Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Electric-field-effect studies of atomically thin flakes of superconducting $NbSe_2$ prepared by mechanical exfoliation NEAL STALEY, JAIN WU, PETER EKLUND, YING LIU, Pennsylvania State University, LINJUN LI, ZHUAN XU, Zhejiang University, China — Recent years have yielded many studies on electric field modulated superconductivity. In order to achieve the high carrier density changes needed to modulate superconductivity, two main approaches have been tried, ultra thin films grown by in situ quench deposition or few-layer single crystalline films of superconductors grown by pulsed laser deposition or molecular beam epitaxy. However in both cases, difficulties have been encountered, ultra thin films are subject to large amounts of disorder, and it is difficult if not impossible to grow single layered superconductors. Using a simple micromechanical exfoliation technique, we are able to create single crystal single layered graphite, featuring a linear density of states, allowing its physical properties to be tuned by gate voltage. Using this mechanical exfoliation procedure we fabricated ultra thin single crystalline $NbSe_2$ flakes ranging from double layered to many layered as estimated using an optical technique correlated to AFM and Raman spectroscopy measurements. Using a lithography-free, "all dry" process we fabricated devices showing modulated T_c with applied gate voltage as well as a superconductor insulator transition tuned by the number of layers.

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Date submitted: 14 Dec 2007 Electronic form version 1.4