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Resolving the octant of θ_{23} with T2K and NOνA

Recent results of the MINOS experiment indicate that θ_{23} is not maximal. Global fits to neutrino data give two nearly degenerate solutions for θ_{23}, one in the lower octant (LO: $\theta_{23} < \pi/4$) and the other in the higher octant (HO: $\theta_{23} > \pi/4$). $\nu_\mu \to \nu_e$ oscillations are sensitive to the octant and are capable of resolving this degeneracy. We consider the ability of current and near future long baseline experiments to resolve the octant. As in the case of hierarchy, there exist favorable (unfavorable) values of δ_{CP} for which octant resolution is easy (challenging). Unlike in the case of hierarchy, the unfavorable δ_{CP} values of the neutrino data are favorable for the anti-neutrino data and vice-verse. We compute the combined sensitivity of T2K and NOνA to resolve the octant. Because of the hierarchy-δ_{CP} degeneracy, the impact of hierarchy on octant resolution has to be taken into account. If LO is the true octant, then NOνA can rule out HO at 2σ C.L., irrespective of the hierarchy. Addition of T2K data improves the octant sensitivity. If the combination HO and normal hierarchy is true, then the combined data from NOνA and T2K with its designed run of 5 years in neutrino mode, is incapable of a 2σ resolution of octant. This becomes possible for all four combinations of octant and hierarchy if T2K has balanced neutrino and anti-neutrino runs of 2.5 years each.

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