Correlated phases near the van Hove singularity in trigonally warped bilayer graphene

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Diverging density of states can lead to correlated phases in low dimensional systems. This includes the graphene family that hosts electric-field controlled Lifshitz transitions and concomitant van Hove singularities in the density of states. Here, we present the observation of experimental signatures consistent with various interaction-driven phases in naturally occurring AB bilayer graphene including the fractional metals of Stoner type [1]. More prominently, we have found competing nontrivial insulating and metallic phases that exhibit intriguing temperature dependences and nonlinear I-V characteristics at zero magnetic field [1]. Evidencing interacting physics in this simple and reproducible system offers a fertile ground for exploring intricating many-body phases.

References

[1] A. M. Seiler, F. R. Geisenhof, F. Winterer, K. Watanabe, T. Taniguchi, T. Xu, F. Zhang and R.T. Weitz, Nature 608, 298–302 (2022)

Figures

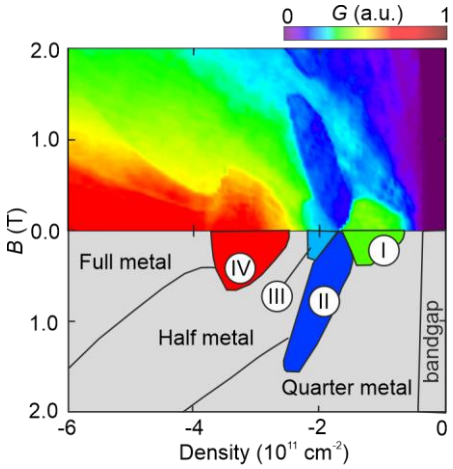

Figure 1: Conductance map as a function of charge carrier density and magnetic field B at a large electric displacement field measured in encapsulated bilayer graphene at a temperature of 10 mK. Several correlated phases of Stoner (quarter metal and half metal) and non-Stoner type (phases I-IV) appear.