

Lepton flavour violation in a two-Higgs-doublet seesaw model

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From the experimental observation of neutrino oscillations, lepton flavor violation (LFV) in the neutrino sector has been observed. However, that violation has not yet been observed in the charged-lepton sector and it is not quite certain where it is most likely to be observed first. The most promising LFV low-energy channels are probably mu and tau decays in to one lepton and gamma.

We consider a two-Higgs-doublet extension of the Standard Model (SM), with three right-handed neutrino singlets and the seesaw mechanism. It is assumed that the lepton flavours are conserved in the Yukawa couplings and broken only in the Majorana mass terms of the right-handed neutrinos; this assumption is field-theoretically consistent because those mass terms have dimension three while the Yukawa couplings have dimension four. Therefore all the Yukawa coupling matrices are lepton flavour-diagonal and LFV originates solely in the non-flavour-diagonal Majorana mass matrix of the right-handed neutrinos.

We have computed the branching ratios of the mu and tau decays in to one lepton and gamma in the case of a two-Higgs-doublet model assuming that the first doublet coincides with the Higgs doublet of the SM. Also, we have employed several simplifying assumptions in order to reduce the parameter space of the model and demonstrate that making some finetuning is possible to find a region in parameter space where the branching ratios are close to their experimental limits.

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