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Spin-dependence photocurrent for monolayer MoS2 with ferromagnetic contacts XIAO-XIAO ZHANG, EMMA DOHNER, Stanford Univ, YOU LAI, DMITRY SMIRNOV, NHMFL, Tallahassee, TONY HEINZ, Stanford Univ — In this paper, we examine charge transport between a monolayer of a semiconducting transition metal dichalcogenide (TMDC) and ferromagnetic contacts. Using excitation of the TMDC (MoS_2) monolayer at the optical band gap with circularly polarized light, we preferentially create photocarriers with a given spin state. We then compare the photocurrent collected by the ferromagnetic contacts for different handednesses of the excitation to characterize the spin dependence of the process. Consistent with a previous report in WS_2[1], we observe a significant modulation of the photocurrent with carrier spin. This effect is confirmed by switching the alignment of the ferromagnetic domains in the contact by an external magnetic field under the same photoexcitation conditions. We discuss the implications of our results for spin diffusion lengths. In addition, for comparison, samples with non-ferromagnetic contacts were measured as a function of an applied out-of-plane magnetic field. A similar dependence of the photocurrent on the polarization state of the light was observed in this case. This effect is, however, only present at a much higher magnetic field strengths and is of a different physical origin. [1]L. Xie and X. Cui, PNAS. USA 113, 37463750 (2014)

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