ID de Contribution: **35** Type: **Non spécifié**

Predicting the neutrino CP phase with charged lepton corrections

mercredi 9 juillet 2014 18:00 (1 heure)

After the successful determination of the reactor neutrino mixing angle \mbox{$\theta_{13} \cong 0.16 \neq 0$}, a new feature suggested by the current neutrino oscillation data is a sizeable deviation of the atmospheric neutrino mixing angle θ_{23} from $\pi/4$. Using the fact that the neutrino mixing matrix $U = U_e^\dagger U_\nu$, where U_e and U_ν result from the diagonalisation of the charged lepton and neutrino mass matrices, and assuming that U_ν has a i) bimaximal (BM), ii) tri- bimaximal (TBM) form, or else iii) corresponds to the conservation of the lepton charge $L' = L_e$-L_μ-L_τ (LC), we investigate quantitatively what are the minimal forms of U_e, in terms of angles and phases it contains, that can provide the requisite corrections to U_ν so that θ_{13}, θ_{23} and the solar neutrino mixing angle θ_{12} have values compatible with the current data. Two possible orderings of the 12 and the 23 rotations in U_e, standard" andinverse", are considered. The results we obtain depend strongly on the type of ordering. In the case of "standard" ordering, in particular, the Dirac CP violation phase δ, present in U, is predicted to have a value in a narrow interval around i) $\delta \cong \pi$ in the BM (or LC) case, ii) $\delta \cong 3\pi/2$ or $\pi/2$ in the TBM case, the CP conserving values $\delta = 0, \pi, 2\pi$ being excluded in the TBM case at more than 4σ.

Based on work done with David Marzocca, S. T. Petcov, Andrea Romanino, M. C. Sevilla
JHEP 05(2013) 073 [arXiv:1302.0423]

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Classification de Session: Poster session