

1. Record Nr.	UNINA9910792713403321
Autore	Mikki Said M.
Titolo	New foundations for applied electromagnetics : the spatial structure of fields / / Said Mikki, Yahia Antar
Pubbl/distr/stampa	Boston : , : Artech House, , [2016] [Piscataway, New Jersey] : , : IEEE Xplore, , [2016]
ISBN	1-63081-368-0
Descrizione fisica	1 online resource (588 pages) : illustrations (some color), charts
Collana	Antennas and electromagnetics analysis library
Disciplina	537
Soggetti	Electromagnetism
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	New Foundations for Applied Electromagnetics: The Spatial Structure of Fields; Contents; Chapter 1 General Outline and Scope of the Book; 1.1 MOTIVATION; 1.2 THE PRESENT STAGE OF ELECTROMAGNETIC SCIENCE; 1.3 FROM STRUCTURES IN SPACE TO SPACE STRUCTURES; 1.4 THE RELEVANCE OF SPATIAL STRUCTURES TO THE PRESENT TECHNOLOGICAL WORLD; 1.5 THE STRUCTURE OF THE BOOK; 1.5.1 Part I: The Theory of Near Fields; 1.5.2 Part II: The Antenna Current Green's Function; 1.5.3 Part III: Nonlocal Metamaterials; 1.5.4 Part IV: Various Application; Part I: The Theory of Electromagnetic Near Fields. Chapter 2 Reactive Energy and the Near Field 2.1 INTRODUCTION; 2.2 ELECTROMAGNETIC ENERGY IN ANTENNA THEORY; 2.3 ON REACTIVE ENERGY; 2.3.1 Introduction; 2.3.2 Background to the Concept of Reactive Energy; 2.3.3 A Generalized Approach to Reactive Energy; 2.3.4 The Limits of the Reactive Energy Concept and the Need to Move Beyond; 2.4 REMARKS ON STORED ENERGY; 2.5 BEYOND REACTIVE ENERGY; 2.6 RELEVANCE OF A FUNDAMENTAL UNDERSTANDING OF ELECTROMAGNETIC ENERGY TO OTHER MAINSTREAM RESEARCH DIRECTIONS; 2.7 CONCLUSION; Chapter 3 The Spatial Theory of Electromagnetic Fields; 3.1 INTRODUCTION. 3.1.1 Motivations for the Search for a Theory of Antenna Near Fields 3.1.2 Philosophy of the New Theoretical Program; 3.1.3 Overview of the Chapter; 3.2 GENERAL CONSIDERATION FOR ENERGETICS AND POWER FLOW IN ANTENNA SYSTEMS; 3.3 THE STRUCTURE OF THE ANTENNA

NEAR FIELD IN THE SPATIAL DOMAIN; 3.4 DIRECT CONSTRUCTION OF THE ANTENNA NEAR-FIELD STARTING FROM A GIVEN FAR-FIELD RADIATION PATTERN; 3.4.1 Introduction; 3.4.2 Mathematical Description of the Far-Field Radiation Pattern and the Concomitant Near-Field; 3.4.3 Derivation of the Exterior Domain Near-Field from the Far-Field Radiation Pattern. 3.4.4 General Remarks 3.5 A PHENOMENOLOGICAL EXAMINATION OF THE SPATIAL DISTRIBUTION OF ELECTROMAGNETIC ENERGY IN THE ANTENNA EXTERIOR REGION; 3.5.1 Introduction; 3.5.2 Self-Interaction of the Outermost Region (Far Zone, Radiation Density); 3.5.3 Self-Interactions of the Inner Regions; 3.5.4 Mutual Interaction Between the Outermost Region and The Inner Regions; 3.5.5 Mutual Interaction Between Different Inner Regions; 3.5.6 Summary and Conclusion; 3.6 THE CONCEPT OF REACTIVE ENERGY: THE CIRCUIT POINT OF VIEW OF ANTENNA SYSTEMS; 3.6.1 Introduction. 3.6.2 Construction of the Reactive Energy Densities 3.6.3 Remarks and General Discussion; 3.6.4 Additional Remarks; 3.6.5 Ambiguity of the Concept of Reactive Field Energy; 3.6.6 Critical Reexamination of the Near-Field Shell; 3.7 CONCLUSION; 3.8 APPENDICES AND SUPPLEMENTARY MATERIALS; 3.8.1 On the Uniform Convergence of the Energy Series using Wilcox Expansion; 3.8.2 Computation of the Functions $g_{4n, n}(l, m)$, $g_{5n, n}(l, m)$, and $g_{6n, n}(l, m)$; 3.8.3 On Rearrangement of the Y_{lm}/r^n Terms in the Multipole Expansion; 3.8.4 On Rearrangement of the $1/r^n$ Terms in the Multipole Expansion.

Sommario/riassunto

This comprehensive new resource focuses on applied electromagnetics and takes readers beyond the conventional theory with the use of contemporary mathematics to improve the practical use of electromagnetics in emerging areas of field communications, wireless power transfer, metamaterials, MIMO and direction-of-arrival systems. The book explores the existing and novel theories and principles of electromagnetics in order to help engineers analyze and design devices for today's applications in wireless power transfers, NFC, and metamaterials. This book is organized into clear and logical sections spanning from fundamental theory, to applications, promoting clear understanding through-out. This resource presents the theory of electromagnetic near fields including chapters on reactive energy, spatial and spectral theory, the scalar antenna, and the morphogenesis of electromagnetic radiation in the near field zone. The Antenna Current Green's Function Formalism is explored with an emphasis on the foundations, the organic interrelationships between the fundamental operational modes of general antenna systems, and the spectral approach to antenna-to-antenna interactions. The book offers perspective on nonlocal metamaterials, including the material response theory, the far-field theory, and the near-field theory.