

1. Record Nr.	UNINA9910796811803321
Autore	Koshelev V. I. (Vladimir I.)
Titolo	Ultrawideband Short-Pulse Radio Systems
Pubbl/distr/stampa	Boston, Massachusetts : , : Artech House, , 2017 [Piscataqay, New Jersey] : , : IEEE Xplore, , [2017]
ISBN	1-5231-1768-0 1-63081-443-1
Descrizione fisica	1 online resource (xi, 432 pages) : illustrations
Collana	Artech House antennas and electromagnetics analysis library
Disciplina	621.3841/35
Soggetti	Ultra-wideband antennas
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Machine generated contents note: ch. 1 Introduction to Ultrawideband, Short-pulse Radio Systems -- 1.1. History of the Development of Ultrawideband Radio Systems -- 1.2. Ultrawideband radar -- 1.2.1. Detection of Radar Objects -- 1.2.2. Recognition of Radar Objects -- 1.3. Ultrawideband Communication Systems -- 1.3.1. Single-band Ultrawideband Communications -- 1.3.2. Multiband Ultrawideband Communications -- 1.3.3. Ultrawideband Direct Chaotic Communications -- 1.4. Susceptibility of Electronic Systems to Ultrawideband Electromagnetic Pulses -- 1.5. Ultrawideband Technology Applications -- Conclusion -- Problems -- References -- ch. 2 Ultrawideband Pulse Radiation -- Introduction -- 2.1. Elementary Sources of Ultrawideband Pulse Radiation -- 2.1.1. The Electric Hertzian Dipole -- 2.1.2. The Slot Radiator -- 2.1.3. The Magnetic Hertzian Dipole -- 2.2. Fields of Finite-size UWB Pulse Radiators -- 2.2.1. Radiation from Ring Sources -- 2.2.2. Radiation from Disk and Circular Aperture Sources -- 2.3. The Structure of the Field of an Ultrawideband Radiator -- 2.3.1. The Boundaries of the Field Regions of a Short Radiator -- 2.3.2. The Boundaries of the Field Regions of Aperture Radiators -- 2.4. Efficiency of the Generation of Electromagnetic Pulse Radiation -- 2.4.1. Radiation Patterns -- 2.4.2. The Energy, the Peak-power, and the Peak-field-strength Efficiency of a UWB Radiator -- Conclusion -- Problems -- References -- ch. 3

Propagation of Ultrawideband Pulses -- Introduction -- 3.1. Propagation of Ultrawideband Electromagnetic Pulses in Conducting Media -- 3.1.1. Propagation of Ultrawideband Pulses in Unbounded Media -- 3.1.2. Earth's Atmosphere -- 3.1.3. Distortions of High-power Pulses in the Earth's Lower Atmosphere -- 3.2. Layered Media -- 3.2.1. Propagation of an Ultrawideband Pulse through an Interface between Two Media -- 3.2.2. Propagation of Pulses Generated by a Point Source in a Multilayered Medium -- Conclusion -- Problem -- References -- ch. 4 Scattering of Ultrawideband Electromagnetic Pulses by Conducting and Dielectric Objects -- Introduction -- 4.1. Scattering of Pulsed Electromagnetic Waves by Conducting Objects -- 4.1.1. Statement of the Problem. Derivation of Calculation Formulas -- 4.1.2. Wave Scattering by a Perfectly Conducting Rectangular Plate -- 4.1.3. Wave Scattering by a Perfectly Conducting Ellipsoid or Sphere -- 4.1.4. Wave Scattering by a Perfectly Conducting Finite Circular Cone -- 4.1.5. Creeping Waves -- 4.2. Scattering of Pulsed Plane Electromagnetic Waves by Dielectric Objects -- 4.2.1. Wavelet Analysis of the Wave Scattering by a Dielectric Sphere -- 4.2.2. Numerical Results and Discussion -- Conclusion -- Problems -- References -- ch. 5 Impulse Responses of Objects and Propagation Channels -- Introduction -- 5.1. The Impulse Response: Models of Signals and Their Spectral Characteristics -- 5.1.1. Forms and Properties of the Impulse Response -- 5.1.2. The Envelope, Instantaneous Phase, and Instantaneous Frequency of a Signal: The Analytic Signal -- 5.1.3. Kramers -- Kronig-Type Relations -- 5.1.4. A Pole Model of Exponentially Decaying Signals -- 5.1.5. The Singular Value Decomposition Method in Problems of Impulse Response Estimation and Reconstruction -- 5.2. Use of Regularization and a Kramers-Kronig-Type Relation for Estimating Transfer Functions and Impulse Responses -- 5.2.1. General Relations -- 5.2.2. Reconstruction of Transfer Functions and Impulse Responses using Regularization and Kramers-Kronig-Type Relations -- 5.2.3. Comparison of the Impulse Responses Estimated Using Two Phase Spectrum Models -- 5.3. A Pole Model of the Signal in the Problem of Estimating the Impulse Response of a Propagation Channel -- 5.3.1. Signal Representation and Impulse Response Estimation using Pole Functions -- 5.3.2. Estimation of the Impulse Response of a Coaxial Cable Transmission Line -- 5.3.3. Stability of the Reconstruction of Impulse Responses to the Probe Pulse Waveform and Measurement Noise -- 5.4. A Pole Model of a Signal in Estimating the Impulse Responses of a Conducting Sphere and Cylinder -- 5.5. Reconstruction of Ultrawideband Pulses Passed Through Channels with Linear Distortions -- 5.5.1. Solution of the Pulse Reconstruction Problem -- 5.5.2. Numerical Simulation -- 5.5.3. Experimental Verification of the UWB Pulse Reconstruction Method -- Conclusion -- Problems -- References -- ch. 6 Receiving Antennas -- Introduction -- 6.1. The Transfer Function of a Receiving Antenna -- 6.1.1. Determination of the Transfer Function of a Receiving Antenna -- 6.1.2. The Current Distribution in the Receiving Wire of an Antenna -- 6.1.3. Electromagnetic Parameters of a Linear Receiving Antenna -- 6.1.4. The Transfer Function of a Straight Receiving Wire -- 6.1.5. The Transfer Function of a Curvilinear Receiving Wire -- 6.2. Distortion of Ultrawideband Electromagnetic Pulses by a Receiving Antenna -- 6.2.1. Receiving of Ultrawideband Electromagnetic Pulses by a Dipole -- 6.2.2. Receiving of Ultrawideband Electromagnetic Pulses by a Loop Antenna -- 6.2.3. Proportion Between the Received Signal Power and the Dissipated Power -- 6.3. Methods for Reducing Distortion of a Received Signal -- 6.3.1. Long Dipoles with Noncollinear Arms -- 6.3.2. Unmatched Short Dipoles -- 6.3.3. Active Antennas -- 6.4.

Vector Antennas for Recording the Space-Time Structure of Ultrawideband Electromagnetic Pulses -- 6.4.1. Design Concepts of Vector Receiving Antennas -- 6.4.2. Investigation of the Polarization Structure of a Pulsed Electromagnetic Field -- 6.4.3. Determination of the Direction of Arrival of Ultrawideband Electromagnetic Pulses -- Conclusion -- Problems -- References -- ch. 7 Transmitting Antennas -- Introduction -- 7.1. The Transfer Function of a Transmitting Antenna -- 7.1.1. The Transfer Function of a Radiation Source -- 7.1.2. The Current Distribution in a Linear Radiator -- 7.1.3. The Transfer Function of a Linear Radiator -- 7.2. Distortion of Ultrawideband Electromagnetic Pulses during Radiation -- 7.2.1. The Radiated Pulse Waveform for a Monopole and a Collinear Dipole -- 7.2.2. The Waveform of a Pulse Radiated by a V-shaped Radiator -- 7.2.3. The Waveform of a Pulse Radiated by a Ring Radiator -- 7.3. Methods for Broadening the Pass Band of a Transmitting Antenna -- 7.3.1. The Energy Relationships Determining the Match Band of a Radiator -- 7.3.2. The Quality Factor of a Linear Radiator -- 7.3.3. The Pass Band of a Combined Radiator -- 7.4. Flat Combined Antennas -- 7.4.1. Unbalanced Combined Antennas -- 7.4.2. Balanced Combined Antennas -- 7.5. Volumetric Combined Antennas -- 7.5.1. Radiation of Low-power Pulses -- 7.5.2. Antennas Intended for Radiation of High-power Pulses -- Conclusion -- Problems -- References -- ch. 8 Antenna Arrays -- Introduction -- 8.1. Directional Properties of Antenna Arrays -- 8.1.1. Numerical Calculations -- 8.1.2. Experimental Investigations -- 8.2. Energy Characteristics of Antenna Arrays -- 8.2.1. Distribution Systems -- 8.2.2. Structure of the Radiating System -- 8.3. Antenna Arrays Radiating Orthogonally Polarized Pulses -- 8.4. Characteristics of Wave-beam-scanning Linear Antenna Arrays -- 8.4.1. Nanosecond Pulse Excitation of the Arrays -- 8.4.2. Picosecond Pulse Excitation of Antenna Arrays -- 8.5. Active Receiving Antenna Arrays -- 8.5.1. A Dual-polarized Planar Array -- 8.5.2. A Switched Dual-Polarized Linear Antenna Array -- Conclusion -- Problems -- References -- ch. 9 High-Power Ultrawideband Radiation Sources -- Introduction -- 9.1. The Limiting Effective Radiation Potential of a UWB Source -- 9.2. A Bipolar High-Voltage Pulse Generator -- 9.2.1. A Monopolar Voltage Pulse Generator -- 9.2.2. A Bipolar Pulse Former with an Open Line -- 9.3. Single-Antenna Radiation Sources -- 9.4. Radiation Sources with Synchronously Excited Multielement Arrays -- 9.4.1. The Radiation Source with a Four-element Array -- 9.4.2. Radiation Sources with 16-element Arrays -- 9.4.3. A Radiation Source with a 64-element Array -- 9.5. Production of Orthogonally Polarized Radiation Pulses -- 9.6. A Four-Channel Source Radiating in a Controlled Direction -- 9.7. A Controlled-Spectrum Radiation Source -- Conclusion -- Problems -- References.

Sommario/riassunto

This resource provides a comprehensive treatment of the methods, analysis, and practice of impulse and ultrawideband (UWB) systems. Sources, antennas, propagation, electromagnetic theory, and actual practical systems are explored. This book provides novel perspective on impulse and short-pulse wireless engineering along with practical guidance on how to build antennas and radio hardware for high-power impulse signals. Theoretical and experimental results in the time-frequency domain are presented. The book explains and discusses the scattering of UWB electromagnetic pulses by conducting and dielectric objects. Impulse responses of objects and propagation channels are explored with details of signal models and their spectral characteristics and uses of regularization of a Kramers-Kronig type relation for estimating transfer functions. Readers gain insight into the

development of high-power sources of UWB radiation with megavolt effective potential on the base of combined antenna arrays excited with bipolar voltage pulses. This in-depth volume includes chapters on receiving antennas, transmitting antennas, and antenna arrays along with details on high-power UWB radiation sources as well as problem sets.
