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Spin orbit coupling induced splitting in excitations of high mobility 2DESs[1] ALBERT F. RIGOSI, URSULA WURSTBAUER, ARON PINCZUK, Columbia University, JOHN WATSON, SUMIT MONDAL, MICHAEL J. MANFRA, Purdue University, KEN W. WEST, LOREN N. PFEIFFER, Princeton University — Spin orbit interaction (SOI) induces a splitting of the conduction bands in two-dimensional electron systems (2DES) in GaAs. We study the impact of zero-field spin-splitting on excitations of ultra high mobility 2DESs by resonant inelastic light scattering experiments. To distinguish between splitting caused by bulk inversion asymmetry (Dresselhaus) and structure inversion asymmetry (Rashba), we studied symmetric (two-side modulation doped) and asymmetric (single-side modulation doped) quantum wells grown along (001) and (110) crystallographic directions. We probe the excitation modes as a function of transferred momentum for different crystallographic directions in the plane of the QW. At large wave vectors we find a complex splitting of the single-particle intersubband excitation mode that is strongly dependent on the combination of Dresselhaus and Rashba SOI. The observed mode splitting is a result of effective SOI fields in both, ground and first excited subband. Suitable choices of crystallographic orientations yield Dresselhaus and Rashba terms.

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Ursula Wurstbauer
Columbia University

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