Spin-orbit qubits seen through holes

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The spin-orbit interaction couples an electronic spin degree of freedom to a gate-tunable electric-field enabling spin control via electric dipole spin resonance. This possibility was exploited in a recent publication [Maurand *et al.*, Nature Communications **7**, 13575 (2016)] where we reported the experimental demonstration of a hole spin qubit in a silicon device where coherent spin rotations are electrically driven by a resonant gate-voltage modulation. Here we take a step further and present an experimental and theoretical work revealing the physical origin of the observed hole spin resonance. Our work builds upon measurements of the full angular dependence of the Rabi frequency, the gate-voltage dependence and the anisotropy of the hole g-factors. We show that a formalism based on the Landé g-matrix can simultaneously capture and discriminate the contributions of two mechanisms so-far independently discussed in the literature: one relying on a modulation of the g tensor components, the other not. The validity of this approach to other types of spin-orbit qubits is discussed.