Northeastern
SMART Center

2021 Seminar Series –

COHERENT INFORMATION PROCESSING WITH ON-CHIP HYBRID MAGNONICS

Dr. Yi Li

Abstract: Hybrid dynamic systems have recently attracted great attention due to their applications in quantum computing, communications, and sensing. In particular, they provide a new paradigm for combining platforms and devices that can perform different tasks such as storing, processing, and transmitting coherent states. In this talk, I will discuss the potential in quantum information processing brought by magnon—the collective excitations of magnetization. Magnons exhibit a few key features making them highly competitive in quantum information processing, namely their strong coupling to microwave photons, their extraordinary tunability and flexibility for chip-based circuit integration, as well as their excellent compatibility for coupling with various dynamic media such as mechanical excitations and optical photons for coherent quantum transduction. In the first part, I will demonstrate strong coupling between magnons and microwave photons by integrating magnetic devices with coplanar superconducting resonators on Si substrate. The on-chip integration of such superconducting hybrid magnonic circuits provides great flexibility in circuit design, device scalability as well as being extended to the circuit quantum electrodynamics for qubit controls. In the second part, I will cultivate the dynamic interaction between magnons and excitations with far different frequencies, such as mechanical excitations and optical photons, for advanced sensing of magnetic excitations. The device-level coupling between diverse excitations suggest a compelling candidate of magnons for building a universal coherent transducer in bridging different quantum systems for extended functionality.

Time: 11:15 am -12:45 pm, January 29th, Friday, 2021

Virtual:
Join by Zoom: https://northeastern.zoom.us/j/95476781454

Dr. Yi Li is currently a postdoc in the Superconductivity and Magnetism Group at Argonne National Laboratory. He has obtained his B.S. degree in Physics from Peking University (2009) and his Ph.D. degree in Materials Science & Engineering from Columbia University (2015). Prior to Argonne he has been a postdoc at CEA Saclay in France for two years (2015-2017). Yi Li's research focuses on building hybrid quantum magnonic circuits based on microwave superconducting circuits and magnetic devices for their applications in quantum information processing. Yi was the recipient of the Postdoctoral Performance Awards (2020) at Argonne National Laboratory and the IEEE Chicago "Distinguished R&D" Award (2020) for his pioneering work on magnon-photon coupling in superconducting resonator for Quantum Information Science. For more information about his work please visit: https://sites.google.com/view/prc1988.