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Development and Performance Evaluation of Readout Systems for Belle II ARICH Upgrade

The Aerogel Ring Imaging CHerenkov (ARICH) counter of the Belle II detector takes the role of particle identification. It detects Cherenkov ring images using Hybrid Avalanche Photo Detectors (HAPD).
In the future upgrade, it is planned to replace HAPDs with other photon detectors. The new detectors should be resistant against the high neutron radiation and magnetic field. The candidates are Multi-Pixel Photon Counter (MPPC).and Large Area Picosecond Photo Detector (LAPPD). In this research, several readout systems are being developed and evaluated in parallel considering using with MPPCs or LAPPDs.
For the readout system of MPPCs, the prototype ASIC "TF01A64"is developed. This is customized for ARICH and is the upgraded edition of current ASIC used in ARICH. The evaluation of the requirements for the ASIC has been done using MPPC signals.
The other readout system is also developed using ToFPETv2 or FastIC ASICs. This system is designed for the readout of either LAPPDs or MPPCs. The evaluation for an LAPPD is ongoing, using ToFPETv2 ASIC with built-in ADC and TDC.
Now the development of each readout system is ongoing towards the beam test to demonstrate the Cherenkov light detection.
In this presentation, the development and evaluation status of the readout systems will be reported.

Primary experiment

Belle II

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