Nuclear Modification at 17.3 GeV Nucleon-Nucleon Collision Energy, Measured by the Experiment CERN-NA49

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In the dissertation, the *experimental* methods and results are discussed, concerning the evolution of the single particle spectra at high transverse momentum, when going from proton-proton through proton-nucleus to nucleus-nucleus collisions, at 17.3 GeV nucleon-nucleon collision energy. The presented results are based on the p+p, p+Pb and Pb+Pb data of the CERN-NA49 fixed target experiment at 158 GeV/c beam momentum per nucleon.

The production of the high transverse momentum particles is well characterized by their yields in nucleus-nucleus collisions, relative to elementary reactions scaled up on a geometrical basis (e.g. scaled p+p), which is called nuclear modification. The results of the experiments at the RHIC accelerator at Brookhaven show, that this modification at 200 GeV nucleon-nucleon collision energy is a suppression, which may be a signature of the quark-gluon plasma formation. To look for a possible phase transition using this effect, the energy dependence of the amount of suppression has to be studied. As presently only the NA49 experiment recorded appropriate data for this study at about a factor of 10 lower collision energy than at RHIC, the analysis of the existing NA49 data from this aspect is of natural choice.

A brief description of the setup and operation of the NA49 detector is given. An overview of the data reduction procedure is also presented. The main parts of the dissertation cover the details of the analysis procedures, which mostly concerns calibration, cut, and correction methods, many of which were developed by the *author*.

The results may be grouped into the following description.

- The fully corrected single particle transverse momentum spectra of $\pi^{\pm}$, $p, \bar{p}$, $K^{\pm}$ around midrapidity were obtained for p+p, p+Pb and Pb+Pb collisions, at 17.3 GeV nucleon-nucleon collision energy. The covered transverse momentum region extends to about 4.5 GeV/c.

- As an result of the π^0 analysis surveys, a robust iterative unfolding method, for general applications in signal processing, was developed. Examples for the performance of this method are given.

- By comparing to the published 200 GeV RHIC results, a complete energy scan of various quantities, derived from single particle spectra, are shown. The net-baryon/meson ratios show a factorization in energy and transverse momentum. They are well reproduced by the blast-wave model description. The derived nuclear modification factors show that the energy dependence of the high transverse momentum particle suppression is surprisingly small, although the amount of suppression is less than at 200 GeV for $\pi^{\pm}$. The data do not show a sudden disappearance of suppression with decreasing collision energy.