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Pairing in nuclear matter and nuclei in a relativistic formalism and possible astrophysics implications for neutron star cooling

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We present some results for pairing in nuclear matter using a relativistic formalism investigating its density dependence, and also how the singlet pairing state changes with temperature for some spherical and deformed nuclei. We will discuss some astrophysical implications of these results, namely the pairing of neutron in the singlet and triplet states, which reduces the neutrino emission from neutron stars associated with the direct Urca process that dominates over other neutrino emitting processes in the star core. The nuclear pairing effect on this reaction used recently to explain the temperature data observed for the neutron star Cas A cooling, over a 10 year period, will be presented.

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