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RECENZII **BOOK REVIEWS**

ROOT D.E., VERSPECHT J., HORN J., MARCU M., *X-Parameters. Characterization, Modeling and Design of Nonlinear RF and Microwave Components*. Cambridge University Press, ISBN 978-0-521-19323-8.

Considered "Holy Grail" of microwave instrumentation (Mike McKinley, Georgia Tech), "a new measurement science" (Don DeGroot, Connected Community Networks) or simply "large-signal network analysis (LSNA)" (Jan Verspecht), X parameters represent a revolution in the RF/microwave measurements, the second one after the introduction of S parameters in 1980s. Similar to anything else able to shape the future, X parameters represents not only a simple mathematical concept but also a multimillion dollar business, taking into account the new measurement devices (LSNA hardware) able to measure the X-parameters. In fact, NVNA (nonlinear vector network analyzer) is considered the most innovative HP/Agilent instrument in 25 years!

It is important to notice that these parameters were proposed by Van Verspecht -engineer at Agilent Technologies and co-author of this book- in 1996 and Advanced Design System (ADS), an Agilent product, already uses these parameters for circuit simulations, therefore being several steps ahead of other competitors. In addition, other collateral businesses appeared on the market, such as modeling the RF components sold on the market with X parameters. The other three co-authors, engineers at Agilent Technologies (one Romanian among them), are involved in X-parameters development for measurement and commercialization.

As clearly emphasized in this book, the insertion of X parameters constitutes a necessity since S parameters are based on the superposition principle and can accurately represent linear devices only (excited with small signals). In addition, they were not invented by accident or by a flash of genius, being specifically built for characterizing the large signal behavior of RF circuits. In this regard, magnitude and phase of all frequencies of interest for the device under test (DUT) are measured and processed.

The book has 6 chapters and 5 Appendix sections. As key features we can notice:

1. Well structured chapters, the first one reviewing S parameters and clearly explaining their practical limitations while others entirely focused on X parameters: fundamental concepts (Chapter 2), spectral linearization (Chapter 3), measurement (Chapter 4), multi-tone case (Chapter 5) and memory case (Chapter 6).

2. A list of exercises at the end of each chapter, contributing to a better theory understanding. Solutions are also offered (Appendix E).

3. A list of 36 references covering scientific articles (journals & conferences), tutorials, text books, PhD thesis and application notes.

4. A supplementary list of 24 additional references available at the end of each chapter, originally called "Additional reading" and covering scientific articles (journals, conferences), tutorials, text books, PhD thesis, patents and books.

5. Plenty of examples and graphics on how to measure and validate the X parameters for different RF blocks.

This book is a must and represents an invaluable reference for any RF/microwave engineer.

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CARVALHO N.B., SCHREURS D., *Microwave and Wireless Measurement Techniques*. Cambridge University Press, ISBN 978-1-107-00461-0.

In a scientific world dominated by circuit design, this book steps ahead focusing on RF and microwave metrology. With this material, authors prove that four chapters are sufficient to synthesize the basics in this regard. In my point of view, it represents a must in this field. Thus, its content is presented in a very simple and concise form, measuring theory is gradually presented, all particular details are discussed, nothing that really matters in this field not being left out of the topic. The comprehensive list of instruments (power meters, spectrum analyzers, vector signal analyzers) and clear explanations about the calibration and measurement process make this material attractive not only for students but for anyone else having the first touch with technology. Indeed, the first thing done even before designing a circuit is measuring it with such instruments, therefore the metrology importance from an education perspective is even greater than expected.

As key features we can notice:

1. A list of problems at the end of each chapter, contributing to a better understanding of theory

2. A list of 81 references covering scientific articles (journals & conferences), text books, standards and application notes

3. Good insights on practical limitations of instrument operation

4. Good practical hints on measuring different parameters such as S-parameters, NF, P1dB and IIP3.

Even though it does not seem to be an extraordinary reference, this book should be the first when starting with metrology.

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Thomas Zwick, Werner Wiesbeck, Jens Timmermann, Grzegorz Adamiuk, *Ultra-Wideband RF System Engineering*. Cambridge University Press, 2013, ISBN 978-1-107-01555-5.

This book is a comprehensive summary of the state of the art in ultra-wideband (UWB) system engineering including all aspects of UWB design: component design, propagation channel modeling, and system engineering.

The content is organized in 6 chapters: an introduction, fundamentals of UWB transmission, antennas and antenna arrays, monolithic integrated circuits for transceivers, and representative applications.

The authors present in the introductory chapter the UWB signal definition and a review of world wide regulations in the field. Then, fundamentals of UWB radio transmission are covered in the second chapter that includes the description of the UWB channel in the time domain and in the frequency domain, the modeling of UWB propagation channel, the parameters for UWB RF systems and component characterization, UWB pulse shapes and pulse shape generation, modulation and coding, and basic architectures for UWB transmitter and receiver.

The third chapter deals with antennas for UWB RF systems covering subjects like antenna measurement methods, design of an UWB radiator, polarization diversity antennas, and special UWB antennas for medical applications. In the next chapter UWB antenna arrays are discussed and includes a presentation of the array factor in UWB systems and an analysis of UWB amplitude monopulse arrays.

The monolithic integrated circuits for UWB transceivers are the subject of the fifth chapter where the requirements for pulse radio transceivers are presented and design aspects for pulse generation and detection are explained. Also, special features for the RF front end components and their monolithic integration are revealed.

The final chapter reviews the main domains of applications of UWB systems: communication, localization, radar, imaging, medical applications.

This book is aimed at scientists and RF system and component engineers working in short range wireless technologies. The book can be used as a supplementary reference for graduate studies.

Prof. Ion Bogdan