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Cutting rules and unitarity constraints for CP asymmetric processes

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The asymmetries in out-of-equilibrium decays or scatterings necessary for lepto/baryogenesis can only occur in sufficiently complex particle models, where irreducible phases of couplings are possible. Imaginary kinematics is required in loop diagrams. Even when these ingredients are present, the resulting asymmetry may vanish due to the CPT and unitarity constraints. In this talk, we show how to systematically generate a complete list of asymmetric reactions in any perturbative order, simplify their calculations, and identify the terms that cancel due to the unitarity and CPT symmetry. The work is primarily based on Phys. Rev. D 103, L091302, and includes recent applications to freeze-in leptogenesis with Dirac neutrinos.

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