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Manipulate atoms

- Challenge for the quantum information processing with atoms -

Motivation

Neutral atom is a complex particle that has specific internal state. We can control the state quantum mechanically with electro-magnetic field. Then, why not using single atoms as single quantum devices? Superconducting atom chip paves a way for creating new quantum devices with single atoms.

Originality

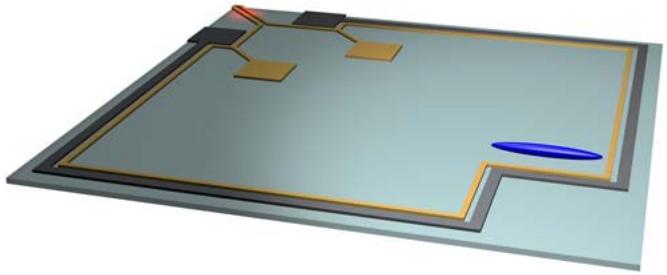
Persistent supercurrent atom chip, that NTT BRL achieved for the first time, is practically noise free and expected to trap single atoms with maximum flexibility. For that purpose we have developed a new technology to control a persistent supercurrent with an on chip thermal switch operated by laser.

Impact

Single atomic devices will be a practical resource for applying quantum mechanics to real world. With single atomic devices we will be able to realize high precision measurement, quantum state transfer, and quantum computations.

Contact person: Dr. Tetsuya Mukai
Physical Science Laboratory, NTT Basic Research Laboratories
TEL: 046-240-3634 FAX: 046-240-4722
e-mail: tetsuya@will.brl.ntt.co.jp

Persistent supercurrent atom chip



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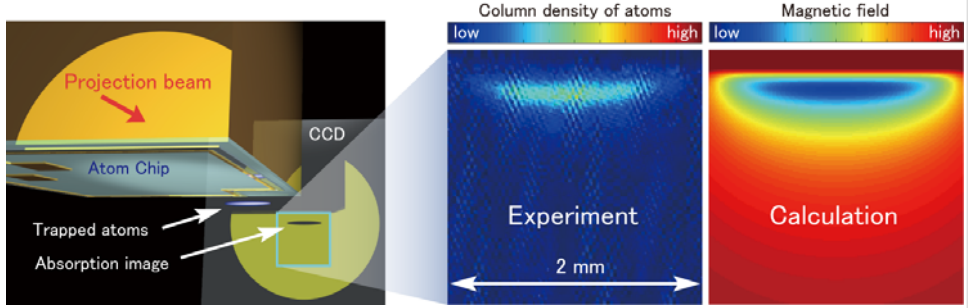

NTT BRL succeeded in trapping rubidium atoms in a magnetic potential generated from a persistent supercurrent on an atom chip. This is the first step for the single atomic device.

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