Electromagnetic Wave Scattering from Random Rough Surfaces: Asymptotic Models

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Electromagnetic wave scattering from random rough surfaces is an active, interdisciplinary area of research with myriad practical applications in fields such as optics, acoustics, geoscience and remote sensing. Focusing on the case of random rough surfaces, this book presents classical asymptotic models used to describe electromagnetic wave scattering. The authors begin by outlining the basic concepts relevant to the topic before moving on to look at the derivation of the scattered field under asymptotic models, based on the Kirchhoff-tangent plane, in order to calculate both the scattered field and the statistical average intensity. More elaborated asymptotic models are also described for dealing with specific cases, and numerical results are presented to illustrate these models. Comparisons with a reference numerical method are made to confirm and refine the theoretical validity domains.
The final chapter derives the expressions of the scattering intensities of random rough surfaces under the asymptotic models. Its expressions are given for their incoherent contributions, from statistical calculations. These results are then compared with numerical computations using a Monte-Carlo process, as well as with experimental models, for sea surface backscattering.

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About the Authors

Nicolas Pinel worked as a Research Engineer at the IETR (Institut d'Electronique et de Télécommunications de Rennes) laboratory at Polytech Nantes (University of Nantes, France) before joining Alyotech Technologies in Rennes, France, in July 2013. His research interests are in the areas of radar and optical remote sensing, scattering and propagation. In particular, he works on asymptotic methods of electromagnetic wave scattering from random rough surfaces and layers.
Christophe Bourlier works at the IETR (Institut d'Electronique et de Télécommunications de Rennes) laboratory at Polytech Nantes (University of Nantes, France) and is also a Researcher at the French National Center for Scientific Research (CNRS) on electromagnetic wave scattering from rough surfaces and objects for remote sensing applications and radar signatures. He is the author of more than 160 journal articles and conference papers.

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