DEPARTMENT OF
PHYSICS &
ASTRONOMY

Physics & Astronomy
Colloquium

Prof. Rui He

Texas Tech University

3:30 - 4:30 p.m. | Tuesday, Sept. 2

ELECE Building 101

Raman spectroscopy of quantum materials of 2D magnets

Van der Waals (2D) materials with intrinsic magnetism have attracted massive interest because of their potential applications in data storage and spintronics devices. Atomic layers of chromium triiodide (CrI_3) are one of such 2D ferromagnetic (FM) materials that have been demonstrated to realize long range FM order in its monolayer limit. Raman spectroscopy is a convenient and powerful technique to probe the lattice, electronic, and magnetic excitations in 2D magnets. In this talk, I will present our Raman spectroscopy studies of magnons (spin waves) in bulk CrI_3 and studies of moiré magnetism in twisted double bilayer CrI3. We have revealed a novel mixed state of layered antiferromagnetism (AFM) and FM in 3D bulk CrI_3 and have revealed the emergence of finite net magnetization that originates from spin frustrations and noncollinear spin texture introduced by moiré superstructures in twisted double bilayer CrI_3. I will also show our Raman spectroscopy studies of spin-induced nematicity in few-layer XY-type magnet $NiPS_3$ and our observation of phonon Zeeman splitting in monolayer MoS_2 which is usually considered as a non-magnetic material. Our Raman spectroscopy studies offer an unprecedented venue for probing novel magnetic states and phases in diverse quantum materials.

Biography

Dr. Rui He obtained her B.S. degree from Fudan University in China in 1999. She received her Ph.D. degree in Applied Physics from Columbia University in the City of New York in 2006. After her graduation from Columbia, she joined the Hong Kong University of Science and Technology as a postdoc in the Physics Department. In 2009 she returned to Columbia University where she worked as a postdoctoral research scientist. She joined the Physics Department at the University of Northern Iowa as an assistant professor in August 2011 and became an associate professor in 2016. She joined the Electrical and Computer Engineering Department at Texas Tech University as an associate professor in July 2017 and became a full professor in 2023. She is an NSF CAREER award recipient, and her research interests include the general area of Raman studies of nanostructures and quantum materials.