Contribution ID: **125** Type: **talk**

A genuine fermionic quintuplet seesaw model: phenomenological introduction

Wednesday, 14 July 2021 15:00 (15 minutes)

We study a model which generates Majorana neutrino masses at tree-level via low-energy effective operator with mass-dimension-9. The introduction of such a higher dimensional operator brings down the lepton number violating mass scale to TeV making such model potentially testable at present or near future colliders. This model possesses several new $SU(2)_L$ fermionic multiplets, in particular, three generations of triplets, quadruplets and quintuplets, and thus a rich phenomenology at the LHC. Noting that lepton flavour violation arises very naturally in such a setup, we put constraints on the Yukawa couplings and heavy fermion masses using the current experimental bounds on lepton flavour violating processes. We also obtain 95% CL lower bounds on the masses of the triplets, quadruplets and quintuplets using a recent CMS search for multilepton final states with137 inverse femtobarn integrated luminosity data at 13 TeV centre of mass-energy. The possibility that the heavy fermions could be long-lived leaving disappearing charge track signatures or displaced vertex at the future colliders like LHeC, FCC-he, MATHUSLA, etc. is also discussed.

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Session Classification: Beyond Standard Model

Track Classification: Beyond Standard Model Physics