Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Resonantly enhanced spin-spin interaction of ultracold atoms in an optical lattice for quantum information and simulation KENSUKE INABA, KAZUTO NODA, NTT Basic Research Labs., YUUKI TOKUNAGA, NTT Secure Platform Labs., KIYOSHI TAMAKI, KAZUHIRO IGETA, MAKOTO YAMASHITA, NTT Basic Research Labs. — Control of the spin-spin interactions between atoms in an optical lattice is a key ingredient for simulating quantum magnetism and also creating entanglement required for quantum computation. Here, we investigate the use of resonant enhancement of the perturbative spin interactions. First, we discuss entanglement generation with a tunable Ising interaction. Enhancing the interaction allows us to shorten operation time. However, it conflicts with the perturbative nature of the interaction and inevitably induces unwanted correlations that degrade fidelity. We propose a method for overcoming this difficulty. Next, we also discuss characteristic magnetism caused by the resonantly enhanced interaction. In the similar way to the above, the transition temperatures can be increased, which is limited by the breakdown of the perturbation. We will discuss the mechanism of the limitation. This work was partly supported by JST CREST.

Kensuke Inaba
NTT Basic Research Labs.

Date submitted: 30 Jan 2014 Electronic form version 1.4