

DarkSide-20k and the Liquid Argon Dark Matter Program

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The DarkSide program already produced world-class results for both the low mass ($M_{WIMP} < 10\text{GeV}/c^2$) and high mass ($M_{WIMP} > 100\text{GeV}/c^2$) direct detection search for dark matter with its primary DarkSide-50 detector. Operating since late 2013, it is a 50-kg-active-mass dual-phase Liquid Argon Time Projection Chamber (TPC), filled with low radioactivity argon from an underground source. The next step of DarkSide program consists of a new generation experiment involving collaboration within Global Argon Program for Dark Matter that engages all the current Argon-based experiments. DarkSide-20k is designed as a 20-tonne fiducial mass dual-phase Liquid Argon TPC with SiPM based cryogenic photosensors with high detection efficiency. TPC will be installed inside a cryostat containing more than 700 t of liquid argon and be surrounded by an active neutron veto. The detector will be housed at the INFN Gran Sasso (LNGS) underground laboratory, just like his predecessor, and should be free of any instrumental background for exposure of >100 tonne x year. DarkSide-20k is expected to attain a WIMP-nucleon cross-section exclusion sensitivity of $7.4 \times 10^{-48} \text{ cm}^2$ for a WIMP mass of $1\text{TeV}/c^2$ in a 200 t yr run. The talk will highlight the latest updates on the ongoing R\&D activities toward large-scale argon detectors and their capabilities.

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