

# Joint CQSE and CASTS Seminar

Weekly Seminar  
Mar. 11, 2016 (Friday)

TIME Mar. 11, 2016, 14:30 ~ 15:30  
TITLE Spin-orbit coupled one dimensional Fermi gas in the magnetic field  
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PLACE Rm716, CCMS & New Physics Building, NTU

## Abstract

The interplay between spin-orbit coupling (SOC) and interaction effects has drawn enormous attention in both the condensed matter and cold atom communities lately thanks to the search of quantum phases with non-trivial topological properties.

Based on the DMRG and the infinite time-evolving block decimation (iTEBD) method we study the interacting spin-orbit coupled 1D Fermi gas in a transverse magnetic field.

This system has been suggested to host Majorana fermion in the mean field study.

However, our numerical results show no positive evidence of Majorana fermions, which is likely destroyed by quantum fluctuation in the 1D system.

Instead, we find the system with an attractive interaction can have interesting pairing phases as we vary the chemical potential and the strength of the magnetic field. Spin-orbit coupling (SOC) enhances the triplet pairing order at zero momentum in both the superconducting and the Luther-Emery phases, which leads to an algebraically decaying correlation with the same exponent as that of the singlet pairing one. In contrast to the Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) phase found in the spin imbalanced system without SOC, pairings at finite momentum in these two phases have larger exponents hence do not dictate the long range behavior.

