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ELECTRICAL & COMPUTER ENGINEERING
TEXAS A&M UNIVERSITY

S E M I N A R

Room 236C WEB

Friday, October 14, 2016 2:00 – 3:30 P.M.

THz and mm-Wave Technologies for Sensing and Imaging Applications

by

Dr. Aydin Babakhani
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Abstract: The first section of this talk will focus on techniques for producing and detecting picosecond pulses in silicon that are based on a laser-free fully electronic direct digital-to-impulse radiation. The source technology can produce high-power pulses with duration of less than 2psec, frequency spectrum up to 1.1THz, and line-width of 2Hz at 1THz. In addition to design details and circuit topology, a method of fsec-laser based sampling system will be presented that can characterize radiated pulses from a silicon chip up to 4THz. This will be followed by a presentation on THz gas spectroscopy and hyper-spectral imaging.

The second part of the talk will focus on precision wireless synchronization of array elements using millimeter waves. This technique is used to scale up the array size and eliminate wires between the array elements. As an alternative method to millimeter-wave synchronization, the technique of optically locked microwave oscillators will be presented.

Finally, the last part of the talk will discuss a single-chip full-duplex transceiver for Electron Paramagnetic Resonance (EPR) spectroscopy and a millimeter-size battery-less energy-harvesting microchip with on-chip antennas for medical implants.

Dr. Babakhani is a Louis Owen Junior Chair assistant professor of Electrical and Computer Engineering Department and the Director of the Rice Integrated Systems and Circuits Laboratory. He received his B.S. degree in Electrical Engineering from Sharif University of Technology in 2003, and his M.S. and Ph.D. degrees in Electrical Engineering from Caltech in 2005 and 2008, respectively. Dr. Babakhani was a postdoctoral scholar at Caltech in 2009 and a research scientist at IBM T. J. Watson Research Center in 2010 before joining Rice in 2011.

Dr. Babakhani's research at Rice has been recognized by multiple best paper awards, which includes the Best Paper Award in IEEE RWS Symposium in 2016, the Best Paper Award in IEEE RWS Symposium in 2015, the Best Paper Award in IEEE IMS Symposium in 2014, and the second-place Best Paper Awards in IEEE APS 2016 and IEEE IMS 2016. He has more than 60 publications in peer reviewed journals and conferences as well as 15 patents that are issued or pending. His research is supported by NSF, DARPA, AFOSR, ONR, Keck Foundation, SRC, and more than 10 companies. He received a prestigious NSF CAREER award in 2015, an innovation award from Northrop Grumman in 2014, and a DARPA Young Faculty Award (YFA) in 2012. He is the recipient of the Caltech Electrical Engineering Department's Charles Wilts Best Ph.D. Thesis Prize for his work on Near-Field Direct Antenna Modulation (NFDA).