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CMB limits on decaying dark matter: going beyond the ionization threshold

The temperature and polarization anisotropies of the cosmic microwave background (CMB) have been used to set constraints on decaying dark matter models down to keV masses. In this talk, I will discuss recent work to extend these limits down into the sub-keV mass range. I will show how we used principal component analysis to estimate the lower bound on the decay lifetime for a basis of different dark matter masses and Standard Model final states, and then how we validated our principal component analysis using Markov chain Monte Carlo methods and Planck 2018 data. I will then show a separate analysis for models decaying into photons below the hydrogen ionization threshold, where the redshift dependence of the effect on the CMB is entirely different. This work constitutes a step towards a complete understanding of the CMB as a probe of exotic energy injection.

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