Coherent transport in a network of chiral one-dimensional states in minimally twisted bilayer graphene

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Twisted by a tiny angle, two graphene layers undergo lattice reconstruction forming a triangular tiling of Bernal-staked (AB and BA) domains [1]. In such bilayers, the AB/BA domain walls are interconnected by metallic quantum dot-like AA regions, and the whole system behaves purely as a network of one-dimensional chiral states when an interlayer bias is applied [2,3]. Here we study transport properties of such a network at high in-plane biases and external perpendicular magnetic fields and demonstrate the magneto-electric Aharonov-Bohm effect. The observed effect is robust against temperature and persists up to 80 K.

References

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Figures

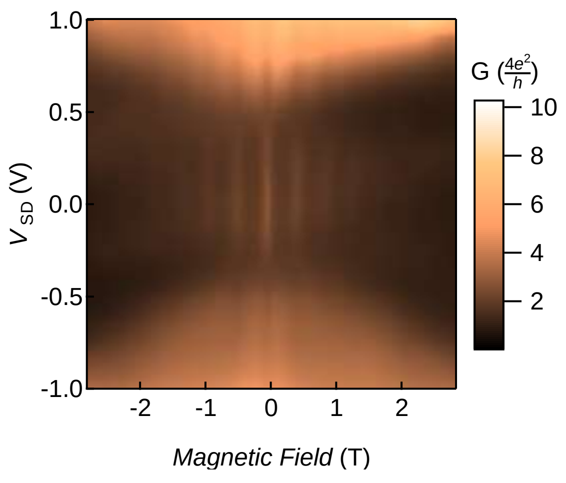

Figure 1: Differential conductance G of the network as a function of a perpendicular magnetic field and an intra-layer bias V_{SD}. At zero in-plane bias, G demonstrates giant Aharonov-Bohm oscillations. As V_{SD} is increased from 0 V to 1 V, the phase of the oscillations changes in a threshold-like fashion. We attribute this behaviour to the electric Aharonov-Bohm effect in electrostatic high-field domains.