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The NEXT-100 experiment

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Searches for neutrinoless double-beta decay (0νββ) represent one of the most promising avenues for uncovering new frontiers in particle physics, particularly in understanding the true nature of the neutrino.

The Neutrino Experiment with a Xenon TPC (NEXT) investigates neutrinoless double-beta decay (0νββ) in ^{136}Xe using high-pressure Xenon time projection chambers. The key technologies of the NEXT include a photomultiplier tube (PMT) plane in correspondence of the cathode for precise energy measurement, and a silicon photomultiplier (SiPM) plane at the anode for detailed tracking of event topology.
Another key feature of the NEXT is the production of secondary light via electroluminescence from drifted electrons as they reach the anode plane. This approach enables excellent energy resolution, and combined with the detection of the primary scintillation light, allows for the measurement of the absolute z-position of the track.

The NEXT-100 experiment, holding up to 100 kg of Xenon at 15 bar, is currently under commissioning at the Canfranc Underground Laboratory. It has demonstrated an O(10 ms) electron drift time, much longer than the maximum drift time, and achieved an energy resolution better than 5% FWHM at 42 keV using ^{83m}Kr decays. After three years of data taking, it is expected to reach a half-life sensitivity >10^{25} years, with a background rate of ~ one count per year within the region of interest. In the future, NEXT-HD based on the technique developed in NEXT-100 with 1 ton of enriched Xenon is expected to reach a sensitivity >10^{27} y in less than 5 years of data taking. Moreover in the context of a ton scale detector, the implementation of the barium tagging technique might lead to zero background operation, making NEXT one of the leading detector in the search of the 0νββ decay.

In this talk an overview of the NEXT experiment with particular focus on NEXT-100 and the path towards a ton scale detector will be given.

Collaboration you are representing

NEXT

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