Contribution ID: **175** Type: **Poster**

Effects of Non-Standard Interactions and Earth Composition on Atmospheric Neutrino Oscillations

Atmospheric neutrinos passing through the Earth provide an independent probe of its interior. The effects of matter on their oscillations depend on the electron number density and, therefore, on the chemical composition of the layers they traverse. Hydrogen is the only element with a Z/A ratio appreciably different from 1/2, making oscillation tomography particularly sensitive to its possible presence in the core. However, non-standard neutral current interactions also modify the matter potential, and both effects can be partially degenerate. We examined this using a Monte Carlo simulation of μ-type events in a large Cherenkov detector. We focus on the energy and nadir angle region most sensitive to the outer core (4–10 GeV, 10°–60°) and use a PREM-based Earth model with 55 constant-density layers, with the evolution operator in each layer calculated using the Cayley-Hamilton theorem. For an ORCA-type detector with a 10-year exposure, we find that the diagonal couplings εee − εμμ and εττ − εμμ are correlated with the composition of the outer core. Thus, changes in Z/A can be partially compensated by NSI. This correlation persists at 2σ, while no correlation appears for off-diagonal couplings. We also analyzed the impact of density uncertainties and mass ordering; the inverted ordering produces considerably weaker constraints.

Academic position of the presenting author

Professor

Primary author: D'OLIVO, Juan Carlos (Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México)

Co-authors: Dr HERRERA, José Arnulfo (Insituto de Ciencias Nucleares, UNAM); Prof. SAMPAYO, Oscar Alfredo (IFIMAR, Universidad Nacional de Mar del Plata)

Presenter: D'OLIVO, Juan Carlos (Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México)

Session Classification: Posters & Empanadas

Track Classification: Neutrinos