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Leptogenesis and gravity: baryon asymmetry without decays

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Explaining the matter-antimatter asymmetry of the Universe remains one of the most intriguing problems in particle physics and cosmology. A popular class of theories attributes this asymmetry to CP-violating decays of super-heavy particles in the Early Universe. We present a new source of baryogenesis within these models, and show how the same Yukawa phases which provide the CP-violation for decays, combined with curved-spacetime loop effects, allow matter and antimatter to fall differently in the presence of gravity. This splits the energy spectrum for matter and antimatter, driving the system towards an asymmetric state. By analysing the full Boltzmann equation, we demonstrate regions of parameter space where the observed asymmetry is produced solely by gravitational effects, with decays playing no part at all.

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