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Lukas Treuer ”Quantum Effects on Neutrino Parameters From a Flavored Gauge Boson”

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Despite the longstanding assumption that neutrinos are massless, oscillation experiments have shown that they are, in fact, massive, and furthermore mix significantly. Constraints from other observations additionally indicate that these masses are very small compared to others in the Standard Model. A possible explanation is provided by the seesaw mechanism, wherein heavy intermediate particles suppress the masses of the Standard Model neutrinos. On the other hand, the unique dimension-five Weinberg-Operator provides a model-independent description of Majorana neutrino masses. Restrictions on its structure, and thus the mixing angles, are often induced via flavor symmetries. Furthermore, radiative running effects can significantly impact neutrino phenomenology due to the different scales involved in mass generation, neutrino creation, and detection mechanisms. In this work, we combine the above-mentioned paradigms, and consider the renormalization group equations (RGEs) of the Weinberg-Operator in flavor-nonuniversal gauge theories, such as the U(1)*{L*\mu - L_\tau} extension of the Standard Model. We find that in such models, the new gauge bosons induce novel terms in the beta-function of the neutrino mass matrix at the one-loop level. These terms can raise the rank of the mass matrix even at the one-loop level, and generate up to three neutrino masses via RGE running only. We then derive the most general RGEs for the Weinberg-Operator and its mass eigenvalues, and discuss their origin. Furthermore, we provide formulae that verify straightforwardly whether the new terms discovered in this work appear in any theory of interest.

Session Classification: Short talks