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Spin Hall Effect in Monolayer and Bilayer WSe_2[1] BABAK FALLAHAZAD, HEMA C. P. MOVVA, Univ of Texas, Austin, XIAO LI, University of Maryland, College Park, TAKASHI TANIGUCHI, KENJI WATANABE, National Institute of Materials Science, Japan, QIAN NIU, SANJAY K. BANERJEE, EMANUEL TUTUC, Univ of Texas, Austin — Transition metal dichalcogenides (TMDs) are expected to possess a large spin Hall effect thanks to the strong spin-orbit coupling in these materials. The recent progress in realization of high mobility WSe_2 samples with Ohmic contacts [1] can facilitate the experimental access to the rich physics of the TMDs. Using non-local resistance measurements in multi-terminal, high mobility hole-doped dual-gated WSe_2 samples we extract the spin Hall conductivity as a function of carrier density and temperature. We find that WSe_2 possesses a spin Hall conductivity that is weakly dependent on the carrier density in the range 5×10^{12} cm^{-2} $-$ 10×10^{12} cm^{-2}, increases with reducing the temperature down to 1.5 K, and is significantly larger than e^2/h. We discuss the different mechanisms, namely intrinsic, side-jump, and skew scattering that contribute to the measured spin Hall conductivity. [1] B. Fallahazad *et al.*, Phys. Rev. Lett. 116, 086601 (2016).

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