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Precision Cosmological Constraints on Atomic Dark Matter

Monday, 8 May 2023 17:00 (15 minutes)

Atomic dark matter (aDM) is a simple but highly theoretically motivated possibility for an interacting dark sector that could constitute some or all of dark matter. We perform a comprehensive study of precision cosmological observables on minimal atomic dark matter, exploring for the first time the full parameter space of dark QED coupling and dark electron and proton masses ($\alpha_D, m_{e_D}, m_{p_D}$) as well as the two cosmological parameters of aDM mass fraction f_D and temperature ratio ξ at the time of SM recombination. We also show how aDM can alleviate the (H_0, S_8) tension from late-time measurements, leading to a significantly better fit than ΛCDM or ΛCDM + dark radiation. Furthermore, including late-time measurements leads to strikingly tight constraints on the parameters of atomic dark matter. An aDM fraction $f_D > 0.1$ is preferred, with a dark recombination around $z = 2 \times 10^4$.

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