Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Excitons in Ultrathin PbI_2 Crystals ALEXIS TOULOUSE, BENJAMIN ISAACOFF, Physics, University of Michigan, GUANGSHA SHI, EMMANOUIL KIOUPAKIS, Materials Science and Engineering, University of Michigan, MARIE MATUCHOVÁ, Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, ROBERTO MERLIN, Physics, University of Michigan — Due to their weak inter-layer van der Waals bonding, layered materials offer the unique possibility to produce natural quantum wells in the form of single and few atomic layer samples. A technique known as micromechanical cleavage, involving repeated cleaving, is used to isolate samples of all thicknesses [1]. Here, we present a combined experimental and theoretical study of band-edge excitons in the layered compound PbI_2 and, in particular, on their behavior as a function of sample thickness. Results of photoluminescence and reflection experiments are reported on samples with thicknesses ranging from a few micrometers down to a few monolayers, as determined by atomic force microscopy measurements. The data display striking and well reproducible changes in the transition from three to two-dimensions, which will be compared with results of first-principles calculations of the electronic band structure based on density functional and many-body perturbation theory. Computational resources were provided by the DOE NERSC facility. [1] A. K. Geim et. al. Nature Materials 6, 183 (2007)

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Date submitted: 08 Nov 2012 Electronic form version 1.4