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Probing the properties of Core-Mantle Boundary using Atmospheric Neutrino Oscillation

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(REMOTE)

Information about the interior of Earth is obtained from indirect probes used in traditional seismic and gravitational studies. While gravitational measurements give precise values of the mass and moment of inertia of Earth, seismic measurements tell us about the physical and chemical properties of Earth. Complementary information may be obtained using the observations of neutrinos that pass through Earth. While propagating through the different regions inside Earth, the multi-GeV energy range neutrinos encounter the Earth's matter effects due to the forward elastic scattering with the ambient electrons, which alter the neutrino oscillation probabilities. These matter effects depend upon the energy of neutrinos as well as the density distribution of electrons they encounter during their propagation.
In this talk, we present how well an atmospheric neutrino oscillation experiment like Iron Calorimeter (ICAL) detector at India-based Neutrino Observatory (INO) would probe the location of the core-mantle boundary (CMB) and the density jump at CMB. The ICAL detector with 1000 kt·yr exposure would be able to locate the CMB with a precision of about ±250 km and probe the density jump at CMB with a precision of about 15% at the 1σ confidence level. We demonstrate that the charge identification capability of ICAL would play an important role in achieving these precisions.

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