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Landau level crossings in imbalanced, two-valley two-dimensional electron systems KAMRAN VAKILI, TAYFUN GOKMEN, MEDINI PADMANABHAN, OKI GUNAWAN, YAKOV P. SHKOLNIKOV, EMANUEL TUTUC, MANSOUR SHAYEGAN, Department of Electrical Engineering, Princeton University, Princeton, NJ 08544 — We report results of magnetotransport measurements performed on two-dimensional electron systems in AlAs quantum wells with highly imbalanced valley occupation. We observe spikes in the diagonal resistance that signal the crossing of Landau levels originating from each of the occupied valleys. From the positions of these spikes and their dependence on tilt angle, we can extract the valley splitting as well as the ratios of the effective electron masses and g-factors for the two-valleys. We find that the mass ratio is unchanged from the band value and the g-factors are equal between the two valleys despite the high degree of density imbalance. We have also explored the interaction-induced finite gaps that persist at avoided crossings between Landau levels and discuss some of our results.

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