Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

A photon-photon quantum gate using a multilevel atomic system

YUUKI TOKUNAGA, NTT SC Labs. — We propose a method for a quantum gate between photons assisted by a multilevel atomic system. The atomic system is supposed to be in a cavity or a one-dimensional waveguide. The system can transfer a quantum state between a photon and the atom, and also works as a quantum gate for consecutively input photons. This system could be used for a building block for a universal quantum computation. We also discuss the characteristics of such quantum gates with several different multilevel system.

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Date submitted: 14 Nov 2014 Electronic form version 1.4