Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Optically induced changes to the tunneling properties of molecular junctions.[1] PAVLO ZOLOTAVIN, CHARLOTTE EVANS, DOUGLAS NATELSON, Department of Physics Astronomy, Rice University — We report increased conductance under laser illumination in plasmonically active atomic scale gold junction in a cryogenic environment (substrate temperatures down to 4 K). Additionally, we observe changes in the bias dependence of differential conductance, which we attribute to local heating due to the illumination. We differentiate between plasmon and direct gold absorption by investigating the polarization dependence of the observed temperature change. The effect is quantified by measuring optically induced changes in the resistance of the metal nanowire and by the change in the magnitude of simultaneously measured Johnson-Nyquist noise. A combination of these techniques provides independent measurements of effective lattice and electronic temperatures. Unlike previous experiments at room temperature and 80 K, we report a substantially larger light-driven temperature increase of 80-120K for devices fabricated on SiO_2/Si substrates held at substrate temperatures as low as 4 K. The implications of the observed behavior for electronic transport in single molecular junctions with plasmonically active nanowire leads will be discussed.

[1]ARO award W911 NF-13-1-0476

Pavlo Zolotavin
Department of Physics
Astronomy, Rice University

Date submitted: 05 Nov 2015 Electronic form version 1.4