Abstract for IAS Quantum Forum on Altermagnetism and Beyond (August 10-13, 2026)

Multiferroic p-Wave Magnets

Qian SONG

Department of Physics, University of California Berkeley, USA

Email: qiansong@berkeley.edu

Altermagnets are a new class of magnetic materials possessing zero magnetization like antiferromagnets but exhibiting non-relativistic spin splitting of the electronic bands and anomalous Hall responses like ferromagnets. Recent studies have explored non-collinear non-centrosymmetric magnetic systems that exhibit odd-parity spin splitting with non-relativistic origin (p-wave magnets). Symmetry considerations suggest the possibility of coupling p-wave magnetism with ferroelectricity in polar chiral magnets, potentially allowing for novel mechanisms for electric-field control of p-wave magnetism.

In this talk, I will start by discussing our optical studies of spin spiral multiferroicity in van der Waals material NiI2 down to the two-dimensional limit [1]. I will then focus on our recent work on electrical switching of p-wave magnetism in NiI2, and its connection to ferroelectricity and chirality [2]. Lastly, I will conclude with an outlook for potential applications of spin-spiral multiferroics for information storage.

References:

[1] Q. Song, et al. *Nature* 602, 601 (2022)

[2] Q. Song, et al. *Nature* 642, 64 (2025)