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The DoubleChooz DAQ systems.

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The Double Chooz (DC) reactor anti-neutrino experiment consists of a neutrino detector and a large area Outer Veto detector. A custom data-acquisition (DAQ) system written in Ada language for all the sub-detector in the neutrino detector systems and a generic object oriented data acquisition system for the Outer Veto detector were developed. Generic object-oriented programming was also used to support several electronic systems to be readout providing a simple interface for any new electronics to be added given its dedicated driver. The core electronics of the experiment is based on FADC electronics (500MHz sampling rate), therefore a data-reduction scheme has been implemented to reduce the data volume per trigger. A dynamic data-format was created to allow dynamic reduction of each trigger before data is written to disk. The decision is based on low level information that determines the relevance of each trigger. The DAQ is structured internally into two types of processors: several read-out processors reading and processing data at crate level and one event-builder processor collecting data from all crates and further processing data before writing into disk. An average rate of 40MB/s data output can be handled without dead-time. The Outer Veto DAQ uses a token-passing scheme to read out five daisy chains of multi-anode PMTs via five USB interfaces. The maximum rate that this system can handle is up to 40MB/s limited only by the USB2.0 throughput. A dynamic data reducer is implemented to reduce the amount of data written to disk. An object-oriented event builder process was developed to collect the data from the multiple USB streams and merge them into a single data stream ordered in time. A separate object oriented code was developed to merge the information coming from the neutrino and Outer Veto DAQ in a single event based on time information.
The internal architecture and functioning of the Double Chooz DAQs as well as examples of performance and other capabilities will be described.

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