Operational status of the Belle II Time-Of-Propagation counter readout and data acquisition system

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The Time-Of-Propagation counter is a new particle identification (PID) device which was introduced by the Belle II experiment, an upgrade of the Belle experiment. The counter is based on a novel idea of extracting Cherenkov ring information using precise timing information. This feature enables significant improvement of PID performance and a compact detector system, allowing more space for tracking. To realize this concept, it is necessary to detect each single Cherenkov photon with timing resolution of better than 100 ps. Therefore, high-speed electronics is a key point for this detector.

We developed dedicated front-end electronics, which can perform fast waveform sampling and online data processing. Thanks to these features, an excellent timing resolution of 50 ps for single photon detection is achieved and data taking with an input trigger rate of up to 30 kHz is possible. The entire TOP readout system consists of 64 subdetector readout modules (SRM), where each SRM contains 128 readout channels with 8,192 channels in total. All the SRMs are installed in the detector and operational. Firmware development for online data processing for the real detector was started from a simple and robust algorithm, but with limited readout performance. This firmware has been evolving to complicated and high-performance version. We are now finalizing and verifying this readout scheme for the coming first collisions in the Belle II experiment.

In this presentation, the current performance of the readout system for the installed TOP counter is reported and an overview of the hardware is given.

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