清华大学高等研究院

Institute for Advanced Study, Tsinghua University

物理学术报告
Physics Seminars (biweekly)

Title: **Higher angular momentum pairing from transverse gauge interactions**

Speaker: **Prof. Suk Bum Chang**
(*IBS-CCES, Seoul National University*)

Time: **3:15pm, Wednesday, May 7, 2014**
(2:45~3:15pm, Tea, Coffee, and Cookie)

Venue: **Conference Hall 322, Science Building, Tsinghua University**

Abstract

In this paper, we study the superconductivity of nonrelativistic fermions at finite-density coupled to a transverse $U(1)$ gauge field, with the effective interaction including the Landau-damping. This model, first studied by Holstein, Norton, and Pincus [Phys. Rev. B 8 2649 (1973)] has been known as an example of a non-Fermi liquid, i.e., a metallic state in which the decay rate of a quasiparticle is large compared to the characteristic quasiparticle energy; other examples of the non-Fermi liquid includes the two dimensional (2d) electron gas in a magnetic field at $\nu=1/2$ and the normal state of optimally doped cuprate superconductors. Our study thus addresses the question of whether or not non-Fermi liquids, like Fermi liquids, are unstable towards the formation of superconductivity. The results are (i) the non-Fermi liquid is stable against superconductivity below a critical gauge coupling, (ii) above this critical coupling, the ground state is an unconventional superconductor with angular momentum $\ell \geq 2$. Our results are obtained from a solution of the Dyson-Nambu equation. Note that in this problem there is a quantum critical point between a non-Fermi liquid state and the superconducting state, as the critical coupling is nonzero. This is in contrast to a weakly coupled metal, which exhibits superconductivity for infinitesimally weak interaction regardless of its sign.

Ref: Chung, Mandal, Raghu and Chakravarty, Phys. Rev. B 88, 045127 (2013)