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Baryon Asymmetry and Gravitational Waves from Pseudoscalar Inflation

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In models of inflation driven by an axion-like pseudoscalar field, the inflaton, a, may be coupled to the standard model hypercharge via a Chern-Simons-type interaction, $L \supset a\, F \tilde{F}$. This coupling results in explosive gauge field production during inflation, which has two interesting phenomenological consequences: (1) The primordial hypermagnetic field is maximally helical and, thus, capable of sourcing the generation of nonzero baryon number (via the standard model chiral anomaly) around the electroweak phase transition. (2) The gauge field production during inflation feeds back into the spectra of primordial perturbations, which, among other things, leaves an imprint in the stochastic background of gravitational waves (GWs). In this talk, I am going to discuss the correlation between these two phenomena. I will (a) present an updated investigation of baryogenesis via hypermagnetic fields and (b) describe the corresponding implications for GWs. As it turns out, successful baryogenesis is indeed feasible – provided the axion couples to the gauge fields with a certain strength. Moreover, in the case of successful baryogenesis, one expects a characteristic peak in the GW spectrum at high frequencies.

Presentation type

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