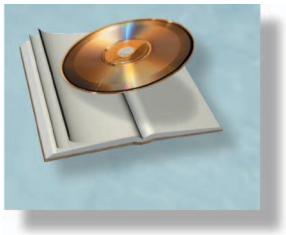


# Book Reviews

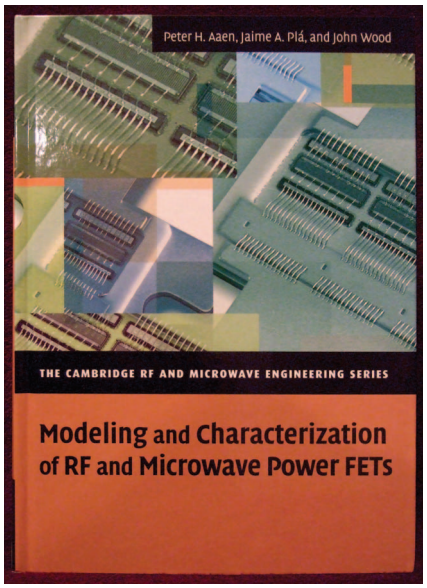
■ **Alfy Riddle, Associate Editor**

*IEEE Microwave Magazine* is looking for book and/or software reviewers. Please communicate your interest, along with your technical area of expertise, to the book review editor, Alfy Riddle, at admin@macallanconsulting.com. Books and software received for reviews will be forwarded to volunteer reviewers based on their subject matter.

## More Power

Device characterization has come a long way since curve tracers (now parameter analyzers) were developed. And power devices present an involved multidisciplinary challenge between electrical, thermal, mechanical, and semiconductor physics realms. As semiconductor device power capability and digital signal complexity have matured, so have measurement groups within companies and publications on device modeling. Over the years books on device modeling tended to be computer-oriented, measurement-oriented, or device-construction-oriented. *Modeling and Characterization of RF and Microwave Power FETs* by P.H. Aaen, J.A. Plá, and J. Wood strikes a very nice balance between computer methods, device construction, and device measurement. This book manages to cover the topics of device construction, model selection, device measurement, and model validation in sufficient detail to be truly useful. While obviously not designed as a university text, the book contains enough math and fundamentals to serve as a foundation for a course.

The first chapters set up the framework for modeling. FET construction creates different issues for MESFETs, HEMTs, and LDMOS transistors. Power devices carry their own issues with thermal effects, memory effects, and packaging. This book condenses many years of research by different groups into one book. Choosing between model types such as those based on semiconductor physics to those that use compact equivalent circuits and finally those using abstract behavioral models is a tradeoff between speed and accuracy. Issues such as validating a model force researches to delve into measurement techniques and which calibration algorithms (TRL and SOLT) and fixturing methods are best. All of this is discussed in detail in this book. Power devices present such low electrical impedances that 50Ω systems are not optimal. This requires fixturing and de-embedding the fixture to get at the device




Modeling and Characterization of RF and Microwave Power FETs
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*Alfy Riddle is with Macallan Consulting, 1583 Pinewood Way, Milpitas, CA 95035 USA, admin@macallanconsulting.com.*

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impedances. The power levels of the devices present a challenge between attempting to measure the static device characteristics and not changing the device performance by raising the device temperature. Most power devices are packaged with inductors and capacitors to move the impedance up toward 50Ω. Chapters on passive component modeling and thermal modeling gradually peel the onion so the last chapters cover models of just the transistor itself. These final chapters delve into the details of each kind of model (physical, compact, and behavioral), classes of simulators, statistics, and validation of models.

This is a well-written and useful text. One of the enjoyable aspects of the book is that it does not read like a review of how the authors perform their daily work, or a tour of the research problems the authors have dealt with, but a coherent review of the advanced state of power FET modeling and characterization.

## Fundamental Electromagnetics

*Fundamentals of Engineering Electromagnetics* provides a broad coverage of topics in electromagnetic applications, which are presented by the experts in the field of engineering electromagnetics. In each topic, the necessary electromagnetic principles are outlined first, then the corresponding applications to the actual engineering problems are described. The book is a desk reference for the readers who desire to learn the fundamentals of engineering electromagnetics and to know how the electromagnetic field theory can be employed to solve real-life electromagnetic problems. Plus, this book can be used as a textbook for graduate-level engineering electromagnetics courses.

With the contributions from the experts in the field of engineering electromagnetics, this book is a textbook for the readers who look for a good review of the

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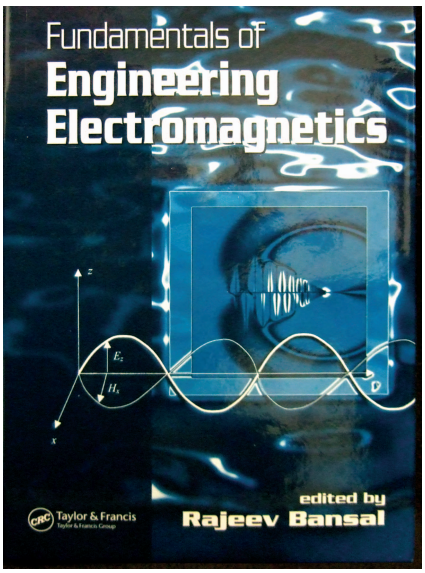


Fundamentals of Engineering Electromagnetics
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*—Nan-Wei Che*

necessary electromagnetic theory, such as Maxwell's equations, wave propagation, and transmission lines, along with its application to the actual engineering problems; e.g. waveguides, antennas, and electromagnetic compatibility. On the other hand, this book appears to be a handbook/reference for practicing engineers engaged in electromagnetic applications in a variety of professional settings. This book will be more complete if some errors/typos are corrected.

A few errors and typos in the expressions and context are as follows.

1) page 127, Eq. (4.9) should read

$$V_{AB \text{ along } aorb} = V_A - V_B = \grave{\mathrm{O}}_{A \text{ along } aorb}^{B} \mathbf{E}_{ind} \times d\mathbf{l}$$

2) page 135, Eq. (4.9) should read

$$J(z) = J_0 e^{-z/d}$$

3) page 168, the $E(z)$ in Eq.(5.45) should be bold
4) page 172, the $E_i$, $a_x$, and $a_z$ in Eq. (5.77) should be bold
5) page 172, the $H_i$, and $a_y$ in Eq. (5.78) should be bold
6) page173, from Eqs. (5.79) to (5.82), all vectors should be bold
7) page 135, in Eq. (9.80), remove the minus sign after $-J\omega$
8) page 321, the figure is exactly the same as the one on page 320
9) page 352, in Eqs. (10.7) and (10.8) the argument associated with the sinusoidal function should be $q$.

I recommend this book for a reader who would like to review the fundamentals of engineering electromagnetics and to know the electromagnetic principles of some practical applications. This well-organized resource can definitely broaden his/her scope of experience in electromagnetic theory.