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Strangeness production in Au+Au collisions at $\sqrt{s_{NN}} = 62.4GeV$

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BRAHMS experiment [1] took data in the short RHIC run for Au+Au collisions at c.m. energy of 62.4 GeV. The BRAHMS setup was able to measure and identify charged particles over the widest rapidity range at RHIC. This feature enabled us to shed some light on one of the predicted signals of quark gluon plasma (QGP), strangeness enhancement.
Experimentally, BRAHMS measures charged pions, charged kaons, protons and anti-protons so the strange quarks are identified through the charged kaons. The majority of the produced strange quarks form negative kaons and Λ baryons in comparable quantities so K^- is not a good tool for strangeness estimation when we don't control the Λ yield. The anti-strange quarks however form mostly positive kaons and K^0s. The $\bar{\Lambda}$ yield is $\approx 20\%$ from the yield of positive kaons. Thus, the number of positive kaons is a rough estimate of the total strangeness created during the collision.
From the AGS energies up to the highest RHIC energy we observed experimentally that the K^+/π^+ ratio is higher than the same ratio in p+p collisions at the same collision energy. We also observed that the difference between the strangeness ratio in nucleus-nucleus collisions and the one in p+p collisions is varying. There are different scenarios proposed for this behaviour of the strangeness ratio. At SPS energy it was claimed that the known "horn" dependence of the K^+/π^+ ratio on $\sqrt{s_{NN}}$ is a consequence of the onset of deconfinement [2] while at AGS energies [3] the data was reproduced well by hadronic cascade models, e.g. RQMD.
By looking at SPS data [4] in mid-rapidity, together with BRAHMS 62.4 GeV data in different rapidity slices, we observed that there is a strong dependence of the K^+/π^+ ratio with the $\bar{p}/p$ ratio (within BRAHMS coverage, the $\bar{p}/p$ ratio is varying with a factor bigger than 20 which allows this comparison). Although the initial conditions for the collisions at RHIC and SPS are very different, the compared systems develop the same chemistry which seems to be determined by the baryo-chemical potential.
In this work we will show measured yields and ratios of identified particles from the 10% most central Au+Au collisions at 62.4 GeV together with comparisons with results from other experiments and from theoretical models.

References

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