ID de Contribution: **56** Type: **YSF (Young Scientists Forum)**

Determination of atmospheric neutrino mixing parameters and octant of θ23 at INO-ICAL detector

lundi 16 mars 2015 19:30 (5 minutes)

The India-based Neutrino Observatory (INO) is an approved atmospheric neutrino project, located at Theni (TamilNadu) in South India. A 50 kt magnetized Iron CALorimeter (ICAL) detector will be the main detector at INO for the determination of correct neutrino mass ordering, right octant of mixing angle θ23 and also for precise measurement of current mixing parameters. The detector will have modular structure and consists of a stack of 151 horizontal layers of 5.6 cm thick iron slab interleaved within 4 cm gap for the Resistive Plate Chambers (RPCs), which are the active detector elements. The uniqueness of this experiment is its charge identification ability hence it can distinguish between neutrino and anti-neutrino by identifying the charge of the leptons produced in the neutrino interaction with the iron target.
We show the INO-ICAL sensitivity for the precision measurement of atmospheric neutrino oscillation parameters (sin^{2} θ23 & |Δm^{2}_{32}|) and the detector capability to determine the octant of mixing angle θ23 using muon neutrino events, generated through Monte Carlo NUANCE event generator. We have used the realistic resolutions and efficiencies obtained by the INO collaboration from GEANT4-based simulation. In the shed of recently measured large mixing angle θ13, a marginalised χ2 analysis has been performed using reconstructed neutrino energy and muon direction as observables. On the basis of this analysis we will present the physics potential of ICAL detector towards the precision measurement and octant sensitivity for 10 years of exposure.

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Classification de Session: Young Scientist Forum 1

Classification de thématique: Experiment