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**Snake states and their symmetries in graphene** RAKESH TIWARI, University of Basel, YANG LIU, MATEJ BRADA, Loughborough University, C. BRUDER, University of Basel, F. V. KUSMARTSEV, Loughborough University, E. J. MELE, University of Pennsylvania — Snake states are open trajectories for charged particles moving in two dimensions under the influence of a spatially varying perpendicular magnetic field. They can also occur in a constant perpendicular magnetic field when the particle density is made nonuniform as realized at a pn junction in a semiconductor, or in graphene. We examine the correspondence of such trajectories in monolayer graphene in the quantum limit for two families of domain walls: (a) a uniform doped carrier density in an antisymmetric perpendicular magnetic field and (b) antisymmetric carrier density distribution in a uniform perpendicular magnetic field. Although, these families support different internal symmetries, the pattern of the boundary and interface currents is the same in both cases. We demonstrate that these two physically different situations are gauge equivalent when rewritten in a Nambu doubled formulation of the two limiting problems. Using gauge transformations in particle-hole space to connect these two problems, we map the protected interfacial modes to the Bogoliubov quasiparticles of an interfacial one-dimensional p-wave paired state.

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