

SPP Colloquium

Date: 15 July 2021
Time: 5:00 PM – 7:00 PM
Location: Online Zoom Meeting



GUEST SPEAKER:

Prof. Dr. Dmitri Efetov

ICFO – The Institute of Photonic Sciences, Barcelona, Spain.

TITLE:

"Magic Angle Bilayer Graphene – Superconductors, Orbital Magnets, Correlated States and beyond"

ABSTRACT:

When twisted close to a magic relative orientation angle near 1 degree, bilayer graphene has flat moire superlattice minibands that have emerged as a rich and highly tunable source of strong correlation physics, notably the appearance of superconductivity close to interaction-induced insulating states. Here we report on the fabrication of bilayer graphene devices with exceptionally uniform twist angles. We show that the reduction in twist angle disorder reveals insulating states at all integer occupancies of the four-fold spin/valley degenerate flat conduction and valence bands, i.e. at moire band filling factors $\nu = 0, +(-) 1, +(-) 2, +(-) 3$, and reveals new superconductivity regions below critical temperatures as high as 3 K close to - 2 filling. In addition we find novel orbital magnetic states with non-zero Chern numbers. Our study shows that symmetry-broken states, interaction driven insulators, and superconducting domes are common across the entire moire flat bands, including near charge neutrality. We further will discuss recent experiments including screened interactions, fragile topology and the first applications of this amazing new materials platform.

PROFILE OF PROF DR DMITRI EFETOV:

Prof. Dr. Dmitri Efetov received his PhD in 2014 from Columbia University, where he investigated the electronic properties of 2D van der Waals materials. He then came to MIT as a postdoctoral researcher where he investigated the fundamental thermal properties of Dirac electrons in graphene for quantum sensing applications. Since 2017 he is professor at ICFO, Barcelona (Spain), and group leader of the Low-Dimensional Quantum Materials group.