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## Rare event searches with argon detectors

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Liquid argon, a key player in our quest to unravel the physics beyond the standard model, is indeed one of the most sensitive targets for GeV-scale dark matter candidates, such as Weakly Interacting Massive Particles (WIMPs), as demonstrated by the DEAP-3600 experiment and DarkSide-50 experiment. The unique R&D has led to the design of the next experiment within the Global Argon Dark Matter collaboration, DarkSide-20k, currently under construction at LNGS. Its 50-tonne ultra-pure argon target will allow for investigating for the very first time in argon dark matter-nucleon cross-section as low as  $7.4 \times 10^{-48} \text{ cm}^2$  for a WIMP mass of  $1 \text{ TeV}/c^2$  in a 200 t yr run. At the same time, the first calibrations on superheated argon are proceeding within the Scintillating Bubble Chamber demonstrator, whose setup at SNOLAB shows a projected sensitivity down to  $10^{-43} \text{ cm}^2$  at  $1 \text{ GeV}/c^2$ . On the other hand, argon has served as an active veto for the neutrinoless double beta decay of 76-Germanium, first in GERDA and now in LEGEND-200, whose collaboration recently showed their newest lower limit at  $1.0 \times 10^{27} \text{ year}$ , confirming the substantial background rejection possible thanks to the argon bath and pushing for the extension of this technology also to the future LEGEND-1000, where the argon would be extracted in the URANIA plant, aiming for the same mBq/kg argon radioactivity level also at the very base of DarkSide-20k's success.

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