Recent studies of e−e+ → hadrons with the CMD-3 detector

Budker Institute of Nuclear Physics – Novosibirsk – Russia - V. Kazanin on behalf of CMD-3 collaboration

Abstract

Since 2010 the CMD-3 detector has been collecting data at the VEPP-2000 e−e+ collider accelerator. CMD-3 is a general purpose detector designed to study e−e+ annihilation studies in the center of mass energy range from 0.32 up to 2 GeV. The current status of e−e+ hadrons studies and luminosity measurement are presented. The measurement is based on a data sample of ~ 50 pb−1.

VEPP-2000 accelerators complex and CMD-3 Detector

The layout of the VEPP-2000 electron-positron complex is essential for the operation of the former VEPP-2000 complex, where the novel technique of round beams was realized for the first time. This technique allows to increase luminosity by factor of 10. The complex operates since 2009 in wide c.m. energy range from 320 MeV up to 2000 MeV. SND and CMD-3 detectors take part in experiments.

Luminosity measurement

The luminosity measurement is based on an analysis of the elastic electron-positron scattering and combined with two-photon annihilation processes. The luminosity is measured from the rate of elastic processes in DOLPHIN experiment. The cross-section is calculated, and the luminosity measured with two separate cuts on opposite signs are satisfying the following relations: 

\[ \sigma_{ee}^{+} / \sigma_{ee}^{-} = \alpha \pm \beta \]

The luminosity is computed using the formula, the precision of the cross sections with relative corrections L = \sigma_{ee}^{+} / \sigma_{ee}^{-} - 1.0 for the level of 4%. 

Efficiency e−e+ → Kπ: e−e+ energy → 0.8%, e−e+ efficiency of selection in calorimeter - 6.0%, Kπ → 99.0% e−e+ efficiency of selection in calorimeter - 6.0%.

The luminosity measurement in SND is done by measuring ionisation losses in drift chamber using likelihood function technique. The total systematic error is 3.9%, rad. correction: 0.5%, angular correction: 0.5%. Typical value of statistical error is 3.3% ± 0.5% per energy point.

Study of e−e+ → KKπ

The study is based on statistics taken in 2011-2012 in the √s range from 1.175 to 2 GeV. The only 6 points coming from e+e− are studied, since the contribution from other channels is small (~1%). All the energy points with total energy of the recoil particle (assuming that it is the π+ or π− meson) are studied, since the contribution from other channels is small (~1%). All the energy points with total energy of the recoil particle (assuming that it is the π+ or π− meson) are studied, since the contribution from other channels is small (~1%). All the energy points with total energy of the recoil particle (assuming that it is the π+ or π− meson) are studied, since the contribution from other channels is small (~1%).

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