

Abstract

Study of charged hadron production with tof-dE/dx identification method in central Ar+Sc collisions in NA61/SHINE experiment at CERN

This thesis presents results on inclusive spectra of protons, anti-protons, π^+ , π^- , K^+ and K^- in 10% of the most central $^{40}\text{Ar}+^{45}\text{Sc}$ collisions. Data on A+Sc collisions were collected by the NA61/SHINE experiment at the CERN SPS. Results are presented for six beam momenta: 13A, 19A, 30A, 40A, 75A, and 150A GeV/c. This is the first measurement of hadron production in Ar+Sc collisions in the SPS energy range.

Identification of charged particles was performed via the tof-dE/dx method. The method is based on the simultaneous measurement of particle energy loss in the Time Projection Chambers and time-of-flight through the detector.

Two-dimensional particle spectra are presented as a function of rapidity and transverse momentum. The results include corrections for various effects related to detector and reconstruction procedure efficiencies and particles originating from weak decays. Special attention was paid to the production of K mesons, lightest strange particles produced in heavy ion collisions. Transverse momentum spectra of charged kaons in mid-rapidity were parametrized with a Boltzmann-like exponential function. The parametrization yielded values for the inverse slope parameter T and enabled the calculation of kaon yields in mid-rapidity. Strangeness production in mid-rapidity was studied in the scope of the onset of deconfinement in intermediate-mass nuclei at the CERN SPS energy range.

Hadron production in Ar+Sc interactions is part of the main program of NA61/SHINE related to the study of the onset of deconfinement and the search for the critical point in strongly-interacting matter. The results presented in this thesis were compared with hadron production measurements in $p+p$, Be+Be, and Pb+Pb collisions recorded by the NA61/SHINE and NA49 experiments. Moreover, a comparison with predictions of three microscopic theoretical models was provided.