Department of Electrical and Computer Engineering

TEXAS TECH UNIVERSITY
Edward E. Whitacre Jr.
College *of* Engineering

Fall 2025 Seminar Series

Seminar Title: ***Tunable Magnon-Phonon Cavity via Structural Phase Transition***

Time: 3:00-3:50 PM, Monday, Nov. 10, 2025

Location: ECE 101

Speaker:
Wencan Jin
Auburn University

Abstract:
Strong coupling between two quantized excitations in a cavity has the potential to lead to hybridized states that bestow novel quantum phenomena and device applications. In particular, tunable hybrid magnon-phonon cavities with precise control knobs are critically in need for developing quantum functionalities in solid-state platforms. However, hybrid quantum systems based on conventional magnetic multilayers encounter significant challenges in tuning interfacial coupling by design. In this work, using a combination of synthesis and characterization tools, we present an epitaxial $La_{0.7}Sr_{0.3}MnO_3/SrTiO_3$ (LSMO/STO) heterostructure that manifests strong couplings between the Kittel magnon and the transverse acoustic phonon. Remarkably, leveraging the magnetoelastic interaction at the epitaxial interface, we demonstrate that when the STO substrate undergoes a cubic-to-tetragonal phase transition at ~105 K, the Kittel magnon of the LSMO thin film splits into three bands due to anisotropic structural strains along the [100], [010], and [001] crystalline axes, hence, resulting in an array of non-degenerate, hybridized magnon-phonon modes. Moreover, we develop an analytical model that can reproduce the interfacial strain-induced magnon splitting and the strength of magnon-phonon coupling. Our work highlights structural phase transitions as a sensitive trigger for generating multistate magnon-phonon hybridization in high-quality magnetoelastic oxide heterostructures – a new route for implementing strain-mediated hybrid magnonics in phononic systems with potential applications in coherent energy and signal transduction.
Reference: C. Tang *et al*., arXiv:2510.06464 (2025)

Speaker Bio:
Dr. Wencan Jin is Thomas and Jean Walter Associate Professor in the Department of Physics and Adjunct Professor of Electrical and Computer Engineering at Auburn University. His research focuses on nonlinear optical spectroscopy (SHG) and photoemission spectroscopy (ARPES, XPS) studies of novel quantum materials with emphasis of light-matter interactions in 2D vdW materials (funded by NSF EPM and NSF CAREER) and ferroic orders in complex oxides (funded by DOE EPSCoR and AFOSR). He graduated from Renmin University of China in 2011 and received his Ph.D. from Columbia University in 2017. He then worked as a Postdoctoral Researcher at the University of Michigan, Ann Arbor and joined Auburn University in 2019.