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Gate-tunable tunneling resistance in graphene/topological insulator vertical junctions[1] LIANG ZHANG, 1 State Key Laboratory for Mesoscopic Physics, Department of Physics, Peking University, Beijing 100871, P.R. China , YUAN YAN, State Key Laboratory for Mesoscopic Physics, Department of Physics, Peking University, Beijing 100871, P.R. China, HAN-CHUN WU, School of Physics, Beijing Institute of Technology, Beijing, 100081, P.R. China , ZHI-MIN LIAO, DAPENG YU, State Key Laboratory for Mesoscopic Physics, Department of Physics, Peking University, Beijing 100871, P.R. China — The emergence of graphene-based vertical heterostructures, especially stacked by various layered materials, opens up new promising possibilities for investigations and applications. The junction based on two famous Dirac materials, graphene and topological insulator, Bi_2Se_3, can considerably enlarge the family of van der Waals heterostructures, while the experimental approach to obtain controllable interface of these junctions is still a challenge. Here we show the experimental realization of the vertical heterojunction between Bi_2Se_3 and monolayer graphene. The tunneling-mediated quantum oscillations are identified to arise from several two-dimensional conducting layers. The electrostatic field induced by back gate voltage, as well as the magnetic field, is applied to tailor the available density of states near the Fermi surface. We observe exotic gate-tunable tunneling resistance in high magnetic field, which is attributed to semimetal-quantum Hall insulator transition in the underlying graphene.

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