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Predicting the Leptonic Dirac CP Violation Phase from Sum Rules

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Establishing the status of the CP symmetry in the lepton sector is one of the major goals of the programme of future research in neutrino physics. In the reference 3-neutrino mixing scheme CP-violating effects in neutrino oscillations can be caused by the Dirac CP violation phase δ present in the 3×3 unitary neutrino mixing matrix U. Using the fact that $U = U_e^\dagger U_\nu$, where U_e and U_ν are 3×3 unitary matrices which diagonalise respectively the charged lepton and the neutrino mass matrices, we consider in a systematic way forms of U_e and U_ν allowing us to express δ as a function of the neutrino mixing angles present in U and the angles contained in U_ν. After obtaining sum rules for $\cos\delta$, we consider several forms of U_ν dictated by, or associated with, symmetries, such as tri-bimaximal, bimaximal, etc., for which the angles in U_ν are fixed. For each of these forms and forms of U_e allowing to reproduce the measured values of the neutrino mixing angles, we construct the likelihood function for $\cos\delta$, using i) the latest results of the global fit analysis of neutrino oscillation data, and ii) the prospective uncertainties in the determination of the neutrino mixing angles. Our results show that the measurement of δ along with improvement of the precision on the neutrino mixing angles can provide unique information about the possible existence of symmetry in the lepton sector.

additional information

Based on arXiv:1410.8056, arXiv:1504.00658 and a study in progress.

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