Contribution ID: **24** Type: **Poster & Mini-talk**

Probing the unseen: Prospects for sterile neutrino searches using the NINJA detector

Friday, 20 June 2025 17:15 (7 minutes)

Although the standard three-flavor neutrino framework has been firmly established, several experimental anomalies remain that cannot be explained within this model. One possible explanation involves extending the paradigm by introducing a light sterile neutrino - an SU(2) singlet that does not interact via the weak force. While this extension is theoretically well motivated, experimental confirmation is still lacking. The NINJA experiment, designed to measure neutrino-nucleus cross-sections using nuclear emulsion films and a high-intensity neutrino beam from J-PARC, also offers an opportunity to explore new physics beyond the Standard Model. In particular, its short-baseline configuration makes it a promising candidate for investigating sterile neutrino oscillations at the eV-scale. In this poster, I present a sensitivity study of NINJA to sterile neutrino parameters. I examine the impact of different flux configurations, including on-axis and off-axis beams, as well as various exposure scenarios, such as the combination of data from two detector locations. The analysis includes expected event rates and demonstrates how NINJA could contribute to constraining sterile neutrino parameters in future runs.

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Session Classification: Mini-talk