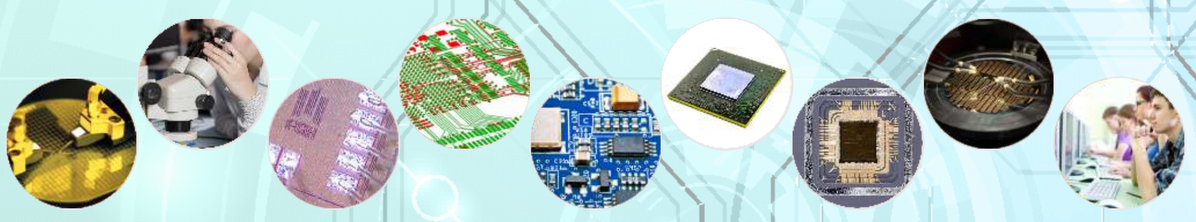
Invited Lectures by Prof. Bogdan Staszewski

organized by the IEEE Solid-State Circuits Society Poland Chapter
and Department of Measurement and Electronics, AGH

Towards a Practically Realizable CMOS Quantum Computer

14:30 - 16:00 Friday, March 16th, 2018, building B1, room 121

A quantum computer (QC) is a new paradigm that exploits basic principles of quantum mechanics, such as entanglement and superposition. It potentially enables unprecedented speedups in solving intractable problems in, for example, prime factorization for encryption, quantum simulations for synthesis of drugs and materials, and complex optimizations. The potential of QC is so enormous that it can irreversibly change the future of computing as well as information storage and communications. In its fundamental embodiment, a QC comprises a quantum processor and a classical electronic controller. The quantum processor consists of a set of quantum bits (qubits) operating at extremely low temperatures, typically a few tens of mK, while the classical electronic controller is used to read out and control the quantum processor, and is typically implemented today with room-temperature laboratory instruments. A recent work in which this applicant was involved at TU Delft has proposed a monolithic integration of the read-out and control circuitry in a standard CMOS technology operating at cryogenic temperatures (cryo-CMOS). Although other specialized electronic technologies can handle cryogenic temperatures, only CMOS can work down to at least 30mK while providing complex system-on-chip (SoC) integration capable of handling thousands or millions of qubits necessary for realistic QC algorithms. A drastic reduction of the complex interconnections between the cryogenic chamber and room-temperature electronics will result in enhanced compactness and reliability, thus paving the way to the creation of practical quantum computers. This talk addresses such issues of building a practical QC.



ALL STUDENTS ARE WELCOME

Biography of the invited speaker

R. Bogdan Staszewski received BSEE (summa cum laude), MSEE and PhD from University of Texas at Dallas, USA, in 1991, 1992 and 2002, respectively. From 1991 to 1995 he was with Alcatel in Richardson, Texas. He joined Texas Instruments in Dallas, Texas in 1995. In 1999 he co-started a Digital RF Processor (DRP) group in TI with a mission to invent new digitally intensive approaches to traditional RF functions. Dr. Staszewski served as a CTO of the DRP group between 2007 and 2009. In July 2009 he joined Delft University of Technology in the Netherlands where he is currently a part-time Full Professor. Since Sept. 2014 he is a Full Professor at University College Dublin (UCD) in Ireland. He has co-authored two books, four book chapters, 230 journal and conference publications, and holds 160 issued US patents. His research interests include nanoscale CMOS architectures and circuits for frequency synthesizers, transmitters and receivers. He is an IEEE Fellow and a recipient of IEEE Circuits and Systems Industrial Pioneer Award.

Meeting venue
AGH University of Science and Technology
Av. Mickiewicza 30, Kraków, Poland
Building B1, 121 lecture hall, 1st floor