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Searching for dark matter (and more) with XENON detectors

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We know that we know (almost) nothing. This statement is particularly true for our knowledge about the energy content of the Universe, which is essentially composed of the unknown ingredients dark matter and dark energy. Indirect evidence from cosmology and astronomy predict the dark matter abundance with a high precision, outnumbering ordinary matter by a factor five. However, as of today, the dark matter particle remains unidentified and is a prime example for physics beyond the standard model. Well-motivated candidates are the weakly interacting massive particle (WIMP) and the axion.

Low-background detectors, operated in deep-underground laboratories to suppress cosmic ray backgrounds, are employed to search for galactic WIMP dark matter. At the moment, the most sensitive of such detectors are dual-phase time projection chambers (TPCs), filled with liquid xenon. In this talk, I will introduce the XENON and DARWIN instruments, and how they can be used to search for WIMP dark matter. Their ultra-low background makes various other rare processes -- within and beyond the standard model -- also accessible. Searches for axions, solar pp-neutrinos, neutrinoless double beta decays, coherent neutrino-nucleus scattering (CNNS) and even supernova neutrinos offer a wide physics program.