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CONTENTS; I. INTRODUCTION TO TRANSMISSION LINES AND THEIR APPLICATION TO ELECTROMAGNETIC PHENOMENA; 1.1 Simple Experimental Example; 1.2 Examples of Impulse Sources; 1.3 Model Outline; 1.4 Application of Model for Small Node Resistance; 1.5 Transmission Line Theory Background; 1.6 Initial Conditions of Special Interest; One Dimensional TLM Analysis. Comparison with Finite Difference Method; 1.7 TLM Iteration Method; 1.8 Reverse TLM Iteration; 1.9 Example of Reverse Iteration for Non-Uniform Line; 1.10 Derivation of Scattering Coefficients for Reverse Iteration 1.11 Complete TLM Iteration (Combining Forward and Reverse Iterations) 1.12 Finite Difference Method . Comparison with TLM Method; Two Dimensional TLM Analysis. Comparison with Finite Difference Method; 1.13 Boundary Conditions at 2D Node; 1.14 Static Behavior About 2D Node; 1.15 Non-Static Example: Wave Incident on 2D Node; 1.16 Integral Rotational Properties of Field About the Node; 1.17 2D TLM Iteration Method for Nine Cell Core Matrix; 1.18 2D Finite Difference Method . Comparison With TLM Method; Appendices; 1A.1 Effect of Additional Paths on Weighing Process 1A.2 Novel Applications of TLM Method: Description of Neurological Activity Using the TLM Method II. NOTATION AND MAPPING OF PHYSICAL PROPERTIES; 2.1 1D Cell Notation and Mapping of Conductivity and Field; 2.2 Neighboring 1D Cells With Unequal Impedance; 2.3 2D Cell Notation. Mapping of Conductivity and Field; 2.4 3D Cell Notation. Mapping of Conductivity and Field; Other Node Controlled Properties; 2.5 Node Control of 2D Scattering Coefficients Due to Finite Node Resistance; 2.6 Simultaneous Conductivity Contributions; 2.7 Signal Gain; 2.8 Signal Generation. Use of Node Coupling 2.9 Mode Conversion Example of Mapping: Node Resistance in a Photoconductive Semiconductor; 2.10 Semiconductor Switch Geometry (2D); 2.11 Node Resistance Profile in Semiconductor; III. SCATTERING EQUATIONS; 3.1 1D Scattering Equations; 3.2 2D Scattering Equations; 3.3 Effect of Symmetry on Scattering Coefficients; 3.4 3D Scattering Equations: Coplanar Scattering; General Scattering, Including Scattering Normal to Propagation Plane; 3.5 Equivalent TLM Circuit. Quasi-Coupling Effect; 3.6 Neglect of Quasi-Coupling; 3.7 Simple Quasi-Coupling Circuit: First Order Approximation 3.8 Correction to Quasi-Coupling Circuit: Second Order Approximation 3.9 Calculation of Load Impedance with Quasi-Coupling; 3.10 Small Coupling Approximation of Second Order Quasi-Coupling; 3.11 General 3D Scattering Process Using Cell Notation.; 3.12 Complete Iterative Equations; 3.13 Contribution of Electric and Magnetic Fields to Total Energy; Plane Wave Behavior; 3.14 Response of 2D Cell Matrix to Input Plane Wave; 3.15 Response of 2D Cell Matrix to Input Waves With Arbitrary Amplitudes; 3.16 Response of 3D Cell Matrix to Input Plane Wave 3.17 Response of 3D Cell Matrix to Input Waves With Arbitrary Amplitudes

Problems in electromagnetic propagation, especially those with complex geometries, have traditionally been solved using numerical methods, such as the method of finite differences. Unfortunately the mathematical methods suffer from a lack of physical appeal. The researcher or designer often loses sight of the physics underlying the problem, and changes in the mathematical formulation are often not identifiable with any physical change. This book employs a relatively new method for solving electromagnetic problems, one which makes use of a transmission line matrix (TLM). The propagation space i

