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The XLZD liquid-xenon Observatory and the DARWIN R&D programme

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Liquid xenon time projection chambers are nowadays recognized as one of the most sensitive technologies for dark matter direct detection. The ultimate goal of these experiments is to explore the allowed parameter space for nuclear recoils down to the neutrino fog before coherent neutrino-nucleus scattering begins to dominate the detector signals. Achieving this objective necessitates maintaining an ultra-low background level, *while scaling up active target mass by about a factor of 10 compared to current-generation detectors. Such an observatory will be suited* as well for the search of a large number of other rare-event searches such as solar neutrinos, neutrinoless double beta-decay of 136-Xe without isotopic enrichment, axions and axion-like particles, neutrinos from supernovae and different rare nuclear processes. The DARWIN programme is currently addressing the challenges of constructing and operating a _large_dual-phase TPC, as envisioned by the XLZD (XENON-LZ-DARWIN) collaboration. This presentation will cover the ongoing R&D efforts undertaken within the DARWIN project.

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