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CP Violation in the τ Lepton Yukawa Coupling and Flavour Symmetries

CP violation in the third generation fermion Higgs couplings may play an important role in the electroweak baryogenesis, however it is strongly bounded by the experimental limits on the electron electric dipole moment. In the effective field theory framework to beyond the Standard Model physics, it can originate from dimension six operators. Under such assumptions like Minimal Flavour Violation or flavour symmetries, the Wilson coefficients of those operators have in general certain flavour structure. In that case the imaginary parts of the $h\tau\tau$ and hee couplings are linked to each other. We point out that due to the very strong bound from the electron electric dipole moment on the imaginary part of hee coupling, the bound on the imaginary part of the $h\tau\tau$ coupling is then generically two orders of magnitude stronger than the one obtained from the τ -loop contributions to the Barr-Zee diagram. We briefly discuss the potential impact of this fact on the electroweak baryogenesis.

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