Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Designer quantum matter in van der Waals heterostructures

Somesh Chandra Ganguli

Aalto University, Finland

In my talk, I will demonstrate the versatility of van der Waals (vdW) heterostructures to engineer artificial electronic phenomena. The vdW systems has recently become de facto platform for the designer materials for its extremely clean, defect-free and atomically well-defined interfaces. These factors make it possible to combine materials with seemingly competing electronic orders such as ferromagnetism, superconductivity.

In the first part of my talk, I will describe the fabrication of designer 2-dimensional topological superconductor having 1-dimensional Majorana edge modes by combining 2D ferromagnet monolayer $CrBr_3$ and s-wave superconductor $NbSe_2$. I will also demonstrate how the Moire′ pattern between $CrBr_3$ and $NbSe_2$ modulates the topological band structure.

In the second part of my talk, I will demonstrate that Kondo coupling between 2 different geometrical phases of TaS_2, namely 1T-TaS_2 having localised magnetic moments and 1H-TaS_2 having itinerant conduction electrons generates artificial heavy fermion system which mimics the behaviour of compounds containing rare-earth elements with 4f or 5f electrons.

Finally, I will talk about the signatures of unconventional superconductivity in monolayer transition metal dichalcogenide superconductors 1H-$NbSe_2$ and 1H-TaS_2 demonstrating the role of the dimensionality and confinement in realising unconventional superconductivity in vdW systems.

Thursday, Nov 2nd 2023

11:30 AM (Tea / Coffee 11.15 AM)

Auditorium, TIFR-H