Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

High-transmission ridge nanoapertures for quantum dot devices[1]
AKIHIRO KIRIHARA, JUNICHI FUJIKATA, NEC Corporation, TOSHIHIRO NAKAOKA, NAOTO KUMAGAI, KATSUYUKI WATANABE, University of Tokyo, MASAYUKI SHIRANE, SHUNSUKE OHKOUCHI, SHINICHI YOROZU, NEC Corporation, YASUHIKO ARAKAWA, University of Tokyo — We report on double-ridge apertures to enhance the coupling between a single quantum dot (QD) and optical field. The double-ridge aperture has two metallic tips protruding inward and facing each other, which work as an effective antenna for a QD just below the tips. We performed FDTD simulation to optimize the apertures, and fabricated them on InAs/GaAs QDs emitting at 960nm. By single-dot PL spectroscopy through the double-ridge aperture, we demonstrated 5-6 times enhancement in PL extraction efficiency, compared to that through a conventional circular aperture. Because our double-ridge aperture works not only as an optical antenna but also as an electrode for a QD, it will be applicable to electrically-driven photon generators or photon detectors.

[1]This work was supported by Japanese Special Coordination Funds for Promoting Science and Technology.

Akihiro Kirihara
NEC Corporation

Date submitted: 20 Nov 2008 Electronic form version 1.4