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Electric manipulation of a heavy hole acceptor qubit in SiGe quantum wells. JOSE CARLOS ABADILLO-URIEL, MARIA CALDERON, CSIC - Madrid — Recently, proposals of hole-based qubits in silicon have drawn considerable attention due to the strong spin-orbit interaction in the valence band. A hole bound to an acceptor in silicon reduces the cubic symmetry, allowing mixing of heavy hole and light hole states when an electric field is applied. Moreover, the presence of an interface close to the acceptor gives rise to a Rashba type spin-orbit interaction which together with the symmetry of the acceptor can be used to manipulate both heavy-hole and light-hole qubits through electric means only. In this work we study the effects of confining an acceptor into a SiGe quantum well. Due to strain within the quantum well, the qubit subspace has a predominantly heavy-hole nature. Again, both the Rashba spin-orbit interaction and the tetrahedral symmetry of the acceptor permit the manipulation of the qubit subspace through electric means, but now it is possible to take advantage of the g-factor difference between the well and the barriers to allow manipulation through the g-tensor modulation resonance technique. The presence of sweet spots and the Rabi frequency dependence on different parameters of the quantum well is discussed.

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