

Topic:           **Circuit Topologies and Design Methodologies for High Data-Rate mm-Wave Radio Transceivers in SOI and FDSOI CMOS**

Presenter:    **Prof. Sorin Voinigescu**  
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Location:     JKU, Linz, Science Park 1/Altenberger Str. 69,  
Room MT121 / 1<sup>st</sup> Floor



Abstract:

This presentation will explore fully digital architectures and circuit topologies for future wireless backhaul systems with aggregate data rates comparable to those of future 64Gbaud fiberoptic systems. The main features of FD-SOI CMOS technology and how to efficiently use its unique features for RF and mm-wave SoCs will be reviewed first. We will discuss the impact of the back-gate bias on the measured I-V, transconductance,  $f_T$  and  $f_{MAX}$  characteristics and compare the MAG of FDSOI MOSFETs with those of planar bulk CMOS, SOI and SiGe BiCMOS transistors through measurements up to 325 GHz. I will provide examples of FDSOI LNA, mixer, switches, and PA circuit topologies and layouts that make efficient use of the back-gate bias to overcome the limitations associated with the low breakdown voltage of sub-28nm CMOS technologies. Examples of measured 45nm SOI CMOS digital transmitters with free space constellation formation at 100 GHz and 140 GHz will be provided along with a 1-30GHz fully digital I-Q transmitter with 20 dBm output power for 5G terminals. Finally, Predistortion and spectral shaping techniques in the transmitter, and receiver ADC-based equalization at 64 GBaud will be discussed.

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 10G Ethernet 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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