Contribution ID: **62** Type: **Parallel talk**

Impact of flux systematics on ND fits

Tuesday 8 April 2025 14:30 (15 minutes)

T2K is a long-baseline neutrino oscillation experiment located in Japan, designed to investigate the properties of neutrinos by measuring their oscillations between different flavours. The experiment's oscillation analysis requires precise predictions of event rates, where systematic uncertainties, particularly those related to neutrino flux, play a significant role. The experiment has a near detector (ND280) that constrains the unoscillated flux, and this information is propagated to the far detector to improve predictions. In the T2K experiment, systematic uncertainties related to neutrino flux are parameterised in bins of neutrino energy by flavour, detector, and beam configuration and incorporated into a covariance matrix prior to near detector (ND280) fits. These fits constrain the unoscillated flux which can be propagated to the far detector. This approach effectively reduces uncertainties in the predicted event rates, which are crucial for precise measurements of oscillation parameters. However, it limits the interpretability of the ND constraint in the context of the systematic properties driving this uncertainty, as the post-fit uncertainties only provide the total uncertainty without isolating contributions from individual underlying systematics. This work aims to address this limitation by incorporating the impact of leading flux systematics into the fit as their own parameters. This novel fitting approach will potentially allow the post-fit results to directly quantify the impact of ND constraints on each underlying flux systematic. By disentangling the individual contributions, this work provides valuable insights into the dominant sources of uncertainty affecting the predicted event rates. Such insights are particularly relevant for Hyper-Kamiokande, where systematic uncertainties will dominate due to its higher statistical precision, motivating potential strategies for external constraints on key systematics.

Author: APTE, Koustubh (Imperial College London)

Presenter: APTE, Koustubh (Imperial College London)

Session Classification: Neutrino Physics

Track Classification: Neutrino Physics