

Experiment description:

The DarkSide-50 detector is located in Hall C of the Italian National Laboratories of the Gran Sasso of the Italian Institute for Nuclear Physics (the Laboratori Nazionali del Gran Sasso (LNGS) of the Istituto Nazionale di Fisica Nucleare (INFN)) under the Gran Sasso mountain, 100 km east of Rome, Italy.

The experiment is a search for dark matter in the form of weakly interacting massive particles using a two-phase liquid argon time-projection chamber (TPC) as target. The TPC is surrounded by a 4 meter diameter active neutron veto using borated scintillator, and the neutron veto in turn is surrounded by a cylindrical water tank 10 meters high and 11 meters in diameter to identify muons and shield the inner detectors from gamma rays and neutrons from the surrounding rock.

The experiment is designed to be background-free in a three year exposure. The experiment took data starting in November 2013 with atmospheric argon and has published a dark matter sensitivity limit from an exposure of 1440 kg days of atmospheric argon. In April 2015, the atmospheric argon target (1 Bq/kg) was replaced with low-radioactivity argon (<0.003 Bq/kg). The experiment is proposing to run at least two years with this target.

The role of the DOE in the experiment:

The DOE supports research groups at Princeton under Professor Peter Meyers, and at Fermilab under Dr. Stephen Pordes. In the construction of the experiment, the DOE groups were responsible for the TPC mechanical design and assembly, the TPC trigger, the TPC data acquisition system (DAQ), the design and assembly of the calibration insertion device and the argon handling system (the latter in collaboration with the UCLA group of Dr. Hanguo Wang). At this time, the DOE supports

- the operations of the groups at Princeton and Fermilab for travel for shift at the LNGS and collaboration meetings,
- the minor items associated with maintenance of the trigger and the DAQ, and
- the cost of data storage (at present 600 Terabytes of data, the majority from the atmospheric argon running, and expected to rise by ~100 Terabytes/year).

Data storage for all raw data, as needed reconstruction, and analysis by the U.S. groups uses computing resources made available by Fermilab. (Data storage, reconstruction, and analysis are also performed in Italy.)

Partnerships:

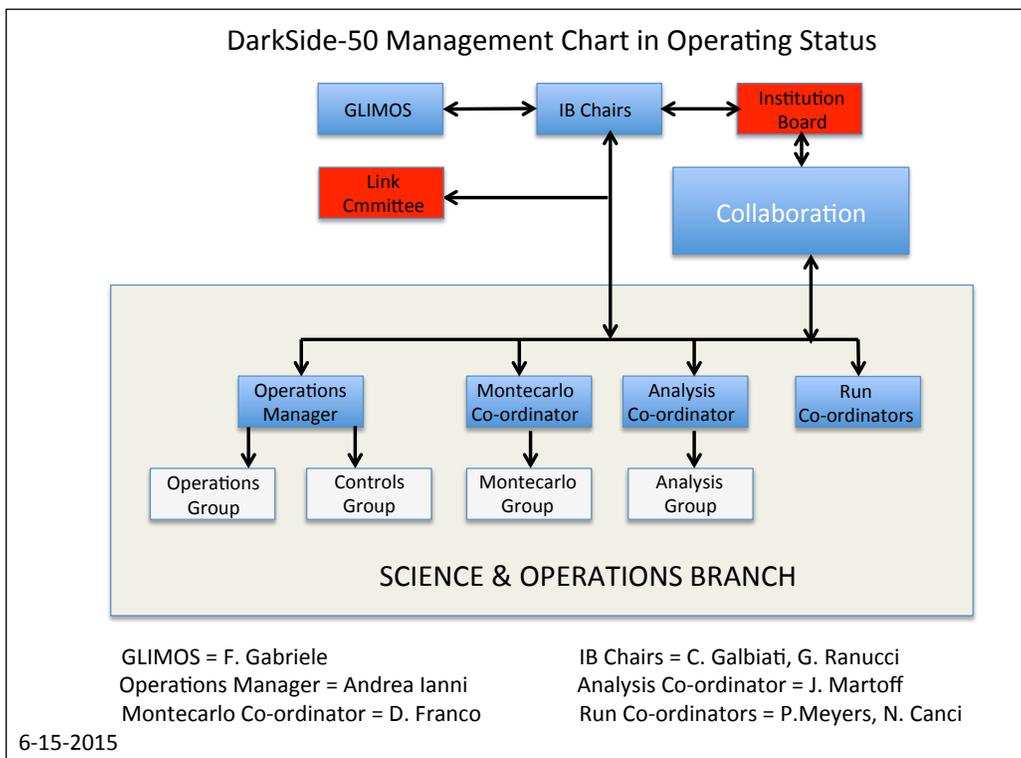
There are no formal partnerships between the D.O.E. and other agencies. The experiment as a whole receives support from the U.S. National Science Foundation, the Italian INFN, and the D.O.E..

Organization: Agency/Lab level

The Laboratori Nazionali del Gran Sasso (current Director Stefano Ragazzi) of the Italian National Institute for Nuclear Physics (the INFN) is the host laboratory, responsible for the experiment.

Organization - Experiment Level:

The experiment organization chart in our present operating status is shown below. The roles are self-explanatory except for the GLIMOS, the group leader in matters of safety who is appointed by and reports to the LNGS management and the link committee. The latter is responsible for any needed interfacing and co-ordination with our neighbors in Hall C, the Borexino experiment, with whom we share some technical facilities (but not computing).



Collaboration:

The collaboration has about 140 members from 27 institutions from 7 countries (USA, China, France, Italy, Poland, Russia, Ukraine).

Data policy management:

The policy for management of analysis results data is set by the collaboration

Data Description & Processing:

The experiment has a single level trigger. The raw data in normal running constitutes about 0.3 TB/day; once a run (a few hours of data) ends, its data is immediately transferred from the DAQ computers to storage at the LNGS main

computing system. The DAQ system itself has 7 TB of storage in case of problems with the transfer system. At the main LNGS system, the data are stored as raw-data files, and separate reconstructed data files are made for all the raw-data with an automated process in real time. The reconstructed files and the raw-data files are kept on disk at LNGS, and both are also transferred to Fermilab, with a typical lag of less than 1/2 a day. At Fermilab, both the raw data files and the reconstructed data files are archived to tape. A third data set is generated at both Fermilab and LNGS and may be considered as data summary files. The reduction in data volume from the raw data to reconstructed data is a factor of 28; the subsequent reduction in volume from reconstructed data to data summary files is another factor of 196.

New releases of the reconstruction software have been restricted to three a year. If major reprocessing is required, it is expected to occur not more than once per year. On the one occasion a major reprocessing was performed, it was easily accommodated on opportunistic resources from the Open Science Grid.

The experiment computing requirements, including occasions when calibrations would temporarily increase the data rate, were presented to the Fermilab Scientific Computing Portfolio Management Team in March 2015. The presentation can be found [here](#).

Data Products and Releases:

The raw data and the reconstructed data are available to anyone in the collaboration once processing is complete on any run.

Serving Data to the Collaboration and Community:

All data of all types are available to anyone in the collaboration. The availability to people outside the collaboration would be on a case by case basis. No requests for such access have ever been received.

Plans for Archiving Data:

We abide by the regulations for data retention in place at Fermilab. A copy of all the raw data is sent to Fermilab and archived and retained as described in our experiment operations plan submitted December 6 2014. Quoting from the plan:

All raw data from the experiment are stored on disk at LNGS and on archival tape at Fermilab. Fermilab data management retention and management practices are described at:

computing.fnal.gov/xms/Science_%26_Computing/Data_Management_Practices_%26_Policies and http://computing.fnal.gov/xms/About/Computing_and_Data_Resources_at_Fermilab

The default retention period for raw data is stated in the above policies as “.. the primary copy of the raw data ..is.. kept for a minimum of 3 years after project/experiment completion” - where completion is defined as after the end of analysis of the experiment data. Before “completion” of the experiment, DarkSide-50

and Fermilab computing management will discuss and agree on any longer term retention period and include this in a Technical Scope of Work.

Plans for Making Data Used in Publications Available:

We plan to follow the practice in the dark matter field of submitting points on the sensitivity limit curves we obtain to the results database at dmtools.brown.edu . We have not anticipated any requests for lower level data from outside the experiment collaboration. Given that all the raw data and the programs used to analyze them will be archived, we expect to be able to respond to any specific requests should such arise.

Responsiveness to SC Statement on Digital Data Management

We believe our digital data management plan and policy accords fully with the Office of Science Statement on Digital Data Management.

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