

Improved cosmological constraints on axion-lepton interactions

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We present improved cosmological constraints on lepton couplings to thermally produced axion-like particles (ALPs). These interactions can affect the expansion history of the early Universe and leave distinctive signatures on the Cosmic Microwave Background (CMB) and Baryon Acoustic Oscillations (BAO). We compute precise ALP energy spectra by numerically solving the full Boltzmann equation, accounting for non-equilibrium production effects. Using Planck 2018 and the latest DESI data, we obtain the tightest cosmological limits to date on lepton-ALP couplings.

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