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**CENTRALITY DEPENDENCE OF  $K^+$  PRODUCED IN Pb+Pb  
COLLISIONS AT 158 GEV PER NUCLEON**

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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 hadron to quark-gluon plasma (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 hadron to quark-gluon plasma phase transition predicted by QCD <sup>2</sup> may occur and manifest itself in ultrarelativistic heavy ion collisions through discontinuities in the energy density dependence of relevant observables. A major example of such a discontinuity is seen in the  $J/\Psi/DY$  ratio <sup>3</sup>. 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 <sup>4</sup>. We report here on new preliminary results from the 1998 run of the NA52 experiment, on  $K^+$  at rapidity 4.1 and trans-

verse momentum near 0 produced in Pb+Pb collisions at 158 A GeV <sup>5</sup>. In this run a new electromagnetic lead/quartz fiber calorimeter (QFC) with improved acceptance and resolution <sup>6</sup> was used.

## 2 Results and discussion

For the kaon measurement we modified the 1998 set up of NA52 <sup>7</sup> 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) in the way described in <sup>4</sup>. Particle identifica-

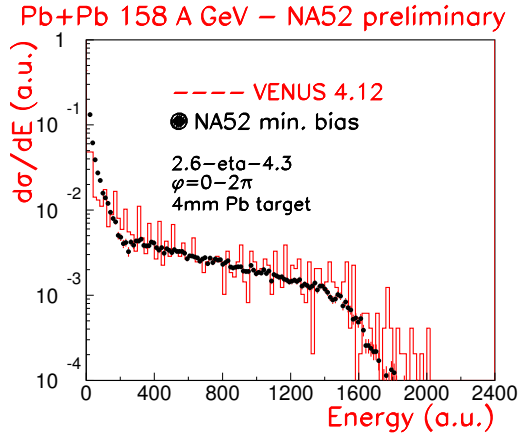


Figure 1. Preliminary energy distribution in arbitrary units in minimum bias Pb+Pb collisions at 158 A GeV, from the 1998 NA52 run.

tion is described in <sup>4</sup> and references there. The positive kaon yield divided by  $N$  is independent of  $N$ , for  $N > 100$  (figure 2) in agreement with previous NA52 results <sup>4</sup>. Assuming that  $N$  is proportional to the volume of the particle source, figure 2 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 <sup>4</sup> of kaons from the point  $N=100$  on, corresponding to energy density  $\epsilon \sim 1.3 \text{ GeV}/\text{fm}^3$  <sup>8,9,1</sup>, near the critical energy density  $\epsilon_c \sim 1-2 \text{ GeV}/\text{fm}^3$  <sup>2,10</sup>. 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 like e.g. the  $J/\Psi$  suppression at the relevant  $\epsilon$  values and their theoretical understanding <sup>10,3,8,11</sup>.

### Acknowledgments

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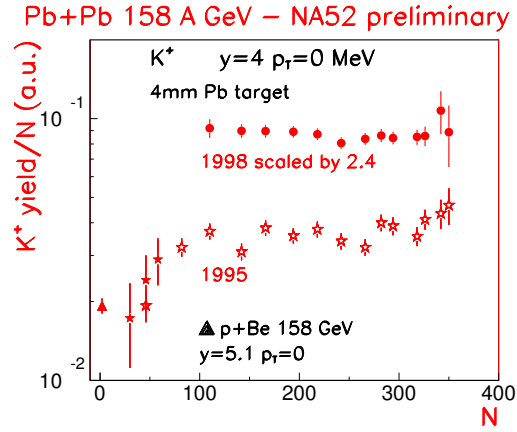


Figure 2. Preliminary  $K^+$  yield in arbitrary units per participant nucleon  $N$ , as a function of  $N$  from Pb+Pb collisions at 158 A GeV, measured in the 1998 NA52 run. For comparison the 1995 NA52 data <sup>4</sup> are also shown. The 1998 data are scaled by 2.4 with respect to the 1995 data.

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