NEXT: a neutrinoless double beta experiment

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NEXT (Neutrino Experiment with a Xenon TPC) is an experiment that searches for neutrinoless double beta decay in ¹³⁶Xe using a high pressure xenon (HPXe) gas time projection chamber with electroluminescent (EL) amplification. The aim is to determine whether neutrinos are Majorana particles (i.e. they are their own antiparticle) or not, having huge implications in cosmology and particle physics.

The NEXT collaboration has established a path towards the accomplishment of this task through different phases. The NEXT-White (NEW) detector was a prototype that operated at Laboratorio Subterráneo de Canfranc (LSC) between 2016 and 2021 to validate the HPXe-EL technology in a large-scale detector. Its main goals were fulfilled: validation of the background model¹, demonstration of a great energy resolution² and topological discrimination³, and measurement of the two-neutrino double beta decay half-life⁴. NEXT-100 is a double sized version of NEW, currently under construction at LSC. It is expected that NEXT-100 will achieve, in the search of neutrinoless double beta decay, similar limits to those of its main competitors in the hundred-kilogram scale. Nevertheless, sensitivity to longer half-lives requires detectors with larger exposures. NEXT-HD is a future tonne-scale HPXe that will pursue the goal of the experiment after NEXT-100.

In this talk I will review the latest NEXT-White results, the construction status of NEXT-100, and R&D efforts toward future tonne-scale detectors.

¹P. Novella et al., Journal of High Energy Physics 10 (**2019**) 51

²J. Renner et al., Journal of High Energy Physics 10 (2019) 230
³P. Ferrario et al., Journal of High Energy Physics 10 (2019) 52

⁴P. Novella et al., Phys. Rev. C. (**2022**) 105, 055501

Author: PÉREZ MANEIRO, Martín

Presenter: PÉREZ MANEIRO, Martín

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