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Quantum Dot Spectroscopy D.M. ZUMBÜHL, MIT, C.M. MARCUS, Harvard University, M.P. HANSON, UCSB, A.C. GOSSARD, UCSB — Spectroscopy experiments of a GaAs lateral double dot system are presented. A large dot is weakly coupled to an adjacent few electron dot, which is used as a tunable energy spectrometer probing the density of states locally in the big dot, revealing quasistable periodic orbits embedded in a sea of chaotic electron dynamics in the big dot. A comparison with wave-packet simulations gives good agreement. Further, the tunneling current from the big dot into the spectrometer follows a power law, demonstrating a mesoscopic Fermi edge singularity which is caused by a quasiresonance of electrons with the holes left behind after tunneling from the big dot into the spectrometer. The measured power law exponents depend on mesoscopic parameters such as shape of the big dot, spectrometer energy and magnetic flux, as recently predicted by theory. Finally, the electron distribution functions in the big dot can be directly measured using the spectrometer. For short dwell times with several modes coupling the big dot to the reservoirs, a double stepped non- equilibrium distribution function is observed. When the dwell time is increased by reducing the number of modes, a single fermi-like distribution function is seen. Partially supported by DARPA SPIN (MDA972-01-1-0024) and by the NSF (DMR-0072777).

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