Contribution ID: **676** Type: **Poster**

Probing the interior of Earth using oscillating neutrinos at INO-ICAL

Atmospheric neutrinos offer the possibility of exploring the internal structure of Earth. This information is complementary to the traditional probes of seismic and gravitational studies. While propagating through Earth, the multi-GeV neutrinos encounter the Earth's matter effects due to the coherent forward scattering with the ambient electrons, which alters the neutrino oscillation probabilities. We present how well an atmospheric neutrino oscillation experiment like the 50 kt Iron Calorimeter (ICAL) detector at INO would validate the presence of Earth's core, measure the location of the core-mantle boundary (CMB), and probe the dark matter inside the Earth in a unique way through Earth matter effects in neutrino oscillations. Owing to good angular resolution, ICAL can observe the core-passing neutrinos efficiently. Due to its magnetized setup, it would be able to observe neutrinos and antineutrinos separately. With 500 kt·yr exposure, the presence of Earth's core can be independently confirmed at ICAL with a median $\Delta\chi^2$ of 7.45 (4.83) for normal (inverted) mass ordering. With 1000 kt·yr exposure, ICAL would be able to locate the CMB with a precision of about ± 250 km at 1σ. It would also be sensitive to the possible presence of dark matter with 3.5% of the mass of Earth at 1σ. The charge identification capability of ICAL would play an important role in achieving these precisions.

Collaboration / Activity

INO

Primary authors: Dr KUMAR, Anil (DESY, Zeuthen, Germany); Mr UPADHYAY, Anuj Kumar (Department of Physics, Aligarh Muslim University, Aligarh & Institute of Physics, Bhubaneswar); Prof. AGARWALLA, Sanjib Kumar (Institute of Physics, Bhubaneswar, HBNI, Mumbai, WIPAC, University of Wisconsin, Madison); Prof. DIGHE, Amol (TIFR, Mumbai)

Presenter: Dr KUMAR, Anil (DESY, Zeuthen, Germany)

Session Classification: Poster session

Track Classification: Neutrino Physics