

Topic: **Si-based Transistor and Analog-Mixed-Signal Circuit Scaling and the Natural Progression of Moore's Law to Silicon Quantum Computing at the Atomic Scale**

Presenter: **Prof. Sorin Voinigescu**  
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Date: 11.12.2018, 13:00 – 15:00

Location: TU Graz, Inffeldstr 12EG, HS Integrierte Schaltungen



Abstract:

This presentation will compare the high frequency performance scaling of SiGe HBTs and MOSFETs to 2-3nm gate length and beyond 2THz transistor f<sub>MAX</sub> based on technology CAD (TCAD) and atomistic simulations. Characterization techniques and S-parameter measurements of state-of-the-art silicon MOSFETs, SiGe HBTs, and of a variety of HBT-HBT and for MOS-HBT cascodes from DC to 325 GHz will be discussed along with simulations of the scaling of analog and mixed-signal mm-wave benchmark circuit performance from the current to future technology nodes. Finally, we will take a look at the room-temperature operation requirements for coupled double quantum-dot Si qubits which rely on resonant tunnelling multiple-gate MOSFET structures with sub-5nm dimensions in all directions.

Bio:

Sorin P. Voinigescu received the MSc degree in Electronics from the Polytechnic Institute of Bucharest, Romania, in 1984 and the PhD degree in Electrical and Computer Engineering from the University of Toronto, in 1994. Since 2002 he has been with the Electrical and Computer Engineering Department at the University of Toronto, where he is a Professor. His research and teaching interests focus on atomic-scale electronic devices and their application in integrated circuits and Systems-on-Chip at frequencies beyond 300 GHz. He is the author of several frequently-cited papers on Si and SiGe microwave and mm-wave devices and integrated circuits, and of a well-regarded book on High-Frequency Integrated Circuits published by Cambridge University Press in 2013. In 2008-2009 and 2015-2016 he spent sabbatical leaves at Fujitsu Laboratories of America, Sunnyvale, CA, USA, at NTT's Device Research Laboratories in Atsugi, Japan, at Robert Bosch GmbH in Germany, and at UNSW in Sydney, where he conducted research on technologies and circuits for mm-wave radio, radar and sensors, and on 1Tb/s fiber-optic systems. In 2009-2010 he co-founded and was the CTO of Peraso Technologies which commercializes mm-wave radio WiGig and backhaul transceivers. In 2000, Dr. Voinigescu co-founded and was the CTO of Quake Technologies in Ottawa, Canada, which introduced the first commercial single-chip 10Gb/s SONET and 10GEthernet transceivers in 2001 and 2002, respectively, and which was acquired by AMCC in 2006 after 23 quarters of continuous revenue growth. Between 1994 and 2000 he was with NORTEL in Ottawa where he was responsible for projects in high-frequency characterization and statistical scalable compact model development for Si, SiGe and III-V devices. He also conducted research on wireless and optical fiber building blocks and transceivers in these technologies. From 1984 through 1991 he worked as a microwave semiconductor device and circuits research engineer at the Research Institute for Electronic Components in Bucharest, and as Assistant Professor in the Electronics Department of the Polytechnic Institute of Bucharest. Dr. Voinigescu is an IEEE Fellow, a member of the IDRS and of the ExCom of the IEEE BCTM. He was a Guest Editor of the IEEE Journal of Solid State Circuits in 2015 and 2017, and of the IEEE Transactions on Microwave Theory and Techniques in 2012. From 2003 to 2013 he served on the TPC and ExCOM of the IEEE CSICS and was the Conference Chair in 2012. Between 2008 and 2015 he was a member of the RF/AMS committee of the ITRS. He received NORTEL's President Award for Innovation in 1996 and, in 2013, he was recognized with the ITAC Lifetime Career Award for his contributions to the Canadian Semiconductor Industry.

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