Contribution ID: **370**

Type: **Poster**

Effect of Quantum Corrections on a Realistic Nuclear Matter EoS and on Compact Star Observables

Tuesday, 15 May 2018 19:10 (30 minutes)

The accuracy of astrophysical observations regarding compact stars are ahead of a big evolution jump thanks to instruments like NICER [1], which will increase the accuracy of the measurements. The discovery of gravitational waves originating from merging neutron stars in this year (GW170817 [2]) is the first step to use gravitational waves as a probe for extremely dense nuclear matter.

Despite these developments the masquarade problem still persists in modeling cold superdense nuclear matter based on compact star observables. Since many different models yield similar neutron star parameters only high-precision measurements and theoretical reasons can exclude models.

In this talk we present a realistic, Walecka-type model where the bosonic fluctuations are included using the Functional Renormalization Group (FRG) method in the Local Potential Approximation (LPA), based on a our technique published previously [3,4]. The thermodynamical quantities, equation of state (EoS), compressibility are calculated in different approximations: mean field, 1st order and high order. Based on these EoS, the properties of the corresponding neutron stars are also calculated using the Tolman–Oppenheimer–Volkov (TOV) equations.

It is also presented, how calculating quantum corrections in different approximations change the predicted neutron star parameters like mass, radius and compactness. These results show, that in the light of the new developments in astrophysical observations quantum corrections are approaching the threshold where calculating them will be necessary for the correct comparison between different models.

References
[1] NASA 2017, Nicer, https://www.nasa.gov/nicer
[2] Ligo/Virgo 2017, Phys. Rev. Lett., 119, 161101
[3] Barnaföldi G. G., Jakovac A., Posfay P., 2017, Phys. Rev., D95,025004
[4] Pósfay P. Barnaföldi G.G., A. Jakovác,
arXiv:1710.05410, arXiv:1610.03674

Content type

Theory

Collaboration

Cost Action CA16214, PHAROS

Centralised submission by Collaboration

Presenter name already specified

Primary authors: PÓSFAY, Péter (Wigner Research Centre for Physics); JAKOVAC, Antal (Eotvos University Budapest); BARNAFOLDI, Gergely Gabor (Wigner RCP Hungarian Academy of Sciences (HU))

Presenter: BARNAFOLDI, Gergely Gabor (Wigner RCP Hungarian Academy of Sciences (HU))

Session Classification: Poster Session

Track Classification: High baryon density and astrophysics