Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Temperature, Magnetic Field, and Dimensionality Effects on the Raman Spectra of $TaSe_2$ J. R. SIMPSON, Towson University, S. CHOWDHURY, Catholic University of America, A. R. HIGHT WALKER, NIST — In bulk form, $TaSe_2$ exhibits transitions between commensurate and incommensurate charge-density wave (CDW) phases, and is attracting interest for advanced device applications. In order to explore the evolution of the groundstate CDW phase with layer number, mechanical exfoliation of bulk crystals provides few- to single-layer flakes. In the present work, we extend our opto-thermal Raman measurements[1] on MoS_2 to include other TMDs, specifically $TaSe_2$, in both $1T$ and $2H$ crystallographic phases. A novel, magneto-Raman microscope system affords measurement of low-frequency (down to $10\,\mathrm{cm}^{-1}$) vibrational modes as a function of both temperature (100 to 400) K and magnetic field (0 to 9) T. The dependence of the observed Raman-active phonons on temperature and magnetic field will be discussed and compared with earlier results on MoS_2. Specifically, we observe the appearance of low-frequency, zone-folded modes in the CDW state, which soften with temperature similar to the higher frequency, in-plane E_{2g} mode. Additionally, we compare the measured magneto-Raman results to calculations using *ab initio*, density functional theory.

[1]R. Yan, J. R. Simpson, *et al.*, ACS Nano **8**, 986 (2014).

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Date submitted: 06 Nov 2015 Electronic form version 1.4