

SECOND EDITION

The Essential Guide to RF and Wireless

- The easy-to-understand guide to the wireless revolution—fully updated for the latest technologies!
- New and expanded coverage: broadband fixed wireless, WLANs, wireless Internet, Bluetooth™, smart antennas, and more

RF与无线技术精要

[美] Carl J. Weisman 著

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通信与信息科学教育丛书

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北京 · BEIJING

内 容 简 介

本书主要介绍了射频和无线技术的基本知识及其具体应用。其中包括 CDMA 技术、宽带技术的具体应用、无线网络、蓝牙技术等。本书以图文并茂的方式进行讲解,让读者能更深入地了解书中的内容。

本书可供射频电路设计人员和无线电技术人员阅读,也可作为相关专业的高年级本科生、研究生的参考书。

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出版说明

近年来,通信与信息科技发展之快和应用之广,大大超出了人们的预料和专家的预测。从国民经济到社会生活的日益信息化,标志着通信与信息科技的空前发展。

为了满足高等院校师生教改和教学的需求以及广大技术人员学习通信与信息新技术的需要,电子工业出版社约请北京地区的清华大学、北京大学、北京航空航天大学、北京邮电大学、北方交通大学、北京理工大学,南京地区的东南大学、解放军理工大学、南京邮电学院,上海地区的上海交通大学,成都地区的西南交通大学、电子科技大学,西安地区的西安电子科技大学、西安交通大学,天津地区的南开大学,深圳地区的深圳大学,东北地区的哈尔滨工业大学等全国知名高等院校教学第一线上的教授和信息产业部有关科研院所的专家,请他们推荐和反复论证,从国外优秀的英文版图书中精选出版了这套《通信与信息科学教育丛书》(英文版)。

本套丛书可作为高等院校通信、计算机、电子信息等专业的高年级本科生、研究生的教材或教学参考书,也适合广大信息产业技术人员参考。

本套丛书所选取的均是国际上通信与信息科学领域具有代表性的经典著作,它们在全世界许多大学被用做教材或教学参考书。其主要特点是具有较强的先进性、实用性和权威性。丛书内容丰富,深入浅出,层次清楚,理论与应用并重,能够较好地引导读者将现代通信信息与信息科学的原理、技术与应用有机结合。我们希望本套丛书能够进一步推动国内高等院校教学与国际接轨,同时满足广大技术人员及时学习通信与信息科学领域中新知识的需求。

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*This book is dedicated to my parents,
Sylvan Weisman and Claire Weisman,
who taught me the joy of education
and the value of perseverance.*

Preface

A lot has transpired in the world of RF and wireless since I wrote the first edition of *The Essential Guide to RF and Wireless*. It seems as though this wonderful technology, which has actually been around quite a long time, has just begun to take off in the last two years. One thing is certain, there is no doubt that our lives will be forever changed by the wireless revolution we are now experiencing.

This book is written for all those who want to understand how this mysterious technology actually works, but did not have the good fortune (?) to get an engineering degree. Toward this end, the book's overriding goal is to simplify RF electronics and wireless technology with analogies, metaphors, and a minimum of mathematics. Many photographs and figures are included to help explain things further. Unlike other books of its kind, however, it takes a distinctly lighthearted approach to the subject by incorporating witticisms and sarcasm, occasionally directed at the book's hypothetical protagonist, the RF engineer. This book is intentionally made humorous because the subject matter is so dry. My feeling is, no matter how brilliantly written or factually correct an introductory book on RF is, if it is too long and boring, you will never get past the first chapter—which is really funny, by the way.

The Essential Guide to RF and Wireless takes an overly simplistic approach to the subject matter. In this vein, it accomplishes two main objectives: it provides a conceptual understanding of RF components and wireless systems, and it exposes you to the main vocabulary used in the industry. You can hardly expect to understand a topic as complex as wireless communications without first learning its *lingua franca*.

The Essential Guide to RF and Wireless is intended for non-technical people who know absolutely nothing about RF but need to or just want to. For every engineer working in the field of RF, there are many more non-technical people working in the field who can benefit from understanding and speaking RF. They include non-technical managers, sales administrators, distribution specialists, manufacturer's representatives, buyers, marketing and communications personnel, advertising agents, tradeshow booth staffers, executive recruiters, financial analysts, and technical writers. The first edition was especially popular among investment bankers and venture capitalists.

This book can be used three different ways. First, it can be read cover to cover as the book is organized in such a way where each successive chapter builds on the one before it, starting with basic concepts and terminology and ending with the various kinds of wireless systems. Second, each chapter can be read on a stand-alone basis, for those who need to quickly grasp a single subject or concept. Some of the subject matter is repeated in different chapters in an effort to make each chapter understandable by itself. Finally, this book can be used as a reference. The many tables, the Glossary, and Appendices A and B provide quick access to terminology, acronyms, and specifications used in the wireless industry.

Regardless of how you use this book, if you are new to the subject of RF, you should read all of Part 1 (Chapters 1 and 2), as the rest of the book builds on the fundamental concepts and vocabulary introduced there.

Part 2 (Chapters 3, 4, and 5) is primarily intended for those working in the RF and wireless industry, as it covers the underlying technology of an RF system in great detail. All of the important building blocks used to make RF hardware are explained, as are the different methods used to manufacture them. Also covered is the fascinating topic of modulation, which is how ground-based information gets prepared to enter the wireless world.

New items added to Part 2 in the second edition include smart antennas and superconducting filters. Other components new to the second edition are the phase shifter and phase detector (and the role they play in phase modulation). Consequently, a greatly expanded discussion and visual depiction of phase modulation has been added. Also new to the second edition is a discussion of some of the newer semiconductor materials used today.

Finally, Part 3 (Chapters 6, 7, and 8) is where the fun begins. This part of the book gives you an overview of several wireless systems. Chapter 6 discusses some wireless systems that have been around awhile. These are mostly systems

Preface

with which you are already familiar but probably never knew how they worked. New additions to Chapter 6 include an expanded discussion of GPS as well as an introduction to satellite Internet delivery.

Chapter 7, which is completely rewritten in the second edition, is devoted entirely to mobile telephony. The chapter discusses the different mobile telephone choices worldwide and how they work. There is even a block diagram of a generic digital cellular phone. Because of its importance to the future of mobile telephony, an entire section in Chapter 7 is devoted to the workings of CDMA. The chapter concludes with a discussion about the future of mobile telephony.

Chapter 8, which is new to the second edition, is devoted to all those wireless technologies, systems, and applications that have exploded onto the scene since I published the first edition. These include developments in broadband fixed wireless, wireless networking, and mobile Internet access. The chapter concludes with discussions of leading-edge wireless technologies, wireless security, and health concerns.

I would like to thank everyone who took the time to provide me with feedback on the first edition. While I enjoyed receiving the complimentary feedback more, the critical feedback hopefully contributed to a better second edition.

If you would like to provide me with your feedback on this edition, feel free to contact me at cjweisman@yahoo.com

Enjoy.

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Part 1

Fundamentals