Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Controllable Coupling between Flux Qubit and Nanomechanical Resonator[1] YING-DAN WANG, NTT Basic Research Laboratory, FEI XUE, RIKEN DML, CHANGPU SUN, Institute of Theoretical Physics, Chinese Academy of Sciences, HAJIME OKAMOTO, HIROSHI YAMAGUCHI, KOUICHI SEMBA, NTT Basic Research Laboratories — We propose an active mechanism for coupling the quantized mode of a nanomechanical resonator to the persistent current in the loop of superconducting flux qubit. This coupling is independently controlled by an external coupling magnetic field. The whole system forms a novel solid-state cavity QED architecture in strong coupling limit which has broad applications in demonstrating quantum optical phenomena in solid state system and solid-state quantum computing. The coupling mechanism is applicable for more generalized situations where the superconducting Josephson junction system acts as a multi-level quantum system. We also address the practical issues concerning experimental realization.

[1]This work was partially supported by JSPS KAKENHI (18201018, 16206003) and JST-CREST

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Date submitted: 22 Dec 2006 Electronic form version 1.4