

Abstract Submitted  
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**Conversion of Chern-Simons Number to Electromagnetic Helicity**<sup>1</sup> YIYANG ZHANG, FRANCESC FERRER, Washington University in St. Louis, TANMAY VACHASPATI, Arizona State University — Non-perturbative electroweak processes accessible in the early universe are known to violate baryon plus lepton number, which may give a clue on the cosmic matter-antimatter asymmetry. The associated change in Chern-Simons number has been related to the generation of helical magnetic fields. We study the full dynamics of the Higgs field and the electroweak gauge fields during the electroweak phase transition. Specifically, we set up a pure gauge SU(2) configuration with non-trivial winding in a region with vanishing Higgs field. By numerically evolving the classical equations of motion in the lattice, we confirm that the phase transition results in a change of Chern-Simons number and the generation of a helical magnetic field. The magnitude of the change of Chern-Simons number and magnetic helicity depend on the initial conditions.

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