

Coupling an ensemble to a superconducting qubit

Xiaobo Zhu^a, Shiro Saito^a, Alexander Kemp^a, Kosuke Kakuyanagi^a, Shin-ichi Karimoto^a, Hayato Nakano^a, William J. Munro^a, Yasuhiro Tokura^a, Mark S. Everitt^b, Kae Nemoto^b, Makoto Kasu^a, Norikazu Mizuochi^{c,d}, and Kouichi Semba^a

^aNTT Basic Research Laboratories, NTT Corporation, 3-1 Morinosato-Wakamiya, Atsugi, Kanagawa 243-0198, Japan

^bNational Institute of Informatics, 2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo-to 101-8430, Japan

^cUniversity of Osaka, Graduate school of Engineering Science, 1-3, Machikane-yama, Toyonaka, Osaka, 560-8531, Japan

^dPRESTO JST, 4-1-8 Honcho, Kawaguchi, Saitama 332-0012, Japan

We report here the first demonstration of strong coupling and coherent exchange of a single quantum of energy between a superconducting qubit and an ensemble quantum system. This is the first step towards the realization of a long lived quantum memory for condensed matter systems with an additional potential future application as an interface between the microwave and optical domains.