

Gravitational Wave Probes of Physics Beyond Standard Model 2

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Spectral distortions as a probe of gravitational waves and physics beyond the Standard Model

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Content :

Gravitational waves (GWs) have the potential to probe the entirety of cosmological history due to their nearly perfect decoupling from the thermal bath and any intervening matter after emission. In this talk, we will review the basic physics of spectral distortions (SDs) of the cosmic microwave background (CMB), and highlight how they uniquely probe GWs over six decades in frequency, bridging the gap between astrophysical high- and cosmological low-frequency measurements. This means SDs will not only complement other GW observations, but will be the sole probe of physical processes at certain scales. To illustrate this point, we explore the constraining power of various proposed SD missions on a number of phenomenological scenarios: early universe phase transitions (PTs), GW production via the dynamics of $SU(2)$ and ultra-light $U(1)$ axions, and cosmic string (CS) network collapse. We highlight how some regions of parameter space were already excluded with data from COBE/FIRAS, taken over two decades ago. We thus hope to highlight how SDs open another portal for GW cosmology, with potentially wide reaching implications for particle physics phenomenology.

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