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Transition to Scarred States Probed by a Single Electron Spectrometer ROBERT E. PARROTT, Harvard University, DOMINIK M. ZUMBUHL, Massachusetts Institute Of Technology, ERIC J. HELLER, CHARLES M. MARCUS, Harvard University, MICAH P. HANSON, ARTHUR C. GOSSARD, University of California, Santa Barbara — We examine the use of a novel mesoscopic spectrometer to image electron dynamics in a large, open lateral quantum dot in a perpendicular magnetic field B_z. The spectrometer is comprised of a small single-electron quantum dot weakly coupled to the large dot via a tunnel junction; the current through the dots is measured at finite bias. By varying the energy level of the small dot, the local density of states, $g(r_o, E)$ is measured at the tunnel junction. An unexpected interference effect persists at energies 1 meV below E_F. Using semi-classical and quantum approaches, we show these interference bands in (E, B_z) are due to a dominant, diamond-shaped periodic orbit in the large dot. As B_z is varied, the orbit changes to unstable: the dominant state becomes a scar. This transition is marked by an abrupt change in the area of the orbit, and hence in the spacing ΔB_z of the bands. In a billiard model of the system, this coincides with a pitchfork bifurcation of the orbit. The existence of the bands depends strongly on whether the orbit has appreciable magnitude at the tunnel junction, belying the local nature of the measurement. In this way the tunnel junction, coupled to the small dot, acts like a fixed STM tip embedded in the 2DEG.

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