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Constraints on asteroid-mass primordial black holes in dwarf galaxies using Hubble Space Telescope photometry

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Primordial black holes (PBHs) in the asteroid-mass range remain a viable and until now unconstrained dark matter (DM) candidate. If such PBHs exist, they could be captured by stars in DM-dominated environments with low velocity dispersion such as ultra-faint dwarf galaxies (UFDs). The capture probability increases with the stellar mass, and captured PBHs would rapidly destroy their host stars. As a result, the presence of PBHs in UFDs would alter their stellar mass functions. Using photometric observations of three ultra-faint dwarf galaxies from the Hubble Space Telescope, we show that it is unlikely that their mass functions have been significantly modified by PBHs, and we place constraints on the PBH abundance. In the ultra-faint dwarf galaxy Triangulum II, PBHs around 10^{19} g are excluded at the 2σ (3σ) level from constituting more than $\sim 55\%$ ($\sim 78\%$) of the dark matter, while the possibility that PBHs represent the entirety of the DM is excluded at the 3.7σ level.

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