Guest Lecture

mmWave SiGe BiCMOS Technology and Applications

Dr. David Harame

Chief Technical Officer for RF Technology and Enablement Senior Fellow
and IEEE Fellow Global Foundries

Wednesday, April 22, 2015
3:00 pm - 4:00 pm
Room: BAR II 63 a

Abstract: The talk will begin by reviewing what SiGe HBT BiCMOS technology is and what the current state of the manufacturing technology is. Recent developments are pushing the SiGe HBT performances to the >300 GHz fT and >500 GHz fMAX levels. The author will look at some of the critical technology concerns, such as, self-heating effects, vertical scaling limitations, metal Electromigration, and CMOS Integration. What are the scaling challenges and limitations of the SiGe BiCMOS technology and how high in performance will the technology be able to be able to go? For the most effective mm-Wave design there is more than just the SiGe HBT performance that is required. There are high Q passives, mmWafer transmission line elements and tool kits, digital CMOS libraries and excellent RF Process Design Kit. Support for E&M Simulation tools is also required. SiGe HBT BiCMOS continues to excel in more demanding RF/Analog circuit design applications by offering better power-performance tradeoffs. The technology is found in applications that require mostly RF/Analog and less digital content (Big-A/little-D). All of the current production SiGe BiCMOS technologies are in larger lithographic nodes which enable a much lower manufacture cost. Often there are applications where the existing digital capability (i.e. 250-90nm) is sufficient and SOCs are commonly found. In more demanding digital applications a "big digital" advanced CMOS chip may be included in the system architecture by using a system in package approach.

Bio: David Harame received the PhD in Electrical Engineering from Stanford University in 1984. He joined IBM in 1984 at the T.J. Watson Research Center in Yorktown Heights NY where he immediately began working on using epitaxial growth techniques in silicon technology to improve device performance. Dr. Harame has worked on SiGe BiCMOS since its inception and was the first to bring it into manufacturing. He is currently the chief technical executive for development and enablement in IBM's 200mm specialty foundry in Essex Junction Vermont. David is a member of the IBM Academy. David has been the General and Technical Program Chair for the IEEE Bipolar BiCMOS Circuits and Technology Meeting. He is the organizer for the Electrochemical Society SiGe, Ge, and Related Compounds: Materials, Processing, and Devices Symposium. In 2005 he was awarded the Daniel E Noble Award "For the development of manufacturable Silicon Germanium, HBT Bipolar and BiCMOS technologies" and in 2009 he was awarded the IEEE BCTM award. He is an IBM Fellow and an IEEE Fellow.