Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Carrier and polarization dynamics in monolayer MoS_2: temperature and power dependence BERNHARD URBASZEK, D. LAGARDE, L. BOUET, T. AMAND, X. MARIE, LPCNO-INSA-CNRS-UPS Toulouse, C.R. ZHU, B.L. LIU, Beijing National Laboratory for Condensed Matter Physics, IOP, CAS, China, P.H. TAN, State Key Laboratory of Superlattices and Microstructures, IOP, CAS, China — In monolayer (ML) MoS_2 optical transitions across the direct bandgap are governed by chiral selection rules, allowing optical k-valley initialization [1,2,3]. Here we present the first time resolved photoluminescence (PL) polarization measurements in MoS_2 MLs [4], providing vital information on the electron valley dynamics. Using quasi-resonant excitation of the A-exciton transitions, we can infer that the PL decays within $\tau \simeq$4ps. The PL polarization of $P_c \approx 60\%$ remains nearly constant in time for experiments from 4K - 300K, a necessary condition for the success of future Valley Hall experiments [1]. τ does not vary significantly over this temperature range. This is surprising when considering the decrease of P_c in continuous wave experiments when going from 4K to 300K reported in the literature [2,3]. By tuning the laser following the shift of the A-exciton resonance with temperature we are able to recover at 300K $\sim 80\%$ of the polarization observed at 4K. For pulsed laser excitation, we observe a decrease of P_c with increasing laser power at all temperatures.

[1] Xiao et al, PRL 108, 196802 (2012).
[2] Mak, et al Nat. Nanotech. 7, 494 (2012).
[3] Sallen et al, PRB 86, 081301 (2012).
[4] Lagarde et al, arXiv:1308.0696.

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Date submitted: 12 Nov 2013 Electronic form version 1.4