

Detecting Dark Matter around Black Holes with Gravitational Waves

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The advent of gravitational wave astronomy has opened up new possibilities for the detection and measurement of dark matter. One of the most promising avenues is the observation of Intermediate Mass Ratio Inspirals (IMRIs) with future space based observatories such as LISA.

Around intermediate mass black holes in the center of smaller halos, dark matter overdensities - so-called dark matter spikes - are expected. When a stellar-mass compact object inspirals, the presence of the dark matter spike can have significant effects on the dynamics. These can be detectable in the gravitational wave signal which should be observable with LISA. With careful modelling, we can map out the dark matter distribution and extract its properties.

I will explain the motivation, status and outlook on the modeling of these systems and how we can use their gravitational wave signals as a powerful new tool to explore the particle nature of dark matter.

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