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Coupling of Mechanical Modes and Shot Noise in a Radio Frequency Quantum Point Contact[1] J. STETTENHEIM, FENG PAN, Dartmouth College, Z. JI, Rice University, MUSTAFA BAL, W.W. XUE, Dartmouth College, MADHU THALAKULAM, Rice University, L.N. PFEIFFER, K.W. WEST, Bell Laboratories, Lucent Technologies Inc., Murray Hill, NJ 07974, A.J. RIMBERG, Dartmouth College — Interesting interactions exist between the electrical and mechanical degrees of freedom in GaAs quantum nanostructures due to the piezoelectric nature of the substrate. Here, we report measurements in radio-frequency quantum point contacts (RF-QPCs) in which the photon assisted shot noise (PASN) in the vicinity of the carrier wave shows strong frequency dependence correlated with sample dimensions. In particular we find that the rf drive excites surface acoustic waves (SAWs) of frequency $f \approx v_s/2l$,where $v_s = 3010$ m/s is the speed of sound in GaAs and l is a length of the device or substrate chip. As a result by varying the sample dimensions, we can manipulate the shot noise spectrum so that the resulting noise is excluded from a chosen bandwidth. Implications for use of the RF-QPC as a fast charge detector will be discussed.

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