Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

**Tapered nanowire spin torque oscillator driven by spin orbit torques** LIU YANG, ANDREW SMITH, BRIAN YOUNGBLOOD, ZHENG DUAN, ILYA KRIVOROTOV, University of California, Irvine — We report microwave signal emission from a spin torque oscillator driven by spin orbit torques in a tapered Pt(7nm)/Py(5nm) ferromagnetic nanowire with 2 um long active region. The tapered nanowire oscillator exhibits lower spectral linewidth (<1 MHz) and higher integrated power (>1 nW) compared to a spin torque oscillator based on a nanowire with spatially uniform width. The tapered nanowire oscillator has two distinct regimes of the microwave signal emission: a low-current, low-amplitude regime with a soft onset of the microwave emission and a higher-current regime with a hard onset of large-amplitude oscillations. The existence of the two regimes arises from spatially non-uniform effective damping in the tapered nanowire geometry. The non-uniformity of the effective damping results in nucleation of magnetization self-oscillations at the narrow end of the nanowire and subsequent steady growth of the self-oscillatory region with increasing current throughout the low-power regime. The sudden turn on of the high-power regime takes place at a critical current, for which spatially averaged effective damping of the nanowire changes sign from positive to negative. Our work paves the way towards high-power spectrally pure spin torque oscillators driven by spin orbit torques.

Liu Yang
University of California, Irvine

Date submitted: 14 Nov 2014 Electronic form version 1.4