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High pressure gas TPC technology for neutrinoless double beta decay searches: The NEXT program

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The NEXT experiment is a neutrino physics program searching for neutrinoless double beta decay using a high pressure gaseous xenon time projection chamber (HPGXeTPC). The HPGXeTPC technology offers several advantages, including excellent energy resolution, topological event discrimination, and low background. NEXT excels on each of these fronts, achieving 1% FWHM energy resolution at 2.6 MeV and a background rejection factor of 27 at 57% signal efficiency for 1.6 MeV electron-positron pairs. The resolution and event discrimination, along with our very radiopure detector, work together to allow us to achieve a background index of $4 \cdot 10^{-4}$ counts/(keV·kg·yr). We will discuss these strengths of the technology for the detection of rare events, as well as the performance of the current iteration NEXT-White detector and plans for future detectors. As discussed in this talk, the intrinsically excellent energy resolution and topological event discrimination of the technology requires continuous Kr^{83m} calibration throughout the active volume of the detector in order to be realized in practice.

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