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Leptogenesis from Oscillations of Heavy Neutrinos with Large Mixing Angles

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The extension of the Standard Model by heavy right-handed neutrinos can simultaneously explain the observed neutrino masses via the seesaw mechanism and the baryon asymmetry of the Universe via leptogenesis. If the mass of the heavy neutrinos is below the electroweak scale, they may be found at LHCb, BELLE II, the proposed SHiP experiment or a future high-energy collider. In this mass range, the baryon asymmetry is generated via CP-violating oscillations of the heavy neutrinos during their production. We study the generation of the baryon asymmetry of the Universe in this scenario from first principles of non-equilibrium quantum field theory, including spectator processes and feedback effects.
We eliminate several uncertainties from previous calculations and find that the baryon asymmetry of the Universe can be explained with larger heavy neutrino mixing angles, increasing the chance for an experimental discovery.
For the limiting cases of fast and strongly overdamped oscillations of right-handed neutrinos, the generation of the baryon asymmetry can be calculated analytically up to corrections of order one.

Summary

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