Contribution ID: **67** Type: **Parallel talk**

# Exploring Flavor Dependent Long-Range Interactions in Atmospheric Neutrino Oscillation at IceCube DeepCore

*Tuesday 15 October 2024 15:30 (15 minutes)*

The IceCube experiment is a 1 km<sup>3</sup> neutrino observatory instrumenting an array of Digital Optical Modules (DOMs) deep inside the ice at the South Pole. DeepCore, a densely-spaced subarray of DOMs at the bottom central region of IceCube, enables the detection of atmospheric neutrinos with an energy threshold in the GeV range. With a wide range of energies over a large range of baselines, the high statistics data of DeepCore provides a unique opportunity to perform standard neutrino oscillation studies as well as explore various sub-leading Beyond the Standard Model (BSM) physics signatures. We consider a well-motivated minimal extension of the Standard Model by an additional anomaly-free, gauged lepton-number symmetry, such as L<sub>e</sub> − L<sub>μ</sub> or L<sub>e</sub> − L<sub>τ</sub>. These symmetries give rise to flavor-dependent long-range interaction, mediated through a very light neutral gauge boson. For instance, a huge electron number density inside the Sun can generate this long-range potential, which may lead to significant modifications in atmospheric neutrino oscillation probabilities. In this talk, we present the sensitivity of the IceCube DeepCore detector to search for this flavor-dependent long-range interaction potential with a runtime of 9.3 years.

## Track type

Neutrino Physics

**Authors:** KUMAR, Anil (DESY, Zeuthen, Germany); UPADHYAY, Anuj Kumar (Aligarh Muslim University, Aligarh & Institute of Physics, Bhubneswar); GARG, Gopal (Aligarh Muslim University, Aligarh & Institute of Physics, Bhubneswar); Mr JAYAKUMAR, Krishnamoorthi (Aligarh Muslim University, Aligarh & Institute of Physics, Bhubaneswar); Prof. AGARWALLA, Sanjib Kumar (Institute of Physics, Bhubaneswar and University of Wisconsin-Madison); CHATTOPADHYAY, Sharmistha (Institute of Physics, Bhubaneswar)

**Presenter:** GARG, Gopal (Aligarh Muslim University, Aligarh & Institute of Physics, Bhubneswar)

**Session Classification:** Parallel - Neutrino