

Abstract Submitted
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Magnetic Fields from Cosmological Perturbations ETHAN SIEGEL, JAMES FRY, University of Florida — Strong observational evidence indicates the presence of magnetic fields on galactic and supergalactic scales. Mechanisms that amplify an initially small seed field are known (such as the dynamo mechanism for spiral galaxies); however, the origins of these initial seed fields are unknown. In this talk, we show that magnetic fields can arise directly from cosmological perturbations in the early universe. Due to the differing scattering cross sections of protons and electrons with photons, local charge separations arise on all cosmological scales. As a result, electric and magnetic fields are then generated in the very early universe. Electric fields created in this way decay at early times, but magnetic fields may remain stable through both the onset of matter-domination and recombination, persisting until the present day. Thus, cosmological perturbations could provide a natural and elegant explanation for the existence of magnetic fields on galactic and larger scales.

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