ICTS Condensed Matter Seminar

Title : Magnon transmission across ν = 1| − 1|1 mono-layer graphene junction as a probe of electronic structure

Speaker : Suman Jyoti De (McGill University, Canada)

Date : Wednesday, 11 September 2024

Time : 11:30 AM (IST)

Abstract : We study magnon transmission across gate-controlled junctions in the n = 0 manifold of Landau levels in monolayer graphene, in the presence of both spin and valley Zeeman fields. Specifically, we consider the 1| − 1|1 sandwich geometry. The nature of the interfaces between regions of different filling turns out to be crucial for magnon transmission. Using the Hartree-Fock approximation, we find that either the spin or the valley degrees of freedom of the occupied one-body states rotate across the interfaces. If the interfaces exhibit spin rotation, magnon transmission is suppressed at high energies, while if the interfaces have valley rotation, magnon transmission becomes perfect at high energies. The valley Zeeman coupling, which arises from partial alignment with the encapsulating Boron Nitride, is independent of perpendicular magnetic field B, while the spin Zeeman and other anisotropic couplings scale linearly with B. This allows the tuning of the relative strength of the valley Zeeman coupling in situ by varying B, which can drive phase transitions of the interfaces between spin-rotated and valley-rotated phases, leading to magnon transmission being either vanishing or perfect at high energies. Our analysis[1], along with the experimental measurements, can be used to determine the anisotropic couplings in the sample.

References
[1] Suman Jyoti De, Sumathi Rao, Ganpathy Murthy, PhysRevB. 110, 085417(2024).

Venue : Emmy Noether Seminar Room
Zoom Link: https://icts-res-in.zoom.us/j/98882253677?pwd=tluqsjza7isbVSFGbcbSidZtNxcuai.1
Meeting ID: 988 8225 3677
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