

Matter-antimatter asymmetry without loops

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We propose a new mechanism for generating matter-antimatter asymmetry via the interference of tree-level diagrams only. We first derive a general result that a nonzero CP-asymmetry can be generated via at least two sets of interfering tree-level diagrams involving either $2 \rightarrow 2$ or $1 \rightarrow N$ (with $N \geq 3$) processes. We illustrate this point in a simple TeV-scale extension of the Standard Model with an inert Higgs doublet and right-handed neutrinos, along with an electroweak-triplet scalar field. The imaginary part needed for the required CP-asymmetry comes from the trilinear coupling of the inert-doublet with the triplet scalar. Small Majorana neutrino masses are generated by both scotogenic and type-II seesaw mechanisms. The real part of the neutral component of the inert-doublet serves as a cold dark matter candidate. The evolutions of the dark matter relic density and the baryon asymmetry are intimately related in this scenario.

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