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Editors

Electromagnetic Waves in Complex Systems

Selected Theoretical and Applied Problems

Springer

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Preface

Our aim in writing this manuscript was to provide young researches and graduate students with a book that combines examples of solving serious research problems in electromagnetics and original results that encourage further investigations. The book contains seven papers on various aspects of resonant wave propagation and scattering written by different authors. Each paper solves one original problem. However, all of the papers are unified by authors' desire to show the advantages of rigorously justified approaches to all stages of the study: from problem formulation and selection of the method of attack to interpretation of the results.

A glance at the Contents will reveal a range of physical problems raised in the book. Mostly, those are the problems associated with wave propagation and scattering in natural and artificial environments or with designing the elements and units for antenna feeders. The authors invoke both theoretical (analytical and numerical) and experimental techniques for handling the problems. Considerable attention is given to the mathematical simulation issues, problems of computational efficiency, and physical interpretation of the results of numerical or full-scale experiments. Most of the presented results are original and have not been published earlier.

The need for rigorous theoretical justification of mathematical modeling and computational experiments—the widely used methodologies of obtaining new knowledge—is evident. Underformulated problems, neglect of the estimation of stability and convergence of numerical schemes cannot guarantee reliability of the results. Furthermore, the rigorous theoretical basis of the laboratory and full-scale experiments allows to conduct research saving time and material resources, to safely test simulated devices in a variety of operating conditions. To demonstrate the advantages of rigorous approaches and their realizability is the heart of the ideology of this book. And we address it to those young researchers who are going to work actively and fruitfully in the field of theoretical and applied physics, electronics, and optics.

The authors of this book are mostly current or former employees of the Department of Mathematical Physics at the O.Ya. Usikov Institute for Radiophysics

and Electronics of the National Academy of Sciences (Kharkiv, Ukraine). Professor Yuriy Sirenko, who has been at the head of the department over the last 25 years, initiated the writing of this rather unusual in its conception book. He has had a major influence on it, both scientific and organizational, and managed to inspire other colleagues with his idea.

The assumed background of the reader is mostly limited to standard undergraduate topics in physics and mathematics.

Kharkiv, Ukraine Lyudmyla Velychko

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