9th International Workshop on Ring Imaging Cherenkov Detectors (RICH 2016)



Contribution ID: 75

Type: Oral presentation

Super-K upgrade and Hyper-Kamiokande

Thursday 8 September 2016 13:55 (25 minutes)

Hyper-Kamiokande is proposed as a next-generation underground water Cherenkov detector having an enormous potential to discover proton decays and leptonic CP violation in neutrino oscillations. Two cylindrical tanks, each with a height of 60m and a diameter of 74m, will be filled with 520,000 metric tons of ultrapure water, a volume approximately 10 times larger than that of predecessor experiment Super-Kamiokande. The innermost main water volume of each tank will be viewed by 40,000 ultrasensitive 50cm diameter photosensors.

As an alternative to Hamamatsu R3600 50cm PMTs, which have been successfully used for 20 years in Super-Kamiokande, we have developed a new 50cm PMT having a high quantum efficiency photocathode and Boxand-Line type dynodes. The new PMT has twice higher single photon detection efficiency and much better timing and charge resolution than those of R3600. Characterization of the new PMT has mostly been completed and a long-term demonstration in a 200-ton water Cherenkov detector is ongoing. The mechanical characteristic of the new PMT will also be present, as well as the R&D status of the PMT protective cover to prevent a chain implosion.

We have also been developing another type of new 50cm photosensor, called hybrid photodetector (HPD). The HPD uses an avalanche diode (AD) for the electron multiplication, instead of metal dynodes, aiming to have far better timing and charge resolution than those of similarly-sized conventional PMTs. The 50cm HPD prototype using a small 5mm diameter AD has shown excellent measurement performances. Towards the completion of the final design 50cm HPD using a 20mm diameter AD, we are trying to reduce the noises caused by the large junction capacitance of the AD.

The possibility to use "optical modules" instrumented with multiple small 3-inch PMTs is also being investigated. The increased granularity and directional information, which would highly benefit the reconstruction, are some of its advantages.

Registered

Yes

Author: NAKAYAMA, Shoei (Kamioka Observatory, ICRR, University of Tokyo)
Presenter: NAKAYAMA, Shoei (Kamioka Observatory, ICRR, University of Tokyo)
Session Classification: Cherenkov detectors in astroparticle physics

Track Classification: Cherenkov detectors in astroparticle physics