

# Dark Matter and Stars: Multi-Messenger Probes of Dark Matter and Modified Gravity

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## Black hole mergers in cubic gravity

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The merging of two black holes is a notoriously difficult process to describe exactly. Nevertheless, the hindrances posed by gravity's nonlinearity can be avoided by focusing on the strict extreme mass ratio limit, in which one of the black holes is infinitely larger than the other. Such an approach has been developed recently and applied within General Relativity to investigate the time evolution of event horizons melding, using nothing but elementary concepts in gravitational physics and simple integrations of geodesics. We apply this strategy to study black hole mergers in Einsteinian cubic gravity, in order to assess how the defining characteristics of the fusion process change as the gravitational theory is modified. In particular, we determine how the mergers' duration, area increment, and rate of throat swelling change as the theory's single coupling parameter is varied. The modified gravity theory under scrutiny possess long-lived microscopic black holes which might play the role of dark matter.

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