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Single-hole tunneling and Coulomb blockade in the strain-relaxation-induced quantum ring GUOHUA WANG, D. TAMBE, A. ZASLAVSKY, V. SHENOY, Department of Physics and Division of Engineering, Brown University, D. SYPHERS, Physics Department, Bowdoin College — We fabricated an ultrasmall Si/SiGe strained vertical quantum dot in the Coulomb blockade regime, where strain relaxation in the SiGe quantum well creates a ring-like confinement potential.[1] The resonant tunneling characteristics contains features near the threshold due to single-hole tunneling and Coulomb blockade. The features are steps in one bias polarity and peaks in the other, which we attribute to the differences in the dynamic occupation of the dot due to double Si barrier asymmetry. The spacing of the features gives the charging energy of the quantum ring. When magnetic fields are applied parallel to the tunneling direction, the evolution of the single-hole tunneling features with magnetic fields reveals cusps arising from the angular-momentum transition of the single-particle ground state of the quantum ring in the magnetic field, and the periodicity of the cusps in magnetic field is consistent with the calculated one from h/e, the magnetic flux quantum. Unlike single-carrier tunneling into quantum dots, our data on the tunneling into a quantum ring show no evidence of a singlet-triplet transition. [1] J. Liu et al, Phys. Rev. Lett. 89, 096804 (2002).

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