

Abstract Submitted
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Normal-mode coupling of rare-earth-metal ions (Pr^{3+}) in a crystal (Y_2SiO_5) to a macroscopic optical cavity mode KOUICHI ICHIMURA, HAYATO GOTO, Frontier Research Laboratory, Corporate Research & Development Center, Toshiba Corporation — Coupling of rare-earth ions (Pr^{3+}) in a crystal (Y_2SiO_5) to a macroscopic cavity mode was demonstrated by observing optical bistability and normal-mode peaks, which is sometimes described as vacuum Rabi splitting, due to sweeping-laser-induced population redistribution of the ions. The experimentally evaluated coupling constant between the individual ions and the single cavity mode is 15 kHz, which is comparable with or larger than the dissipation of the ions. The coupling constant will exceed the cavity dissipation with a narrowing of the mode waist of the cavity to the wavelength. The results advance the application of a coupled system of rare-earth ions in a crystal and an optical cavity for quantum information processing.

Kouichi Ichimura
Frontier Research Laboratory, Corporate Research & Development Center, Toshiba Corporation

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