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Mass-Radius Relation of Neutron Stars in a Scalar-Tensor Theory

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Many researchers are trying to explain the dark sector in the universe by modifying general relativity. Recently, a new cosmological scenario which explains the existence of dark matter by adding an extra scalar field in GR, called asymmetron scenario, was proposed[1]. In this theory, the scalar field gets nontrivial values inside highly dense matter, such as neutron stars, and weaken gravitational force. Therefore, it may also explain the existence of the massive neutron star[2]. Because it can change the internal structure of neutron stars significantly, it can be tested by observing compact binary coalescences using gravitational waves. In this talk, I am going to explain how the internal structure and mass-radius relation of neutron stars are modified in this scenario. I am also going to mention that this theory allows the existence of the massive neutron star even though strange hadrons, such as hyperons, appear inside the core.

Reference:
[1]P. Demorest. et. al., Nature 467, 1081 (2010).
[2]P. Chen, T.Suyama and J. Yokoyama, Phys. Rev. D 92, 124016 (2015).

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