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Probing the B+L violation process with the observation of cosmic magnetic field

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We numerically investigate the B+L violation process by performing three-dimensional lattice simulations of a unified scenario of first-order phase transitions and the sphaleron generation. The simulation results indicate that the Chern-Simons number changes along with the helical magnetic field production when the sphaleron decay occurs. Based on these numerical results, we then propose a novel method to probe the baryon asymmetry generation of the Universe, which is a general consequence of the electroweak sphaleron process, through the astronomical observation of corresponding helical magnetic fields.

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