

Believe it or not: Exact Calculations of Superdense Nuclear Matter Equation of State in Compact Stars by FRG Method!

We propose a novel technique, using the expansion of the effective potential in a base of harmonic functions, to study the Functional Renormalization Group (FRG) method at finite chemical potential. Within this theoretical framework we determined the equation of state and the phase diagram of a simple model of massless fermions coupled to scalars through Yukawa-coupling at the zero-temperature limit [1].

We compared our results to the 1-loop and the mean field approximation of the same model and other high-density nuclear matter equation of states. Here, we present our exact, FRG-based equation of states calculation to describe the superdense nuclear matter inside compact astrophysical objects for the first time. We calculated the mass-radius relation for a compact star using the Tolmann-Oppenheimer-Volkov equation, which was compared to other results as well[2].

References:

[1] G.G. Barnafoldi, A. Jakovac and P. Posfay arXiv:1604.01717 [hep-th] (Submitted to PRD)

[2] P. Posfay, G.G. Barnafoldi, and A. Jakovac The FRG Method as a Novel Technique for Calculating Superdense Nuclear Matter Equation of State in Compact Stars,(Submitted to PRL)

Preferred Track

Baryon-Rich QCD Matter and Astrophysics

Collaboration

Not applicable

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