Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

The effect of the dielectric environment on electrical and optical properties of monolayer molybdenum disulfide DHIRAJ PRASAI, ALEX WYNN, A.K.M. NEWAZ, KIRILL BOLOTIN, Department of Physics and Astronomy, Vanderbilt University — Monolayer molybdenum disulfide (MoS_2) is a two-dimensional atomic crystal characterized by a direct band gap, strong electron-electron and spin-orbit interactions. Electron transport in currently available monolayer MoS_2 devices is dominated by strong Coulomb scattering limiting carrier mobility to < 200 cm^2/Vs. Here, we explore possible routes towards increasing carrier mobility in MoS_2. First, we investigate suspended ($\sim$200nm above Si/SiO_2) monolayer MoS_2 devices by combining electron beam lithography and an isotropic sacrificial etching of the underlying substrate. Second, we explore the mobility of MoS_2 devices fabricated on highly uniform hexagonal boron nitride (h-BN) crystals as a substrate material. Initial results indicate an order of magnitude increase in the electrical mobility using both approaches. Finally, we study MoS_2 devices embedded in a dielectric material with high dielectric constant and explore the interrelation between carrier mobility and dielectric constant.

Dhiraj Prasai
Department of Physics and Astronomy, Vanderbilt University

Date submitted: 04 Jan 2013 Electronic form version 1.4