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CMB spectral distortions from dark sector anisotropies

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We introduce a novel approach to investigate sectors solely gravitationally coupled, characterized by significant anisotropies. These anisotropies undergo damping through gravitational interactions with the baryon-photon fluid, inducing heating in the process. The resultant injected heat leads to observable distortions in the cosmic microwave background spectrum. We provide analytic estimates for the magnitude of these distortions and outline a method to calculate them from first principles. The application of these methods extends to anisotropies arising from a domain wall/cosmic string network, a first-order phase transition, or scalar field dynamics. Our findings indicate that this method holds the potential to explore substantial regions of previously unconstrained parameter space, serving as a valuable complement to upcoming searches for gravitational waves originating from such dark sectors.

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