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Flavoured leptogenesis and type-II seesaw mechanism with two Higgs triplet scalars

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Type-II seesaw mechanism has been widely studied already as the link between neutrino mass generation beyond Standard Model (SM) and leptogenesis. In this study, the SM is minimally extended by two triplet Higgs scalars (with hypercharge $Y = 2$), with one triplet having complex vacuum expectation value (vev) to impose generality. The triplet vevs are bounded by the ρ-parameter constraint as, ω_1, $\omega_2 \ll v$, where v is the vev of the SM Higgs doublet. The neutrino mass gets generated by two massive triplet Higgs, without any right-handed neutrino in this model. On the other hand, purely flavoured leptogenesis is achieved when the triplet Higgs scalar of mass $M_T \sim 10^9$ GeV, undergoes out-of-equilibrium bi-lepton decay, specially through lepton loop. The lepton asymmetries further get converted into baryon asymmetry via nonperturbative sphaleron process. This study shows the efficiency of phenomenologically promising type-II seesaw mechanism with two triplet scalars, in order to estimate the baryon asymmetry through fully flavoured leptogenesis. Here, baryon asymmetry of the order $\sim 10^{-10}$ is achieved through the stated model, which falls within the experimentally obtained range. The dependence of the baryon asymmetry on the branching ratios of triplet scalar is also studied here. To further increase the predictability of the mechanism, two-zero texture- B_2 is introduced in the neutrino mass matrix. The neutrino mass matrix elements are bounded by the latest neutrino oscillation parameter data and the sum of neutrino mass is taken to be $\Sigma_i m_i < 0.16$ eV. The efficacy of two-zero texture B_2 in two Higgs triplet scenario is mentioned.

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