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Search for coherent elastic neutrino-nucleus scattering with the NUCLEUS Experiment

Wednesday, October 1, 2025 11:00 AM (20 minutes)

Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) is a Standard Model process in which a neutrino scatters coherently off an entire nucleus via weak neutral current interactions. First predicted by Freedman in 1973, it remained undetected for over four decades due to the extremely low nuclear recoil energies it produces. In recent years, CEvNS has emerged as a powerful probe for a broad range of physics scenarios, marking a new era in neutrino physics. In this talk, I will present the current status and prospects of the NUCLEUS experiment, which is designed to measure the CEvNS cross-section with high precision and probe the regime of full coherence. The detector employs cryogenic calorimeters based on CaWO_4 and Al_2O_3 crystals, with a total target mass of approximately 10 grams and a nuclear recoil energy threshold as low as 20 eV. The experiment will exploit the intense antineutrino flux from the two reactor cores of the Chooz-B nuclear power plant in France. Following a successful commissioning campaign at the Technical University of Munich (TUM), including the simultaneous operation of different subsystems and a dedicated measurement for background model validation, NUCLEUS is now being relocated to its final experimental site.

Neutrino Properties

The NUCLEUS experiment aims to measure the neutrino cross section with nuclei in the full coherency regime

Neutrino Telescopes & Multi-messenger

none

Neutrino Theory & Cosmology

CEvNS allows to study neutrino properties as magnetic moment and millicharge, but will not be addressed in this talk

Data Science and Detector R&D

The NUCLEUS experimental apparatus, as well as the detector concept, will be described.

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