

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

High Photoresponsivity and Extrinsic Quantum Efficiency in Tri-Layer Tungsten Diselenide Phototransistors ZHENG GUANG LU, NIHAR PRADHAN, KOMALAVALLI THIRUNAVUKKUARASU, JONATHAN LUDWIG, DANIEL RHODES, DMITRY SMIRNOV, LUIS BALICAS, National High Magnetic Field Lab, Florida State University, 1800 E. Paul Dirac Dr. Tallahassee, FL 32310 — We report on the photoresponse properties of three-layer tungsten diselenide field-effect transistors (FETs) fabricated by mechanical exfoliation of bulk crystals on SiO₂/Si substrates connected with Au/Ti contacts. These devices exhibit two-terminal field-effect hole mobilities of about 350 cm²/Vs at 300K increasing up to 500 cm²/Vs at T<50 K. The photoresponse properties were carried out at room temperature using various excitation wavelengths (405nm, 532nm, 670nm). In addition, we mapped photocurrent of these device with a laser spot size considerably smaller than the area of the conducting channel which indicate the photo-electrical response is not from the area surrounding the electrical contacts. It was found that the three-layer WSe₂ FETs display a strong photocurrent response leading up to 0.5 A/W photoresponsivities and high external quantum efficiencies of up to ~ 90%. Also, these transistors display fast photoresponsive transient times of several ms.

Zhengguang Lu
Natl High Magnetic Field Lab

Date submitted: 14 Nov 2014

Electronic form version 1.4