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Effects of modified gravity on stability and age of white dwarfs

This abstract is based on our recent papers PRD 105 (2022) 024028 and PRD 107 (2023) 044072. Recent observations of several peculiar over- and under-luminous type Ia supernovae infer indirect evidences for the violation of the Chandrasekhar mass-limit by suggesting the existence of super- and sub-Chandrasekhar limiting mass white dwarfs (WDs). In an attempt to explain these phenomena in the context of general relativistic extensions, we study them in $f(R)$ gravity. We obtain the super- and sub-Chandrasekhar limiting masses as well as the dynamical instability criteria for WDs in the given gravitational theory. In my presentation, I'll show that the conventional stability condition $\partial M/\partial \rho_c > 0$ with M being the WD's mass and ρ_c central density, is also valid in modified gravity. Moreover, I'll discuss that the underlying gravity model plays a crucial role in determining the internal properties, such as specific heats, Debye temperature, etc. Thereby, I'll demonstrate that a modified gravity inspired WD can have much lesser cooling age than a conventional WD.

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