Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

**Electron Spin Resonance Spectroscopy of Bismuth donors in Silicon using a Parametric Amplifier** YUIMARU KUBO, AUDREY BIENFAIT, MICHAEL STERN, DENIS VION, DANIEL ESTEVE, PATRICE BERTET, Quantronics Group, SPEC, CEA-Saclay, JARRYD PLA, CHEUK CHI LO, JOHN MORTON, London Centre for Nanotechnology, University College London, CHRISTOPH WEIS, THOMAS SCHENKEL, Accelerator and Fusion Research Division, Lawrence Berkeley National Laboratory, MICHAEL THEWALT, Department of Physics, Simon Fraser University — Bismuth donor spins in Silicon are well suited to implement a quantum memory for superconducting qubits [1], owing to their long coherence times and large hyperfine interaction leading to a zero-field splitting of 7.35GHz [2]. We report low-field electron-spin resonance spectroscopies of ensembles of Bismuth spins with a concentration of 5 $10^{16}$cm$^{-3}$ in an isotopically purified $^{28}$Si sample at 10 mK, at which the electronic spin is expected to be fully polarized. The spectrometer consists of a planar aluminium superconducting resonator patterned on top of the substrate, with a quality factor of $10^5$. The signal coming from the spins is amplified using a Josephson Parametric Amplifier [3]. Hahn-echo coherence times up to 10 ms are observed.

[1] B. Julsgaard, C. Grezes, P. Bertet, K. Moelmer, Phys. Rev. Lett. 110, 250503 (2013).
[2] G. Wolfowicz et al., Nature nanotechnology 8, 561 (2013).
[3] X. Zhou et al., Phys. Rev. B 89, 214517 (2014).

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Date submitted: 11 Dec 2014 Electronic form version 1.4