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Coherent coupling of a superconducting flux qubit to an electron spin ensemble in diamond XIAOBO ZHU, SHIRO SAITO, ALEXANDER KEMP, KOSUKE KAKUYANAGI, SHIN-ICHI KARIMOTO, HAYATO NAKANO, WILLIAM J. MUNRO, YASUHIRO TOKURA, NTT Basic Research Laboratories, MARK S. EVERITT, KAE NEMOTO, National Institute of Informatics, MAKOTO KASU, NTT Basic Research Laboratories, NORIKAZU MIZUOCHI, University of Osaka; PRESTO JST, KOUICHI SEMBA, NTT Basic Research Laboratories — We have experimentally demonstrated coherent strong coupling between a single macroscopic superconducting artificial atom (a gap tunable flux qubit [1]) and an ensemble of electron spins in the form of nitrogen–vacancy color centres in diamond. We have observed coherent exchange of a single quantum of energy between a flux qubit and a macroscopic ensemble consisting of about $3.0*10^7$ NV- centers [2]. This is the first step towards the realization of a long-lived quantum memory and hybrid devices coupling microwave and optical systems. [1] *Coherent operation of a gap-tunable flux qubit* X. B. Zhu, A. Kemp, S. Saito, K. Semba, APPLIED PHYSICS LETTERS, Volume: 97, Issue: 10 pp. 102503 (2010) [2] *Coherent coupling of a superconducting flux qubit to an electron spin ensemble in diamond* Xiaobo Zhu, Shiro Saito, Alexander Kemp, Kosuke Kakuyanagi, Shin-ichi Karimoto, Hayato Nakano, William J. Munro, Yasuhiro Tokura, Mark S. Everitt, Kae Nemoto, Makoto Kasu, Norikazu Mizuochi, and Kouichi Semba, Nature, Volume: 478, 221-224 (2011)

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