## A thorough review of scintillation theory and real-world applications

Researchers and engineers apply the name *scintillation* to any observable irregular variation of a wave field e.g., intensity, phase, angle of arrival, Doppler shift, and delay. Scintillation is a nuisance in satellite electromagnetic communications, but this phenomenon has stimulated numerous theoretical developments with science applications. In order to truly understand data signals transmitted by satellites, one must understand scintillation theory in addition to well-established theories of electromagnetic wave propagation and scattering.

This book presents a complete theoretical explanation of scintillation with diverse applications. The author's approach provides an algorithmic formulation that admits no intrinsic limitations, and effectively reformulates the theory to take full advantage of readily available modern computational resources. He tightly integrates practical and scientific applications by using modern signal processing and information theoretic structures, and extends the theory to accommodate scattering objects and boundary surfaces.

The first three chapters present a rigorous but transparent development of scintillation theory. Known analytic results are presented with references to analytic methods that have been used to demonstrate fundamental characteristics. Following chapters treat beacon satellite applications, channel modeling, and scattering in presence of discrete scattering objects and surfaces. Finally, the last chapter addresses remote sensing, featuring an example from synthetic aperture radar.

The robust algorithms presented here can be used to simulate extremely complex phenomena well outside the bounds of analytic results. A complete library of MATLAB<sup>®</sup> codes that reproduce the book's examples and practical case studies can be obtained from the MATLAB<sup>®</sup> Central File Exchange.

This book is designed for electromagnetic wave researchers and practitioners as well as students; it will also benefit professors teaching propagation theory and radio wave and optical communication specialists.

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ISBN: 978-0-470-64477-5

