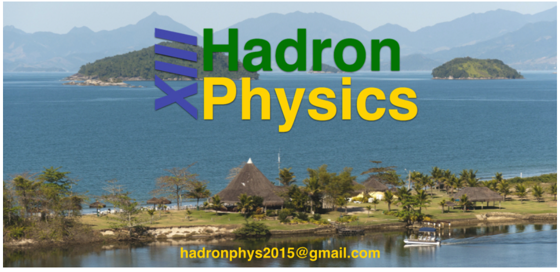

Contribution ID: **105**

Type: **Poster**

Models of general relativistic white dwarfs at zero-temperature

The white dwarfs represents the endpoint of stellar evolution, they are formed when a star, with masses between approximately 0.07 and 8-10 $M_{\odot}$, exhausts its nuclear fuel, then the process that sustain its stability will stop. After this, the internal pressure can no longer stand the gravitational force and the star collapses. In this work we investigate the structure of these stars which are described by the equations of Tolman - Oppenheimer - Volkoff (TOV) and the newtonian equations of gravitation. These equations show us how the pressure varies with the mass and radius of the star. We consider the TOV equations for both relativistic and non-relativistic cases for equation of state (EoS). In the case of white dwarf (WD) star the internal pressure that balances the gravitational one is essentially the pressure coming from the degeneracy of fermions. To have solved the TOV equations we need a equation of state that shows how this internal pressure is related to the energy density. Instead of using politropic equations of state we have solved the equations numerically using the exact relativistic energy equation for the model of fermion gas at temperature $T = 0$ and compare with the solution using the politropic approaches. We discuss the instability due to neutronization threshold and the coulomb corrections to the model of Chandrasekhar for WD of homogeneous composition that was performed by Hamada and Salpeter (HS) and concluded that for same mass the model of HS gives a smaller radius and larger central density if compared with the models of Chandrasekhar, finally in our results we compute the difference in the maximum mass for WDs composed of different nucleus . We also look for a fit of the numerical solution of the TOV with the general EoS for the WD mass-radius relation to make use of this as a more realistic analytic relation between mass and radius for general relativistic WDs than that newtonian $M \sim 1/R^3$.

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Track Classification: Hadronic and quark matter - applications in astrophysics