Abstract Submitted
for the TSF16 Meeting of
The American Physical Society

Negative Differential Resistance of WSe_2 and $HfSe_2$ Diodes J.A. COOKE, NMSU, A. SHAHRABI, M. HASAN, B. SENSALE-RODRIGUEZ, U of Utah — Exploration in advanced materials may yield improved tunnel junction size, higher frequency limits, and better efficiency. 2-dementional (2D) layered materials are emerging as possible solid-state materials that could be used for this. Tungsten diselenide (W) and hafnium diselenide (Hf) were the 2D materials chosen by our group to make high frequency resonant tunneling diodes (RTD) due to their unique band gaps. Using mechanical exfoliation, thin flakes were transferred onto bulk silicon dioxide to make the devises. An atomic force microscope (AFM) was used to determine the exact height and amount of layers while an electron beam (e-beam) of a scanning electron microscope (SEM) was used to make the leads. The devices were tested on a probe station with a Keithley 2400 source meter unit. Due to the tunneling effect, theses devises should be able to have a negative differential resistance (NDR). If the experimental results are successful, we will have demonstrated smaller devices with higher frequency limits and better efficiency.

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Date submitted: 21 Sep 2016 Electronic form version 1.4