THE Alan G. MacDiarmid NanoTech Institute

PRESENTS

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Berkner 2.528

Antonio Maffucci is an Associate Professor of Electrical Science at the Faculty of Engineering, dept. DAEIMI, University of Cassino, Italy.

He received the Laurea Degree in Electronic Engineering (1996) and PhD in Electrical Engineering (2000) at University of Napoli Federico II.

In 1997, Maffucci was with the Engineering Analysis Group at the nuclear fusion lab. JET, Oxford U.K. From 2000 to 2002, he held a post-doc position at the University of Naples Federico II, Department of Electrical Engineering.

His research interests include electromagnetic and circuital modeling of micro and nanoelectronics interconnects, carbon nanotube modeling, computational electromagnetism, electromagnetic compatibility and neural cellular networks.

Dr. Maffucci has authored 100 technical papers on journals and international conferences proceedings, a book (Academic Press, 2001) and several chapters of books.

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ELECTRICAL PROPAGATION MODELS FOR SINGLE AND MULTI-WALL CARBON NANOTUBE INTERCONNECTS

The seminar will give details on some recently proposed models for the signal propagation along carbon nanotubes of arbitrary chirality, at microwave through terahertz frequencies.

The problem of accurately modeling CNT interconnects has been given more and more attention, as CNT electronics moved from a pure research area towards a mature technology field. In principle, an accurate CNT electro dynamical model requires a quantum mechanical approach; on the other hand, to obtain useful tools for real-world applications, this model should be simple enough to allow deriving reduced-order circuital models.

The recent literature proposes different models, either based on phenomenological approach and on semi-analytical one. This seminar will review a rigorous electro dynamical model, based on the semi-classical Boltzmann transport equation. The model may be applied to CNTs of arbitrary chirality, either metallic or semiconducting, at microwave through terahertz frequencies, and may be extended to the case of multi-wall CNTs. A CNT constitutive equation is derived in frequency domain and coupled to the classical Maxwell equations, so to obtain a circuit model in the frame of the transmission line theory, where the classical electromagnetic per-unit-length parameters are modified to take into account the presence of kinetic and quantistic phenomena. The circuital model applies to bundles of both single-wall and multi-wall CNTs and generalizes the existing ones, including the effects of CNT size, chirality, temperature and curvature. Is extended to benchmarks and case-studies are presented, referring to the use of CNT as on-chip or package-level interconnects.