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Dark-matter admixed white dwarfs[1] SHING CHI LEUNG, MING CHUNG CHU, LAP MING LIN, KA WING WONG, Department of Physics and Institute of Theoretical Physics, The Chinese University of Hong Kong, Hong Kong, China — We study the equilibrium structures of white dwarfs (WD) with dark matter cores formed by non-self-annihilating dark matter (DM) particles with masses ranging from 1 GeV to 100 GeV, assuming in form of an ideal degenerate Fermi gas inside the stars. For DM particles of mass 10 GeV and 100 GeV, we find that stable stellar models exist only if the mass of the DM core inside the star is less than $O(10^{-3})M_{\rm sun}$ and $O(10^{-6})M_{\rm sun}$, respectively. The global properties of these stars, and the corresponding Chandrasekhar mass (CM) limits, are essentially the same as those of traditional WD models without DM. Nevertheless, in the 10 GeV case, the gravitational attraction of the DM core is strong enough to squeeze the normal matter in the core region to densities above neutron drip. For the 1 GeV case, the DM core inside the star can be as massive as $O(0.1)$ $M_{\rm sun}$ and affects the global structure of the star significantly. The radius of a stellar model with DM can be about two times smaller than that of a traditional WD. Furthermore, the CM limit can be decreased by as much as 40%. Our results may have implications on the extent to which type Ia supernovae can be regarded as standard candles.

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