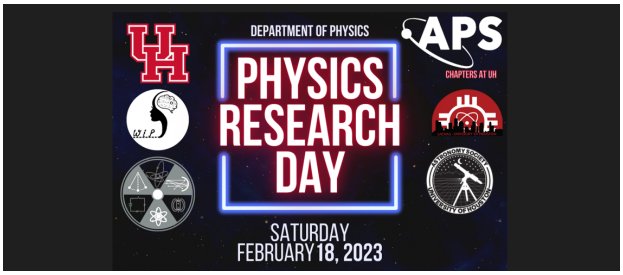

Contribution ID: **8** Type: **Talk**

Vortical effects in chiral band structures

Saturday 18 February 2023 14:00 (15 minutes)

The chiral vortical effect is a chiral anomaly-induced transport phenomenon characterized by an axial current in a uniformly rotating chiral fluid. It is well-understood for Weyl fermions in high energy physics, but its realization in condensed matter band structures, including those of Weyl semimetals, has been controversial. In this work, we develop the Kubo response theory for electrons in a general band structure subject to space- and time-dependent rotation or vorticity relative to the background lattice. For continuum Hamiltonians, we recover the chiral vortical effect in the static limit. In the transport limit, we discover a new effect that we dub the gyrotropic vortical effect. The latter is governed by Berry curvature of the occupied bands while the former contains an additional contribution from the magnetic moment of electrons on the Fermi surface. The two vortical effects can be understood as analogs of the well-known chiral and gyrotropic magnetic effects in chiral band structures. We address recent controversies in the field and conclude by describing device geometries that exploit vortical effects in transport properties.

Academic year

3rd year

Research Advisor

Pavan Hosur

Authors: Dr HOSUR, Pavan (University of Houston); NANDA, Swadeepan

Presenter: NANDA, Swadeepan

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