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4. Ideal Models vs Real-World Systems -- Introduction -- 4.1 Ideal Transmission Lines -- 4.2 Ideal Model Transmission Line Input and Output -- 4.3 Real-World Transmission Lines -- 4.4 Effects of Surface Roughness -- 4.5 Effects of the Propagating Material -- 4.6 Effects of Grain Boundaries -- 4.7 Effects of Permeability -- 4.8 Effects of Board Complexity -- 4.9 Final Conclusions for an Ideal versus a Real-World Transmission Line -- Endnotes -- 5. Complex Permittivity of Propagating Media -- Introduction -- 5.1 Basic Mechanisms of the Propagating Material -- 5.2 Permittivity of Permanent Polar Molecules -- 5.3 Induced Dipole Moments -- 5.4 Induced Dipole Response Function, $G(\omega)$ -- 5.5 Frequency Character of the Permittivity -- 5.6 Kramers-Kronig Relations for Induced Moments -- 5.7 Arbitrary Time Stimulus. 5.8 Conduction Electron Permittivity -- 5.9 Conductivity Response Function -- 5.10 Permittivity of Plasma Oscillations -- 5.11 Permittivity Summary -- 5.12 Empirical Permittivity -- 5.13 Theory Applied to Empirical Permittivity -- 5.14 Dispersion of a Signal Propagating through a Medium with Complex Permittivity -- Endnotes -- 6. Surface Roughness -- Introduction -- 6.1 Snowball Model for Surface Roughness -- 6.2 Perfect Electric Conductors in Static Fields -- 6.3 Spherical Conductors in Time-Varying Fields -- 6.4 The Far-Field Region -- 6.5 Electrodynamics in Good Conducting Spheres -- 6.6 Spherical Coordinate Analysis -- 6.7 Vector Helmholtz Equation Solutions -- 6.8 Multipole Moment Analysis -- 6.9 Scattering of Electromagnetic Waves -- 6.10 Power Scattered and Absorbed by Good Conducting Spheres -- 6.11 Applications of Fundamental Scattering -- Endnotes -- 7. Advanced Signal Integrity -- Introduction -- 7.1 Induced Surface Charges and Currents -- 7.2 Reduced Magnetic Dipole Moment Due to Field Penetration -- 7.3 Influence of a Surface Alloy Distribution -- 7.4 Screening of Neighboring Snowballs and Form Factors -- 7.5 Pulse Phase Delay and Signal Dispersion -- Chapter Conclusions -- Endnotes -- 8. Signal Integrity Simulations -- Introduction -- 8.1 Definition of Terms and Techniques -- 8.2 Circuit Simulation -- 8.3 Transient SPICE Simulation -- 8.4 Emerging SPICE Simulation Methods -- 8.5 Fast Convolution Analysis -- 8.6 Quasi-Static Field Solvers -- 8.7 Full-Wave 3-D FEM Field Solvers -- 8.8 Conclusions -- Endnotes -- Bibliography -- Index.

Sommario/riassunto

The first book to focus on the electromagnetic basis of signal integrity The Foundations of Signal Integrity is the first of its kind-a reference that examines the physical foundation of system integrity based on electromagnetic theory derived from Maxwell's Equations. Drawing upon the cutting-edge research of Professor Paul Huray's team of industrial engineers and graduate students, it develops the physical theory of wave propagation using methods of solid state and high-energy physics, mathematics, chemistry, and electrical engineering before addressing its application
