Thermodynamic measurements of correlated states in Magic Angle Twisted Bilayer Graphene

Dmitri K. Efetov

LMU Munich, Munich, Germany

It has been recently postulated, that the strongly correlated flat bands of magic-angle twisted bilayer graphene (MATBG) can host coexisting heavy and light carriers. While transport and spectroscopic measurements have shown hints of this behavior, a more direct experimental proof is still lacking. Here, we explore the thermoelectric response of MATBG through the photo-thermoelectric (PTE) effect in gate-defined MATBG pn-junctions. At low temperatures, we observe sign-preserving, filling dependent oscillations of the Seebeck coefficient at non-zero integer fillings of the moiré lattice, which suggest the preponderance of one carrier type despite tuning the Fermi level from hole to electron doping of the correlated insulator. Furthermore, we use the ultra-low carrier concentration in MATBG to engineer ultra-sensitive single photon detectors for near-IR photons.