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Quantum Blockades and Loop Currents in Graphene with Topological Defects YAN-YANG ZHANG, JIANG-PING HU, B.A. BERNEVIG, XIANGRONG WANG, XIN-CHENG XIE, WU-MING LIU — We investigate the effect of topological defects on the transport properties of a narrow ballistic ribbon of graphene with zigzag edges. Our results show that the longitudinal conductance vanishes at several discrete Fermi energies where the system develops loop orbital electric currents with certain chirality. The chirality depends on the direction of the applied bias voltage and the sign of the local curvature created by the topological defects. This novel quantum blockade phenomenon provides a new way to generate a magnetic moment by an external electric field, which can prove useful in carbon electronics.

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