

凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: Room 413, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: 13:30-15:00, Wednesday, 7 November 2012

“Quantum effects in one-dimensional fermion dynamics”

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Abstract:

Recently, the non-equilibrium dynamics of cold atoms has attracted much attention, because cold atom systems are ideal as isolated quantum systems which can be experimentally designed [1]. These experiments (*e.g.* [2]) and theories motivate us to research one-dimensional dynamics, because quantum effects in dynamics have not been clarified even in one-dimensional systems.

In this talk, we show two results of one-dimensional fermion dynamics. One is the collision dynamics of two fermion clusters [3]. The other is the effect of the forced, slow motion of a species-dependent trap capturing a single fermion in a cloud of another type of fermions. We adopt the one-dimensional Fermi-Hubbard model and the time-dependent density matrix renormalization group method [4] to simulate these dynamics with contact interaction. We analyze the simulation results by comparing some semi-classical models to investigate the quantum effects.

References:

- [1] D. Jaksch and P. Zoller, *Ann. Phys.* **315**, 52 (2005).
- [2] A. Sommer, M. Ku, G. Roati and M.W. Zwierlein, *Nature* **472**, 201 (2011).
- [3] J. Ozaki, M. Tezuka and N. Kawakami, *Phys. Rev. A* **86**, 033621 (2012).
- [4] S. R. White and A. E. Feiguin, *Phys. Rev. Lett.* **93**, 076401 (2004).