A Large Atmospheric Neutrino Detector Using Resistive Plate Chambers

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India-based Neutrino Observatory (INO) collaboration is proposing a large magnetized iron tracking calorimeter of total weight 50 kton using atmospheric neutrinos as source. The main physics goals of this experiment are; (i) a significantly improved measurement of the oscillation parameters with respect to earlier measurements, (ii) search for potential matter effects in neutrino oscillations, (iii) determining the sign of δm^2_{23} using matter effect , (iv) probing CP and CPT violation using atmospheric neutrinos. It is also envisaged that this detector can be used in future as a far detector for a neutrino factory.

The proposed detector will have a modular structure of total lateral size 48 m X 16 m and will consist of a stack of 140 horizontal layers of ~6 cm thick magnetized iron plates interleaved with 2.5 cm gaps to house the active detector layers. Considering the over all size of the detector and its large active area of ~ 10^5 m^2, it is desirable that such a detector should be of low cost, modular in construction with elements of a size suitable for mass production. It must also have good spatial and time resolution to discriminate between up and down going neutrino events. Considering all these factors Resistive Plate Chamber (RPC) seems to be ideal active detector for this experiment. A total of 27000 RPCs of lateral dimension 2 m X 2 m will be needed for this experiment. RPCs can be constructed using either glass or bakelite and R & D effort is in progress for both type of RPCs. Several glass based RPCs of different sizes were built and tested for their efficiencies as well as time resolution in avalanche as well as streamer mode.

In this talk a detailed description of the INO detector, its physics goals and the results obtained so far on RPC R & Ds will be discussed.