

1. Record Nr.	UNINA9910813795003321
Autore	Ruehli A. E (Albert E.), <1937->
Titolo	The partial element equivalent circuit method for electro-magnetic and circuit problems : a paradigm for EM modeling // Albert E. Ruehli, Giulio Antonini, Lijun Jiang
Pubbl/distr/stampa	Hoboken, New Jersey : , : John Wiley & Sons, , 2016 [Piscataway, New Jersey] : , : IEEE Xplore, , [2017]
ISBN	1-119-07840-7 1-119-07839-3 1-119-07838-5
Descrizione fisica	1 online resource (436 pages)
Collana	Wiley - IEEE
Disciplina	621.301/51
Soggetti	Electric circuits - Mathematical models Electromagnetism - Mathematical models
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	-- DEDICATION xv -- PREFACE xvii -- ACKNOWLEDGEMENTS xxi -- ACRONYMS xxv -- 1 Introduction 1 -- References, 6 -- 2 Circuit Analysis for PEEC Methods 9 -- 2.1 Circuit Analysis Techniques, 9 -- 2.2 Overall Electromagnetic and Circuit Solver Structure, 9 -- 2.3 Circuit Laws, 11 -- 2.4 Frequency and Time Domain Analyses, 13 -- 2.5 Frequency Domain Analysis Formulation, 14 -- 2.6 Time Domain Analysis Formulations, 17 -- 2.7 General Modified Nodal Analysis (MNA), 22 -- 2.8 Including Frequency Dependent Models in Time Domain Solution, 28 -- 2.9 Including Frequency Domain Models in Circuit Solution, 31 -- 2.10 Recursive Convolution Solution, 39 -- 2.11 Circuit Models with Delays or Retardation, 41 -- Problems, 43 -- References, 44 -- 3 Maxwell's Equations 47 -- 3.1 Maxwell's Equations for PEEC Solutions, 47 -- 3.2 Auxiliary Potentials, 52 -- 3.3 Wave Equations and Their Solutions, 54 -- 3.4 Green's Function, 58 -- 3.5 Equivalence Principles, 60 -- 3.6 Numerical Solution of Integral Equations, 63 -- Problems, 65 -- References, 66 -- 4 Capacitance Computations 67 -- 4.1 Multiconductor Capacitance Concepts, 68 -- 4.2 Capacitance Models, 69 -- 4.3 Solution Techniques for Capacitance

Problems, 74 -- 4.4 Meshing Related Accuracy Problems for PEEC Model, 79 -- 4.5 Representation of Capacitive Currents for PEEC Models, 82 -- Problems, 85 -- References, 86 -- 5 Inductance Computations 89 -- 5.1 Loop Inductance Computations, 90 -- 5.2 Inductance Computation Using a Solution or a Circuit Solver, 95 -- 5.3 Flux Loops for Partial Inductance, 95 -- 5.4 Inductances of Incomplete Structures, 96 -- 5.5 Computation of Partial Inductances, 99 -- 5.6 General Inductance Computations Using Partial Inductances and Open Loop Inductance, 107 -- 5.7 Difference Cell Pair Inductance Models, 109 -- 5.8 Partial Inductances with Frequency Domain Retardation, 119 -- Retardation, 123 -- Problems, 125 -- References, 131 -- 6 Building PEEC Models 133 -- 6.1 Resistive Circuit Elements for Manhattan-Type Geometries, 134.
6.2 Inductance / Resistance (L_p, R) PEEC Models, 136 -- 6.3 General (L_p, p, R) PEEC Model Development, 138 -- 6.4 Complete PEEC Model with Input and Output Connections, 148 -- 6.5 Time Domain Representation, 154 -- Problems, 154 -- References, 155 -- 7 Nonorthogonal PEEC Models 157 -- 7.1 Representation of Nonorthogonal Shapes, 158 -- 7.2 Specification of Nonorthogonal Partial Elements, 163 -- 7.3 Evaluation of Partial Elements for Nonorthogonal PEEC Circuits, 169 -- Problems, 181 -- References, 182 -- 8 Geometrical Description and Meshing 185 -- 8.1 General Aspects of PEEC Model Meshing Requirements, 186 -- 8.2 Outline of Some Meshing Techniques Available Today, 187 -- 8.3 SPICE Type Geometry Description, 194 -- 8.4 Detailed Properties of Meshing Algorithms, 196 -- 8.5 Automatic Generation of Geometrical Objects, 202 -- 8.6 Meshing of Some Three Dimensional Pre-determined Shapes, 205 -- 8.7 Approximations with Simplified Meshes, 207 -- 8.8 Mesh Generation Codes, 208 -- Problems, 209 -- References, 210 -- 9 Skin Effect Modeling 213 -- 9.1 Transmission Line Based Models, 214 -- 9.2 One Dimensional Current Flow Techniques, 215 -- 9.3 3D Volume Filament (VFI) Skin-Effect Model, 227 -- 9.4 Comparisons of Different Skin-Effect Models, 238 -- Problems, 244 -- References, 246 -- 10 PEEC Models for Dielectrics 249 -- 10.1 Electrical Models for Dielectric Materials, 249 -- 10.2 Circuit Oriented Models for Dispersive Dielectrics, 254 -- 10.3 Multi-Pole Debye Model, 257 -- 10.4 Including Dielectric Models in PEEC Solutions, 260 -- 10.5 Example for Impact of Dielectric Properties in the Time Domain, 276 -- Problems, 281 -- References, 281 -- 11 PEEC Models for Magnetic Material 285 -- 11.1 Inclusion of Problems with Magnetic Materials, 285 -- 11.2 Model for Magnetic Bodies by Using a Magnetic Scalar Potential and Magnetic Charge Formulation, 292 -- 11.3 PEEC Formulation Including Magnetic Bodies, 295 -- 11.4 Surface Models for Magnetic and Dielectric Material Solutions in PEEC, 300.
Problems, 307 -- References, 308 -- 12 Incident and Radiated Field Models 309 -- 12.1 External Incident Field Applied to PEEC Model, 310 -- 12.2 Far-Field Radiation Models by Using Sensors, 312 -- 12.3 Direct Far-Field Radiation Computation, 318 -- Problems, 322 -- References, 322 -- 13 Stability and Passivity of PEEC Models 325 -- 13.1 Fundamental Stability and Passivity Concepts, 327 -- 13.2 Analysis of Properties of PEEC Circuits, 332 -- 13.3 Observability and Controllability of PEEC Circuits, 334 -- 13.4 Passivity Assessment of Solution, 337 -- 13.5 Solver Based Stability and Passivity Enhancement Techniques, 342 -- 13.6 Time Domain Solver Issues for Stability and Passivity, 359 -- Acknowledgment, 364 -- Problems, 364 -- References, 365 -- A Table of Units 369 -- A.1 Collection of Variables and Constants for Different Applications, 369 -- B Modified Nodal Analysis Stamps 373 -- B.1 Modified Nodal Analysis Matrix Stamps,

373 -- B.2 Controlled Source Stamps, 380 -- References, 382 -- C
Computation of Partial Inductances 383 -- C.1 Partial Inductance
Formulas for Orthogonal Geometries, 385 -- C.2 Partial inductance
formulas for nonorthogonal geometries, 398 -- References, 407 -- D
Computation of Partial Coefficients of Potential 409 -- D.1 Partial
Potential Coefficients for Orthogonal Geometries, 410 -- D.2 Partial
Potential Coefficient Formulas for Nonorthogonal Geometries, 418 --
References, 421 -- E Auxiliary Techniques for Partial Element
Computations 423 -- E.1 Multi-function Partial Element Integration,
423 -- Subdivisions for Nonself-Partial Elements, 428 -- References,
429 -- INDEX 431.

Sommario/riassunto

This book provides intuitive solutions to electromagnetic problems by using the Partial Element Equivalent Circuit (PEEC) method. This book begins with an introduction to circuit analysis techniques, laws, and frequency and time domain analyses. The authors also treat Maxwell's equations, capacitance computations, and inductance computations through the lens of the PEEC method. Next, readers learn to build PEEC models in various forms: equivalent circuit models, non-orthogonal PEEC models, skin-effect models, PEEC models for dielectrics, incident and radiate field models, and scattering PEEC models. The book concludes by considering issues like such as stability and passivity, and includes five appendices some with formulas for partial elements. . Leads readers to the solution of a multitude of practical problems in the areas of signal and power integrity and electromagnetic interference. Contains fundamentals, applications, and examples of the PEEC method. Includes detailed mathematical derivations Circuit-Oriented Electromagnetic Modeling Using the PEEC Techniques is a reference for students, researchers, and developers who work on the physical layer modeling of IC interconnects and packaging, PCBs, and high-speed links.
