Speaker:

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Title:

Transport in electrostatically induced bilayer graphene quantum dots

Abstract:

The tuneability and control of quantum nanostructures in two-dimensional materials offer promising perspectives for their use in future electronics. It is hence necessary to analyze quantum transport in such nanostructures. Material properties such as a complex dispersion, topology, and charge carriers with multiple degrees of freedom, are appealing for novel device functionalities but complicate their theoretical description. Here, we study quantum tunnelling transport across a few-electron bilayer graphene quantum dot. We demonstrate how to uniquely identify single- and two-electron dot states' orbital, spin, and valley composition from differential conductance in a finite magnetic field. Furthermore, we show that the transport features manifest splittings in the dot's spin and valley multiplets induced by interactions and by the magnetic field (the latter being a consequence of bilayer graphene's Berry curvature). Our results teach about spin- and valley-dependent tunnelling mechanisms and will help to utilize bilayer graphene quantum dots, e.g., as spin and valley qubits.