Erratum: What Determines the K^- Multiplicity at Energies around $(1–2)A$ GeV? [Phys. Rev. Lett. 90, 102302 (2003)]

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In the article [1] an error occurred in the calculation of the in-medium properties of K^-. This caused an underestimation of the K^- production in the strangeness-exchange reaction $\pi Y \leftrightarrow NK^-$ when K^-N potential were turned on. This error did not effect the major conclusion of the paper that the final state K^- are dominantly produced in $\pi Y \leftrightarrow NK^-$ reactions and therefore the production cross sections of K^+ and K^- are linked. Moreover, due to the enhancement of K^- production in this reaction the system approaches even further chemical equilibrium. However, the statement of the independence of the K^- yield on the K^-N potential has to be modified. The new figures are shown here together with a short explanation.

Figure 1 shows the time evolution of the different reaction channels: (i) the strangeness producing channels with nonstrange baryon-baryon interactions (dotted black line) and pion-nonstrange baryon collisions (dashed line); (ii) the strangeness-exchange channel pion-hyperon (dash-dotted line) and its inverse reaction of K^- absorption (solid line) in central ($b = 0$ fm) Au + Au reaction at 1.48A GeV incident energy. We observe that the pion-hyperon channels come last and dominate the yield. In the time interval between 15 and 20 fm$/c$, production and absorption of K^- are separated by the mean lifetime of the K^-, so we have a steady-state situation as already stated in [1].

Figure 2 shows the time evolution of the K^- yield (divided by the final K^+ yield) when the cross section of the strangeness-exchange reaction is multiplied by an arbitrary factor R. For C + C reaction we see for an increase of the cross section by a factor of 2 that the yield increases by only 30%. For Au + Au collisions, where absorption becomes more important, the situation is different. An increasing cross section reabsorbs the K^- produced in the other channels until, at $R = 1.5$, they are gone. A further increase of R influences only the strangeness-exchange reaction. Therefore, the K^- yield of Au + Au decreases first with increasing R. The approach towards equilibrium (characterized by a small dependence of the K^- yield on the cross section modification factor R) is even stronger than reported in the Letter [1].

In the Letter [1] it was stated that the K^-N potential influences only slightly the K^- yield while the K^+N potential shows a strong influence on the yield due to the dependence of the strangeness-exchange reaction on the hyperon yield. The hyperon is produced associately together with a K^+. This statement has to be modified: Both the repulsive K^+N potential as well as the attractive K^-N potential modify the final K^- yield almost identically, however in the opposite direction. Therefore, turning on both potentials about the same yield of K^- is found as without any potential as shown in Fig. 3. Switching on and off the K^- potential only, however, changes the K^- yield by about 50%. It should be noted that the K^-N in-medium cross section is deduced from the cross section of a free K^- having the same center-of-mass-momentum as the in-medium K^-. Changing this choice also influences the K^- cross section and may enhance the effect of the K^-N potentials up to a factor of 2–3.

The influence of the potential on the K^- yield has also consequences for the K^-/K^+ ratio as shown in Fig. 4. The influence of the K^+N potential cancels in this ratio and one observes the influence of the K^-N potential. This causes a 50% effect. In the calculation as well as in a recent experiment of the KaoS Collaboration [2], the K^-/K^+ ratio is

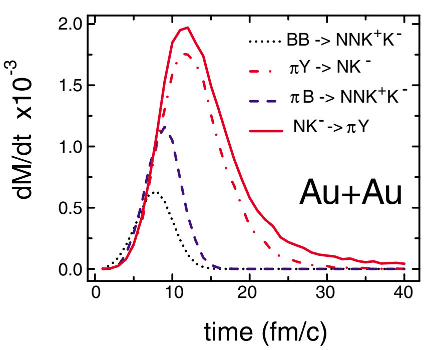

FIG. 1 (color online). Time evolution of different production channels and of the absorption channel in Au + Au collisions at 1.48A GeV for central collisions ($b = 0$ fm).

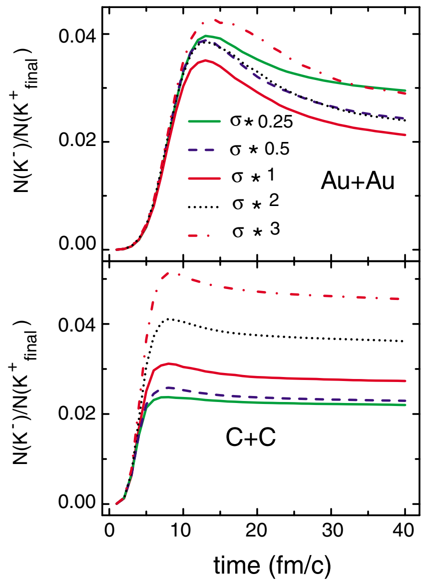

FIG. 2 (color online). Time evolution of the K^- yield for different cross section multiplication factors R for Au + Au (above) and C + C (below) for an incident energy of 1.5A GeV and an impact parameter of $b = 0$ fm.

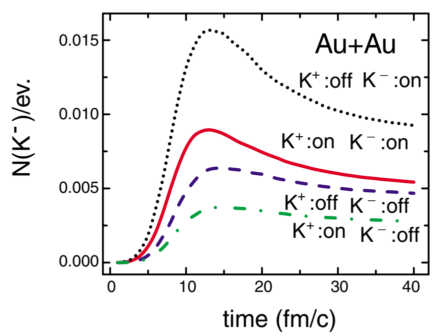

FIG. 3 (color online). Time evolution of the K^- yield for different options of the KN potentials.

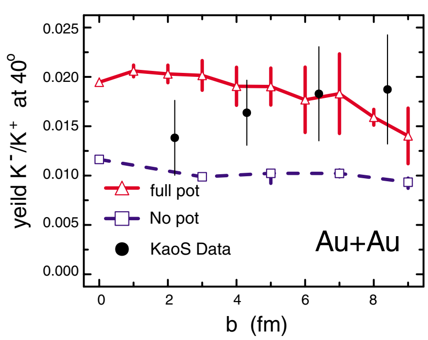

FIG. 4 (color online). Centrality dependence of the ratio K^-/K^+ in Au + Au collisions for two options: with both KN potentials (solid line) and without any KN potential (dashed line). For comparison, recent data from [2] are given as full points.

roughly constant as a function of the impact parameter.

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[1] Ch. Hartnack, H. Oeschler, and J. Aichelin, Phys. Rev. Lett. **90**, 102302 (2003).
[2] KaoS Collaboration, A. Förster *et al.*, Phys. Rev. Lett. **91**, 152301 (2003).