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Primordial Gravitational Wave Calculations: Nonlinear vs Linear Codes 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." Here, I present the first results of direct numerical simulations of primordial plasma turbulence as it applies to the generation of gravitational waves. I 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. This calculation is completed using two numerical codes, one which utilizes full General Relativity calculations based on modified BSSN equations while the other utilizes a linearized approximation of General Relativity. The results show that there is a significant difference between the spectrum of gravitational waves calculated using a nonlinear code as opposed to that calculated with a linear approximation. This implies that simulations that do not take into account nonlinear effects may not give accurate results.

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