

Light scalars from triplet Higgs fields: neutrinos, cosmology, and colliders

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Content:

SU(2) triplet Higgs fields coupling to leptons are a means to generate Majorana masses for neutrinos. A priori the neutral scalar and pseudoscalar components S and A could be light, as e.g. realised in majoron models in which A is the Goldstone boson of spontaneously broken lepton number. Such a light particle mediating a new force between neutrinos can alleviate cosmological puzzles such as the scalar-to-tensor ratio in the cosmic microwave background and the different values of the Hubble constant observed at different cosmological scales. While all renormalisable triplet models do not permit to have either A or S light with the other neutral particle heavy enough to forbid $Z \rightarrow AS$ as required by LEP data, I show that one can circumvent this roadblock with dimension-6 terms in the Higgs potential. If A or S are light, the singly (doubly) charged triplet Higgs boson is lighter than 280 GeV (400 GeV), which make the model falsifiable with better LHC data.

Primary author: Prof. NIERSTE, Ulrich

Co-author: BARENBOIM, Gabriela (University of Valencia & IFIC (UV-CSIC))

Presenter: Prof. NIERSTE, Ulrich

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