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Matter vs Vacuum Oscillations in Atmospheric Neutrinos

Atmospheric neutrinos travel very long distances through earth matter. It is expected that the matter effects lead to significant changes in the neutrino survival and oscillation probabilities. Initial analysis of atmospheric neutrino data by the Super-Kamiokande collaboration is done using the vacuum oscillation hypothesis, which provided a good fit to the data. Existence of matter effects is well established for solar neutrino oscillations but not for atmospheric neutrino oscillations. In this work, we did a study to differentiate the effects of vacuum oscillations and matter modified oscillations in the atmospheric neutrino data. We find that magnetized iron detector, ICAL at INO, can make a 3σ discrimination between vacuum oscillations and matter oscillations in ten years, for both normal and inverted hierarchies.

Mini-abstract

ICAL can make a 3σ discrimination between vacuum and matter oscillations in atmospheric neutrinos.

Experiment/Collaboration

India-Based Neutrino Observatory (INO)

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