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The DarkSide 20k experiment: construction and goals

The DarkSide 20k experiment is the next generation Liquid Argon-based, direct Dark Matter search experiment, focusing on extending the present sensitivity limits on the search for WIMP-like particles. It is a dual-phase LAr-TPC equipped with custom-developed arrays of SiPMs, assembled at LNGS, for light readout. The project draws from the successful experiences of DS50 and DEAP, to which it adds the use of a DUNE-like membrane cryostat, that will hold the main detector vessel in a bath of atmospheric argon (AAr). The actual detector will sit in a leak-tight stainless-steel vessel, hanging from the cryostat and filled with underground argon (UAr), depleted in ^{39}Ar , specially extracted from the Urania plant in Colorado.

The cryostat and AAr cryogenics plant are completed at LNGS; the production of detector components is ongoing, with the photosensors being produced in LNGS and tested in Naples, whereas TPC parts will undergo test assembly and preparation in the University of Alberta in the second half of 2026.

This contribution aims at giving an overview of the DarkSide detector and goals, along with its rich prototypes program. As well, status of construction will be described in detail, focusing on the cryostat and cryogenics plants, and the production and test of photodetectors.

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