

Integrated Systems

Scalable Standing Wave Integrated Circuits for Reconfigurable Power Generation, Radiation and Beam Steering at mm-Wave and Terahertz Spectrum

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Zoom Link/Code: [Meeting ID: 966 6085 4996, Passcode: 206787](#)

Abstract: The power generation of transistors declines as the operation frequency increases. At the same time, the free space propagation loss increases, demanding more radiated power from the system. The loss of passive elements in the circuit increases as well, making functions such as oscillation or radiation even more challenging. In order to boost the limited power, multiple sources need to be coupled together in an array structure. However, the significant loss of the coupling circuitry and phase shifters at mm-wave and terahertz frequencies hinders the implementation of large and efficient radiator and phased arrays. Scalable standing wave array structures are proposed based on efficient low loss coupling schemes in order to boost the power and operation bandwidth. Furthermore, a practical approach is proposed to maximize Equivalent Isotropic Radiated Power (EIRP) of the source by optimizing influential parameters of the radiation apparatus. Finally, we demonstrate a new phase shifting method based on combining standing and traveling waves and show how it can achieve significantly higher reconfigurability, phase shifting range and bandwidth. Using all these methods we present coupled-oscillators, scalable radiator arrays, and reconfigurable phased arrays that can produce high resolution images and achieve record beam steering range, tuning range, and output power at mm-wave and terahertz frequencies.

Biography:



Dr. Omeed Momeni (S'04-M'12-SM'18) received the B.Sc. degree from Isfahan University of Technology, Isfahan, Iran, the M.S. degree from University of Southern California, Los Angeles, CA, and the Ph.D. degree from Cornell University, Ithaca, NY, all in Electrical Engineering, in 2002, 2006, and 2011, respectively. He joined the faculty of Electrical and Computer Engineering Department at University of California, Davis in 2011 and is currently an Associate Professor. He was a visiting professor in Electrical Engineering and Computer Science Department at University of California, Irvine from 2011 to 2012. From 2004 to 2006, he was with the National Aeronautics and Space Administration (NASA), Jet Propulsion Laboratory (JPL) as a RFIC designer. His research interests include mm-wave and terahertz integrated circuits and systems.

Prof. Momeni serves as an Associate Editor for The IEEE Microwave and Wireless Components Letters (MWCL) since 2021, and a Technical Program Committee (TPC) member of Radio Frequency Integrated Circuits (RFIC) Symposium since 2018. He has also served as a Distinguished Lecturer for Solid-State Circuits Society (SSCS) in 2020-22, an Associate Editor of Transactions on Microwave Theory and Techniques (TMTT) in 2018-20, a Steering Committee Member (2020) and Technical Program Review Committee Member (2017-20) of the International Microwave Symposium (IMS), an organizing committee member of IEEE International Workshop on Design Automation for Analog and Mixed-Signal Circuits in 2013, and the chair of the IEEE Ithaca GOLD section in 2008-11. Prof. Momeni is the recipient of UC Davis Graduate Program Advising and Mentoring Award in 2022, National Science Foundation CAREER award in 2015, the Professor of the Year 2014 by IEEE at UC Davis, the Best Ph.D. Thesis Award from the Cornell ECE Department in 2011, the Outstanding Graduate Award from Association of Professors and Scholars of Iranian Heritage (APSIH) in 2011, the Best Student Paper Award at the IEEE Workshop on Microwave Passive Circuits and Filters in 2010, the Cornell University Jacob's fellowship in 2007 and the NASA-JPL fellowship in 2003.

Hosted by Prof. Hossein Hashemi, Prof. Mike Chen and Prof. Constantine Sideris

Organized and hosted by Vinay Chenna (vchenna@usc.edu).