



Institute for Advanced Study, Tsinghua University

Physics Seminars (biweekly)

Title: Superfluidity in one dimension as a dynamical phenomenon

Speaker: Prof. Masaki Oshikawa (*University of Tokyo*)

Time: 3:15pm, Wednesday, May 22, 2013
(2:45~3:15pm, Tea, Coffee, and Cookie)

Venue: Conference Hall 322, Science Building, Tsinghua University

Abstract

Superfluid density is often related to helicity modulus, which is a static response of the free energy to phase twist. In one dimension, the helicity modulus generally vanishes in the thermodynamic limit at finite temperatures, implying absence of superfluidity. Recently, however, experimental observation of super fluidity in liquid ^4He confined in one-dimensional nanopore is reported [1]. This urges us to reconsider the notion of superfluidity and its relation to the helicity modulus which is a completely static quantity.

We develop a theory of superfluidity in one dimension, as an essentially dynamical phenomenon [2]. Our result agrees qualitatively with the experimental results on liquid ^4He in one-dimensional nanopore, and predicts a weak but significant frequency dependence of the onset of the superfluid response.

References

[1] J. Taniguchi, Y. Aoki, and M. Suzuki, Phys. Rev. B 82, 104509 (2010).

[2] T. Eggel, M. A. Cazalilla, and M. Oshikawa, Phys. Rev. Lett. 107, 275302 (2011).