

凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: **Room 413**, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: **13:30-15:00**, Wednesday, 21 August 2019

“Topological nontrivial Andreev bound states, double dimensionality, and synthetic dimensions”

Speaker:

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Abstract:

Andreev bound states are low energy excitations appearing below the particle-hole gap of superconductors, and are expected to be topologically trivial. In this seminar, I will report the theoretical prediction of topologically nontrivial Andreev bound states in one-dimensional superconductors. These states correspond to a novel topological invariant defined in a synthetic two-dimensional space, the particle-hole Chern number, which we construct in analogy to the spin Chern number in quantum spin Hall systems. Nontrivial Andreev bound states have distinct features and are topologically nonequivalent to Majorana bound states. Yet, they can coexist in the same system, have similar spectral signatures, and materialize with the concomitant opening of the particle-hole gap. The coexistence of Majorana and nontrivial Andreev bound state is the direct consequence of “double dimensionality”, i.e., the dimensional embedding of the one-dimensional system in a synthetic two-dimensional space, which allow the definition of two distinct topological invariants (Z_2 and Z) in different dimensionalities.

References:

[1] P. Marra and M. Nitta, arXiv:1907.05416 (2019).