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Modeling the noise power spectrum of a quantum point contact coupled to a nano-mechanical oscillator DAVID STOPHER, D.H. SANTAMORE, Dept. of Physics, Temple University — The experiments of Rimberg et al. (Nature 466, 86 (2010)) inadvertently illuminated the entanglement of a quantum point contact (QPC) with the two-dimensional electron gas (2DEG) on which the QPC is constructed. Acting as a nano-mechanical oscillator, the 2DEG couples to the QPC in such a way that the current passing through the QPC fluctuates in a manner highly suggestive of shot noise. Historically, such QPC coupling has been treated as a relationship between the tunneling electron and the external system. However, the experimental results of Rimberg et al. indicate that the quantum noise arises from the coupling of the 2DEG not with the tunneling electron but rather with the electrons in the reservoirs on either side of the QPC. We investigate this mechanism and provide a theoretical framework for comprehension of this phenomenon. Specifically, we derive a two-time correlation function of the current in order to obtain the noise power spectrum.

Deborah Santamore
Dept. of Physics, Temple University

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