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DarkSide-20k Physics Potential for Dark Matter direct searches

Wednesday 26 March 2025 09:00 (15 minutes)

The DarkSide program at Laboratori Nazionali del Gran Sasso (LNGS) aims to detect dark matter WIMP particles using a dual-phase Liquid Argon (LAr) Time Projection Chamber (TPC). Since 2015, the DarkSide-50 detector, featuring a 50-kg active mass dual-phase LAr TPC filled with low-radioactivity argon sourced from underground, has produced world-class results for both low-mass and high-mass direct detection searches. The next stage of the DarkSide program will be a new generation experiment involving a global collaboration from all the current Argon based experiments.
The upcoming DarkSide-20k experiment is designed to exploit a 20-tons fiducial mass dual-phase LAr TPC equipped with SiPM-based cryogenic photosensors. Like its predecessor, DarkSide-20k will be hosted at the INFN LNGS underground laboratory. It is expected to reach a WIMP-nucleon cross-section exclusion sensitivity of $7.4 \times 10^{-48}\ cm^2$ for a WIMP mass of $1 TeV/c^2$ in a 200 t yr exposure.
This presentation will provide an overview of the recent DarkSide-50 results and the projected physics capabilities of DarkSide-20k, focusing on both the WIMP framework and the light dark matter searches.

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Session Classification: SESSION 10: Direct Detection: status of liquid/gas WIMP detectors