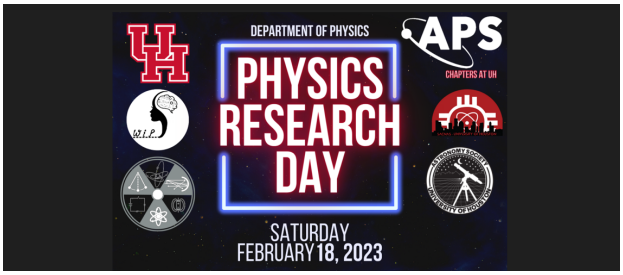

Contribution ID: **25** Type: **Talk**

Quantum Transport of Charge Density Waves

Saturday 18 February 2023 14:45 (15 minutes)

The charge density wave (CDW) is a condensate known to carry electric current en masse, but collective CDW transport remains poorly understood at the microscopic level. Its quantum nature is clearly revealed by oscillations of period $h/2e$ in CDW conductance vs. magnetic flux, sometimes accompanied by telegraph-like switching, in $TaS3$ rings above 77 K. Here we show evidence for quantum time evolution, via a matrix element with Zener-like field dependence, which couples evolving macrostates. We find that, for temperatures ranging from 9 to 474 K, current-voltage plots of three CDW materials agree almost precisely with a modified Zener-tunneling curve and with time-correlated soliton tunneling model simulations. In the model we treat the Schrödinger equation as an emergent classical equation that describes fluidic Josephson-like coupling between evolving topological states. We find that an extension of this "classically robust" quantum picture explains both the $h/2e$ magnetoconductance oscillations and switching behavior in CDW rings. Finally, we discuss hybrid CDW-superconductor qubit device concepts, to enable quantum computer operation at higher-than-milli-Kelvin temperatures.

Academic year

3rd year

Research Advisor

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