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Correlating Gravitational Wave and Gamma-ray Signals from Primordial Black Holes

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Asteroid-mass primordial black holes (PBH) can explain the observed dark matter abundance while being consistent with the current indirect detection constraints. These PBH can produce gamma-ray signals from Hawking radiation that are within the sensitivity of future measurements by the AMEGO and e-ASTROGAM experiments. PBH which give rise to such observable gamma-ray signals have a cosmic origin from large primordial curvature fluctuations. There must then be a companion, stochastic gravitational wave (GW) background produced by the same curvature fluctuations. I will show that the resulting GW signals will be well within the sensitivity of future detectors such as LISA, DECIGO, BBO, and the Einstein Telescope. The multi-messenger signal from the observed gamma-rays and GW will allow a precise measurement of the primordial curvature perturbation that produces the PBH, and the correlation between the two types of observations can provide a smoking-gun signal of PBH.

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