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Finite temperature effects on magnetized Bose-Einstein Condensate stars

We study the role of temperature on the macroscopic properties of magnetized Bose-Einstein condensate stars. These compact objects are composed of a gas of interacting neutral vector bosons coupled to a uniform and constant magnetic field. We assume that the boson-boson interactions are independent of the temperature and the magnetic field, and modeled them as tow-body contact interactions, while the thermal part was described through the exact thermodynamic potential of a hot gas of free vector bosons under the action of an uniform and constant magnetic field, including antiparticles. To obtain the macroscopic properties we used the γ-structure equations since they properly describe the axial deformation of magnetized stars. The main consequence of a finite temperature in the magnetized equations of state is to increase the inner pressure of the star. As a consequence, magnetized hot Bose-Einstein condensate stars are, in general, larger and heavier than their zero-temperature counterparts. However, the maximum masses given by the model remain almost unchanged, and the magnetic deformation of the star increases with the temperature. Besides, augmenting the temperature reduces the number of stable stars, an effect that the magnetic field enhances. The implications of our results for other stars´ observables and evolution are analyzed.

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