1. Record Nr. UNINA9910337874803321

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Titolo	Electromagnetic and Optical Pulse Propagation : Volume 1: Spectral Representations in Temporally Dispersive Media / / by Kurt E. Oughstun
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2019
ISBN	3-030-20835-4
Edizione	[2nd ed. 2019.]
Descrizione fisica	1 online resource (XXVI, 737 p. 150 illus., 45 illus. in color.)
Collana	Springer Series in Optical Sciences, , 0342-4111 ; ; 224
Disciplina	535.2 537.6 530.141
Soggetti	Optics Electrodynamics Microwaves Optical engineering Lasers Photonics Atoms Physics Classical Electrodynamics Microwaves, RF and Optical Engineering Optics, Lasers, Photonics, Optical Devices Atoms and Molecules in Strong Fields, Laser Matter Interaction Mathematical Methods in Physics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Preface to the Revised Second Edition -- Preface -- Chapter 1 Introduction -- Chapter 2 Microscopic Electromagnetics -- Chapter 3 Microscopic Potentials & Radiation -- Chapter 4 Macroscopic Electromagnetics -- Chapter 5 Fundamental Field Equations in a Temporally Dispersive Medium -- Chapter 6 Plane Wave Reflection and Refraction -- Chapter 7 The Angular Spectrum Representation of the

Pulsed Radiation Field -- Chapter 8 The Angular Spectrum Representation of Pulsed Electromagnetic and Optical Beam Fields in Temporally Dispersive Media -- 9 Free Fields in Temporally Dispersive Media -- Appendix A The Dirac Delta Function -- Appendix B Helmholtz' Theorem -- Appendix C The Effective Local Field -- Appendix D Magnetic Field Contribution to the Lorentz Model of Resonance Polarization -- Appendix E The Fourier-Laplace Transform -- Appendix F Reversible & Irreversible, Recoverable & Irrecoverable Electrodynamic Processes in Dispersive Dielectrics -- Appendix G Stationary Phase Approximations of the Angular Spectrum Representation -- Appendix H The Radon Transform -- Index.

Sommario/riassunto

In two volumes, this book presents a detailed, systematic treatment of electromagnetics with application to the propagation of transient electromagnetic fields (including ultrawideband signals and ultrashort pulses) in dispersive absorptive media. This expanded, updated, and reorganized new edition presents a rigorous development of both time- and frequency-domain electromagnetics, from classical theory to current topics in applied research on temporally pulsed wave fields in dielectric, conducting, and semiconducting materials. With meaningful exercises throughout, it is suitable as a graduate textbook in electromagnetic wave theory and will be of use to researchers as a resource on electromagnetic radiation and wave propagation theory with applications to radar, imaging, communications, and safety issues. Volume 1 develops the fundamental Maxwell-Lorentz theory of microscopic electromagnetics and its relationship to macroscopic electromagnetics in complex media with particular emphasis given to temporally dispersive materials, supplemented with several appendices on mathematical methods. The second edition includes new material on conjugate electromagnetic fields, time-reversal invariance, the four-potential and Lorentz invariance, anisotropic and spatially dispersive media, double-negative metamaterials, and generalized Fresnel reflection and refraction coefficients for complex media. The relationship between both the mathematical and physical interpretation of classical electromagnetic field theory with the special theory of relativity is emphasized throughout the volume. Volume 2 covers temporal pulse dynamics in dispersive attenuative media, with asymptotic analysis at the forefront.