

Search for sterile neutrinos and NSIs by accelerator neutrino oscillation experiments Jian Tang



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- Three-flavor neutrinos are among elementary particles in SM.
- Neutrino oscillation shows quantum coherence, where a neutrino changes its flavor after propagation in a distance.
- Neutrino oscillation probabilities depend on two mass-squared differences, three mixing
- Neutrino oscillation probabilities rely on the propagation distance and neutrino energy. Interactions between neutrinos and matter





Energy spectrum demo V Discovery reach of CP violation V Precision measurements

Study of non-unitarity violations

Mysteries in neutrino physics



- What is the neutrino mass ordering?
- Is there CP violation in the leptonic sector?
- Whether is there a maximal mixing for $\theta 23$
- Can we achieve precision measurements of neutrino mixing angles at the same level as the quark mixings?
- Is there a sterile neutrino in Nature?
- Whether is there non-unitary mixing?
- Is there Non-Standard Interactions (NSIs)?
- Whether does a neutrino decay?

Working principle of accelerator neutrino oscillation experiments







♥ Constraints of non-unitary mixing parameters induced by sterile neutrinos by DUNE, T2HK, and LENF.

Study of Charged-Current Non-Standard Interactions



- 1) Accelerator neutrino source: high-energy protons hit the target station to produce charged mesons which can decay to generate muons and muon-flavor neutrinos.
- 2) Near detector: flux measurements, cancel the systematic uncertainties...
- 3) Far detector: detection of oscillated neutrinos, reconstruction of oscillation probabilities, conduct physics analysis.

MuOn-decay Medium baseline NeuTrino beam experiment (MOMENT)



♥ Exclusion limits of CC-NSI parameters at the MOMENT far detector.

References

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- 2) Jian Tang, Yibing Zhang, Study of Non-Standard Charged-Current Interactions at the MOMENT experiment, Phys. Rev. D 97 (2018) 035018, arXiv: 1705. 09500.

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