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The DarkSide-20k TPC and underground argon cryogenic system

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Darkside-20k will exploit the physical and chemical properties of liquid argon housed within a large dual-phase time project chamber (TPC) in its direct search for dark matter. The TPC will utilize a compact, integrated design with many novel features to enable the 20t fiducial volume of underground argon. Underground argon (UAr) is sourced from underground CO₂ wells and depleted in the radioactive isotope ³⁹Ar, greatly enhancing the experimental sensitivity to dark matter interactions. Sourcing and transporting O(100 t) of UAr for DarkSide-20k is costly, and a dedicated single-closed-loop cryogenic system has been designed, constructed, and tested to handle the valuable UAr. We present an overview of the DarkSide-20k TPC design and the first results from the UAr cryogenic system.

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