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Dark matter minihalos from primordial magnetic fields

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Primordial magnetic fields (PMFs) can enhance baryon perturbations on scales below the photon mean free path. However, a magnetically driven baryon fluid becomes turbulent near recombination, thereby damping out baryon perturbations below the turbulence scale. In this letter, we show that the growth of baryon perturbations is gravitationally imprinted in the dark matter perturbations, which are unaffected by turbulence and eventually collapse to form $10^{-11} - 10^3 M_{\odot}$ dark matter minihalos. In the process, we analytically derive the evolution of the PMF power spectrum in the viscous drag regime. If the magnetic fields purportedly detected in the blazar observations are PMFs generated after inflation and have a Batchelor spectrum, then such PMFs should also produce minihalos.

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