

# Abstract

Au-Au collisions at RHIC energies exhibit features suggesting that the system has undergone evolution through a stage of partonic matter. The hot and dense system created in the collision builds up substantial collectivity leading to rapid transverse expansion. In particular recent measurements show that  $\Xi$  and  $\Omega$  baryons develop substantial elliptic flow. Properties of the induced flow strongly depend on whether the collectivity is achieved on partonic or hadronic level. Multi-strange baryons may be, due to their presumably small hadronic cross-sections, mainly sensitive to the early (possibly partonic) stage.

The main objective of this thesis is to study femtoscopic  $\pi-\Xi$  correlations in Au+Au collisions at  $\sqrt{s_{NN}}=200$  GeV and  $\sqrt{s_{NN}}=62$  GeV recorded by the STAR experiment at RHIC. Measurements of momentum correlations of particles at small relative velocities are used to extract information about space-time extension of the particle-emitting source at the time of kinetic freeze-out. Non-identical particle measurements are sensitive not only to the size of the system, but also to an emission asymmetry between different particle species. Since this asymmetry may arise from the collective expansion and/or early decoupling of  $\Xi$  these measurements of  $\pi-\Xi$  correlations provide important test of the dynamics of heavy-ion collisions.

In this work are presented first femtoscopic measurements with multi-strange baryons. In the measured  $\pi-\Xi$  correlation function effects of Coulomb and strong interactions were observed with the latter going via  $\Xi^*(1530)$  resonance. It is a first observation of this resonance in collisions of heavy nuclei.

The measurements show that in Au+Au collisions at energies  $\sqrt{s_{NN}}=200$  GeV and  $\sqrt{s_{NN}}=62$  GeV the average emission space-time points of pions and  $\Xi$  are not identical. It is presented that the observed emission asymmetries and source-sizes are in agreement with emission of particles coming from a source in which both the pions and  $\Xi$  take part in the collective transverse expansion. This measurement is hence an independent confirmation of a flow of multi-strange baryons in high energy heavy-ion collisions.