



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  $\theta_{12}$ ,  $\theta_{23}$ ,  $\theta_{13}$ , a Dirac Phase due to CP violation  $\delta_{CP}$ , and the 3 mass states  $m_1$ ,  $m_2$ ,  $m_3$ ). Values of the parameters  $\theta_{12}$ ,  $\theta_{13}$ ,  $\Delta m_{21}^2$ ,  $|\Delta m_{32}^2|$  are well determined whilst  $\theta_{23}$ ,  $\delta_{CP}$  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  $\delta_{CP}$  and  $\theta_{23}$  using data from the NOvA and T2K experiments. We identify how the current Standard Model constrains 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  $3\sigma$  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 constrains the poorly determined parameters the same way, with the only exception being in the  $3\sigma$  region.

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

YES

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

MSc

**Primary author:** MSIZA, Thabo

**Co-authors:** RAZZAQUE, Soebur (University of Johannesburg); RAHAMAN, Ushak (University of Johannesburg)

**Presenter:** MSIZA, Thabo

**Session Classification:** Poster Session 2

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