Fundamental Quantum Science Program
Seminar series No.4

●Date & Time : **Monday 8th July 2024 14:00-15:30**
●Venue : # Room309, Frontier Research Laboratory

Prof. Mandar M. Deshmukh

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" Berry curvature dipole senses topological properties of a moiré superlattice"

Topological aspects of electron wavefunction play a crucial role in determining the physical properties of materials. Berry curvature and Chern number are used to define the topological structure of electronic bands. While Berry curvature and its effects in materials have been studied detecting changes in the topological invariant, Chern number, is challenging; particularly changes of valley Chern type. In this regard, twisted double bilayer graphene (TDBG) has emerged as a promising platform to gain electrical control over the Berry curvature hotspots and the valley Chern numbers of its flat bands. In addition, strain induced breaking of the three-fold rotation (C3) symmetry in TDBG, leads to a non-zero first moment of Berry curvature called the Berry curvature dipole (BCD), which can be sensed using nonlinear Hall (NLH) effect. We reveal, using TDBG, that the BCD detects topological transitions in the bands and changes its sign [1]. In TDBG, the perpendicular electric field tunes the valley Chern number and the BCD simultaneously providing us a tunable system to probe the physics of topological transitions. I will also discuss our preliminary experiments probing the chirality of moire systems using non-linear Hall physics.

1. Sinha et al. Nature Physics 18, 765 (2022).

・Hosted by : Dr. Naoto Nagaosa
(Fundamental Quantum Science Program)