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A comparative study of Neutron Star structure using 3 models: Walecka Model, PAL Model and M.I.T. Bag Model

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Neutron stars are the most compact objects in nature widely used in the study of dense matter physics. This kind of objects are described by nuclear physics, special relativity, general relativity and particle physics.
In the present work, the structure of neutron stars is studied from theoretical perspectives by using the Equations of State (EoS) derived from microscopic calculations. In the context of nuclear physics, since we are dealing with hadrons degrees of freedom, two classes of models for the nuclear potential that reproduces the general features of normal nuclear matter were used to derive a proper EoS of baryonic matter: the-well know linear Walecka Model within the framework of the relativistic mean-field theory (RMF), and M. Prakash, T.L. Ainsworth, and J.M. Lattimer Model (PAL Model). However, in the context of particle physics, we choose the usual M.I.T Bag Model which is a QCD inspired model with 3-flavours quarks (u,d and s) degrees of freedom. In all the models studied in this work, the temperature is null and without the inclusion of electromagnetic fields.
Finally, we solved the Tolman-Oppenheimer-Volkov equations numerically and compared ours results with the actual pulsar data recently observed PSR J1614-2230 with a mass 1.97+- 0.04 M/M0.

Summary

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