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DarkSide-20K

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The DarkSide Collaboration has started consideration of DarkSide-20k, a direct WIMP search with a Liquid Argon Time Projection Chamber (LAr-TPC) with an active (fiducial) mass of 23 (20) tonnes. The DarkSide-20k LAr-TPC will be deployed in the shield/veto facility already built in support of the DarkSide-50 experiment in the Gran Sasso underground laboratory (LNGS). DarkSide-20k will be a detector with ultra-low background levels, the ability to measure its backgrounds in situ, and sensitivity to WIMP-nucleon interactions with cross sections of 9×10E-48 cm2 (9x10E-47 cm2) for WIMPs of 1 TeV/c2 (10 TeV/c2) mass, achieved in a background-free exposure of 100 t yr accumulated in a run of 5 yr. We believe, in particular, that the ability to identify, measure, and reject background will ultimately define the sensitivity of direct dark matter searches. The sensitivity of DarkSide-20k compares favourably with the sensitivity of other projects to start data taking before 2020. DarkSide-20k could become the most powerful dark matter experiment searching for high mass dark matter to start data taking by 2020. The use of the two-phase argon technology afford a sharp definition of the fiducial volume e effecting a strong reduction of the systematic error that dominates the measurement of 7Be neutrinos in Borexino. To meet this challenge, DarkSide-20k will exploit the auxiliary facilities including radon-free clean rooms, already built at LNGS as part of the DarkSide program. It will also use the water muon veto constructed for the DarkSide program. DarkSide-20k will be instrumented with SiPMs as photosensors and will establish the entire chain of production, purification, transport, and storage of low-radioactivity argon at the multi-tonne level. In short, DarkSide-20k will perform the most sensitive search for dark matter yet proposed and will also provide a convincing foundation for a 100 t scale detector. A summary of the future experiment and the improvement of the existing facilities will be presented.

Presentation type

Section talk (10+5 min)

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