

Gravitational Waves from Chiral Plasma Instability in Standard Cosmology

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In the primordial plasma, at temperatures above the scale of electroweak symmetry breaking, the presence of chiral asymmetries is expected to induce the development of helical hypermagnetic fields through the phenomenon of chiral plasma instability. It results in magnetohydrodynamic turbulence due to the high conductivity and low viscosity and sources gravitational waves that survive in the universe today as a stochastic polarized gravitational wave background. In this article, we show that this scenario only relies on Standard Model physics, and therefore the observable signatures, namely the relic magnetic field and gravitational background, are linked to a single parameter controlling the initial chiral asymmetry. We estimate the magnetic field and gravitational wave spectra, and validate these estimates with 3D numerical simulations.

Primary author: LONG, Andrew (Rice University)

Presenter: LONG, Andrew (Rice University)