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Primordial Black Holes and Gravitational Waves from Axion

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I present a new mechanism of primordial black hole (PBH) formation from QCD axion in the context of the Peccei-Quinn symmetry breaking during inflation. The axion string-wall network re-enters horizon sufficiently late, so the closed domain walls that naturally arise in the network are sufficiently large to collapse into PBHs. Besides, free axions from the collapse of open walls bounded by strings account for dark matter. Intriguingly, our PBHs can naturally explain the gravitational microlensing events observed by the OGLE collaboration. In addition, the collapse of string-wall network will release gravitational waves (GWs), which is drastically different from that in the scaling regime. For certain parameter space of axion-like particles, such GW spectra could possibly account for the reported nHz stochastic GW background and can be tested by various GW interferometry experiments.

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