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First measurement using NOvA detectors of neutrino oscillation parameters sinˆ{2}\theta_{23} and \Delta mˆ{2}_{32} (18’ + 2’)

Saturday 6 August 2016 14:00 (20 minutes)

This talk reports the first measurement using the NOvA detectors of ν_μ disappearance in a ν_μ beam. Oscillation parameters Δm^2_{32} and $\sin^2\theta_{23}$ are measured as function of the count and energy spectrum of ν_μ interactions at a Near and Far Detector, separated by a distance of 810 km. High-statistics Near Detector energy spectra are compared to Monte Carlo predictions, and discrepancies used to perform a data-driven, bin-by-bin “Far/Near extrapolation” correction to the predicted Far Detector energy spectrum. The corrected spectrum is fit to data in Δm^2_{32} and $\sin^2\theta_{23}$, marginalizing over systematic uncertainties and the remaining oscillation parameters (excepting δ_{CP}, which is left unconstrained) to produce best fit points and 90% confidence level contours. Systematic uncertainties considered cover particle simulation, cross-sections, detector calibration, and differences in exposure and performance between the Far and Near Detectors. This analysis uses a 14 kton-equivalent exposure of 2.74×10^{20} protons-on-target from the Fermilab NuMI beam. Assuming the normal neutrino mass hierarchy, we measure $\Delta m^2_{32} = (2.5^{+0.20}_{-0.18})\times10^{-3}$ eV^2 and $\sin^2\theta_{23}$ in the range $0.38-0.65$, both at the 68% confidence level, with two statistically-degenerate best fit points at $\sin^2\theta_{23}=0.43$ and 0.60. Results for the inverted mass hierarchy are also presented.

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