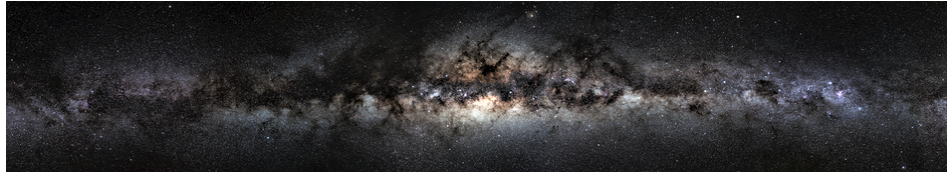


Dark Sectors of Astroparticle Physics (AstroDark-2021): Axions, Neutrinos, Black Holes and Gravitational Waves



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Black Hole Superradiance of Self-Interacting Scalar Fields

Thursday, 9 December 2021 11:56 (18 minutes)

Black hole superradiance is a powerful probe of light, weakly-coupled hidden sector particles. Particles with a Compton wavelength comparable to the black hole's radius lead to an instability, extracting mass and angular momentum from the black hole. Many ultralight candidates, such as axions, generically have self-interactions that can influence the evolution of the superradiant instability. Self-interactions lead to energy exchange between bound levels and particle emission to infinity; for large self-couplings, superradiant growth is saturated at a quasi-equilibrium configuration of reduced level occupation numbers. In this talk, I will review the basic aspects of black hole superradiance and give a qualitative picture of how it changes when quartic self-interactions are present. Finally, I will discuss possible signatures, which include coherent, monochromatic gravitational and axion waves that can be probed in current or future experiments.

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