

Probing scalar fields with extreme mass ratio inspirals

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Extreme mass ratio inspirals (EMRIs), binary systems composed of a stellar mass compact object (SCO) inspiralling to a supermassive black hole (SMBH), are one of the target sources for the Laser Interferometer Space Antenna (LISA). Since EMRIs may spend about 10^5 cycles in the sensitivity band of the interferometer, they are regarded as golden sources to probe new fundamental fields. Scalar fields coupled to the metric have been largely studied in recent time. They may be coupled to gravity either in the gravitational sector or in the matter sector of Einstein's equations. If the coupling of the scalar field with gravity is relevant at the scale of the SCO size, we can assume that the SMBH spacetime is well described by the Kerr metric, while the SCO is endowed with a 'scalar charge', which leaves a characteristic imprint on the emitted gravitational waveform. We discuss the detectability of this scalar charge by LISA for general EMRI orbits, for massless and massive scalar fields. We also discuss the case of a massive, ultra-light, time-dependent scalar field forming a cloud around the secondary body.

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