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Utmost Precision on 2-3 Oscillation Parameters using the synergy among DUNE and T2HK

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Recent advancement in Neutrino Oscillation study has reached the precision era and hence a highly precise measurement of θ_{23} mixing angle takes a prime role to address long-standing flavor problems by ruling out different theoretical mass models. Two highly promising future long-baseline experiments DUNE and T2HK can serve us to pin down the atmospheric neutrino oscillation parameters with significantly high precision. The latest global fit analyses of world oscillation data under 3ν-paradigm show 1.6σ indications for lower θ_{23} octant and favor normal mass ordering (NMO) at 2.5σ hint. In this work, we find that, the individual performance of DUNE [5 yrs ν + 5 yrs $\bar{\nu}$] and T2HK [2.5 yrs ν + 7.5 yrs $\bar{\nu}$] can improve relative 1σ precision on $\sin^2\theta_{23}$ (Δm^2_{31}) of current canvas of global oscillation data significantly. Further the combined performance of DUNE and T2HK enhances the present fit by a factor of 7.64 (5.45). We show that DUNE (T2HK) can resolve octant of θ_{23} at 5 (4.42)σ confidence level with the present global neutrino oscillation data. We also show the possible correlations and degeneracies among $\sin^2\theta_{23}$, Δm^2_{31} in the neutrino, antineutrino, and their combined modes. It is remarkable that the combined antineutrino data of DUNE and T2HK can exclude the wrong octant solution at 3σ C.L but cannot attain the same in the neutrino mode.

Session

Neutrino Physics

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