

Minimal SO(10)-based GUT Model

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Contrary to SUSY-based GUT models, the gauge couplings in non-SUSY models do not unify naturally. However, gauge coupling unification may still be achieved by intermediate symmetry breaking steps or new physics around the TeV scale. Motivated by this, we perform fits to an SO(10)-based GUT model with one-step symmetry breaking to the SM. Neutrino masses are generated by the type-I or type-II seesaw mechanism, or a combination of both. We find that in order to fit the SM observables, we need either type-I seesaw or both. These fits are performed in a consistent way, by evolving the parameters from the GUT-scale to the electroweak scale, where the fit is performed.

In order to keep the fits general, we do not impose gauge coupling unification, but show that the results are insensitive to changes in the GUT scale and the exact values of the gauge couplings there. We also construct a specific realisation of this model, which achieves gauge coupling unification by the addition of two SU(3) octets originating in the scalar 210-dimensional representation. We also derive predictions on the proton lifetime in such a model.

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