



Electromagnetic and Optical Pulse Propagation 2: Temporal Pulse Dynamics in Dispersive, Attenuative Media (Springer Series in Optical Sciences)

Kurt Oughstun

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Electromagnetic & Optical Pulse Propagation presents a detailed, systematic treatment of the time-domain electromagnetics with application to the propagation of transient electromagnetic fields (including ultrawideband signals and ultrashort pulses) in homogeneous, isotropic media which exhibit both temporal frequency dispersion and attenuation. The development is mathematically rigorous with strict adherence to the fundamental physical principle of causality. Approximation methods are based upon mathematically well-defined asymptotic techniques that are based upon the saddle point method. A detailed description is given of the asymptotic expansions used. Meaningful exercises are given throughout the text to help the reader's understanding of the material, making the book a useful graduate level text in electromagnetic wave theory for both physics, electrical engineering and materials science programs. Both students and researchers alike will obtain a better understanding of time domain electromagnetics as it applies to electromagnetic radiation and wave propagation theory with applications to ground and foliage penetrating radar, medical imaging, communications, and the health and safety issues associated with ultrawideband pulsed fields.

Volume 2 presents a detailed asymptotic description of plane wave pulse propagation in dielectric, conducting, and semiconducting materials as described by the classical Lorentz model of dielectric resonance, the Rocard-Powles-Debys model of orientational polarization, and the Drude model of metals. The rigorous description of the signal velocity of a pulse in a dispersive material is presented in connection with the question of superluminal pulse propagation.

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