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Insights into 1-loop corrections to neutrino low-scale type-I seesaw mechanism

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Abstract

The standard type-I seesaw can also be regarded as a low-scale seesaw by using the freedom of the Casas-Ibarra parameterization. In this framework, radiative corrections to the neutrino mass matrix can dominate over the tree-level contribution. We show that a naive use of the Casas-Ibarra parametrization in the presence of 1-loop corrections leads to incorrect predictions for the neutrino oscillation parameters. By using a modified Casas-Ibarra parametrization, in which 1-loop corrections are reabsorbed into the right-handed neutrino mass matrix, we obtain a light neutrino mass matrix consistent with experimental values. On the other hand, we show that physical processes related to right-handed neutrino propagation, such as heavy neutral lepton searches, do not depend on the 1-loop corrections. Moreover, we show that Br($\mu \to e\gamma$) provides competitive constraints on the parameter space of heavy neutral lepton search experiments for masses above 100 GeV.

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