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Characterization of Gravitational Waves from Primordial Relativistic Turbulenc DAVID GARRISON, University of Houston - Clear Lake — This work is a follow-up to the paper, "Numerical Relativity as a Tool for Studying the Early Universe." In this article, we present the first results of direct numerical simulations of primordial plasma turbulence as it applies to the generation of gravitational waves. We calculate the normalized energy density, strain and degree of polarization of gravitational waves produced by a simulated turbulent plasma similar to what was believed to have existed at the electroweak scale, 246 GeV. The initial random magnetic field amplitude was allowed to vary between otherwise identical data runs. We find that in the absence of an initial magnetic field, no gravitational waves are produced but as the amplitude increases, gravitational waves with normalized energy densities as high as 10^{-47} may be produced. We also observed a significant degree of polarization in gravitational waves produced by the turbulent plasma field in agreement with Kahniahvili's results. The spectrum of gravitational waves produced appeared to mirror the spectrum of density and temperature fluctuations as expected. These and future results can be used to determine the conditions of the early universe, specifically the magnitude of primordial magnetic fields, from future gravitational wave observations.

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