

Compact stars on the brane: what could they reveal about extra dimensions?

Tuesday 12 May 2015 12:00 (30 minutes)

According to braneworld models the observable universe could be restricted to a 1+3 surface (a “brane” where Standard Model particles and fields are trapped) embedded in a higher dimensional spacetime (the “bulk”) that can be accessed by gravity. In this work we investigate the properties of compact stars in the Randall-Sundrum II type braneworld. Adopting the well established BPS equation of state below a fiducial density, and a causal equation of state above it, we solve the Tolman-Oppenheimer-Volkoff equations on the brane and obtain the causal limit for stellar configurations in the mass-radius diagram. Such limit is different to the one obtained within the frame of general relativity due to local and nonlocal extra-dimensional modifications to the structure equations on the brane. We analyse the properties of quark and hadronic stars using the MIT bag model and a relativistic mean-field model for the equation of state. We examine the stability of the stellar configurations and discuss smoking guns for extra dimensions that could emerge from future compact star observations.

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Track Classification: STARS2015