第24回トポロジカル物質科学セミナー
Topological Material Science Seminar (24)

Anomalous Hall effects in Chiral Superfluids

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Abstract:

The superfluid phases of ^{3}He are paradigms for spontaneous symmetry breaking in quantum field theory and condensed matter physics. The microscopic physics underlying the phenomenology of ^{3}He - that of an interacting Fermi system with strong-coupling between Fermions to *paramagnons* - provided the basic theoretical model for spin-triplet superconductivity in Sr_2RuO_4 [1]. The phases of bulk superfluid ^{3}He are also paradigms for topological order and the subject of intense theoretical and experimental research [2]. I discuss signatures of broken space-time symmetries - particularly, parity and time-reversal (BTRP) - and the implications for topological order of chiral superfluids. I highlight signatures of BTRP in ^{3}He-A [3], and chiral superconductors [4]. I summarize the theory for the anomalous Hall effect for electron transport in chiral superfluids, and show that the experimental results for electron transport in superfluid ^{3}He-A provide direct evidence for the spectrum of Weyl Fermions in ^{3}He-A [5]. I conclude with a discussion of BTRP in chiral superconductors.

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[2] T. Mizushima. et al., J.Phys.Soc. Jpn. **85**, 022001 (2016).
[3] H. Ikegami, Y. Tsutsumi, and K. Kono, Science **341**, 59 (2013).
[4] E. R. Schemm, et al. Science **345**, 190 (2014).
[5] O. Shevtsov and J. A. Sauls, Phys. Rev. B **96**, 064511 (2016).

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