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Large-scale structure formation in presence of cosmological magnetic fields

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In this study, we examine how primordial magnetic fields (PMFs) influence the formation of large-scale structure in the universe. Working within a magnetized extension of the standard Λ CDM framework, we include the contributions of PMF energy density and pressure in the evolution equations governing matter perturbations. Our analysis investigates the resulting modifications to the matter power spectrum, the linear density contrast, the structure growth rate $f(z)$, and the combined growth observable $f\sigma_8$, which links the growth rate to the amplitude of matter fluctuations. These quantities are calculated for a range of PMF amplitudes and spectral indices, and the predictions are compared with recent $f\sigma_8$ data and power spectrum measurements from galaxy surveys such as BOSS and DES, as well as with CMB constraints from Planck.

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