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High frequency measurements of shot noise suppression in atomic-scale metal contacts[1] PATRICK J. WHEELER, Department of Physics and Astronomy, Rice University, KENNETH EVANS, Applied Physics Program, Rice University, JEFFREY RUSSOM, Department of Physics and Astronomy, Rice University, NICHOLAS KING, Department of Physics and Astronomy, DOUGLAS NATELSON, Department of Physics and Astronomy, Rice University — Shot noise provides a means of assessing the number and transmission coefficients of transmitting channels in atomic- and molecular-scale junctions. Previous experiments at low temperatures in metal and semiconductor point contacts have demonstrated the expected suppression of shot noise when junction conductance is near an integer multiple of the conductance quantum, $G_0 \equiv 2e^2/h$. Using high frequency techniques, we demonstrate the high speed acquisition of such data at room temperature in mechanical break junctions. In clean Au contacts conductance histograms with clear peaks at G_0, $2G_0$, and $3G_0$ are acquired within hours, and histograms of simultaneous measurements of the shot noise show clear suppression at those conductance values. We describe the dependence of the noise on bias voltage and analyze the noise vs. conductance histograms in terms of a model that averages over transmission coefficients.

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