Abstract Submitted
for the NWS14 Meeting of
The American Physical Society

**Electrically tunable light-emitting diodes based on monolayer WSe2 p–n junctions** MARIE SCOTT, JASON ROSS, XIAODONG XU, University of Washington, XU LAB TEAM — Following the discovery of graphene, other two-dimensional (2D) materials have been identified including a variety of truly 2D semiconductors. These new semiconductors are exciting candidates for next-generation optoelectronic devices because of their unique optical properties. Further, despite being atomically thin, techniques have recently been developed to transfer and stack these monolayer materials and produce arbitrarily complex heterostructures. Here, we present our adaptation of these transfer techniques in conjunction with electron beam lithography to produce the first monolayer LED using 2D crystals of tungsten diselendide(WSe2). We stack monolayer WSe2 along with boron nitride onto metal gates to from a lateral p–n junction. This structure allows effective injection of electrons and holes, and, combined with the high optical quality of WSe2, yields bright electroluminescence with 1,000 times smaller injection current and 10 times smaller linewidth than seen in MoS2 schottky junction electroluminescence. By increasing the injection bias we can tune the electroluminescence between regimes of impurity-bound, charged and neutral excitons.

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Date submitted: 21 Mar 2014 Electronic form version 1.4