Properties of Strange Quark Matter Stars

Ch. Kettner, F. Weber, M. K. Weigel, and N. K. Glendenning [a]

[a] Nuclear Science Div. and Inst. for Nuclear & Particle Astrophysics, LBNL, Berkely, CA 94720, USA

We determine all possible equilibrium sequences of compact strange-matter stars with nuclear crusts, which range from massive strange stars to strange white-dwarf-like objects (strange dwarfs). The properties of such stars are compared with those of their non-strange counterparts, – neutron stars and ordinary white dwarfs.

The main emphasize of this paper is on strange dwarfs, which we divide into two distinct categories. The first one consists of a core of strange matter enveloped within ordinary white dwarf matter. Such stars are hydrostatically stable with or without the strange core and are therefore referred to as 'trivial' strange dwarfs. This is different for the second category which forms an entirely new class of dwarf stars that contain nuclear material up to $\sim 4\times10^4$ times denser than in ordinary white dwarfs of average mass, $M \sim 0.6\, M_\odot$, and still about 400 times denser than in the densest white dwarfs. The entire family of such dwarfs, denoted dense strange dwarfs, owes its hydrostatic stability to the strange core.

One of the striking features of strange dwarfs is that the entire sequence from the maximum-mass strange star to the maximum-mass strange dwarf is stable to radial oscillations. The minimum-mass star is only conditionally stable, and the sequences on both sides are stable. Such a stable, continuous connection does not exist between ordinary white dwarfs and neutron stars, which are known to be separated by a broad range of unstable stars. As a result, we find an expansive range of very-low-mass (planetary-like) strange-matter stars (masses even below $\sim 10^{-4}\, M_\odot$ are possible) that arise as natural dark-matter candidates, which, if abundant enough in our Galaxy, should be seen in the gravitational microlensing searches that are presently being performed.

Details are presented in the following references.

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