High Frequency Techniques

An Introduction to RF and Microwave Engineering

by Joseph F. White

Reviewed by Gary Breed
Editorial Director

The author begins the preface to *High Frequency Techniques,* "This book is written for the undergraduate or graduate student who wishes to pursue a career in radio-frequency (RF) and microwave engineering." It will be the lucky student who has this book to learn from!

The book begins with notes on the history of radio communications, essential lessons for students who have grown up long after the events that created this area of engineering specialization.

Chapter 2 reviews AC circuit analysis and establishes the "language" of RF and microwaves—reactance, impedance, admittance, decibels, power transfer, loss, scattering parameters and parasitics.

Chapter 3 introduces LC circuits, covering the concepts of resonators, coupling, matching networks and *Q*. This leads to Chapter 4's coverage of distributed circuits, introducing transmission lines, dielectrics, wave propagation, reflections, mismatch and impedance transformations.

At this point, the fundamental concepts have been presented, and Chapters 5 and 6 begin the process of analysis, covering the Smith chart and its relationship to transmission line and component behavior, then moving to matrix analysis, including *Z*, *Y*, ABCD and scattering matrices.

Chapter 7, "Electromagnetic Fields and Waves" will present a challenge to most students (as this topic always seems to do). To deal with the traditional difficulty with EM concepts, it is clear that Dr. White put special effort into the organization and writing of this chapter, the longest in the book. This chapter is a good review for an engineer of any experience level, covering a wide range of material from basic E and H fields and vector concepts, through Faraday's and Maxwell's contributions, waves, polarization, waveguides, antennas, and finally, the process of EM modeling and simulation.

Chapter 8 provides a close-up look at directional couplers and other coupled-line circuits, including a thorough section on the important topic of even- and odd-mode analysis.

Chapter 9 continues the coverage of practical circuits with filters, providing an excellent summary of classical filter design, enhanced with examples and notes on computer simulation of filters.

Chapter 10, "Transistor Amplifier Design," leads the reader through the all-important subject of amplifier design, with complete coverage of biasing, gain, stability, matching and noise analysis, plus significant material on nonlinear amplifiers and broadband techniques.

Five appendices add appropriate references on symbols and units, complex mathematics, wire sizes, material properties and standard waveguides. As a bonus, the insides of the front and back covers contain numerous commonly-needed equations and reference data—much better than just blank pages.

Although structured as a textbook, engineers at all experience levels can benefit from a review of the fundamental topics. The more advanced chapters on electromagnetic principles, directional couplers, and amplifiers will be used regularly by any engineer who buys this book for his or her reference library.

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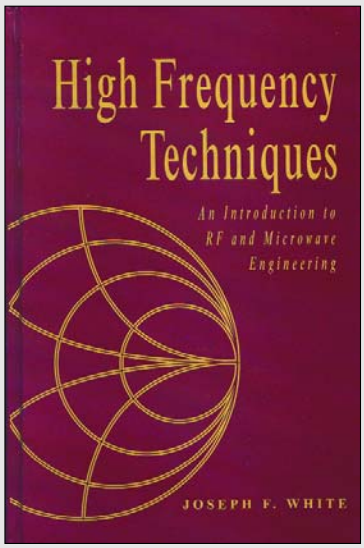

The author is well-known within the microwave community, with 25 years of design experience, a past position as technical director at M/A-COM, serving as editor of *Microwave Journal*, then founding and editing *Applied Microwave & Wireless*. He is now a consultant and instructor through his company, JFW Technology, Inc.

Joseph White earned the PhD degree in Electrical Engineering from Renssalaer Polytechnic Institute, following a BSEE from Case Institute of Technology and MSEE degree from Northeastern University. He is a Fellow of the IEEE and a member of Eta Kappa Nu and Sigma Xi honorary fraternities. He holds several patents and in 1977 wrote the book, *Microwave Semiconductor Engineering*, now in its third printing.