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Minimal adjoint-SU(5) x Z_4 GUT model

The extension of the adjoint SU(5) model with a flavour symmetry based on Z_4 group is investigated. The Z_4 symmetry is introduced with the aim to lead the up- and down-quark mass matrices in the Nearest-Neighbour-Interaction form. As consequence of the discrete symmetry embedded in the SU(5) gauge group the charged lepton mass matrix also gets the same form. Within this model, light neutrinos get their masses through type-I, type-III and one-loop radiative seesaw mechanisms, implemented, respectively, via a singlet, a triplet and an octet from the adjoint fermionic 24 fields. It is demonstrated that the neutrino phenomenology oblige the introduction of at least three 24 fermionic multiplets. The symmetry SU(5) X Z_4 allows only two viable zero textures for the effective neutrino mass matrix. It is showed that one texture is compatible with normal hierarchy, while the other with inverted hierarchy in the light neutrino mass spectrum. Finally, it is also demonstrated that Z_4 freezes out the possibility of proton decay through exchange of colour Higgs triplets at tree-level.

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