Abstract Submitted
for the PSF16 Meeting of
The American Physical Society

Interlayer breathing and shear modes in NbSe2 atomic layers ZHIPENG YE, GAIHUA YE, University of Northern Iowa, CHUN HUNG LUI, University of California, Riverside, RUI HE, University of Northern Iowa — Atomically thin transition metal dichalcogenide (TMD) niobium diselenide (NbSe2) has recently stimulated strong scientific interest due to its distinctive electronic and magnetic properties. We investigate the interlayer phonons of few-layer NbSe2 by ultralow-frequency Raman spectroscopy. We observe both the interlayer breathing modes and shear modes at frequencies below 40 cm-1 for samples of 2 to 15 layers. Their frequency, Raman activity, and environmental instability depend systematically on the layer number. In addition, the interlayer phonon modes evolve smoothly from T = 300 K to 8 K, with no observable response to the charge density wave formation in NbSe2. Our results are useful to understand the thickness-dependent properties of NbSe2.

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Date submitted: 29 Sep 2016 Electronic form version 1.4