

Toward energy-efficient and scalable mm-wave systems

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Zoom Link/Code: [Meeting ID: 950 2226 0136, Passcode: 325523](#)

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Abstract: The end of device scaling is the dawning of a new era in integrated circuit design. Today, there is a growing demand for energy-efficient systems in multi-sensor electric vehicles, UAVs, and distributed wireless pico-cells. This is while, the intrinsic performance of analog building blocks no longer scales with technology nodes. In this talk I will argue that in the absence of device-level scaling, rethinking the frontend architecture by modernizing the traditional hierarchical design can open the door to substantial improvements in hardware efficiency and scalability. I will present two examples to support this claim.

In the first work we rethink digital processing in phase modulated radars by replacing it with a more efficient mixed analog processing scheme. The new system demonstrates more than an order of magnitude improvement in energy efficiency compared to traditional radar sensors. In the second work I introduce a nearest element phase monitoring architecture that overcomes the scalability challenges in traditional LO distribution schemes. Based on this new approach and for the first time, we implement a mm-wave phased array radiator with seamless multi-chip scalability. These two examples demonstrate how combining architectural and circuit-level innovations in this new era can lead to efficient and scalable mm-wave and THz systems.

Biography:



Yahya Tousi received his Ph.D. degree in 2012 from the Department of Electrical and Computer Engineering at Cornell University, Ithaca, NY. In 2014 he joined the IBM T. J. Watson Research Center at Yorktown Heights, NY to develop the next generation of mm-wave phased array transceivers for wireless communication systems, and since 2017 he has been with the ECE Department at the University of Minnesota, Twin Cities. His current research interests are in high performance integrated circuits and novel architectures for mm-wave and terahertz systems with applications in communication, sensing, and healthcare. Dr. Tousi is the co-recipient of ISSCC Lewis Award for Outstanding Paper, and the Journal of Solid-State Best Paper Award both in 2017, the DARPA Young Faculty Award in 2020 and the DARPA Director's Fellowship Award in 2022.

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

Organized and hosted by Michella Rustom (rustom@usc.edu), IEEE GRSS-APS-SSCS Joint Student Chapter.