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Rotating dark matter compact star in the framework of the pseudo-complex general relativity

In the theory of pseudo-complex General Relativity (pc-GR), the field equations have an extra term, associated to the nature of spacetime, of repulsive character, which is believed to halt the gravitational attractive collapse of matter distributions in the evolution process of compact stars. This additional term arises from micro-scale phenomena due to vacuum fluctuations, which simulate the presence of dark energy in the Universe. In this contribution, we explore the presence of this additional term and propose a toy model consisting of dark matter, represented by Standard Model Fermi gauge singlets having their origin in the Higgs portal model, held together by the presence of the gravitational interaction and superimposed to the repulsive background of dark energy forming a type of unconventional and non-luminous star, composed only by dark matter and dark energy, a rare compact object formed solely by exotic content. The combination of these two ingredients, gravitational attraction and dark energy repulsion, allows the hydrostatic equilibrium condition of the star to hold. Solving the corresponding field equations and the TOV equations, and assuming that the fluid components interact only gravitationally, we determine the hydrostatic equilibrium equations of the star. We them analyze the corresponding results obtained for the equation of state and for the mass-radius relations and we them determine the maximum mass of the exotic rotating star for different parameter configurations. Star rotation is implemented via the Lorene Code.

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