August 2015 Vol. 13 No. 8

NTT Technical Review 8 2015

https://www.ntt-review.jp/archive/2015/201508.html

Feature Articles
Frontier Research on Low-dimensional Semiconductor Physics

Regular Articles

Global Standardization Activities

Practical Field Information about Telecommunication Technologies

Feature Articles
Frontier Research on Low-dimensional Semiconductor Physics

Ultimate Control of Electronic Properties in Low-dimensional Semiconductors

▼Abstract

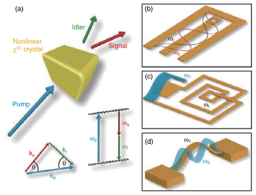
Recent progress in semiconductor technology has enabled the development of structures that are scaled down to the nanometer level with high precision by using highly sophisticated nanofabrication and crystal growth techniques. Confining electrons to such low-dimensional nanostructures makes it possible to achieve precise control of electrons as particles as well as waves. The Feature Articles in this issue review our recent research activities involving low-dimensional semiconductor devices that will be applied to achieve innovative electronics in future science and information and communication technologies.

Regular Articles

Two-mode Squeezing in an Electromechanical Resonator

▼Abstract

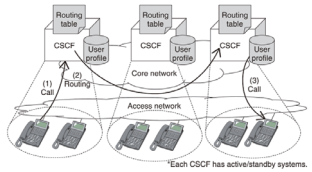
A mechanical resonator integrated with piezoelectric transducers enables mechanical nonlinearities to be dynamically engineered to emulate non-degenerate parametric down-conversion. In this configuration, millions of phonons are simultaneously generated in pairs in two macroscopic vibration modes, which results in the amplification of their motion by more than 20 dB. Mechanical two-mode squeezed states are also created in parallel, which exhibit fluctuations 5 dB below the thermal level of their constituent modes and they harbor correlations between the modes that become perfect as their amplification is increased. This remarkable observation of correlations between two massive phonon ensembles establishes the means to create an entangled macroscopic mechanical system at the single phonon level.



Improving User Capacity and Disaster Recovery Time in IP Telephone Service Systems

▼Abstract

The NTT Group is working on improving Internet protocol (IP) telephone networks and solving certain problems associated with them. Specifically, efforts are underway to improve the accommodation rate, reduce network operating costs when the number of network users increases, and reduce service recovery time when a network is damaged because of a natural disaster. To resolve these problems, we developed a system architecture that simplifies the operation of IP telephone networks and uses network equipment much more efficiently. This is possible with a subscriber data management server. We describe here our new network architecture, the mechanism to solve these problems, and the effect it has on IP telephone networks.



Development of High-capacity Protocol for M2M Services and Its Application to a Pallet Management System

▼Abstract

NTT Network Innovation Laboratories has developed a high-capacity protocol for the 920-MHz band in order to enhance the effectiveness and accelerate the adoption of machine-to-machine (M2M) services. This protocol can detect the movement of hundreds of terminals and manage more than 10,000 terminals. The protocol is applied to physical distribution systems in which very large inventories need to be controlled. It offers efficient management of loading/unloading activities. The protocol was commercialized as a pallet management system in fiscal year 2015. In this article, we describe the protocol and explain how we verified its performance in tests conducted in an actual goods distribution center.