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Anisotropic Pauli Spin Blockade of Holes in a GaAs Double Quantum Dot QINGWEN WANG, OLEH KLOCHAN, JO-TZU HUNG, DIMITRIE CULCER, The University of New South Wales, IAN FARRER, The University of Sheffield, DAVID RITCHIE, The University of Cambridge, ALEX HAMILTON, The University of New South Wales — Electrically defined semiconductor quantum dots are appealing systems for spin manipulation and quantum information processing. Thanks to the weak hyperfine interaction and the strong spin-orbit interaction, heavy-holes in GaAs are promising candidates for all-electrical spin manipulation. However, making stable quantum dots in GaAs has only become possible recently, mainly because of difficulties in device fabrication and device stability. Here we present electrical transport measurements of heavy-holes in a lateral double quantum dot based on a GaAs/$Al_xGa_{1-x}As$ heterostructure. We observe clear Pauli spin blockade and show that the lifting of the spin blockade by an external magnetic field is extremely anisotropic. Numerical calculations of heavy-hole transport through a double quantum dot in the presence of strong spin-orbit interaction demonstrate quantitative agreement with experimental results, which indicates that the observed anisotropy can be explained by the anisotropic hole g-factor and the surface Dresselhaus spin-orbit coupling.

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