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Limits on Asteroid Mass Primordial Black Holes via fast microlensing

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A galactic halo population of Primordial black holes (PBH) are a simple solution to the dark matter (DM) problem. Being dark, massive and non-baryonic, the PBH fits within the phenological traits that define Cold Dark Matter, and may exist in large numbers in the dark halos of spiral galaxies. Gravitational microlensing is among the most productive experimental avenues to constrain the galactic PBH abundance in the mass regime from ~ 10–12 M⊙ (i.e. asteroid-mass scale) to ~ 1000 M⊙. The key to probing the very lowest masses is fast cadence observations on the order of hours to minutes. We previously conducted a 5-night DECam survey of the Large Magellanic Cloud (LMC), monitoring 2 million LMC stars in a single very broad optical filter to a limit of r ≈ 23 at ≈ 40 second cadence, with the primary motivation being to place constraints on the PBH abundance in the Galactic halo in the asteroid- to Jupiter-mass regime (−12 ⩽ logM/M⊙ ⩽ −4). This talk will present the most stringent results on asteroid-mass PBHs in the Milky Way halo by incorporating considerations of second-order realistic corrections to the microlensing signal, such as finite source effects and wave optics. The main discussion of this talk will be the detection pipeline, a discussion on the pipeline efficiency and 95% C.L on the fraction of PBHs that exist as halo DM within the standard halo model.

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