

ECE Colloquium Speaker

SiGe Heterostructure Devices: Overview and Outlook

Steven J. Koester

IBM T. J. Watson Research Center

Thursday, April 21 1:30pm DL 260

Abstract: The introduction by IBM of a production SiGe HBT technology in 1998 marked a major milestone in the microelectronics industry. Not only did this achievement lead to the emergence of silicon in the communications marketplace, but, for the first time, it demonstrated the commercial viability of Si-based heterostructure devices. Today, a new revolution is taking place, as SiGe epitaxy is being introduced into mainstream Si CMOS technology. This development not only offers the possibility for engineering a wide range of heterostructure-based MOSFETs, but also presents a tremendous opportunity for the development of new SiGe heterostructure devices whose commercialization could be enabled by the widespread availability of SiGe hetero-epitaxy.

In this talk, I will provide an overview of SiGe heterostructures and then describe my contribution to SiGe heterostructure device research at IBM. These contributions include the development of strained-Si MOSFETs for advanced CMOS logic technology, the demonstration of SiGe n- and p-MODFETs for high-performance and low-power rf communications and the development of germanium photodetectors for high-speed, massively-parallel optical communications. I will also describe my outlook for future research opportunities in SiGe heterostructure device technology, as well as my views on the research implications brought about by the end of conventional CMOS scaling.

Biography: Dr. Koester joined IBM in 1995, and has over 15 years of experience in the field of semiconductor device research. Since 1997, he has performed research on group-IV heterostructure materials and devices, with an emphasis on strained-layer field-effect transistors and photodetectors. Prior to 1997, Dr. Koester worked as a postdoctoral researcher on the fabrication and characterization of nanostructured devices in Si/SiGe strained-layer materials. Before joining IBM, Dr. Koester was a research fellow at the University of California, Santa Barbara. There he performed research involving the fabrication of quantum devices in the InAs/AlSb heterostructure system. His Ph.D. thesis was entitled “Quantized conductance in InAs/AlSb ballistic constrictions.” He also received M.S.E.E and B.S.E.E. degrees from the University of Notre Dame in 1991 and 1989, respectively. Dr. Koester has authored or co-authored over 70 technical publications and conference presentations. He also holds 8 United States patents.