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Measurements of valley splitting in novel Si/SiGe heterostructures[1]

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— Achieving an appropriate valley splitting is important for making quantum dot qubits in Si/SiGe heterostructures. We measure valley splittings in novel heterostructures grown with an extra layer of Ge, ∼5 monolayers in thickness, between the Si well and the SiGe barrier. For one of these extra-Ge heterostructures, the CVD growth was interrupted between the Si well and the Ge layer to achieve a more abrupt change in composition. The other extra-Ge heterostructure was made with a continuous growth process. Using Hall bar devices on both of these extra-Ge samples as well as one standard sample with no extra Ge, we measure activation energies for valley splittings in the first and second Landau levels. For the $\nu = 3$ valley splitting, we find the abrupt, extra-Ge sample has consistently the highest valley splitting across three different carrier densities. For these densities, the valley splitting in the abrupt, extra-Ge sample is $\sim 50\%$ higher than that of the standard sample.

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