

1. Record Nr.	UNINA9910143567503321
Autore	Ersoy Okan K
Titolo	Diffraction, fourier optics, and imaging [[electronic resource] /] / Okan K. Ersoy
Pubbl/distr/stampa	Hoboken, N.J., : Wiley-Interscience, c2007
ISBN	1-280-72162-6 9786610721627 0-470-08500-2 0-470-08499-5
Descrizione fisica	1 online resource (433 p.)
Collana	Wiley Series in Pure and Applied Optics ; ; v.30
Disciplina	535.42 535/.42
Soggetti	Diffraction Fourier transform optics Imaging systems
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references (p. 397-402) and index.
Nota di contenuto	Diffraction, Fourier Optics and Imaging; Contents; Preface; 1. Diffraction, Fourier Optics and Imaging; 1.1 Introduction; 1.2 Examples of Emerging Applications with Growing Significance; 1.2.1 Dense Wavelength Division Multiplexing/Demultiplexing (DWDM); 1.2.2 Optical and Microwave DWDM Systems; 1.2.3 Diffractive and Subwavelength Optical Elements; 1.2.4 Nanodiffractive Devices and Rigorous Diffraction Theory; 1.2.5 Modern Imaging Techniques; 2. Linear Systems and Transforms; 2.1 Introduction; 2.2 Linear Systems and Shift Invariance; 2.3 Continuous-Space Fourier Transform 2.4 Existence of Fourier Transform 2.5 Properties of the Fourier Transform; 2.6 Real Fourier Transform; 2.7 Amplitude and Phase Spectra; 2.8 Hankel Transforms; 3. Fundamentals of Wave Propagation; 3.1 Introduction; 3.2 Waves; 3.3 Electromagnetic Waves; 3.4 Phasor Representation; 3.5 Wave Equations in a Charge-Free Medium; 3.6 Wave Equations in Phasor Representation in a Charge-Free Medium; 3.7 Plane EM Waves; 4. Scalar Diffraction Theory; 4.1 Introduction; 4.2 Helmholtz Equation; 4.3 Angular Spectrum of Plane Waves

4.4 Fast Fourier Transform (FFT) Implementation of the Angular Spectrum of Plane Waves; 4.5 The Kirchoff Theory of Diffraction; 4.5.1 Kirchoff Theory of Diffraction; 4.5.2 Fresnel-Kirchoff Diffraction Formula; 4.6 The Rayleigh-Sommerfeld Theory of Diffraction; 4.6.1 The Kirchoff Approximation; 4.6.2 The Second Rayleigh-Sommerfeld Diffraction Formula; 4.7 Another Derivation of the First Rayleigh-Sommerfeld Diffraction Integral; 4.8 The Rayleigh-Sommerfeld Diffraction Integral For Nonmonochromatic Waves; 5. Fresnel and Fraunhofer Approximations; 5.1 Introduction; 5.2 Diffraction in the Fresnel Region; 5.3 FFT Implementation of Fresnel Diffraction; 5.4 Paraxial Wave Equation; 5.5 Diffraction in the Fraunhofer Region; 5.6 Diffraction Gratings; 5.7 Fraunhofer Diffraction By a Sinusoidal Amplitude Grating; 5.8 Fresnel Diffraction By a Sinusoidal Amplitude Grating; 5.9 Fraunhofer Diffraction with a Sinusoidal Phase Grating; 5.10 Diffraction Gratings Made of Slits; 6. Inverse Diffraction; 6.1 Introduction; 6.2 Inversion of the Fresnel and Fraunhofer Representations; 6.3 Inversion of the Angular Spectrum Representation; 6.4 Analysis; 7. Wide-Angle Near and Far Field Approximations for Scalar Diffraction; 7.1 Introduction; 7.2 A Review of Fresnel and Fraunhofer Approximations; 7.3 The Radial Set of Approximations; 7.4 Higher Order Improvements and Analysis; 7.5 Inverse Diffraction and Iterative Optimization; 7.6 Numerical Examples; 7.7 More Accurate Approximations; 7.8 Conclusions; 8. Geometrical Optics; 8.1 Introduction; 8.2 Propagation of Rays; 8.3 The Ray Equations; 8.4 The Eikonal Equation; 8.5 Local Spatial Frequencies and Rays; 8.6 Matrix Representation of Meridional Rays; 8.7 Thick Lenses; 8.8 Entrance and Exit Pupils of an Optical System

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Sommario/riassunto

This book presents current theories of diffraction, imaging, and related topics based on Fourier analysis and synthesis techniques, which are essential for understanding, analyzing, and synthesizing modern imaging, optical communications and networking, as well as micro/nano systems. Applications covered include tomography; magnetic resonance imaging; synthetic aperture radar (SAR) and interferometric SAR; optical communications and networking devices; computer-generated holograms and analog holograms; and wireless systems using EM waves.

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