S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES
Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Condensed Matter and Materials Physics

13th December, 2023 **4.00 PM** **ONLINE/FERMION**

SPEAKER
Dr. Bheemalingam Chittari
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TITLE OF THE TALK

ORBITAL HALL EFFECT IN LAYERED TWO-DIMENSIONAL MATERIALS

ABSTRACT

The orbital Hall effect in layered two-dimensional materials is an intrinsic phenomenon. The s- and p-orbital elements, with no spin magnetization, naturally exhibit the orbital Hall effect under an external electric field, which is more fundamental than the spin Hall effect. The quantum Hall phases arise from the topologically invariant non-trivial bands of quantum materials, mainly non-degenerate electronic bands associated with one of the valleys. The pure orbital nature of such electronically non-degenerate states associated with the valleys shows the orbitronics phenomenon. Recently, these orbitronics have become more popularly studied in two-dimensional materials like graphene and transition metal dichalcogenides. It has been demonstrated that the orbital current injected into the ferromagnet utilizes the orbital Hall effect, generating orbital torque on local magnetic moments and leading to a large spin Hall effect. In this talk, we will discuss the origin of the orbital Hall effect in bilayer graphene and hetero-bilayer two-dimensional materials through the orbital Berry curvatures and giant magnetization. Furthermore, we will discuss the interplay of the Haldane parameters for the topological transitions that are related to the orbital Hall nature of the low-energy bands.

HOST FACULTY

Dr. T. Setti, Associate Professor

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