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# Multiple period states in superfluid Fermi gases in an optical lattice

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Interplay between the non-linearity due to the emergence of the superfluid order parameter and the effect of a periodic potential is one of the most important issues of ultracold atomic gases in an optical lattice. However, the study of non-linear phenomena of superfluid Fermi gases in an optical lattice is at a very infant stage unlike that for Bose gases. Appearance of stationary states whose period is not equal to the lattice constant but is a multiple of it, i.e., multiple period states, is a typical non-linear phenomenon. In this talk, we will discuss multiple period states of superfluid Fermi gases in an optical lattice along the crossover between the Bardeen-Cooper-Schrieffer (BCS) and Bose-Einstein condensate (BEC) states, which we have found recently. By solving Bogoliubov–de Gennes equations for a superfluid flow with finite quasimomentum, we find that, in the BCS side of the crossover, the multiple period states can be energetically favorable compared to the normal Bloch states and their survival time against dynamical instability drastically increases, suggesting that these states can be accessible in current experiments, in sharp contrast to the situation in BECs.

## Biography

Gentaro Watanabe has completed his PhD from the University of Tokyo and Post-doctoral studies from NORDITA, University of Trento, and RIKEN. He has worked at APCTP as a Junior Research Group Leader/Assistant Professor and at the Institute for Basic Science in Korea, he is currently a ZJU Young Professor in the Department of Physics of Zhejiang University.

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