



Contribution ID: 20

Type: **Oral presentation**

Construction of Silica Aerogel Radiator System for Belle II RICH Counter

Friday 9 September 2016 09:35 (25 minutes)

We have developed a RICH counter as a new forward particle identification device for the Belle II experiment. In this RICH counter, the Cherenkov radiator consists of dual silica aerogel layers with different refractive indices in upstream and downstream. After intensive R&D on silica aerogel production and optical improvements, a refractive index combination of 1.045 and 1.055 was chosen for the radiator system. Each tile has square dimensions of 180 mm x 180 mm x 20 mm.

Mass-production of aerogel blocks started in November 2013, and it was completed in May 2014. More than 200 tiles for each refractive index were successfully manufactured, and were delivered to KEK. Their optical properties have been measured as a quality check. The average transmission length at 400 nm wave-length was obtained to be ~ 45 mm and ~ 35 mm for upstream and downstream tiles, respectively. These results demonstrate that high transparency was kept for all the tiles. The refractive index was also extracted using the Fraunhofer method, and the resultant values are consistent with our expectation.

After checking an optical quality, the aerogel tile is cut into the wedge shape to arrange the RICH radiator system. This was done using a water jet cutter device. It is emphasized that hydrophobic feature of aerogel tiles enables us to take this machining technique. Optical degradation in aerogel blocks due to this step was found to be quite small. The mechanical structure of the radiator container was fabricated in 2015. The wedge-shaped aerogel tiles was test-installed into one box in the container. It has been successfully done, and the procedures have been carefully examined. An installation work for the radiator system will begin shortly and will be completed by this summer.

In this contribution, details of Belle II radiator system will be reported with emphasis on our results of the optical quality measurements. The present status of the radiator system construction will be also described.

Registered

Yes

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Session Classification: Technological aspects and applications of Cherenkov detectors

Track Classification: Technological aspects and applications of Cherenkov detectors