筑波大学
University of Tsukuba

Condensed Matter Seminar
物性論セミナー

2022年8月10日 (水), Aug.10 (Wed.) 2022
11:00-12:00　Zoom

Exactly solvable model for non-Abelian quasiparticle states

Koji Kudo
Pennsylvania State University

Abstract:
Non-Abelian anyons, exotic particles that are neither bosons nor fermions, have been predicted to emerge in interacting quantum matter. A typical platform is the so-called 5/2 fractional quantum Hall effect, which hosts fractionalized excitations with non-Abelian statistics. There is a theoretical model that is exactly solvable for quasiholes [1,2], which has given a rigorous demonstration of their non-Abelian braid statistics. In this talk, we propose a model Hamiltonian that is solvable for quasiparticles as well as quasiholes. Our Hamiltonian includes two-body and three-body interactions, motivated by the bipartite composite fermion wavefunctions [3,4]. The exact solutions for quasiparticles and quasiholes give the same counting for edge excitations, demonstrating that they obey the same non-Abelian statistics. Our model also allows for exact solutions for neutral excitations. We numerically show that these neutral excited states are adiabatically connected to states given by the three-body interaction in the lowest Landau level problem [5].

[1] G. Moore and N. Read, Nucl. Phys. B 360, 362 (1991)
[2] N. Read and E. Rezayi, Phys. Rev. B 54, 16864 (1996)
[3] G. J. Sreejith, C. Tőke, A. Wójs, and J. K. Jain, Phys. Rev. Lett. 107, 086806 (2011)
[4] I. D. Rodriguez, A. Sterdyniak, M. Hermanns, J. K. Slingerland, and N. Regnault, Phys. Rev. B 85, 035128 (2012)
[5] K. Kudo, A. Sharma, G. J. Sreejith, and J. K. Jain, arXiv:2206.07789

Contact : Y. Hatsugai, 初貝安弘 Email: hatsugai@rhodia.ph.tsukuba.ac.jp