

Probing fundamental physics with extreme mass ratio inspirals

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The discovery of gravitational waves marks a new era in the study of cosmology and gravitational theories. In extreme mass ratio inspirals (EMRIs), where a small compact object inspirals around a massive black hole over tens of thousands of orbits, the inspiral precisely probes the spacetime geometry and environment surrounding the massive black hole. The gravitational-wave signals emitted by such inspirals can be observed by future space-based gravitational-wave detectors. Therefore, EMRIs can be used to probe the dark matter environment around massive black holes, the properties of the massive black holes themselves, and to test theories of gravity. I focus mainly on using EMRIs to investigate dark matter environment, additional charges carried by black holes and additional fundamental fields.

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