Physics

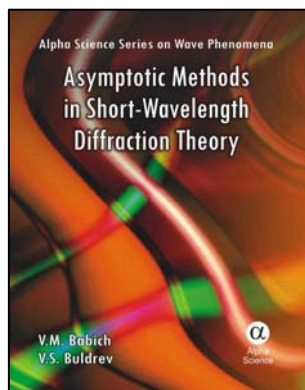*Alpha Science Series on Wave Phenomena*
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Asymptotic Methods in Short-Wavelength Diffraction Theory

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READERSHIP: **Postgraduate Students, Professionals & Researchers in electromagnetics, seismology, acoustics and mathematical physics**

Asymptotic Methods in Short-Wavelength Diffraction Theory is dedicated to modern approaches of a high-frequency technique in diffraction theory. Among the considered topics are: the ray method, the parabolic equation approach, the method of "etalon" problems, an asymptotics of the Laplacian eigenfunctions and of the Green's function to the Helmholtz equation, the theory of high-frequency whispering-gallery waves. Recent results from the literature dealing with localized asymptotic solutions and uniform representation of a high-frequency wave-field are also reviewed. The monograph is addressed to the experts on electromagnetics, seismology and acoustics as well as to mathematicians interested in modern approaches of the mathematical physics.

CONTENTS: Introduction / The Ray Method / The Field Near a Caustic / Derivation of Asymptotic Formulas for Eigenvalues and Eigenfunctions using the Ray Method / The Ray Method "in the small" / The Parabolic Equation Method / Asymptotic Expansions of Eigenfunctions Concentrated Close to the Boundary of a Region / Eigenfunctions Concentrated in the Neighborhood of an Extremal Ray of a Region / Eigenfunctions Concentrated in the Vicinity / Multiple-Mirror Resonators / The Field of a Point Source Located Near a Convex Curve / Asymptotic Expansion of the Green's Function for a Surface Source (The Internal Problem) / The High-Frequency Asymptotics of the Field Scattered by a Smooth Body / Appendixes – *The Airy Equation and Airy Function* / *Nonorthogonal Curvilinear Coordinate Systems* / *Solution of the Equation $y''(s)+K(s)y(s)=y^{-3}(s)$* / *Computation of and Tables for the Function $G_M(\gamma)$* / *Point Source Near a Concave Boundary: The Hybrid Method* / *On the Space-Time Ray Method* / *The Complex Space-Time Ray Method and Quasiphotons* / *An Alternative Approach to Construct Gaussian Beams* / *The Gaussian-Beams Summation Method* / *The Windowed Oscillatory Integral* / *On Non-Geometrical Waves* / References.

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