

Non-zero θ_{13} and δ_{CP} phase with A_4 Flavor Symmetry and Deviations to Tri-Bi-Maximal mixing via $Z_2 \times Z_2$ invariant perturbations in the Neutrino sector.

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Abstract : In this work, a flavour theory of a neutrino mass model based on A_4 symmetry is considered to explain the phenomenology of neutrino mixing. The spontaneous symmetry breaking of A_4 symmetry in this model leads to tribimaximal mixing in the neutrino sector at a leading order. We consider the effect of $Z_2 \times Z_2$ invariant perturbations in neutrino sector and find the allowed region of correction terms in the perturbation matrix that is consistent with 3σ ranges of the experimental values of the mixing angles. We study the entanglement of this formalism on the other phenomenological observables, such as δ_{CP} phase, the neutrino oscillation probability $P(\nu_\mu \rightarrow \nu_e)$, the effective Majorana mass $|m_{ee}|$ and $|m_{eff} \nu_e|$. A $Z_2 \times Z_2$ invariant perturbations in this model is introduced in the neutrino sector which leads to testable predictions of θ_{13} and CP violation. By changing the magnitudes of perturbations in neutrino sector, one can generate viable values of δ_{CP} and neutrino oscillation parameters. Next we investigate the feasibility of charged lepton flavour violation in type-I seesaw models with leptonic flavour symmetries at high energy that leads to tribimaximal neutrino mixing. We consider an effective theory with an $A_4 \times Z_2 \times Z_2$ symmetry, which after spontaneous symmetry breaking at high scale which is much higher than the electroweak scale leads to charged lepton flavour violation processes once the heavy Majorana neutrino mass degeneracy is lifted either by renormalization group effects or by a soft breaking of the A_4 symmetry. In this context the implications for charged lepton flavour violation processes like $\mu \rightarrow e\gamma$, $\tau \rightarrow e\gamma$, $\tau \rightarrow \mu\gamma$ are discussed.

Keywords : $Z_2 \times Z_2$ invariant perturbations, CLFV, delta CP phase, tribimaximal neutrino mixing

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