Contribution ID: **1460** Type: **Invited Speaker / Conférencier invité**

PPD PHD award: Joint Three-Flavour Oscillation Analysis of ν_μ Disappearance and ν_e Appearance in the T2K Neutrino Beam

Thursday 16 June 2016 13:45 (30 minutes)

The T2K experiment is a long-baseline neutrino oscillation experiment based in Japan. An off-axis, high purity ν_μ beam is directed towards a near detector complex (ND280), situated 280 m from the neutrino production target, and the Super-Kamiokande (SK) far detector at 295 km. This talk describes the T2K beam and detectors, including a novel optical transition radiation monitor for precisely measuring the parent proton beam in order to determine the neutrino beam direction. A framework for evaluating the uncertainties in neutrino interactions and pion hadronic interactions in ND280 and SK is presented. A new SK event reconstruction algorithm is described and the SK detector systematic errors are evaluated based on atmospheric neutrino and cosmic ray muon data. These developments are used in a Markov Chain Monte Carlo neutrino oscillation analysis of the T2K Run 1-4 data corresponding to 0.657×10^{21} protons on target. The analysis simultaneously considers the ND280 ν_μ samples, and SK single muon and single electron samples, producing a measurement of ν_μ disappearance and $\nu_\mu \rightarrow \nu_e$ appearance, and precise estimates of neutrino oscillation parameters. Measurements of θ_{13} from reactor neutrino experiments are combined with the T2K data resulting in the first hints toward non-zero δ_{CP}.

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Session Classification: R2-2 Energy Frontier: Further Developments (PPD) / Frontière d'énergie: développements futurs (PPD)

Track Classification: Particle Physics / Physique des particules (PPD)