

Study of charged hadrons produced in central Pb+Pb collisions at the CERN SPS

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Abstract

The study of particle production in heavy-ion collisions provides an opportunity to investigate the hadronic and deconfined phases of strongly interacting matter and the transition between them. The NA61/SHINE experiment at the CERN SPS performs a unique two-dimensional scan by varying the beam momentum from 13A to 150A GeV/c and the size of the colliding ions ($p+p$, $p+Pb$, $Be+Be$, $Ar+Sc$, $Xe+La$, $Pb+Pb$) to study the charged hadron production. A key objective of the NA61/SHINE experiment is to investigate the properties of strongly interacting matter close to the onset of deconfinement by measuring the $\langle K^+ \rangle / \langle \pi^+ \rangle$ ratio produced in the colliding system. This program was motivated by the observation of a sharp peak in the $\langle K^+ \rangle / \langle \pi^+ \rangle$ ratio ("horn") in central Pb+Pb collisions around 30A GeV/c at the NA49 experiment.

The main goal of this analysis is to identify and measure the spectra of charged hadron (π^+ , π^- , K^+ , K^- , p , and \bar{p}) produced in central Pb+Pb collisions at beam momenta of 13A and 30A GeV/c. The analysis provides the $\langle K^+ \rangle / \langle \pi^+ \rangle$ and $\langle K^- \rangle / \langle \pi^- \rangle$ ratios and examines their dependence on collision energy and system size. The results are compared with the published data from other experiments and with theoretical models. The new Pb+Pb data at 13A GeV/c provide an essential low-energy point, bridging the gap between earlier measurements from the AGS (Alternating Gradient Synchrotron) at Brookhaven and the CERN SPS.

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