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Toward the low-mass dark matter searches with DarkSide-20k: the solar neutrino and the argon-39 backgrounds

Friday 14 June 2024 15:00 (15 minutes)

DarkSide-20k will have a 50-tonne total (20-tonne fiducial) dual-phase argon Time Projection Chamber, currently under construction at Hall C of LNGS.
The detector is specifically designed for the direct detection of Weakly Interacting Massive Particles (WIMPs) with masses exceeding 10 GeV/cˆ2. However, as demonstrated with the previous DarkSide-50 detector, the experiment has a significant potential for discovering light dark matter particles (1-10 GeV/cˆ2).
The search for low-mass dark matter particles presents many experimental challenges, such as the loss of discrimination power, the selection of few-electron events and the need to have control over the various background components. Among them, the signals due to solar neutrino interactions, which represent an irreducible background for the DarkSide-20k detector, and the beta decay of argon-39, an unstable argon isotope, are rather relevant and need to be well characterized.
I will discuss the latest calculations of the expected CEvNS and neutrino-electron event rates for the DarkSide-20k Low Mass searches as well as the importance of reducing the argon-39 content by extracting argon from underground sources (Urania program) and purifying it by cryogenic distillation (Aria project).

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