# Centrality dependence of $K^+$ produced in Pb+Pb collisions at 158 GeV per nucleon

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**Abstract.**
The NA52 collaboration searches for a discontinuous behaviour of charged kaons produced in Pb+Pb collisions at 158 A GeV as a function of the impact parameter, which could reveal a QGP phase transition. The $K+$ yield is found to grow proportional to the number of participating ('wounded') nucleons N, above N=100. Previous NA52 data agree with the above finding and show a discontinuous behaviour in the kaon centrality dependence near N=100, marking the onset of strangeness enhancement -over e.g. p+A data at the same $\sqrt{s}$- in a chemically equilibrated phase.

## 1. Introduction

The quark-gluon plasma phase transition predicted by QCD [1] may occur and manifest itself in ultrarelativistic heavy ion collisions through discontinuities in the temperature and energy density dependence of relevant observables. A major example of such a discontinuity is seen in the $J/\Psi$ to Drell Yan ratio [2]. The NA52 collaboration searches for discontinuities in strangeness production measuring charged kaons as a function of the impact parameter. Results from the 1995 NA52 run are published in [3]. We report here on new preliminary results from the 1998 run of the NA52 experiment, on $K^+$ at rapidity 4.1 and transverse momentum near 0 produced in Pb+Pb collisions at 158 A GeV. In this run a new electromagnetic lead/quartz fiber calorimeter (QFC) with improved acceptance and resolution [4] was used.

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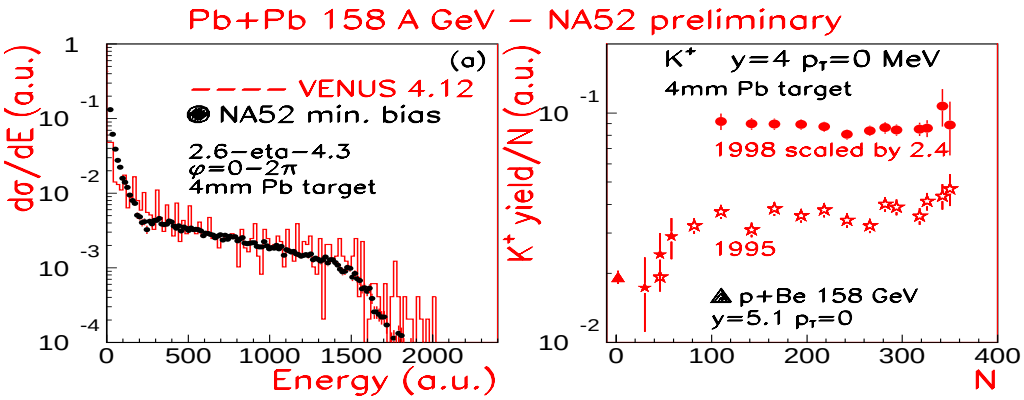


**Figure 1.** Preliminary NA52 data from Pb+Pb collisions at 158 A GeV. (a) Calorimetric energy distribution in arbitrary units. (b): $K^+$ yield in arb. units per N, as a function of N. For comparison the 1995 NA52 data [3] are also shown. The 1998 data are scaled by 2.4 with respect to the 1995 data.

## 2. Results and discussion

For the kaon measurement we modified the 1998 set up of NA52 [5] by placing the target 0.6 m upstream of the calorimeter. The results have been corrected for empty target contributions. The number of participant nucleons N has been estimated from the energy measured with the calorimeter (figure 1, (a)) in the way described in [3]. Particle identification is described in [3] and references there. The positive kaon yield divided by N is independent of N, for N $>$ 100 (figure 1, (b)) in agreement with previous NA52 results [3]. Assuming that N is proportional to the volume of the particle source, figure 1, (b) shows that the kaon number density exhibit a discontinuity, saturating above N=100. This indicates a transition to a phase characterized by a high degree of chemical equilibrium and enhancement [3] of kaons from the point N=100 on, corresponding to energy density $\epsilon \sim 1.3$ GeV/fm$^3$ [6], near $\epsilon_c$ [1, 7]. This change marks the onset of strangeness enhancement seen in kaons in an equilibrated phase, which may be suggestive for a QCD phase transition, depending on the simultaneous appearance of thresholds in other signatures at the relevant $\epsilon$ values and their theoretical understanding [7, 2, 6].

## References

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