779th ASRC Seminar

Date：2月7日(金) 10：30～

Location：先端基礎研究交流棟 2階ロビー

Speaker：安井繁宏氏（慶應義塾大学）

Title: Neutron $^3P_2$ superfluid in neutron stars - tricritical endpoint, domain walls, and surface topology -

Abstract:

Neutron $^3P_2$ superfluid is a quantum state at high density in neutron stars. In this phase, there are Cooper pairs with the total angular momentum J=2 as a sum of spin triplet (S=1) and P-wave angular momentum (L=1), and it leads to the variety of phases of the neutron $^3P_2$ superfluid. The neutron $^3P_2$ superfluid has a topological property as DIII topological matter in terms of the condensed matter physics. Thus, the neutron stars can be regarded as a gigantic topological matter in the universe. In this presentation, I will introduce the Ginzburg-Landau (GL) equation up to the 8th order terms as an effective theory around the critical temperature, and discuss several properties of the neutron $^3P_2$ superfluid. Concretely, I will discuss the phase diagram [1,2], the new universality class at tricritical end point [3], the domain walls [4] and the surface topology [5]. I also discuss the possible applications to astrophysical phenomena in the neutron stars.

[1] S. Yasui, C. Chatterjee, M. Nitta, PRC99, 035213 (2019)
[2] S. Yasui, C. Chatterjee, M. Kobayashi, M. Nitta, PRC100, 025204 (2019)
[3] T. Mizushima, S. Yasui, M. Nitta, arXiv:1908.07944 [nucl-th]
[4] S. Yasui, M. Nitta, arXiv:1907.12843 [nucl-th]
[5] S. Yasui, C. Chatterjee, M. Nitta, arXiv:1905.13666 [nucl-th].

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