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NUCLEUS: cryogenic calorimeters to detect coherent nuclear scattering of reactor antineutrinos

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Coherent elastic neutrino nucleus scattering (CEvNS) is a well-predicted Standard Model process only recently observed for the first time. Its precise study could reveal non-standard neutrino properties and open a window to search for physics beyond the Standard Model.

NUCLEUS is a CEvNS experiment conceived for the detection of neutrinos from nuclear reactors with unprecedented precision at recoil energies below 100 eV. Thanks to the large cross-section of CEvNS, an extremely sensitive cryogenic target of 10g of CaWO₄ and Al₂O₃ crystals is sufficient to provide a detectable neutrino interaction rate.

NUCLEUS will be installed between the two 4.25 GW reactor cores of the Chooz-B nuclear power plant in the French Ardennes, which provide an anti-neutrino flux of $1.7 \times 10^{12} \text{ } \nu / (\text{s cm}^2)$. At present, the experiment is under construction. The commissioning of the full apparatus is scheduled for 2022, in preparation for the move to the reactor site.

This talk will present the concept and design of the experimental setup and go in detail on the sensitive detector technology enabling an advance of neutrino physics at the low-energy frontier.

Collaboration

NUCLEUS collaboration

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