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On-chip detection of photon-assisted shot noise and photocurrent of quantum point contact Y. JOMPOL, P. ROULLEAU, F. PORTIER, P. ROCHE, D.C. GLATTLI, SPEC, CEA/Saclay, France, I. FARRER, D.A. RITCHIE, Cavendish Laboratory, University of Cambridge, England — We present the first experimental realization of on-chip shot noise detection in capacitively-coupled quantum point contacts (QPCs). The detection is based on the photon-assisted effects. A dc voltage biased QPC: the emitter generates broad frequency current shot noise, inducing voltage fluctuations on the second QPC: the detector. This yields photon induced electron-hole pairs whose partitioning between left and right contact causes a current noise called photon-assisted shot noise (PASN). Alternatively, the electron-hole pairs may also generate a photon-assisted current for energy-dependent transmission. Both the photocurrent and PASN are proportional to the product D(1-D), where D is the transmission of a QPC. Our sample is realized using a set of quantum point contacts positioned onto two separate mesas of a two-dimensional electron gas. The QPC emitter is DC biased and emits high-frequency shot noise that is converted into voltage fluctuations at the QPC detector via an interdigital capacitor, C. Two additional QPCs next to the emitter and the detector serve as tunable quantum resistors and are used to control impedance of the circuit. We show that by varying both the emitter and detector transmissions, D^E, D^D, the measured current at the QPC detector is proportional to $D^D(1-D^D)$ $D^E(1-D^E)$ for a given V_{ds}, which is in good agreement with the theoretical prediction. This new way of detection should find fundamental applications in electronic quantum physics.

[X] Prefer Oral Session
[ ] Prefer Poster Session

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