Contribution ID: **63** Type: **not specified**

Kicking the tires on picolensing as a PBH dark-matter probe

Friday, 18 October 2024 11:50 (20 minutes)

Primordial black hole (PBH) dark matter (DM) can be probed by "picolensing". Widely spatially separated gamma-ray detectors near Earth would observe parallax of an intervening PBH lens with respect to a cosmologically distant gamma-ray burst (GRB). This parallax can be of order the Einstein angle of the lens, resulting in differential magnification of the source as viewed from the two detectors. Simultaneous brightness measurements of the same GRB made by two detectors is sensitive to this effect. Two recent studies in the literature have shown this approach could be a promising way to search for PBH dark matter in part of the the "asteroid mass gap", roughly $10^{-15} < M_{\rm PBH}/M_\odot < 10^{-10}$. In this talk, I will discuss some ongoing work to explore the robustness of this signal to various uncertainties not previously carefully accounted for: e.g., uncertainties in the transverse extent of the GRB emission region, its intensity profile, detector background rates, sensitivity of the projection to outlier GRB events, etc. I'll show that, while the large GRB source size uncertainties do degrade previous projections somewhat, it is still possible to probe most of the PBH DM asteroid mass gap with a mission that employs two SWIFT/BAT-class detectors separated by a distance on the order of an AU. Depending on the total number of GRBs that such a mission ultimately observes, it may even be possible to robustly probe new subcomponent DM parameter space at PBH masses above the gap, potentially as high as $M_{\rm PBH} \sim 10^{-6} M_\odot$.

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Session Classification: Dark Sectors in Astrophysics and Cosmology

Track Classification: Contributed Talks