Contribution ID: **311** Type: **Poster Presentation**

Fitting NOvA and T2K data with the revamped A_4 symmetry model for the poorly constrained neutrino oscillation parameters

Thursday, 6 July 2023 16:30 (1 minute)

The Standard Model is widely accepted as one of the most successful predictive theories of Physics, providing insight into the fundamental building blocks of the universe. Over the last few decades this model has shown signs of incompleteness, most of which are attributed to Neutrinos. Within the confines of the standard model a discrepancy exists related to vanishing Neutrino masses, which contradicts the experimental observation of Neutrino Oscillation. Neutrino oscillation depends on 7 parameters (3 mixing angles θ_{12}, θ_{23}, θ_{13}, a Dirac Phase due to CP violation δ_{CP}, and the 3 mass states m_1, m_2, m_3). Values of the parameters θ_{12}, θ_{13}, Δm^2_{21}, $|\Delta m^2_{32}|$ are well determined whilst θ_{23}, δ_{CP} and the mass Hierarchy, whether ($m_1 < m_2 < m_3$) or ($m_3 < m_1 < m_2$), remain poorly determined. The goal of this research is to make use of the Revamped BMV (Babu-Ma-Valle) model to attempt a constrain of the poorly determined parameter values of δ_{CP} and θ_{23} using data from the NOvA and T2K experiments. We identify how the current Standard Model constraints the aforementioned parameters so as to have a comparative analysis of the constraining ability of both models. The analysis of $\Delta\chi^2(\theta_{23}, \delta_{CP})$ suggest better constraints can be obtained for the NOvA experiment in 3σ region, the T2K experiment has no visible difference in both models. The combined (NOvA+T2K) analysis is driven by the new model's effect on the NOvA data. The model fundamentally constraints the poorly determined parameters the same way, with the only exception being in the 3σ region.

Apply to be considered for a student ; award (Yes / No)?

YES

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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Presenter: MSIZA, Thabo

Session Classification: Poster Session 2

Track Classification: Track B - Nuclear, Particle and Radiation Physics