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Interplay Between 3P2 Neutron Quantum Vortices and 1S0 Proton Fluxtubes in the Outer Core of Neutron Stars

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Neutron stars exhibit sudden changes of its rotational velocity, known as “pulsar glitches”. It has been believed that glitches are mainly caused by superfluid neutron vortices in the inner crust of neutron stars. However, importance of contributions of the outer core has been recently discussed, and further microscopic investigations of quantum vortices and fluxtubes in the outer core of neutron stars are highly desired.
In this study, we investigate the interaction between quantum vortices of ${}^3P_2$ superfluid neutrons and fluxtubes of ${}^1S_0$ superconducting protons in the outer core of neutron stars, based on a successful bosonic theory of superfluid, the Gross-Pitaevskii equation (GPE). In this talk, we will discuss how the ${}^3P_2$ superfluid vortices interact with proton fluxtubes under a magnetic field in the outer core of neutron star.

Research field of your presentation

Theoretical Low-energy nuclear physics

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