

# ECSE 500 Fall 2022 Colloquium

11:30 AM to 12:30 PM

Tuesday, October 18, 2022

Meeting ID: 914 3037 7248, Passcode: 874544

## “Toward Energy-Efficient MIMO Communications”

**Abstract:** Increased demand for wireless data traffic will result in a spectrum crunch in 5G and beyond networks. On the other hand, the energy consumption of communication networks has been constantly increasing in the past decade. While studying and enhancing the spectral efficiency (SE) of wireless systems has gained significant attention from research community, the energy efficiency (EE) of these systems has remained less explored. Approaches that address the EE at radio, link and network levels are of significant importance to avoid a possible future energy crunch in beyond 5G networks. In this talk, we will introduce an approach to significantly improve the EE in future wireless networks using novel multi-antenna radio architectures that rely on one or a small number of radio frequency (RF) chains. Unlike conventional multi-antenna radios, multi-antenna single-RF (MASRF) radios are equipped with one RF chain regardless of the number of available antennas. RF chains are major sinks of energy in radios. With economizing on the RF chains, a radio can achieve higher EE in multiple-input multiple-output (MIMO) systems. To utilize the full potential of the MASRF radios, proper signal processing approaches need to be developed. In this talk, we introduce different design aspects of the MASRF radios. Problems such as modulation and signal design, the use of channel state information, low-complexity detection, and multi-user communications are discussed. In addition, we introduce the concept of multi-antenna low RF (MALRF) radios to enhance the transmission rate of the MASRF radios. At the end of the talk, we present some of the potential applications of such radios in 5G and beyond networks



**Hamid Bahrami**  
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**Bio:** Hamid Bahrami is currently an Associate Professor at the Department of Electrical and Computer Engineering (ECE) at The University of Akron, Ohio. He also serves as the Associate Chair for Graduate Studies at the ECE department. His main areas of research include wireless communications, information theory, and applications of signal processing in communication. He has received his Ph.D. degree in Electrical Engineering from McGill University, Montreal, Canada in 2008. From 2007 to 2009 and prior to joining The University of Akron, he was a scientist at Wavesat Inc. (now Marvell Technology) Montreal, Canada, where he was leading an R&D team to develop MIMO transmission and reception algorithms for 4G wireless technologies including WiMAX and LTE standards. Dr. Bahrami has served as the Editor for the IEEE Transactions on Communications and the Transactions on Emerging Telecommunications Technologies (formerly European Transactions on Telecommunications), as the Guest Editor for The Scientific World Journal and Electronics, and as the Technical Program Committee member for numerous IEEE conferences including IEEE GLOBECOM and International Conference on Communications (ICC). He is currently a Senior Member of the IEEE, and a member of the IEEE Communications and the IEEE Vehicular Technology societies.

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