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Aerogel Cherenkov counters for experiments at VEPP-2000 e+e- collider with SND detector

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For experiments at VEPP-2000 e+e- collider with SND detector the particle identification system based on the threshold aerogel Cherenkov counters was developed. The counter design is based on ASHIPH technique (Aerogel, SHifter, PHotomultiplier). Cherenkov light emitted in aerogel is collected by a wavelength shifter and detected by a photomultiplier tube based on microchannel plates (MCP PMT).
For the particle identification two systems with different refractive indexes of aerogel were manufactured: with n=1.13 for the separation of pi and K mesons up to particle energy of 1 GeV and with n=1.05 for e/pi separation up to particle energy of 0.45 GeV.
The construction of the aerogel Cherenkov counter is described.
Main characteristics of counters measured using particles (e, mu, pi, K) produced in e+e- annihilation are presented.

Summary

Experiments at the VEPP-2000 e+e- collider with upgraded SND detector have been started in the Budker Institute of Nuclear Physics (Novosibirsk, Russia) in 2010. The designed parameters of VEPP-2000 are the following: center-of-mass energy is up to 2 GeV, luminosity is 10ˆ32 cmˆ-2sˆ-1. Development of the new particle identification system based on the threshold aerogel Cherenkov counters was a part of the SND upgrade. The counter design is based on ASHIPH technique (Aerogel, SHifter, PHotomultiplier). Cherenkov light emitted in aerogel is collected by a wavelength shifter, re-emited and transported to the photocathode. A microchannel plate photomultiplier tube (MCP PMT) with multialkali photocathode is chosen as a photodetector.
For the particle identification at different energies two systems with different refractive indexes of aerogel were manufactured: with n=1.13 for the separation of pi and K mesons up to particle energy of 1 GeV and with n=1.05 for e/pi separation up to particle energy of 0.45 GeV.
The system with n=1.13 was calibrated with particles (e, mu, pi, K) produced in e+e- collisions. The signal magnitude from ultrarelativistic electron is 6-8 photoelectrons. This system provides pion suppression by more than two orders of magnitude in the momentum range from 0.35 to 1.00 GeV/c.
The measurements of characteristics of system with n=1.05 have been done using particles from e+e->e+e- and e+e->mu+mu- reactions. The average signal from electrons is 3.5 photoelectrons.

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