

Abstract Submitted
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Scalable Neutral Atom Quantum Computer with Interaction on Demand¹ MIKIO NAKAHARA, ELHAM HOSSEINI LAPASAR, KENICHI KASAMATSU, TETSUO OHMI, YASUSHI KONDO, Department of Physics, Kinki University — We propose a scalable neutral atom quantum computer with an on-demand interaction. Artificial lattice of near field optical traps is employed to trap atom qubits. Interactions between atoms can be turned off if the atoms are separated by a high enough potential barrier so that the size of the atomic wave function is much less than the interatomic distance. One-qubit gate operation is implemented by a gate control laser beam which is attached to an individual atom. Two-qubit gate operation between a particular pair of atoms is introduced by leaving these atoms in an optical lattice and making them collide so that a particular two-qubit state acquires a dynamical phase. Our proposal is feasible within existing technology developed in cold atom gas, MEMS, nanolithography, and various areas in optics.

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Mikio Nakahara
Department of Physics, Kinki University

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