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Probing scalar fields with Extreme Mass Ratio Inspirals and LISA

Tuesday, 24 October 2023 15:00 (30 minutes)

Extreme Mass Ratio Inspirals (EMRIs), binary systems with a secondary stellar mass compact object inspiralling into a massive black hole, are among the main targets for LISA, as they harbour the potential for precise strong gravity tests. Although the description of these systems in modified theories of gravity can be drastically complex, for a vast class of theories with additional scalar fields great simplifications occur. 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 the scalar charge carried by the secondary and by the mass of the scalar field. In this talk I will show how, using these simplifications, the secondary's scalar charge and the scalar field mass affect the EMRI's orbital evolution, and how such changes get imprinted on the emitted waveforms. By analysing such signals, I will finally present the results on the LISA's detectability of the scalar charge and mass, which render EMRIs encouraging probes of new fundamental fields.

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