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Observing Left-Right Symmetry in the Cosmic Microwave Background

We consider the possibility of probing the left-right symmetric model (LRSM) via cosmic microwave background (CMB). We adopt the doublet left-right model (DLRM), where all fermions acquire masses via their couplings to the Higgs bidoublet. Due to the Dirac nature of light neutrinos, there exist additional relativistic degrees of freedom that can thermalize in the early universe by virtue of their gauge interactions. We constrain the model from Planck 2018 bound on the effective relativistic degrees of freedom and also estimate the prospects for planned CMB Stage IV experiments to constrain the model further. We find that W_R boson mass below 4.1 TeV can be ruled out in the exact left-right symmetric limit, which is stronger than the existing LHC bounds. We also study the consequence of these constraints on dark matter in DLRM by considering a right-handed real fermion triplet to be the dominant dark matter component.

Mini-abstract

We studied the consequence of the Dirac nature of neutrinos in the left-right symmetric model.

Experiment/Collaboration

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