

量子物理学・ナノサイエンス第 112 回特別セミナー

Gapless superfluidity and neutron stars

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日程 : 7 月 28 日 (月) 14:00-

場所 : 本館地下 B61 物理学系輪講室および Zoom*

概 要

Born from gravitational-core collapse supernovae, with initial temperatures as high as $\sim 10^{12}\text{K}$, neutron stars cool down to temperatures 10^9K within a few days, providing a unique opportunity to explore matter under extreme conditions. In particular, neutron stars contain nuclear superfluids whose presence is supported by observations of pulsar frequency glitches, rapid decline in luminosity of the Cassiopeia A remnant, and crust cooling of neutron stars in low-mass X-ray binaries. Despite the importance of the superfluid dynamics in interpreting these astrophysical phenomena, most microscopic calculations of the nuclear pairing properties have been carried out so far for static situations. We have recently studied the dynamics of hot neutron-proton superfluid mixtures within the time-dependent nuclear energy-density functional theory. The disappearance of superfluidity has also been investigated and reveals the presence of a dynamical "gapless" state in which nuclear superfluidity is not destroyed even though the energy spectrum of quasiparticle excitations exhibits no gap. The absence of an energy gap affects considerably the neutron specific heat which becomes very different from that in the classical BCS state (in the absence of superflows). Implications for the crust cooling of neutron stars in low-mass X-ray binaries will be discussed, as well as the consequences of gapless superfluidity for neutron vortex dynamics.

* 本 ZOOM セミナーに参加されます場合には、事前に下記より登録を済ませてください。

<https://zoom.us/meeting/register/AkyCAWeORjOecQ-cWvvLvg>



また、当日、会場にお越しいただけます方は、登録不要ですので、是非、対面でご参加ください。

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