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Detectable stochastic background of gravitational waves in the presence of primordial black holes

Primordial black hole (PBH) has come up as a very promising cold dark matter candidate in recent years. The signature of PBHs in the gravitational wave background is expected as PBH formation requires a large amplification in inflationary scalar curvature perturbation, which sources the tensor perturbation in second-order and leads to a detectable amplification in the gravitational wave (GW) background. We explore this possibility with a specific PBH-forming inflationary model with different reheating histories. On the other hand, isocurvature perturbation from PBH distributions contributes to the adiabatic perturbation. It leads to resonant amplification in the induced GW background if PBHs dominate the universe for a small duration. Combining these two effects can lead to a smoking gun signature for ultra-low mass primordial black hole scenarios, which will have significant implications for various cosmology and particle physics aspects, like baryon anti-baryon asymmetry and dark matter relic density, etc.

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