2024 IBS-CALDES Seminar

- ✓ **Date & Time:** 4:00PM, November 28 (Thu), 2024
- ✓ **Venue:** IBS POSTECH Campus Bldg. 104
- ✓ **Speaker & Title**

4:00PM~ Prof. Joonho JANG (Seoul National University)

"Engineering multilayer graphene superlattices as a platform for studying interacting quantum phases"

**** This talk will be given only in Korean.***

Organized by: Dr. Jhinhwan LEE (jhinhwan@ibs.re.kr, 054-260-9014)

- **4:00PM~**

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Engineering multilayer graphene superlattices as a platform for studying interacting quantum phases

Joonho JANG
Department of Physics and Astronomy, Seoul National University

A Bilayer of semiconducting 2D electronic systems has long been a versatile platform to study electronic correlation with tunable interlayer tunneling, Coulomb interactions and layer imbalance. In the natural graphite bilayer, Bernal-stacked bilayer graphene (BBG), the Landau level gives rise to an intimate connection between the valley and layer. Adding a moiré superlattice potential enriches the BBG physics with the formation of topological minibands, potentially leading to tunable exotic quantum transports. Further increasing the number of layers is expected to rapidly expand the possible phase space one can explore to tune the interplay between the electronic correlation and band topology.

In this talk, I will present our recent magneto-transport measurements of a high-quality bilayer graphenehexagonal boron nitride (hBN) heterostructure. The zero-degree alignment between the bilayer graphene and hBN generates a strong moiré superlattice potential for the electrons in BBG and the resulting Landau fan diagram of longitudinal and Hall resistance displays a Hofstadter butterfly pattern with an unprecedented level of detail. Our work demonstrates that the intricate relationship between valley and layer degrees of freedom controls the topology of moiré-induced bands, significantly influencing the energetics of interacting quantum phases in the BBG superlattice. We further observe signatures of field-induced correlated insulators and clear fractional quantization of interaction driven topological quantum phases. Finally, I will discuss the important considerations in utilizing multilayer graphene heterostructures as ideal platforms to study the delicate interplay between topology and electron correlation. In particular, our recent results in helically stacked twisted trilayer graphenes will bepresented as an example.