

# The 2024 Chengdu Symposium on Particle Physics and Cosmology: Phase Transitions, Dark Matter and Experimental Probes (CPCS 2024)

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## Constrain Primordial Black Hole via CMB distortion

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Primordial black holes (PBHs) are considered viable candidates for dark matter and the seeds of supermassive black holes (SMBHs), with their fruitful physical influences providing significant insights into the conditions of the early Universe. Cosmic microwave background (CMB)  $\mu$  distortion tightly constrain the abundance of PBHs in the mass range of  $10^4 \sim 10^{11} M_{\odot}$  recently, limiting their potential to serve as seeds for the SMBHs observed. Given that  $\mu$  distortion directly constrain the primordial power spectrum, it is crucial to employ more precise methods in computing PBH abundance to strengthen the reliability of these constraints. By a Press-Schechter (PS) type method utilizing the compaction function, we find that the abundance of PBHs could be higher than previously estimated constraints from  $\mu$  distortion observations. Furthermore, our analysis shows that variations in the shape of the power spectrum have a negligible impact on our conclusions within the mass ranges under consideration. This conclusion provides us a perspective for further research on the constrain of PBH by  $\mu$  distortion.

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