High Frequency Device Characterization and Modeling for THz applications

Under MHRD Scheme on Global Initiative on Academic Network (GIAN)

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Overview

The field of THz waves is perceived as the new Eldorado in the scientific field and largely unexplored. For decades, the part of the THz spectrum (100GHz to 1THz) was only used in niche applications and fundamental research. Only recently, thanks to the fabrication of high-speed SiGe and InP HBT devices, the scientific community is starting to explore device operation in this frequency range and design THz circuits and systems. At such higher frequencies, parasitic resistances and capacitances start dominating the device characteristics. Thus high frequency characterization with proper calibration and de-embedding techniques are active areas of research. Large-area graphene (2-D material) is gaining momentum as a viable channel material for FET fabrication because of its impressive electrical properties like higher intrinsic mobility and higher cutoff frequency (fT – few hundreds of GHz). Broadband RF mixer and frequency multiplier circuits based on graphene transistors are already reported in the literature. Future SiGe- and InP-THz technologies will enable new electronic applications with socio-economic relevance and spur economic growth in emerging mm-wave and THz markets. They impact applications like: Biology, medical and pharmaceutical (THz-Imaging), Automotive applications (collision avoidance radar) and Wireless Communications (short distance).

This course will cover variety of topics related to THz devices such as – Introduction to THz Electronics and applications, Measurement challenges at high frequencies, calibration and de-embedding techniques, High frequency/speed devices – MOSFET, Diode and HBTs, Circuit design in THz regime and device modeling, Parameter extraction procedure, Electro-thermal effects and their characterization with pulse, DC, AC and RF measurements, Next generation THz devices: Graphene and 2D-devices, Opportunities, challenges and solutions in THz devices and circuits.

Course participants will learn these topics through lectures and hands-on experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

Module A	**Duration : Feb. 27 - March 03, 2017** **Number of participants for the course will be limited to sixty.**
You Should Attend If…	▪ you are an electronics engineer or research scientist interested in semiconductor devices, high frequency or RF/THz electronics.

	▪ you are practicing engineer working in the field of RF device modeling, measurements, parameter extraction or circuit design. ▪ You are executive, engineer or researcher from manufacturing, service and government organizations including R&D laboratories. ▪ you are a student or faculty from academic institution interested in learning how to do research in the broad area of high frequency electronics.
Fees	The participation fees for taking the course is as follows: **Participants from abroad: US $500** **Industry: Rs. 10000/-** **Student: Rs 1000/-** **Faculty: Rs. 3000/-** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charge. The participants will be provided the accommodation on payment basis.

The Faculty

Prof. Thomas Zimmer is with the IMS Institute, Talence, France and is a Full Professor at the University of Bordeaux. His research interests are focused on electrical compact modeling and characterization of HF devices such as HBT (SiGe, InP), graphene nanotubes and graphene transistors. At the IMS lab, he is the leader of the research group "Nanoelectronics." He was (is) involved in a couple of national and European research projects like the European MEDEA+ programs, the National initiatives NANO2012, National Research Agency (ANR) ACCENT and NANOGRAIN. He is a cofounder of the company XMOD Technologies and Senior Member IEEE. He has served as a Reviewer for many journals (IEEE TED, EDL, SSE etc.), was the TPC (Technical Program Chair) of the ESSDERC 2012 conference and participated on the Program Committee of several conferences (BCTM, ESSDERC, EuMW, IMCL). He has organized several workshops dedicated to SiGe-THz technologies, devices and systems. He has published more than 200 peer-reviewed scientific articles, 2 books and contributed to 8 book-chapters.

Dr. Yogesh Singh Chauhan is an associate professor at IIT Kanpur, India. He received Ramanujan fellowship in 2012, IBM faculty award in 2013 and P. K. Kelkar fellowship in 2015. He is the co-developer of ASM-HEMT model for GaN HEMTs which is under industry standardization at the Compact Model Coalition. His group is also involved in development and support of industry standard BSIM models. His research interests are characterization, modeling, and simulation of advanced semiconductor devices.

Course Coordinator

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