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Observation of quantum charge pumping in a gate-confined open dot with symmetrically configured pumping gates[1] SHIH-YING HSU, KAI-MING LIU, Dept. of Electrophysics, Natl. Chiao Tung University, Taiwan, QUANTUM TRANSPORT LABORATORY TEAM — Open quantum dots formed out of a high mobility two dimensional electron gas from negatively biased sub-micron metal gates are fabricated. Two quantum point contacts (QPCs) with independently adjustable transmission mode numbers are deviced as the two entrances of the quantum dots. Two additional metal gates are introduced to function as the pumping gates. The overall gate configuration is symmetric. We observe a dc current with the two pumping gates ac biased in the quantum charge pumping mode where the ac bias voltages are at the same frequency, 0.1$\sim$10MHz, but maintain a given phase difference ϕ. The system remains longitudinally symmetric in this quantum pumping mode. The current amplitude drops with the opening up of the quantum dot. Moreover, we find that the current amplitude decreases with increasing the total transmission mode number in an inverse relation. By switching over to a rectification mode of gate biasing, the dc current characteristic is drastically changed. This leads to strong evidence that we have observed the quantum charge pumping.

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