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Profile and Cooling rate of Non-rotating Magnetars using Strange Quark Matter Equation of States

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Various astrophysical objects like Neutron Stars, Magnetars, Blackholes, etc. have been extensively studied in the last few decades to predict and analyze observations about such compact objects. Despite the multiple attempts, the exact nature of the matter located inside the core of the above compact objects is still an open problem in Astrophysics. In this work, we attempt to find the profile of spherically symmetric non-rotating Neutron Stars by assuming that the core of the Neutron Star is made up of strange quark matter. The calculation has also been carried out with a core consisting of non-strange quark matter for comparison. We also include the impact of magnetic field on the profile of the Neutron Stars employing a modified Tolman-Oppenheimer-Volkoff system of equations. Using the profile thus obtained, Neutron Star cooling rate and cooling rate as a function of radius have also been calculated with and without magnetic field effects using NSCool code. Two approaches namely; a fixed value of the magnetic field and a more realistic distance-dependent magnetic field obtained by using a fitted eight-order polynomial have been used in the current calculation. Finally, we plot the Neutron cooling rate with and without magnetic fields by using the different equations of states along with corresponding observed data for a few neutron Stars.

Session

Astroparticle Physics and Cosmology

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