Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Tunable-Coupling Quantum Antidot Molecule WEI ZHOU, F.E. CAMINO, V.J. GOLDMAN, Stony Brook University — We report experiments on two double-antidot devices. The molecule is formed by two equal-size lithographic antidots fabricated from a very low-disorder GaAs/AlGaAs heterostructure. The two antidots are close enough so that the states bound on each antidot become hybridized and form bonding and antibonding states, like in a diatomic molecule or a qubit [1]. We observe resonant tunneling peaks on the f=1 and 1/3 quantum Hall plateaus. The quantum-coherent coupling between the antidots can be tuned by a gate bias and by magnetic field B. The f=1 conductance peaks display three regimes as a function of B: (i) one peak per period $\Delta = h/2eS$, like in single antidot, but the total area $2S$ contributing. (ii) At higher B, the peak splits into two overlapping peaks; (iii) at yet higher B, nearly sinusoidal double-frequency (one oscillation per $\Delta/2$) conductance oscillations are observed. The fractional regime shows bonding-antibonding split peaks that display a charge $e/3$ back-gate coupling.

[1] Averin and Goldman, Solid State Commun. 121, 25 (2002).

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Date submitted: 21 Nov 2006

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