Abstract Submitted for the MAR17 Meeting of The American Physical Society

Screw-Dislocated Level Structure of Graphene Potential Wells DANIEL WALKUP, Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD 20899, USA; Maryland NanoCenter, University of Maryland, College Park, MD 20742, JOSEPH STROSCIO, Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD 20899, USA — We investigate the linearized graphene Hamiltonian with a radially-symmetric power-law potential in the two-dimensional parameter space of mass and magnetic field. At zero mass the quasibound eigenresonances, denoted $|n,m\rangle$ (where n and m are the radial and azimuthal quantum numbers) form distinct ladders for each m, and each such ladder has the property that for massless particles the energies and eigenstates are discontinuous at a critical field B_c . Turning on a mass bridges this discontinuity, but negative and positive masses connect different eigenstates, producing a screw dislocation in the eigenstate spectrum. We numerically propagate the wavepacket of an $|n,m\rangle$ eigenstate in a slowly-evolving Hamiltonian whose path encloses B_c , and verify that a closed adiabatic loop conveys the particle to the |n+/-1,m> state, demonstrating the existence of a screw dislocation in the spectrum. We explain the dislocation in terms of the Berry phase acquired while encircling the critical magnetic field B_c .

Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD 20899, USA; Maryland NanoCenter, Un

Date submitted: 10 Nov 2016

Electronic form version 1.4