Contribution ID: **29** Type: **not specified**

Neutrino Oscillations with Earth Matter Effects: A PREM-Based Analysis

A precise understanding of matter effects is essential for neutrino oscillation experiments that aim to explore leptonic CP violation. As neutrinos propagate through the Earth, coherent forward scattering with electrons modifies their oscillation behavior, and these effects depend sensitively on the underlying matter density profile. In this work, we study three-flavor neutrino oscillations in vacuum and matter by incorporating a realistic Earth density distribution based on the Preliminary Reference Earth Model (PREM). The neutrino evolution equations are solved numerically with a position-dependent matter potential, and the resulting oscillation probabilities are compared with those obtained using commonly employed constant-density approximations. Particular emphasis is placed on CP-sensitive $\nu\mu \longrightarrow \nu e$ appearance probabilities relevant for long-baseline neutrino experiments. Our study highlights the role of realistic Earth matter modeling in achieving reliable predictions for precision oscillation studies.

Author: SHARMA, Himanshu

Co-authors: Prof. B. C. CHAUHAN; Ms PRIYA

Presenters: SHARMA, Himanshu; Ms PRIYA