The Large-area Hybrid-optics CLAS12 RICH: Assembling, Commissioning and First Data-taking

The CLAS12 experiment at the upgraded 12 GeV continuous electron beam accelerator facility of Jefferson Lab will offer unique possibilities to study the 3D nucleon structure in the yet poorly explored valence region by deep-inelastic scattering, and to perform precision measurements in hadron spectroscopy.

A large area Ring-Imaging Cherenkov detector has been designed to provide clean hadron identification capability in the momentum range from 3 to 8 GeV/c.

The detector will exploit a novel hybrid-optics configuration, in which the Cherenkov photons will either be detected directly for forward particles or after two mirror reflections for large-angle tracks.

The detector comprises a three squared meters layer of aerogel as photon radiator, made of large-area tiles of cutting edge transmittance at n=1.05, a system of glass-skin planar and composite spherical mirrors of unprecedented lightness and, for the first time, an array of 391 Hamamatsu H8500 and H12700 Multi-Anode Photomultiplier Tubes as photodetectors.

The readout of the 25000 electronic channels is provided by a compact system made by an ASIC front-end card based on the MAROC3 chip configured and controlled by an FPGA card.

The first RICH module was assembled during the second half of 2017 and successfully installed at the beginning of January 2018, in time for the start of the first CLAS12 experiments with an unpolarized liquid Hydrogen targets. A second RICH sector is in construction for the beginning of the operation of CLAS12 with transversely polarized target.

In the presentation, the quality assurance tests, the assembling operations and the alignment procedures of the components will be reviewed. The RICH commissioning performed with cosmic muons and with the CEBAF electron beam during the CLAS engineering run will be discussed.

The detector performance during the first months of data-taking will be reported.

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