



Contribution ID: 393

Type: Poster

Particle Identification with the Belle II Aerogel RICH

Monday, 23 May 2022 15:45 (1 minute)

In the forward end-cap of the Belle II spectrometer, the proximity focusing Ring Imaging Cherenkov counter with an aerogel radiator (ARICH) has been in operation since 2018. The single Cherenkov photons emitted from a double layer aerogel radiator are detected by 420 Hamamatsu hybrid avalanche photodetectors (HAPD) with 144 channels working in a perpendicular 1.5 T magnetic field. The sensor signals are digitized by a custom front-end ASIC and sent to the experiment acquisition system. The detector has shown a very reliable operation in several years of operation. 94% of channels are fully operational; there hasn't been any significant degradation since the beginning. Although each HAPDs requires six different high voltages for the operation, the intelligent slow control and monitoring system supports the ARICH function. The ARICH runs almost without any human intervention, e.g., during the last run period, there has not been any significant downtime due to ARICH. A precise alignment and calibration of the detector and the quality assessment of the components before installation contributed to ARICH capabilities. The particle identification performance measured by $D^{\pm*}$ decays meets the design expectations: the kaon identification efficiency is above 96% in the wide momentum range from 0.5 to 4 GeV/c at a relatively low pion misidentification probability of 10%. The ARICH was designed to operate up to the nominal design luminosity of $8 \times 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$. Until then, the leak current of HAPDs will increase, causing the degradation of HAPD performance. Also, single event upsets will affect the electronics. We are implementing several new mitigation measures to ensure the ARICH functionality. For the operation beyond the design luminosity, we are studying different possible HAPD replacements: silicon photomultipliers and large area picosecond photon detectors.

Collaboration

for the Belle II Aerogel RICH group

Primary author: PESTOTNIK, Rok (Jozef Stefan Institute)

Presenter: PESTOTNIK, Rok (Jozef Stefan Institute)

Session Classification: Photo Detectors and Particle ID - Poster session