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Evaporating Primordial Black Holes: Reformation and Isocurvature Perturbations

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Primordial black holes (PBHs) lighter than 10^9 g are expected to have fully evaporated before the big bang nucleosynthesis, leaving their past abundances unconstrained by observations. Depending on their initial abundance, these PBHs could have temporarily dominated the Universe or remained as a subdominant component. In this talk, I explore the cosmological implications of such light mass PBHs. If they induced an early matter-dominated phase, the growth of initial PBH density perturbations could trigger collapse on horizon scales, leading to the formation of significantly heavier PBHs. These reformed PBHs survive beyond the evaporation of the original PBHs, and could give multi-messenger signatures observable today. Alternatively, if light mass PBHs never dominated the Universe, they can generate significant isocurvature perturbations due to their biased clustering and the branching ratio of their Hawking radiation. This can provide a novel avenue for observationally constraining their past abundances through cosmic microwave background constraints on the isocurvature perturbations.

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