香港城市大學 City University of Hong Kong

Department of Electronic Engineering

State Key Laboratory of Millimeter Waves 毫米波國家重點實驗室 (香港城市大學伙伴實驗室) (Partner Laboratory in City University of Hong Kong)

IEEE (HK) Section AP/MTT

Distinguished Lecture on

The Wonderful World of Nonlinearity: Modeling and Characterization of RF and Microwave Circuits

by

Prof. José Carlos Pedro
Universidade de Aveiro, Portugal

Abstract

Despite the many studies that have been undertaken to understand the wonderful world of nonlinearity, most undergraduate electrical engineering programs are still confined to linear analysis and design tools. As a result, the vast majority of microwave designers still cannot profit from the significant technological advancements that have been made in nonlinear circuit simulation, active device modeling and new instrumentation for performance verification. So, they tend to conduct their designs relying on experience, empirical concepts, and many trial and error iterations in the lab. This talk will reveal the ubiquitous presence of nonlinearity in all RF and microwave circuits and the recent efforts made to understand, model, predict, and measure its diverse manifestations. We aim to bring microwave engineers' attention to newly available techniques, and attract researchers to pursue further studies on this scientifically exciting topic. Starting with some elementary properties of nonlinear circuits (like nonlinear signal distortion, harmonic generation, frequency conversion and spectral regrowth), we will show that nonlinearity is present in all wireless circuits, either to perform a desired signal operation or as unintentional distortion. In this way, we will show how oscillators, modulators or mixers could not exist without nonlinearity, while power-amplifier designers struggle to get rid of its distortion effects. After this theoretical overview, we will introduce some recent advancements in nonlinear microwave circuit analysis tools and illustrate different types of models that are currently being used to represent and predict device, circuit, and system performance. Finally, we will focus the talk on the key metrics that are used to characterize nonlinear behavior, as well as newly developed lab instruments and their ability to assess device performance.

Biography

Jose Carlos Pedro received the Diploma and PhD Degrees in Electrical Engineering from University of Aveiro - Portugal, in 1985 and 1993, respectively. From 1985 to 1993 he was an Assistant Lecturer at University of Aveiro, where he became a Professor in 1993. Currently, he is a Full Professor at the same University, and a Senior Research Scientist at the Telecommunications Institute, where he heads the Wireless Circuits and Systems group. As a professor, he has been responsible for several electrical engineering degree courses and undergraduate or graduate students' projects and he has imparted several invited talks and short-courses in symposia and workshops (e.g. the IEEE MTT-IMS and the European Microwave Conf.) and for several portuguese and foreign companies. Among several other administrative responsibilities, he was the Coordinator of the Scientific Council of the Department of Electronics, Telecommunications and Informatics of University of Aveiro in the academic year of 2004/2005 and the Department Head from 2007 to 2011. His main scientific research interests include the development of computer aided design tools for nonlinear electronic circuits design, telecommunication systems identification, active device modelling and the analysis and design of various nonlinear microwave circuits, in particular, the design of highly linear power amplifiers and mixers. He has authored or co-authored more than 200 papers in international journals and symposia and he is the leading author of the book Intermodulation *Distortion in Microwave and Wireless Circuits* published by Artech House in 2003. He has been serving the IEEE MTT-S as member of the Technical Committee 11 on Microwave Measurements and as a reviewer for the MTT Int. Microwave Symposium, the IEEE Trans. on Microwave Theory and Techniques, and as an Associate Editor of that journal from 2005 to 2010. He chaired several sessions in national and international symposia, including the IEEE MTT-IMS and the EuMC, and he was the General Chair of the IEEE technically sponsored INMMIC Workshop of 2006 and the TPC Chair of the IEEE Region 8 EuroCon-2011. Prof. Pedro received the Marconi Young Scientist Award in 1993 and the 2000 Institution of Electrical Engineers (IEE), U.K., Measurement Prize. In 2007, Prof. José Carlos Pedro was awarded the Fellow grade by the IEEE "*for Contributions to Nonlinear Distortion Analysis of Microwave Devices and Circuits*".

Date : 04 February, 2015 (Wednesday)
Time : 02:00 pm – 03:00 pm
Venue : Room 15-202, meeting room of State Key Laboratory of Millimeter Waves, 15/F, Academic 3, City University of Hong Kong

***** ALL ARE WELCOME *****

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