



Contribution ID: 45

Type: oral

Multi High Charged Scalars and Majorana Neutrino Mass Generations

Wednesday, November 13, 2013 9:20 AM (25 minutes)

One natural way to understand the excess of the measured $H \rightarrow \gamma\gamma$ rate over the standard model (SM) expectation at the Large Hadron Collider (LHC) is to have charged scalar bosons, existing in most of the SM extensions. Motivated by this LHC result, we explore if it also sheds light on solving the small neutrino mass generation problem. We concentrate on a class of models with high dimensional representations of scalars to realize Majorana neutrino masses at two-loop level without imposing any new symmetry. In these models, multi scalars with the electric charges higher than two are naturally expected, which not only enhance the $H \rightarrow \gamma\gamma$ rate, but provide more searching grounds at the LHC. In particular, the rate of $H \rightarrow Z\gamma$ also changes similar to that of the diphoton channel.

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Session Classification: Neutrinos I

Track Classification: Neutrinos