

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

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## Multimessenger signals from dark photons around black holes

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I will discuss how rotating black holes source exponentially large numbers of gravitationally-bound ultralight particles, creating nature's laboratories for new physics. These systems emit gravitational waves, allowing observatories such as LIGO to search for axions and dark photons. If the dark photons interact with the Standard Model, black holes could turn into a new type of bright 'pulsar' in the sky. I will focus on the electrodynamics of a kinetically mixed dark photon cloud that forms through superradiance around a spinning black hole. I will describe the resulting multimessenger signals of these systems which, if they exist, could result in some of the brightest X-ray sources in the universe.

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