

India-Based neutrino Observatory (INO) Project

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Abstract

India-based Neutrino Observatory (INO) is a proposed underground facility in the southern part of India. The project envisage the construction of an underground laboratory with a large cavern of dimensions 132m X 26m X 20m to house a 50 kton magnetized iron tracking calorimeter detector (ICAL) to study atmospheric neutrinos. In addition, two smaller caverns will also be constructed to host other experiments. There will be at least 1.2 km rock overburden in all directions.

INO-ICAL detector will have a modular structure of total lateral size $48m \times 16m$ and will consist of a stack of 150 horizontal layers of 5.6 cm thick magnetized iron plates interleaved with 4 cm gaps to house the active detector layers. The active detector elements are resistive plate chambers (RPCs), made up of a pair of 3mm thick glass plates of area $2m \times 2m$, separated by 2mm spacers.

The main physics goals of INO-ICAL detector are:

- (i) Reconfirmation with greater statistical significance the first oscillation dip in L/E of the atmospheric neutrinos, and measure $|\Delta_{31}| \approx |\Delta m_{atm}^2|$ and $\sin^2 2\theta_{23}$ precisely.
- (ii) Determine the sign of Δm_{31}^2 and hence the neutrino mass hierarchy using matter effect.
- (iii) Measure the deviation of θ_{23} from maximality, and resolve the octant ambiguity.
- (iv) Distinguish $\nu_{\mu} \leftrightarrow \nu_{\tau}$ from $\nu_{\mu} \leftrightarrow \nu_s$ oscillation from muonless events.
- (v) Search for CPT violation.

This detector can also be used as an end detector at the magic base line of 7000 km with a neutrino factory. The present status of the project and the progress made so far will be discussed.