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Discrete Component Front End and Acquisition system for Hyperkamiokande

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Hyper-Kamiokande is a next generation underground water Cherenkov detector designed to study neutrinos from astronomical sources, nucleon decay, with the main focus on the determination of leptonic CP violation. To detect the weak Cherenkov light generated by neutrino interactions or proton decay, the newly developed 20inch PMT will be used in addition to a system of small photomultipliers as implemented in the KM3NeT experiment, the multiPMT. We proposed a full Front End and Acquisition system based on discrete components for cost reduction, introduction of newer and more performing components every year and small package reached by modern components. For 20inch PMTs our FE is composed of two sections, a fast one with an high gain amplifier and a discriminator and a slow one with a charge integrator and 2 ADCs to accomodate the high signal dynamic range (from 1 to 1250 PE). A Xilinx Zynq FPGA will manage the acquisition, an optical Gigabit Ethernet for data transfer and will also provide the time measurement with a TDC.

Each mPMT system is composed of 19 3inch PMTs and all the electronics required for the system, with a power budget of only 4 W. The FE follows the same principle of the 20inch PMTs, a fast discriminator and a slow shaper followed by a 12 bit@2MSPS ADC. The FPGA collects the data and provide a TDC measurements with 270 ps resolution. The ARM CPU equipped with Linux and Midas manage the acquisition. This approach let us to match all the HK requirements.

Minioral

No

IEEE Member

No

Are you a student?

Yes

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