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Oscillation Sensitivity with Upward-going Muons in ICAL at India-based Neutrino Observatory (INO)

The proposed magnetised Iron Calorimeter (ICAL) detector at the India-based Neutrino Observatory (INO) lab is mostly sensitive to the atmospheric muon neutrinos. These are detected through the detection of charged muons arising from the charged-current (CC) interactions of muon-neutrinos with the material of the detector and are the primary signal in the study of atmospheric neutrinos.
Upward-going muons also known as rock muons arise from the interactions of atmospheric neutrinos with the rock material surrounding the detector in the earth's crust and then finally
reach the detector. It is important to study these, although their numbers are small. An additional complication is the energy loss that the muons undergo as they travel through the
rock to reach the detector. For this study, they are to be discriminated from:
(i) Neutrino events producing muons through interactions inside ICAL detector.
(ii) Cosmic ray muon events produced in the earth's atmosphere directly interacting with ICAL, which are the main background of the ICAL detector.
Hence, we need to study the upward-going muons with the separation of them from (i) and (ii). Analysis of upward-going muons requires an understanding of the reconstruction of muon tracks in ICAL as a function of both energy and direction also (that is, their energy and direction resolution). Since these muons arise from interactions of atmospheric neutrinos, they will also carry information on neutrino oscillations. We present results for oscillation studies with upward-going muons and discuss the significance of them in the INO-ICAL experiment.

WG3: Accelerator Physics (Yes/No)

No

WG2: Neutrino Scattering Physics (Yes/No)

No

WG4: Muon Physics (Yes/No)

No

WG1: Neutrino Oscillation Physics (Yes/No)

Yes

Type of presentation

Poster

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