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Observation of Spin-Spin Interaction in InSb Quantum Wells R.C. MEYER, T. KASTURIARACHCHI, X.H. ZHANG, N. GOEL, S.J. CHUNG, R.E. DOEZEMA , M.B. SANTOS , University of Oklahoma, Y.J. WANG, National High Magnetic Field Laboratory, Florida State University — For 2D electron systems in InSb, the energy of spin-conserving transitions between neighboring Landau levels (LLs) depends on spin orientation. The spin up transition will have a higher energy than the spin down transition due to the non-parabolicity of the InSb conduction band. These spin-resolved cyclotron resonance features allow us to probe the spin dependence of avoided-level crossings between LLs associated with different subbands. Previous studies in GaAs, where cyclotron resonance peaks were not spin resolved, demonstrated that the anti-crossing energy gaps depend linearly on the tilt of the magnetic field. In our spin-resolved studies, we do observe a linear dependence for anti-crossings between levels with the same spin. However, the strength of this dependence is different for the two spin orientations. More notably, we observe anti-crossings between levels with opposite spin, as would be expected for a spin-spin interaction. The gap for these opposite-spin crossings is essentially tilt-angle independent. None of the observed spin dependencies are expected from the conventional theory behind subband LL anti-crossings. Although spin-orbit effects are strong in InSb, the origin of the observed spin dependencies has not yet been definitively identified. This work is supported by the NSF under Grants No. DMR-0080054 and DMR-0209371.

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