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Status and prospects of the NEXT experiment

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NEXT is a staged experimental program aiming at the detection of neutrinoless double beta (ββ0ν) decay in 136Xe using successive generations of high-pressure gaseous xenon time projection chambers. The collaboration is presently concluding four years of operation of NEXT-White, a radiopure 50-cm diameter and length TPC operated with enriched xenon at 10 bar, at the Laboratorio Subterràneo de Canfranc. NEXT-White has successfully demonstrated the two key features of the technology, namely excellent energy resolution (1% FWHM at the Q-value of the decay) and highly effective topological-based background discrimination. The latter was recently boosted using a new image deblurring technique which allows reducing background by an additional factor of ~5 compared to the previous state-of-the-art. This technique is presently employed for the analysis of two-neutrino double beta decay events recorded in NEXT-White. The next stage of the program is NEXT-100, planned for commissioning in 2021, which will be twice larger than NEXT-White, and operated with 97 kg of enriched xenon at 15 bar, with half-life sensitivity on the scale of 1026 y. In parallel, the collaboration pursues an extensive R&D program to develop the capability of detecting the 136Ba daughter resulting in 136Xe double beta decays inside a running TPC using single molecule fluorescence imaging. This effort can lead to a background-free search for ββ0ν decay on the tonne-scale, with half-life sensitivities close to 1028 y. This talk will present the current status of the program, focusing on recent developments in topological analysis and barium tagging, and outline the future steps of the experiment.

Collaboration name

NEXT Collaboratio

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