Protoneutron Star Neutrinos as a Signal of Color Superconductivity

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Abstract

The onset of color superconductivity in dense quark matter will modify in-medium neutrino propagation. We calculate the neutrino mean free path in order to study the cooling of such matter via neutrino diffusion. The cooling process slows when quark matter undergoes a second order phase transition to a superconducting phase at the critical temperature T_c. Cooling subsequently accelerates as the temperature decreases below T_c. This may lead to observable changes in the neutrino signal from a newly born neutron star, should its core contain quark matter, and thus provide evidence for superconductivity in extremely dense matter.

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