

Abstract Submitted
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Hybrid quantum circuit with a superconducting qubit coupled to a spin ensemble¹ YUIMARU KUBO, CECILE GREZES, ANDREAS DEWES, DENIS VION, CEA-Saclay, JUNICHI ISOYA, University of Tsukuba, VINCENT JACQUES, ANAIS DREAU, JEAN-FRANCOIS ROCH, ENS de Cachan, IGOR DINIZ, ALEXIA AUFFEVES, CNRS-Grenoble, DANIEL ESTEVE, PATRICE BERTET, CEA-Saclay — We report the experimental realization of a hybrid quantum circuit combining a superconducting qubit and an ensemble of electronic spins. The qubit, of the transmon type, is coherently coupled to the spin ensemble consisting of nitrogen-vacancy (NV) centers in a diamond crystal via a frequency-tunable superconducting resonator acting as a quantum bus [1,2]. Using this circuit, we prepare arbitrary superpositions of the qubit states that we store into collective excitations of the spin ensemble and retrieve back later on into the qubit [3]. These results constitute a first proof of concept of spin-ensemble based quantum memory for superconducting qubits.

[1] Y. Kubo *et al.*, Phys. Rev. Lett. **105**, 140502 (2010).

[2] Y. Kubo *et al.*, arXiv: 1109.3960.

[3] Y. Kubo *et al.*, arXiv: 1110.2978.

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