ABOUT MAGNETIC SUSCEPTIBILITY OF DENSE SUPERFLUID NEUTRON MATTER WITH SPIN-TRIPLET p-WAVE PAIRING

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S u m m a r y

Pure neutron matter with the spin-triplet p-wave pairing is studied in the framework of the non-relativistic generalized Fermi-liquid theory at subnuclear and supranuclear densities (in the range $0.7n_0 \leq n < n_C(\text{Skyrme}) < 2n_0$, where $n_0 = 0.17$ fm^{-3} is the saturation density of the symmetric nuclear matter) at zero temperature and in the presence of a strong magnetic field. The Skyrme effective forces are used as interactions between neutrons. As a result, the general expression (valid for an arbitrary parametrization of the Skyrme forces) is obtained for the magnetic susceptibility of superfluid neutron matter, and it is specified then for three types of the Skyrme interaction with different power dependences on the density n. In particular, it is found for neutron matter with the so-called RATP, Gs, and SLy2 parametrizations of the Skyrme forces that the magnetic susceptibility diverges at the densities $n_C(\text{RATP}) \approx 1.03n_0$, $n_C(\text{Gs}) \approx 1.33n_0$ and $n_C(\text{SLy2}) \approx 1.72n_0$. These critical densities correspond to phase transitions from the superfluid paramagnetic state of neutron matter with triplet pairing to the ferromagnetic state which coexists with triplet superfluidity at densities higher than $n_C(\text{Skyrme})$. Such phase transitions might occur in the liquid outer cores of pulsars and the so-called magnetars.