EUROPEAN LABORATORY FOR PARTICLE PHYSICS

CERN/SPSC YYYY–NNN
CERN/SPSLC/XXXX.....
DD MMMMMM YYYY.....

Letter of Intent

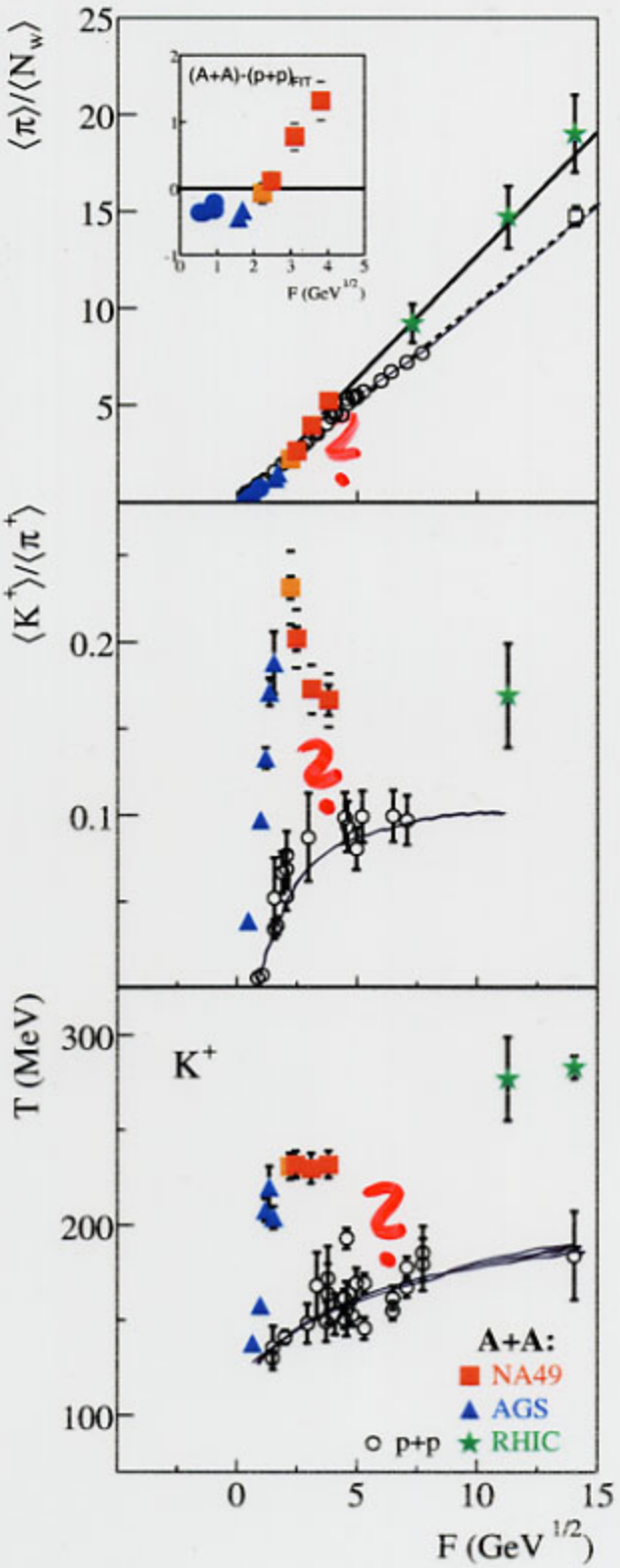
Study of Energy Dependence of Hadron Production with Nuclei and Proton Beams at the CERN SPS

DRAFT 1

- BASIC MOTIVATION
- HISTORY AND CURRENT STATUS OF ENERGY SCANS
- NEW MEASUREMENTS AT SPS

BASIC MOTIVATION

PB+PB ≠ p+p



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NEED FOR:

ENERGY SCAN WITH LIGHT NUCLEI (A+A)

TO UNDERSTAND THE ROLE PLAYED BY THE VOLUME OF THE FIREBALL OF STRONGLY INTERACTING MATTER IN DETERMINING THE ONSET OF DECONFINEMENT PHASE TRANSITION

ENERGY SCAN WITH PROTONS (p+p, p+A)

TO SIGNIFICANTLY CONSTRAIN MODELS OF THE COLLISION PROCESS, IN PARTICULAR MICROSCOPIC DYNAMICAL APPROACHES

HISTORY AND THE CURRENT STATUS OF THE ENERGY SCAN PROGRAMS

SPS:

- DATA TAKING IN THE PbtPb ENERGY SCAN PROGRAM AT SPS FINISHED (20, 30, 40, 80, 158 GEV)
  ANALYSIS IN PROGRESS

- LAST COLLAB. MEETING: DREAMS ON ENERGY SCAN WITH LIGHT NUCLEI

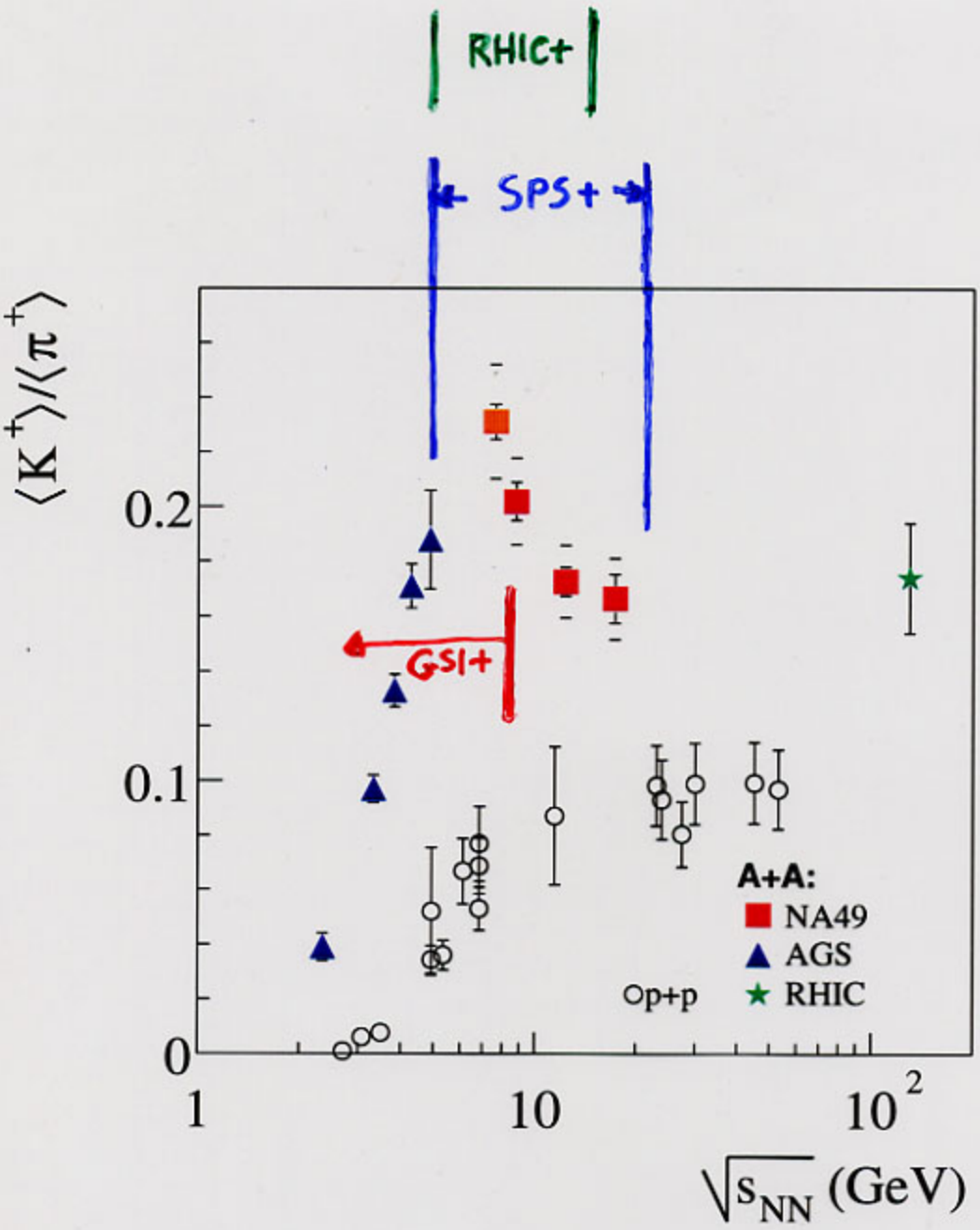
- SOON AFTER CHANGE OF THE CERN POLITICS WITH RESPECT TO HEAVY IONS
  (DISCUSSIONS WITH Detraz, RB MINUITS)
  (PREPARATION OF LoI FOR Cogne meeting SEPTEMBER 2004)

RHIC:

- OCTOBER 9 WORKSHOP ON FIXED TARGET PROGRAM AT RHIC
  (10-100 AGEV)

GSI:

- NEW GSI FACILITY CONDITIONALY APPROVED
  (2-35 AGEV 2012 →)

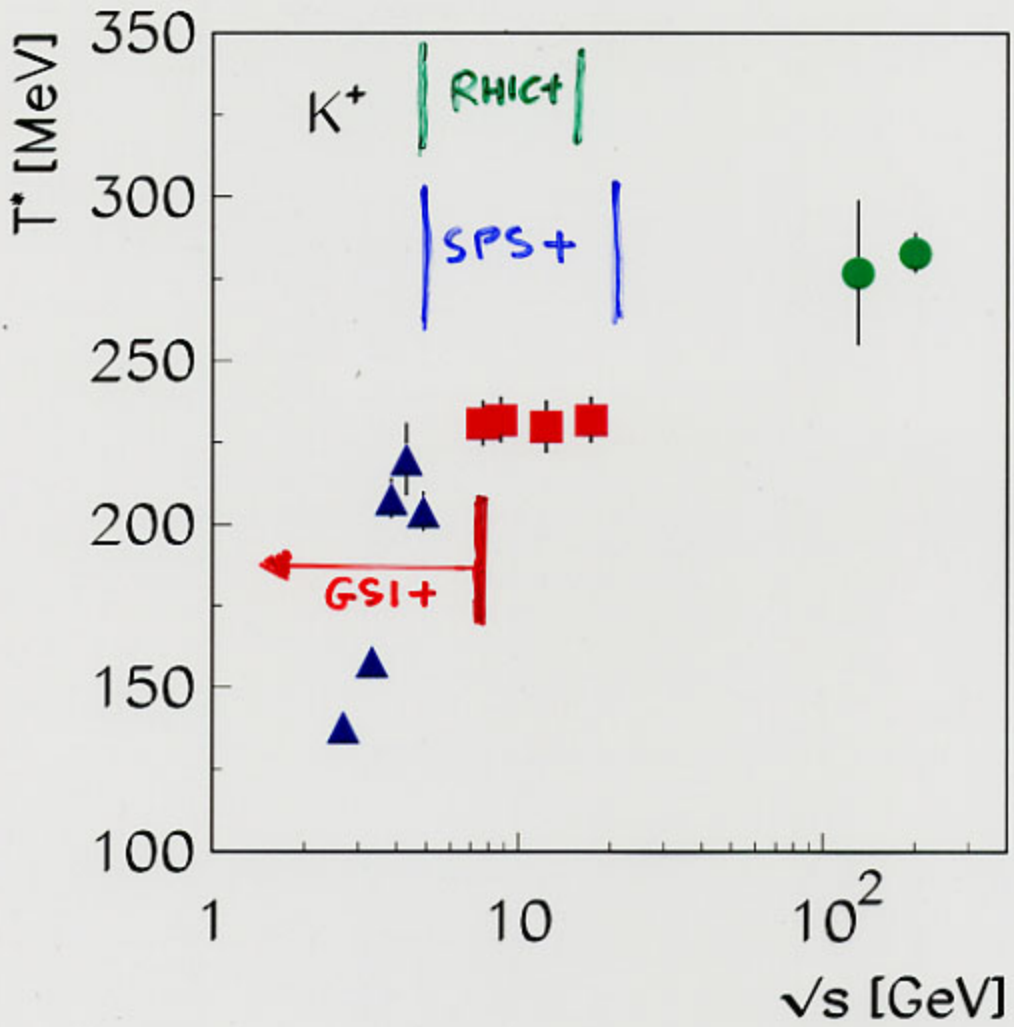


MACHINE: FOCUS ON:

GSI+ – SMALL CROSS SECTIONS

SPS+ – LIGHT SYSTEMS

RHIC+ – CONTINOUS EXCITATION FUNCTION


T* [MeV]
350
300
250
200
150
100
K+
RHIC+
SPS+
GSI+
1
10
10^2
√s [GeV]

●●● NEW MEASURMENTS AT SPS

MAXIMUM PROGRAM:

IONS:

CENTRAL C+C, Si+Si, Ag+Ag
AT 10, 20, 30, 40, 80, 160 A·GEV

PROTONS:
ALL INELASTIC p+p, p+A(?) (C, Ag, Pb?)
AT 10, 20, 30, 40, 80, 160 GEV

MINIMUM MODIFICATIONS NEEDED:

IONS AND p+p: NO

p+A : 4π ACCEPTANCE
(HOW?)

RESEARCH BOARD 10 APRIL 2003

Finally K. Königsmann discussed the requests of CERES/NA45 and NA49 to participate in the indium run this year. At the previous Research Board meeting, the request from NA49 was not approved, due to concerns of interference with test beam for CMS. However, following that meeting it was understood that it was possible to rearrange the schedule to avoid such interference, so NA49 renewed their request. CERES had been asked to report to the SPSC on the physics impact of an indium run limited to 30 days, including a comparison to the data that was taken by the experiment reducing the length of the run to 30 days was expected to be only a 12% increase in the statistical errors. However, a comparison with the data from 2000 could not be performed, as the analysis of that data is not yet complete, due to difficulties with the calibration of the TPC. Instead, a comparison was shown with a Monte Carlo simulation of the expected results from 2000. J.-J. Blaising expressed concern over the length of time that the analysis of the 2000 data is taking, which suggested a lack of available manpower. It was considered that the added value from the indium run for CERES compared to the predicted results from their 2000 data was not sufficient to justify changing the existing plan.

K. Königsmann then showed some exciting recent results from NA49, concerning a clear peak in the K-to-p ratio at low SPS energies. R. Cashmore agreed that they were interesting results, which may well deserve to be investigated further with a full programme of new measurements. However, it was felt that the single measurement of the high-energy indium run would not add significantly to the lower energy results. The Research Board therefore did not approve the requests of CERES and NA49 to participate in the indium run. L. Maiani encouraged the experiments to complete their studies of the existing data, and after deep analysis of the results to bring forward any new ideas for a possible future programme of measurements beyond 2005.

RESEARCH BOARD 5 JUNE 2003

Concerning the Heavy Ion experiments, NA49 showed results on the energy scan from 20 to 80 A GeV. At the onset of deconfinement they expect anomalies in the energy dependence of relevant observables, such as the charged pion multiplicity and the K to p ratio, and interesting features are seen in the data. NA50 gave a status report on J/y suppression from the runs taken between 1995 and 2000. The SPSC encouraged them to combine the different data sets.
The issue was raised whether the NA45, NA49 and NA57 experiments should now be removed from the beam line, but this was considered to be a question for the directorate rather than the Research Board.

A. Zalewska commented that the detailed study of the low-energy region would be difficult at RHIC, and she encouraged the preparation of ideas for the further study of Heavy Ions at CERN beyond 2005, to be discussed at the meeting that was mentioned above under matters arising.

IONS AND PROTONS AT SPS IN THE FUTURE (> 2005)

(SPS PHYSICS COORDINATOR, M. HAUSCHILD)

- CHANGE OF THE ACCELERATOR CHAIN:
  LHC REQUIRED:

CURRENT:

ION SOURCE → LINAC3 → PS BOOSTER → PS → SPS

NEW:

ION SOURCE → LINAC3 → LEIR → PS → SPS → LHC

(LEIR ≡ LOW ENERGY ION RING)

CURRENT SCHEDULE:

2004	LEIR CONSTRUCTION
2005	LEIR COMMISIONING
2006	COMMISIONING OF IONS IN PS
2007	COMMISIONING OF IONS IN SPS (LHC?)
2008	LHC OPERATION WITH IONS

RUNNING WITH IONS IN SPS (2007?) 2008

●● LIGHT IONS

LHC PROGRAM FORSEES ONLY PB ION SOURCE

CONSTRUCTION OF A NEW (LIGHT ION SOURCE) NEEDED (≈ 2 MCHF)

●●● PARALLEL RUNNING LHC, SPS FIXED TARGET SHOULD BE POSSIBLE

●●●● IONS AT 10 A GEV AT SPS

IT SHOULD WORK,
BUT BEAM QUALITY WORSE THAN AT 20/30 A·GEV

POSSIBLE RUNNING STRATEGY

- 2006:
  ENERGY SCAN WITH PROTONS:
  p+p AT 10, 20, 30, 40, 80 GEV
  (50 DAYS)

- 2007:
  ENERGY SCAN WITH PROTONS:
  p+A(?) AT 10–160 GEV
  (60 DAYS)

- 2008:
  ENERGY SCAN WITH C:
  C+C AT 10, 20, 30, 80, A GEV
  (40 DAYS)

- 2009:
  ENERGY SCAN WITH Si:
  Si+Si AT 10, 20, 30, 80 A·GEV
  (40 DAYS)

- 2010:
  ENERGY SCAN WITH Ag:
  Ag+Ag at 10–160 AGEV
  (60 DAYS)