Abstract

Extremely fast timing from Micro-Channel Plate PhotoMultiplier Tubes (MCP-PMTs) and multi-gigasample per second (GSa/s) waveform sampling ASICs will allow precision timing to play a pivotal role in the next-generation of Ring Imaging CHERENkov (RICH) detectors. We have developed a second prototype of the electronics to instrument the Time of Propagation (TOP) counter for the Belle II detector at KEK in Tsukuba, Japan. The front-end electronics modules consist of an array of waveform sampling / digitizing ASICs controlled by FPGAs with embedded microprocessor cores. The ASICs digitize amplified signals from an array of multi-anode MCP-PMTs coupled to a quartz radiator bar. Unwanted artifacts in the data are corrected with digital signal processing before sending feature-extracted data to the back-end. Readout and control are done via multi-gigabit-per-second fiber optic links to a custom back-end.

The previous generation of these modules has been running in a Focusing Detection of Internally Reflected Cherenkov (fDIRC) mounted in a Cosmic-Ray Stand (CRT) at SLAC continuously for over 12 months. , as well as at a beam test at SPring-8/LEPS in Japan in mid-2013. This experience has influenced the design of the current generation.