Stellar and substellar objects in modified gravity: matter properties and tests of gravitational models

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Motivation. What is done so far

So far, the modified gravity community is used to play mainly in the cosmological framework and/or astrophysical ones:

neutron stars[1]

black holes[2]

exotic environment (wormholes, branes, cosmic strings, ...).

Growing data sets, especially on gravitational waves detections, allows to test and rule out[3] some of the gravitational theory proposals.

Regarding stars in modified gravity[4]

M-R relations (degeneracy with EoS's), stability problem, I-Love-Q relations

Issues: matching conditions (ill behaviour of surface quantities), mass problem, GR scenarios not working (Birkoff theorem, collapse model), non-physical matter

Non-relativistic stars: energy production (light elements burning), evolutionary scenarios, mass' limits, crystallization and convective processes, age of astrophysical objects, constraining theories (true stars vs brown dwarfs, Hayashi tracks, helioseismology,...)

[1] B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), Phys. Rev. Lett. 119 (2017)161101;

[2] B. P. Abbottet al.[LIGO Scientific and Virgo Collabo-rations], Phys. Rev. Lett.116(2016) 061102; K. Akiyamaet al.[Event Horizon Telescope Collabora-tion], Astrophys. J.875(2019) L1

[3] J. Ezquiaga et al., Phys. Rev. Lett. 119, 251304 (2017); S. Boran et al., Phys. Rev. D 97, 041501 (2018); R. Sanders, Int.J.Mod.Phys.D, 27, 14, (2018) 1847027; B. P. Abbottet al.[LIGO Scientific and Virgo Collabo-rations], Phys. Rev. Lett. 123, 011102 (2019); S. Jana et al., Phys. Rev. D 99, 044056 (2019);

[4] G.J. Olmo, D. Rubiera-Gracia, AW, Physics Reports 876 (2020)