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Design and construction of the NUCLEUS experiment for the detection of the Coherent Elastic Neutrino Nucleus Scattering

The coherent elastic neutrino nucleus scattering (CEvNS) is a process largely unexplored until today that could provide a new way to study the neutrino fundamental properties and open a window to search for new physics beyond the Standard Model. NUCLEUS is an above-ground CEvNS experiment conceived for the detection of neutrinos from nuclear reactors with unprecedented precision at low energies thanks to cryogenic detectors based on $CaWO_4$ and Al_2O_3 crystals. A prototype detector already demonstrated an ultra-low threshold of 20 eV in nuclear recoil and a rise time of a few 100 us. NUCLEUS will be installed between the two 4.25 GW reactor cores of the Chooz-B nuclear power plant in the French Ardennes and providing an anti-neutrino flux of $1.7x10^{12}$v/(s cm2). At present, the experiment is under construction and the commissioning of the full apparatus is scheduled in 2022. This talk will show the detectors, shielding and veto systems developed during the last two years and optimized to maximize the sensitivity to the CEvNS signal.

Primary experiment

NUCLEUS

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Track Classification: Dark matter and other low-background experiments