Parallel data readout using SpaceWire for CANDLES experiment


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The CANDLES experiment conducted in Kamioka underground laboratory aims at obtaining the neutrino-less double beta decay from $^{48}\text{Ca}$ in CaF$_2$ crystals. A new data acquisition (DAQ) system for CANDLES will be introduced with new Flash Analog-to-Digital Converter (FADC) modules. Data on the FADCs are read over the SpaceWire networks. SpaceWire is a serial data transfer protocol used on space applications. The SpaceWire helps us to construct a DAQ system with a flexible and multi-path access to FADCs. PCs connected to the SpaceWire networks can access all FADC modules. Therefore, two kinds of parallel readout are possible. One is “module-parallel”, which means several FADC modules are read in parallel. The other one is “event-parallel”, which means several events are read in parallel. Gigabit Ethernet to Space Wire interfaces are used. Gigabit Ethernet makes it possible to use off-the-shelf computers for the readout. Gigabit Ethernet and flexible SpaceWire networks make parallel readout easy. In this report, we will present the parallel-readout speed test with new DAQ system. Results from some initial tests show that the DAQ speed with four parallel-readout is 3.8 times higher than single-readout. CANDLES DAQ system uses DAQ-Middleware. It makes easy to merge data streams from multi-PCs.