

# 779<sup>th</sup> 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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