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Implanted bismuth donors in 28-Si: Process development and electron spin resonance measurements C.D. WEIS, C.C. LO, Lawrence Berkeley National Laboratory, V. LANG, R.E. GEORGE, University of Oxford, A.M. TYRYSHKIN, Princeton University, J. BOKOR, University of California at Berkeley, S.A. LYON, Princeton University, J.J.L. MORTON, University of Oxford, T. SCHENKEL, Lawrence Berkeley National Laboratory — Spins of donor atoms in silicon are excellent qubit candidates. Isotope engineered substrates provide a nuclear spin free host environment, resulting in long spin coherence times [1,2]. The capability of swapping quantum information between electron and nuclear spins can enable quantum communication and gate operation via the electron spin and quantum memory via the nuclear spin [2]. Spin properties of donor qubit candidates in silicon have been studied mostly for phosphorous and antimony [1-3]. Bismuth donors in silicon exhibit a zero field splitting of 7.4 GHz and have attracted attention as potential nuclear spin memory and spin qubit candidates [4,5] that could be coupled to superconducting resonators [4,6]. We report on progress in the formation of bismuth doped 28-Si epi layers by ion implantation, electrical dopant activation and their study via pulsed electron spin resonance measurements showing narrow linewidths and good coherence times.

[1] A. M. Tyryshkin, et al. arXiv: 1105.3772 [2] J. J. L. Morton, et al. Nature (2008) [3] T. Schenkel, et al APL 2006; F. R. Bradbury, et al. PRL (2006) [4] R. E. George, et al. PRL (2010) [5] G. W. Morley, et al. Nat Mat (2010) [6] M. Hatridge, et al. PRB (2011), R. Vijay, et al. APL (2010) This work was supported by NSA (100000080295) and DOE (DE-AC02-05CH11231).

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C. D. Weis
cdweis@lbl.gov
Lawrence Berkeley National Laboratory

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