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CMB μT cross-correlations as a probe of PBH scenarios

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We propose a new method for probing inflationary models of primordial black hole (PBH) production, using only CMB physics at relatively large scales. In these scenarios, the primordial power spectrum profile for curvature perturbations is characterized by a pronounced dip, followed by a rapid growth towards small scales, leading to a peak responsible for PBH formation. We focus on scales around the dip that are well separated from the peak to analytically compute expressions for the curvature power spectrum and bispectrum. The size of the squeezed bispectrum is enhanced at the position of the dip, and it acquires a characteristic scale dependence that can be probed by cross-correlatingCMB μ-distortions and temperature anisotropies. We quantitatively study the properties of such cross-correlations and how they depend on the underlying model, discussing how they can be tested by the next generation of CMB μ-distortion experiments. This method allows one to experimentally probe inflationary PBH scenarios using well-understood CMB physics, without considering non-linearities associated with PBH formation and evolution.

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