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Constraining the Deser-Woodard non-local gravity by Fundamental plane of elliptical galaxies

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Among extended theories of gravity, there are the non-local theories of gravity. In the case when the non-local terms of such a theory are canceled out, the limit of General Relativity is obtained. Non-locality in the present context applies to field theory, and non-local field theory extends classical field theory. Here, we take non-local gravity model given in Deser & Woodard 2007.

On the other hand, the Fundamental plane (FP) is an empirical relation among three global parameters of elliptical galaxies expressed as a relationship between the central projected velocity dispersion, the effective radius, and the mean effective surface brightness within effective radius (for more details see e.g. Dressler et al. 1987, Borka Jovanović et al. 2016, Capozziello et al. 2020).

In this contribution we use freely available observations of elliptical galaxies from Burstein et al. (1997) (their effective radii, effective luminosities and characteristic velocities) in order to study if Deser-Woodard non-local gravity can recover FP of elliptical galaxies. We also use these data to constrain parameters of this gravity model and demonstrate that FP can be successfully recovered without need for dark matter hypothesis.

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