Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Photoluminescence spectroscopy of monolayer $MoSe_2$ in magnetic fields DAVID MACNEILL, COLIN HEIKES, ZACHARY ANDERSON, KIN FAI MAK, KATHRYN MCGILL, JIWOONG PARK, PAUL MCEUEN, DANIEL RALPH, Cornell University — Single layer transition metal dichalcogenides are direct gap semiconductors with unique luminescence properties, including large excitonic effects and coupling between photon handedness and the exciton valley degree of freedom. Furthermore, the luminescence spectra may change under magnetic field due to valley degeneracy breaking, the Zeeman effect and Landau level formation. Here we report measurements of photoluminescence spectra for monolayer $MoSe_2$ at temperatures ranging from 4.2K to 300K and in out-of-plane magnetic fields up to 7T. The measurements are performed using a scanning confocal microscope integrated with a superconducting magnet dewar, with light coupled in and out of the system via an optical fiber. We observe luminescence peaks from the neutral and charged exciton, and explore the evolution of the peak energies, linewidths and intensities as a function of applied field and gating. We will also discuss the magnetic field dependence of the photoluminescence handedness in the Faraday geometry and its implications.

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Date submitted: 15 Nov 2013 Electronic form version 1.4