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Non-singular Vaidya–Tikekar gravastar model in $(3+1)$ dimensions

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Abstract

In this manuscript, we have examined an isotropic, spherically symmetric non-singular gravastar modeled using the Vaidya–Tikekar metric potential. Mazur and Mottola first introduced the concept of the gravastar or gravitational vacuum star, and their work laid the foundation for its structural development. In recent years, gravastars have gained attention as viable alternatives to Black Holes (BHs), as they avoid key problems associated with event horizons and central singularities. Within a gravastar's interior, the pressure equals the negative energy density, generating a repulsive effect that impacts the adjacent region – a thin intermediate shell composed of ultra-relativistic plasma. The exterior region is described by the Schwarzschild geometry. In this work, we analyze the junction conditions connecting these spacetime regions and explore several physical characteristics of the thin shell, including its energy density, proper length, total energy, and entropy. We also investigate the stability properties of our stellar model.

Keywords: Black holes, non-singular gravastar model, Vaidya–Tikekar metric potential

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