

Online Data Processing and DAQ for DarkSide-20k

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Liquid Argon (LAr) Time Projection Chambers (TPC)s are promising detectors for dark matter search, due to their response uniformity, scalability to large target masses, and suitability for extremely low background operations. The Darkside-20k (DS-20k) experiment is a new dark matter detector under construction at INFN LNGS that aims to push the sensitivity for Weakly Interacting Massive Particles (WIMP) detection down to the neutrino floor. Thanks to its size and sensitivity the detector will allow a broad physics program including supernova neutrino detection.

DS-20k will employ a triggerless Data Acquisition system (DAQ) that continuously captures signals from SiPMs-based photosensors. The expected interaction rate is about 100 Hz, with a dark count rate of approximately 20 Hz per channel (2720 in total). The DS-20k DAQ must be able to identify signals as small as 1 photoelectron with event rates as large as 200 Hz. Signals are digitized by 36 newly available commercial VX2745 CAEN 16-bit, 125 MS/s, high channel density (64 channels) waveform digitizers (WFD). The WFD data are read out by a set of Frontend Processors (FEP), which filter signal waveforms and reduce them by identifying hits before passing the data to the Time Slice Processor (TSP), where the whole detector data is assembled in fixed length time series, analysed and stored for offline use.

Moreover, live data monitoring is crucial during the detector run phase for ensuring data integrity, identifying anomalies, and optimizing detector performance. A prototype of the DS-20k monitoring system called “vertical slice” was developed at TRIUMF laboratory. It is fully integrated with a Maximum Integration Data Acquisition System (MIDAS) developed in the Paul Scherrer Institute in Switzerland and TRIUMF laboratory in Canada and will allow us to stress-test a fraction of the DAQ architecture, to test the digitizers readout, and the same diagnostics tools that will be used for DS-20k.

Do you need a VISA letter for traveling to Canada ?

No

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