HIGH MAGNETIC FIELD SPIN-VALLEY SPLIT SHUBNIKOV–DE HAAS OSCILLATIONS IN A WSe_2 MONOLAYER

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We study Shubnikov-de Haas oscillations in a p-type WSe_2 monolayer under very high magnetic field. The oscillation pattern is complex due to a large spin and valley splitting, in the non-fully-resolved Landau level regime. Our experimental data can be reproduced with a model in which the main parameter is the ratio between the Zeeman energy and the cyclotron energy. The model considers the Landau levels from both valleys with the same Gaussian broadening, which allows predicting the relative amplitude of the resistance oscillation originating from each valley. The Zeeman energy is found to be several times larger than the cyclotron energy. It translates into a large and increasing effective Landé factor as the hole density decreases, in the continuity of the values reported in the literature at lower carrier density.

References

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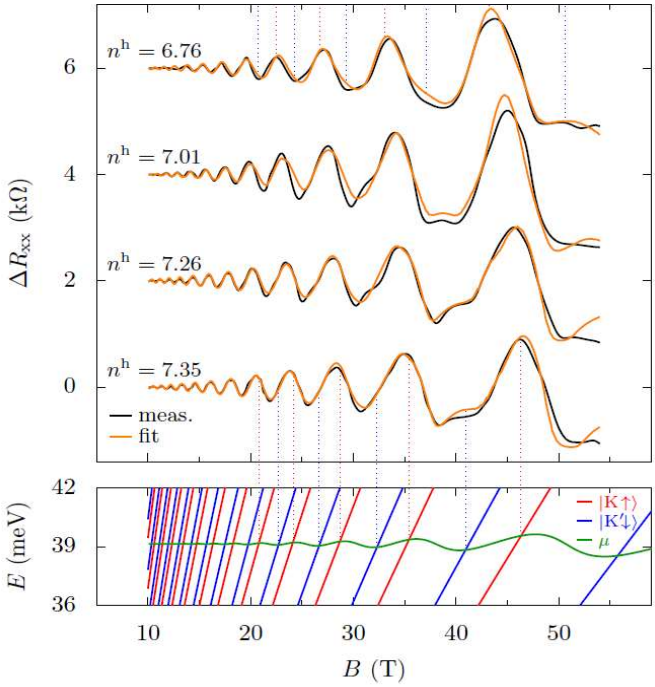

Figure 1: Experimental magneto-resistance (black lines) are compared to the model output (orange lines) for selected hole densities nh (given in unit of 10^{12} cm^{-2}). Bottom frame: Landau level spectrum and evolution of the chemical potential μ(B) for $n_h = 7.35\times10^{12}$ cm^{-2}.

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