

Preface

During the past two decades there has been a substantial growth in research in wireless communications. The number of journals published from various parts of the world catering to the research community has grown exponentially. Despite such a growth, the engineering community still needs more information so as to thoroughly comprehend wireless channel characteristics. What specifically must be understood are the effects of channel degradation brought on by statistical fluctuations in the channel. This must be grasped fully and comprehensively before successful attempts can be made to mitigate the channel impairments. Such statistical fluctuations do manifest as variations in signal powers, which are observed in the channel generally modeled using a variety of probability distributions, both in straight forms as well as in compound forms. While the former might explain some of the effects, the latter, namely, the compound models, which incorporate both short-term and long-term power fluctuations in the channel, help explain the much more complex nature of the signals in these channels. Often, we see newer and more powerful models being proposed, presented, and tested to see how they fit the observed power fluctuations.

This book addresses the needs of graduate students and instructors who are exploring the various aspects of power fluctuations, which are generally expressed in terms of fading, shadowing, and shadowed fading channels. This work grew out of the author's studies and explorations during a two-quarter sabbatical (September 2009–March 2010) granted by Drexel University. The chapters are based on both my teaching and research into the statistical aspects of wireless channels. Specifically, this work focuses on the analysis and study of several models currently available in the literature of wireless communications (books, archival journals, and conference proceedings). This expansive research describes the statistical characteristics of the signals that account for the fading, shadowing, and shadowed fading seen in these channels. The book is not intended as a catalog or encyclopedia of fading and shadowing. Indeed, the thrust of the book is a pedagogical approach to the topics of fading and shadowing. It provides insight into the modeling and analysis of fading and shadowing. Starting with statistical background and digital

communications, the chapters are formulated to follow the details of modeling of the statistical fluctuations of signals in these channels. The degradations in the channels arising from the statistical fluctuations are quantitatively described in terms of various measures. This is followed by the discussion of diversity and associated signal processing algorithms that mitigate the effects of statistical fluctuations in the channel and the quantitative measures of improvements brought on by diversity. The book also examines the effects of interference from other channels. It is my expectation that this work will provide an in-depth and unique coverage of topics for graduate level study in wireless communications.

The book would not have been possible without the full support of my wife Raja and our daughter Raji. Besides reading the early drafts of the chapters, they provided insights into chapter organization and pointed out the need for further explanation. Their efforts made it possible to complete the project in a reasonable period; I am proud to say that the book has been a family project.

I am very grateful to our friend Ms. Maura Curran who graciously agreed to proof read the chapters on very short notice, despite having a full workload as compositor and editor.

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