Department of Electrical and Computer Engineering
Materials Engineering Program
Texas Center for Superconductivity at Univ. of Houston
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10:00 a.m., May 6, 2022
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Probing a ferro-rotational order by optical second harmonic generation

Wencan Jin
Department of Physics, Auburn University

Abstract:

A ferro-rotational order describes a ferroically ordered state of an axial vector moment that is invariant under both spatial inversion and time reversal operations. This order was first theoretically proposed to complete the classification of ferroics with vector order parameters, and now is the last remaining class to be revealed after the discoveries of ferro-toroidal, ferromagnetic, and ferroelectric orders. More recently, this order is suggested to exist in a good number of complex oxides and is responsible for several novel quantum phenomena including the type-II multiferroic order. In this talk, I will present our studies of the ferro-rotational order in a type-II multiferroic material RbFe(MoO4)2 using high sensitivity rotational anisotropy second harmonic generation (RA-SHG). I will show that the higher order electric quadrupole contribution to SHG has been exploited to investigate this inversion-symmetry-preserved ferro-rotational order. I will then reveal several physical properties of this ferro-rotational order including its symmetry, domain distributions, temperature evolutions, and conjugate coupling field. I will further discuss the significance of understanding this ferro-rotational order in device applications and the new opportunities brought by the state-of-the-art SHG spectroscopy and microscopy.

Short Bio:
Dr. Wencan Jin is an Assistant Professor in Department of Physics at Auburn University. He received his Ph.D. from the Department of Applied Physics at Columbia University in 2017, advised by Prof. Richard M. Osgood. From 2017 to 2019, he worked in Prof. Liuyan Zhao's group in the Department of Physics at the University of Michigan, Ann Arbor as a postdoctoral researcher. His research focuses on investigating electronic and magnetic phases of quantum materials using synchrotron-based photoemission spectroscopy and linear/nonlinear optical spectroscopy techniques.