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Operation and performance of the ASHIPH counters at the KEDR detector.

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In 2014 the fully installed ASHIPH (Aerogel, SHifter, PHotomultiplier) system began its operation in the KEDR experiment at the VEPP-4M e+e- collider. The system contains 1000 liters of aerogel with refractive index 1.05 in160 counters that are arranged in two layers. Light collection is preformed by means of wavelength shifters. 160 Micro-Channel Plate PMTs with multialkali photocathode are used as photodetectors. Detection efficiency for relativistic particles was measured with e+e- -> e+e- events and cosmic muons. Detection efficiency for under-threshold particles was measured with cosmic muons. From these data pi/K-separation of 4 sigma at the momentum 1.2 GeV/c was obtained.

Collaboration

KEDR

Summary

The ASHIPH (Aerogel, SHifter, PHotomultiplier) technique of Cherenkov light collection was proposed by the Budker Institute of Nuclear Physics in 1992. It allowed us to decrease significantly the photocathodes area and amount of material before the calorimeter in comparison with direct light collection on PMTs.

Beam test experiment confirmed excellent PID performance of the counters.

Good long-term stability of ASHIPH counters since 2000 is demonstrated.

The fully installed ASHIPH system began its operation at the KEDR detector in 2014.

The high voltage supply system based on active HV dividers from PNPI (St. Petersburg) has been developed. The counters are read out by 28 A6 boards with flash ADCs in the KLUKVA standard developed at the BINP. The slow control system monitors dark count rates of PMTs and provides HV power control.

The first results on full system efficiency for particles of different
momenta have been obtained.

1. Average number of photoelectrons for relativistic cosmic muons (>1GeV/c) that cross both counter layers excluding shifter region is 9.3±0.4 in the barrel, and 12.0±0.5 in the endcaps.
2. Average detection efficiency for relativistic muons in momentum range 0.7 - 1.1 GeV/c if
at least one of two layers hit is (1 - (5.0± 3.5)·1e−4) for amplitude threshold equal to 0.1 photoelectron.
3. Average detection efficiency for under-threshold muons with momentum 0.2 - 0.3 GeV/c in the same approach is 0.20±0.02.
4. These data correspond to pi/K-separation better than 4 sigma in momentum range 0.95 - 1.45 GeV/c.

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