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Type II Seesaw Leptogenesis

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The Type II Seesaw Mechanism provides a minimal framework to explain the neutrino masses involving the introduction of a single triplet Higgs to the Standard Model. However, this simple extension was believed to be unable to successfully explain the observed baryon asymmetry of the universe through Leptogenesis. In our previous work (Phys. Rev. Lett. 128, 141801), we demonstrated that the triplet Higgs of the Type II Seesaw Mechanism alone can simultaneously generate the observed baryon asymmetry of the universe and the neutrino masses while playing a role in setting up Inflation. This is achievable with a triplet Higgs mass as low as 1 TeV, and predicts that the neutral component obtains a small vacuum expectation value $v < 10$ keV. We find that our model has very rich phenomenology and can be tested by various terrestrial experiments as well as by astronomical observations. Particularly, we show that the successful parameter region may be probed at a future 100 TeV collider, upcoming lepton flavour violation experiments such as Mu3e, and neutrinoless double beta decay experiments. Additionally, the tensor-to-scalar ratio from the inflationary scenario will be probed by the LiteBIRD telescope, and observable isocurvature perturbations may be produced for some parameter choices. In this article, we present all the technical details of our calculations and further discussion of its phenomenological implications.

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