

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, 13 July 2011

“Analysis of one-dimensional supersolid in the presence of an obstacle”

Speaker: **Mr. Masaya Kunimi** (Department of Basic Science, University of Tokyo)

Abstract: Feasibility of supersolids which have both crystalline order and superfluidity has been discussed for the last 40 years. Recently, motivated by experiments of solid Helium and realization of cold atomic gases with strong long-range interaction, supersolids have attracted much attention.

We have studied supersolids in the presence of an obstacle preventing a flow. For superfluids, the following properties have been known:

- (1) Below the critical velocity, a stable steady flow state (superfluid state) can exist.
- (2) Above the critical velocity, a stable steady flow state cannot exist and periodical emissions of topological defects, for example, solitons or quantum vortices occur.
- (3) Near the critical velocity, the emission rate of the topological defects obeys a scaling law predicted by a saddle-node bifurcation.

Analyzing Bose-Einstein condensates with a finite-range interaction using the Gross-Pitaevskii equation, we show that one-dimensional supersolids have the properties (1) and (2) [1]. As to (3), we find different scaling law in the supersolid phase [2]. In this seminar, I will talk about above results.

References:

- [1] M.Kunimi, Y.Nagai, and Y.Kato, arXiv:1005.3936.
- [2] M.Kunimi, M.Kobayashi, and Y.Kato, unpublished.