

EVOLUTION OF THE EVENT HORIZON IN BINARY MERGERS WITHIN MODIFIED GRAVITY

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Abstract

The collision of compact objects—such as black holes and neutron stars—is a spectacular cosmic event and a cornerstone of gravitational-wave astronomy. Recent studies have shown that elementary ray-tracing techniques can capture the key features of black hole mergers when applied in the extreme mass-ratio limit in an unconventional way. In this regime, the evolution of the event horizon during the merger of a large black hole with a much smaller compact companion can be computed (semi-)analytically.

In this talk, I will extend this approach to compact object mergers in modified gravity theories that respect the equivalence principle. Illustrative examples will be discussed, including the collision of two black holes in cubic gravity and the merger of hairy black holes in Einstein–scalar–Gauss–Bonnet theory. Differences with respect to mergers in General Relativity will be highlighted, offering new insights into horizon dynamics and potential observational signatures of modified gravity.