XVIII International Conference on Topics in Astroparticle and Underground Physics (TAUP 2023)



Contribution ID: 230 Type: Poster

Unlocking the Light(er) Sterile Neutrino Sector: Matter Effects and Mass Ordering

Wednesday 30 August 2023 16:14 (1 minute)

Future long-baseline experiments will be able to probe hitherto unexplored regions of sterile neutrino parameter space for masses ranging from meV to eV. We present an analytic calculation of the neutrino conversion probability $P(\nu_{\mu} \to \nu_{e})$ in the presence of sterile neutrinos, with exact dependence on Δm_{41}^2 and matter effects. We further express the neutrino conversion probability as a sum of terms of the form $\sin(x)/x$, thus allowing a physical understanding of matter effects and their possible resonance-like behavior. We focus on the identification of sterile mass ordering (sign of Δm_{41}^2) at DUNE. The conversion probability obtained reveals the complex interplay between sterile and matter contributions. We perform numerical calculations of DUNE's sensitivity to sterile mass ordering over a broad range of sterile neutrino masses. Our analytic expressions enable us to explain the dependence of this sensitivity on Δm_{41}^2 values for all mass ordering combinations.

Submitted on behalf of a Collaboration?

No

Authors: Mr CHATTOPADHYAY, Dibya S. (Tata Institute of Fundamental Research, Mumbai); Prof. DEVI, Moon Moon (Tezpur University, India); Prof. DIGHE, Amol (TIFR); Prof. DUTTA, Debajyoti (Assam Don Bosco University, Tapesia Campus, Sonapur, Assam); Dr PRAMANIK, Dipyaman (Instituto de Física Gleb Wataghin - UNICAMP, 13083-859, Campinas, São Paulo, Brazil); Prof. RAUT, Sushant K. (Krea University, India)

Presenter: Mr CHATTOPADHYAY, Dibya S. (Tata Institute of Fundamental Research, Mumbai)

Session Classification: Poster session

Track Classification: Neutrino physics and astrophysics