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EMRIs and new fundamental fields

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Extreme Mass Ratio Inspirals (EMRIs) are asymmetric binary systems composed by a stellar mass compact object inspiralling around a central massive black hole while emitting gravitational waves (GWs), which are among the main targets of the future space detector LISA. By tracking the emitted GWs with LISA, it will be eventually possible to recover with extreme accuracy the intrinsic source parameters. This potential renders EMRIs highly promising candidates for detecting deviations from general relativity or to derive bounds on theories predicting such deviations.
In this talk I will present a theoretical model of EMRIs in gravity theories with new fundamental scalar fields, showing how, for a vast class of such theories, great simplifications occur in the EMRI description. Indeed, at leading order in the binary mass ratio, the primary scalar charge is suppressed, so that the background spacetime is simply described by the Kerr metric. Moreover, the imprint of the scalar field on the waveform is fully captured by two parameters: the scalar charge carried by the secondary and the scalar field mass. Using these simplifications, I will show how these parameters affect the EMRI orbital evolution, and how such changes get imprinted on the emitted waveforms. By analysing such signals, I will finally present the encouraging results on the LISA ability to detect the scalar charge and scalar field mass.

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