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Little Red Dots from Primordial Black Holes

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Recent JWST observations of distant luminous galaxies and compact “little red dots” suggest the existence of early supermassive black holes (SMBHs) with masses $> 10^5 M_{\odot}$. Their rapid emergence challenges conventional seeding and growth scenarios, motivating the question: could these SMBHs be seeded by primordial black holes (PBHs) formed from inflationary perturbations?

Explaining such massive seeds requires primordial power spectrum enhancements that are stringently constrained by cosmic microwave background (CMB) spectral distortions. In this work, we perform the first comprehensive exploration of the parameter space capable of producing SMBH-mass PBH seeds while remaining consistent with CMB μ -distortion constraints. We adopt a model-independent approach, and allow for an arbitrary amount of local-type non-Gaussianity.

Our results delineate the viable region of early Universe parameter space that can reconcile the JWST high-redshift SMBH population with inflationary theory, and highlight that next-generation CMB spectral distortion telescopes will be capable of testing much of this space in the near future.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

PhD

Which keyword describes the area of focus of this talk?

Cosmology

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