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Shubnikov-de Haas oscillations of high mobility holes in monolayer and bilayer WSe_2: spin-valley locking, effective mass, and inter-layer coupling[1] BABAK FALLAHAZAD, HEMA CHANDRA PRAKASH MOVVA, KYOUNGHWAN KIM, STEFANO LARENTIS, Univ of Texas, Austin, TAKASHI TANIGUCHI, KENJI WATANABE, National Institute for Materials Science, 1-1 Namiki Tsukuba, Ibaraki 305-0044, Japan, SANJAY K. BANERJEE, EMANUEL TUTUC, Univ of Texas, Austin — We study the magnetotransport properties of high mobility holes in monolayer and bilayer WSe_2, measured in dual-gated samples with top and bottom hexagonal boron-nitride dielectrics, and using platinum bottom contacts. Thanks to the Pt high work-function combined with the a high hole density induced electrostatically by an applied top gate bias, the contacts remain ohmic down to low (1.5 K) temperatures. The samples display well defined Shubnikov-de Haas (SdH) oscillations, and quantum Hall states (QHS) in high magnetic fields. In both mono and bilayer WSe_2, the SdH oscillations and the QHSs occur predominantly at even filling factors, evincing a two-fold Landau level degeneracy consistent with spin-valley locking. The Fourier transform analysis of the SdH oscillations in dual-gated bilayer WSe_2 reveal the presence of two subbands, each localized in the top or the bottom layer, as well as negative compressibility. From the temperature dependence of the SdH oscillation amplitude we determine a hole effective mass of $0.45m_e$ for both mono and bilayer WSe_2. The top and bottom layer densities can be independently tuned using the top and bottom gates, respectively, evincing a weak interlayer coupling.

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