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DarkSide

- Rayonnement Cosmique et Matière Noire - DarkSide -



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[<https://lphneweb3.in2p3.fr/IMG/distant/png/spipphactio55e9.png>]

Several indications points to the fact that most of the matter in the Universe is composed by non-visible « Dark Matter » that interacts very weakly with the matter we know. One of the most appealing candidates to compose the Dark Matter are the so-called WIMPs (Weakly Interacting Massive Particles . The DarkSide program is designed to directly detect the interactions of these particles by using a detector installed underground, in the Gran Sasso Laboratories in Italy.

The DarkSide-50 detector, currently taking data, consists in a time projection chamber (TPC) filled with 50 kg of Liquid Argon. An interaction of a WIMP with the Argon will produce prompt light (S1) through the excitation of the Argon while some electrons will be produced and drifted by an electric field towards a region on the top of the detector where Argon is in the gas phase. An electric field in this region produces a second emission of light (S2).

One of the main feature of the Liquid Argon is that it is possible to distinguish between electron and nuclear recoils thanks to the different shape of the scintillation signal. DarkSide-50 demonstrated a pulse shape discrimination capability of 1.5×10^7 , opening the possibility of building a larger detector, DarkSide-20K, that will be filled with 20 tons of Liquid Argon and that will be installed at the Gran Sasso laboratories from 2020.

The LPNHE group is involved in the analysis of the data of DarkSide-50 and in the optimisation studies for DarkSide-20k. We also participated to the ARIS experiment at IPNO (Orsay), where a Liquid Argon TPC was exposed to a neutron beam with the goal of characterising the Liquid Argon energy response to nuclear and electronic recoils in the energy interval of interest for the WIMPs. The analysis of the data is on-going and the group is also involved in similar measurements planned for the future.

[DarkSide on the web](#)