Introduction to INO Project

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The India-based Neutrino Observatory (INO) Project is a multi-institutional effort aimed at building a world-class underground laboratory with a rock cover of approx.1200 m for non-accelerator based high energy and nuclear physics research in India.

The project includes
(a) construction of an underground laboratory and associated surface facilities at Pottipuram in Bodi West hills of Theni District of Tamil Nadu,
(b) construction of a Iron Calorimeter (ICAL) detector for studding neutrinos, consisting of 50000 tons of magnetized iron plates arranged in stacks with gaps in between where Resistive Plate Chambers (RPCs) would be inserted as active detectors, the total number of 2m X 2m RPCs being around 29000, and
(c) setting up of National Centre for High Energy Physics at Madurai, for the operation and maintenance of the underground laboratory, human resource development and detector R&D along with its applications. The underground laboratory, consisting of a large cavern of size 132m X 26m X 20m and several smaller caverns, will be accessed by a 2100 m long and 7.5 m wide tunnel.

The initial goal of INO is to study neutrinos. Neutrinos are fundamental particles belonging to the lepton family. They come in three flavours, one associated with electrons and the others with their heavier cousins the muon and the Tau. According to standard model of particle physics, they are mass less. However recent experiments indicate that these charge-neutral fundamental particles, have finite but small mass which is unknown. They oscillate between flavours as they propagate. Determination of neutrino masses and mixing parameters is one of the most important open problems in physics today. The ICAL detector is designed to address some of these key open problems in a unique way. Over the years this underground facility is expected to develop into a full-fledged underground science laboratory for other studies in physics, biology, geology, hydrology etc.

Development of detector technology and its varied applications is an important aspect of the project.

The detector R&D, electronics and control, magnet design as well as physics studies and numerical simulations related to ICAL detector is being done in-house at various participating institutions. On a smaller scale the development of human resource has already started in the form of the INO Graduate Training Programme (GTP) under the umbrella of Homi Bhabha National Institute (HBNI), a deemed-to-be University within DAE. A conscious and consistent effort at developing local components and solutions for all the engineering aspects has been undertaken. A key feature of this project is the INO-Industry interface that has developed because of the large scale of activity involved.