PHYSIKALISCHES KOLLOQUIUM

Sommersemester 2024

Das Kolloquium findet (soweit unten nicht anders angegeben) jeweils montags **jeweils montags um 16:15 Uhr online via Zoom** statt.
(Der jeweilige Link wird noch zur Verfügung gestellt.).

22.04.2024

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Local Kekulé distortions can stabilize topological insulating phases in magic-angle twisted bilayer graphene

Abstract

In the first part of the talk I will give a brief introduction to twisted bilayer graphene. Taking inspiration from the unexpected positive interplay between Coulomb repulsion and Kekulé optical breathing modes in over expanded graphene, I will then move to discuss the outcomes of that same interplay in unstrained magic-angle twisted bilayer graphene. In particular, I will show that Kekulé distortions localised in the tiny AA regions are able to stabilize, in cooperation with Coulomb repulsion, topological insulating phases at any integer occupation of the four flat bands around the charge neutrality point.

When the distortion is dynamical, those insulating phases, which resemble Anderson's RVB states, are ferromagnetic, with a magnetic moment mostly contributed by orbital magnetisation. That implies the unavoidable coexistence of domains, each of them characterized by a different orientation of magnetization as well as a different Chern number.

Moreover, the coupling between electrons and Kekulé modes naturally explains the emergence of superconductivity away from integer fillings, which is predicted to have either chiral d-wave character or a nematic one.

Für die Dozentinnen bzw. Dozenten der Fakultät

Prof. Dr. Hinkov, Prof. Dr. Hinrichsen, Prof. Dr. Porod, Dr. Ünzelmann und Hr. Kuhr