Abstract Submitted
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Electron paramagnetic resonance spectroscopy using a superconducting flux qubit directly coupled to an electron spin ensemble[1] HIRAKU TOIDA, YUICHIRO MATSUZAKI, KOSUKE KAKUYANAGI, XIAOBO ZHU[2], WILLIAM MUNRO, NTT Basic Research Laboratories, KAE NEMOTO, National Institute of Informatics, HIROSHI YAMAGUCHI, SHIRO SAITO, NTT Basic Research Laboratories — Electron paramagnetic resonance (EPR) is a powerful spectroscopic tool to investigate unpaired electrons in materials. Conventional EPR spectrometers rely on a cavity to detect the microwave signal from electron spins. On the other hand, in our spectrometer, polarization of an electron spin ensemble is detected by a magnetometer, which is directly bonded to the spin ensemble. Here, we report EPR spectroscopy with a superconducting flux qubit, which is used as a magnetometer. The electron spin ensemble is excited by applying a continuous microwave signal with an on-chip microstrip. EPR is detected as a change in resonance frequency of the flux qubit. We estimate the sensing volume and the sensitivity to be $\sim 5 \times 10^{-11}$ cm^3 (~ 50 fL) and ~ 500 spins/$\sqrt{\text{Hz}}$, respectively. This result paves the way towards realizing on-chip EPR spectroscopy of a single spin, or highly sensitive nuclear spin detection.

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