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Large Neutrino Mixing Angles in Minimal SO(10) Unification

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The possibility of generating small neutrino mass and large neutrino mixing angles, in the context of the most economic Yukawa sector of non-supersymmetric SO(10) unification is studied. In SO(10) grand unification, the mass matrices of the quarks and leptons are related and given in terms of the same fundamental Yukawa coupling matrices. This is why, it is highly challenging to reproduce the small quark mixings and large neutrino mixings simultaneously. In this work, the minimal SO(10) grand unified theory consistent with these phenomenological requirements is constructed. Our study shows that, if SO(10) gauge symmetry is the only symmetry of the theory, then the Yukawa sector consists of a real 10, a real 120 and a complex 126 dimensional representations. This minimal setup demands the neutrino mass hierarchy to be normal ordering and predicts the two experimentally yet unmeasured quantities, the leptonic Dirac CP-violating phase and the lightest neutrino mass. Gauge coupling unification and proton decay are also analysed.

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