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Carrier Density Dependent Quantum Hall States Sequence of Holes in WSe_2[1] HEMA C. P. MOVVA, BABAK FALLAHAZAD, KYOUNGHWAN KIM, STEFANO LARENTIS, The University of Texas at Austin, TAKASHI TANIGUCHI, KENJI WATANABE, National Institute of Materials Science, SANJAY K. BANERJEE, EMANUEL TUTUC, The University of Texas at Austin — The high intrinsic hole mobility and existence of Ohmic contacts to the valence band have enabled the magnetotransport study of holes in WSe_2. Using multiple monolayer and bilayer WSe_2 samples encapsulated in hexagonal boron nitride, we report an unusual carrier density-dependent quantum Hall states (QHSs) sequence in hole-doped WSe_2. At a fixed carrier density, the samples exhibit either a predominantly even or a predominantly odd QHSs sequence, which is insensitive to an applied transverse electric field. As the density is reduced from 9×10^{12} cm^{-2} to 2×10^{12} cm^{-2}, we observe a transition from even to odd, and back to even QHS filling factors. Furthermore, magnetotransport measurements in a tilted magnetic field reveal that the QHSs sequence is insensitive to the in-plane magnetic field, indicating that the electron spin is locked perpendicular to the WSe_2 plane. These findings suggest that the Landau level Zeeman splitting depends linearly on the perpendicular magnetic field via a carrier density dependent g-factor, as a result of electron-electron interaction.

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