit to demonstrate the effect of the bend on digital pulse waveforms.

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