Institute Seminar

29 January 2016 **4:00 p.m.** **Fermion**

Speaker:
Hidemaro Suwa
Department of Physics, The University of Tokyo

Title:

Phase-Transition Study of Spin-Phonon Systems by Worldline Quantum Monte Carlo Breaking Detailed Balance

Abstract:
The Markov chain Monte Carlo (MCMC) method has been a vital tool for various kinds of statistical problems across the disciplines, such as physics, chemistry, statistics, and so on. In most practical implementations of the method, the detailed balance condition is imposed. It becomes a simple task to find adequate transition probability thanks to the condition. However, the detailed balance is not necessary for the MCMC method. We have invented a general MCMC algorithm without detailed balance[1]. The convergence of estimates by our algorithm gets more than 100 times faster than that by the Metropolis algorithm in the quantum spin chain with magnetic field. In the meantime, we have developed also an unbiased gap-estimation method in the worldline quantum Monte Carlo method[2]. The quantum phase transitions triggered by the spin-phonon interaction were investigated in the combination of our developed methods[3]. We have established that the quantum phonon effect is essential to the critical theory governed by the antiadiabatic limit, i.e., the k=1 SU(2) Wess-Zumino-Witten model.

[1] H. Suwa and S. Todo, Phys. Rev. Lett, 105 120603 (2010)
[2] H. Suwa and S. Todo, Phys. Rev. Lett, 115 080601 (2015)
[3] H. Suwa, Springer Theses 2014

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