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Tenfold increase in the Rabi decay time of the quantum dot hybrid qubit BRANDUR THORGRIMSSON, University of Wisconsin-Madison, DOHUN KIM, Yonsei University, Seoul, South Korea, C.B. SIMMONS, DANIEL R. WARD, RYAN H. FOOTE, D. E. SAVAGE, M. G. LAGALLY, MARK FRIESEN, S. N. COPPERSMITH, M. A. ERIKSSON, University of Wisconsin-Madison —
The quantum dot hybrid qubit is formed from three electrons in a double quantum dot. In previous work, we showed that the hybrid qubit has the speed of a charge qubit and the stability of a spin qubit. Here, we show that the hybrid qubit is also highly tunable, and can be tuned into regimes with desirable coherence properties. By changing the interdot tunnel rate by only 25%, from 5 GHz to 6.25 GHz, we are able to increase the Rabi decay time by a factor of ten, from 18 ns to 177 ns. We attribute this improvement to the refinement of an extended sweet spot in the energy dispersion of the hybrid qubit, where the qubit is less susceptible to charge noise, which is a dominant source of decoherence. This work was supported in part by ARO (W911NF-12-0607) and NSF (DMR-1206915 and PHY-1104660). Development and maintenance of the growth facilities used for fabricating samples is sup- ported by DOE (DE-FG02-03ER46028). This research utilized NSF-supported shared facilities at the University of Wisconsin-Madison.

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