Gravitational radiation from binary neutron stars in a Fourth Order Gravity model

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The recent direct detections of gravitational wave signals from strong astrophysical sources like binary black hole mergers and binary neutron stars have once again strongly established the theory of General Relativity(GR) as the true description of the nature of space-time. Despite its overwhelming success and confirmations coming from various astrophysical observations, it is undeniably true that GR cannot satisfactorily explain the cosmological evolution of the universe without invoking dark energy and dark matter. Modified gravity models which are alternative theories of gravity are formulated so as to account for the large scale observations without necessitating the presence of dark energy and/or dark matter. In this talk, I will discuss a particular modified gravity theory containing fourth order modifications in the field equations. This model has one free length parameter. The model has been shown to explain the galaxy rotation curve data as well as the cosmic acceleration as suggested by the supernovae measurements to a good degree of accuracy. In this talk, I will speak about the effects of the fourth order term on the gravitational waves emission from binary pulsar systems and consequent decay of the orbital period. Using observational data for three binary pulsars: PSR 1913+16, PSR J1518+4904, and PSR J0737-3039, the parameter is constrained and shown to be much smaller than the typical size of the orbit. However, the model admits instabilities and I will discuss its implications for the allowed parameter range.

References

[1] S. Banerjee, S. Bera, S. Banerjee, and T. P. Singh, *Phys. Rev.* D **96**, 084015 (2017).