IEEE (HK) Section AP/MTT

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IEEE MTT Chapter Distinguished Microwave Lecturer Talk

Chip-Scale Wave-Matter Interactions at RF-to-Light Frequencies: Circuits, Systems and Applications

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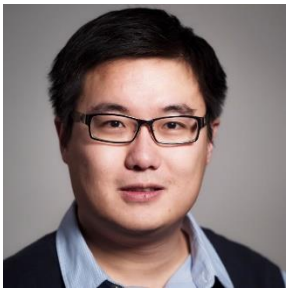
Date: October 6, 2020
Time: 10:00 am to 11:00 am (Hong Kong, UTC+8:00)
Venue: Online
Registration link: https://events.vtools.ieee.org/event/register/239814

Abstract

Traditional electromagnetic (EM) spectral sensors using integrated circuit technologies (e.g. automotive radars, security imagers, cameras, etc.) are normally based on wave scattering or absorption by macroscopic objects at remote distance; the operations are also not specific in wave frequencies. In the past couple of years, a new paradigm of chip-scale EM spectral sensing emerges with features complementary to the above: they utilize various modalities of interactions between EM waves with high-precision frequency control and microscopic particles (molecules, atoms, etc.) in close proximity to the chip. This progress is enabled by the recent advances of silicon devices and processes, especially the increase of circuit operation frequencies into the terahertz regime. Chip-scale sensing and metrology systems with new capabilities, higher performance and unprecedented affordability now become possible. Examples include THz gas spectroscopy sensors, on-chip "atomic-clock-grade" frequency references, room-temperature CMOS-quantum magnetometers, etc. This talk will present the basic physics of a few types of wave-matter interactions, key enabling technologies, as well as the designs and prototypes of chip systems. We will also discuss their potential applications in bio-chemical analysis, wireless networks, PNT (positioning, navigation & timing), security and so on.

Biography



Ruonan Han received the B.Sc. degree in microelectronics from Fudan University, in 2007, the M.Sc. degree in electrical engineering from the University of Florida in 2009, and the Ph.D. degree in electrical and computer engineering from Cornell University in 2014. He has been with the Department of Electrical Engineering and Computer Science, MIT, since July 2014, and is now an associate professor. His research group at MIT focuses on RF-to-photonics integrated circuits and systems for spectroscopy, metrology, imaging, quantum sensing/processing, broadband/secure communication, etc. He was the recipient of the Cornell ECE Directors Ph.D. Thesis Research Award, Cornell ECE Innovation Award, and two Best Student Paper Awards of the IEEE Radio-Frequency Integrated Circuits Symposium (2012 and 2017). He was also the recipient of the IEEE Microwave Theory and Techniques Society (MTT-S) Graduate Fellowship Award, and the IEEE Solid-State Circuits Society (SSC-S) Predoctoral Achievement Award. He is an associate editor of IEEE Transactions on Very-Large-Scale Integration System and IEEE Transactions on Quantum Engineering, a guest associate editor of IEEE Transactions on Microwave Theory and Techniques (2019), and also serves on the Technical Program Committee (TPC) of IEEE RFIC Symposium (2017~present) and the Steering Committee and TPC of 2019 IEEE International Microwave Symposium. He is the IEEE MTT-S Distinguished Microwave Lecturer (2020-2022). He won the Intel Outstanding Researcher Award in 2019 and the National Science Foundation (NSF) CAREER Award in 2017.

***** ALL ARE WELCOME *****

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