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High-pressure Xenon Gas Electroluminescent TPC Concept for Simultaneous Searches for Neutrinoless Double Beta Decay & WIMP Dark Matter

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Xenon is an especially attractive candidate for both direct WIMP and 0- decay searches. Although the current trend has exploited the liquid phase, gas phase xenon offers some remarkable performance advantages for energy resolution, topology visualization, and discrimination between electron and nuclear recoils. The ***NEXT-100*** experiment, now beginning construction in the Canfranc Underground Laboratory, Spain, will operate at ∼12 bars with 100 kg of ^{136}Xe for the 0- decay search. I will describe recent results with small prototypes, indicating that ***NEXT-100*** can provide about 0.5% FWHM energy resolution at the decay 2457.83 keV Q-value, as well as rejection of -rays by topology. However, sensitivity goals for WIMP dark matter and 0- decay searches indicate the need for ton-scale active masses; ***NEXT-100*** provides the springboard to reach this scale with xenon gas. I describe a scenario for performing both searches in a single high-pressure ton-scale xenon gas detector, without significant compromise to either. In addition, – even in a single, ton-scale, high-pressure xenon gas TPC, an intrinsic sensitivity to the nuclear recoil direction may exist – plausibly offering an advance of more than two orders of magnitude relative to current low-pressure TPC concepts. I argue that, in an era of deepening fiscal austerity, such a dual-purpose detector may be possible, at acceptable cost, within the time frame of interest, and deserves our collective attention.