# Strong and Electromagnetic Interactions at SPS Energies 

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- Introduction: the Data
- Particle Ratios
- Implications
- Summary


## The Data:

## NA49, sqrt( $\left.\mathrm{s}_{\text {NN }}\right)=17 \mathrm{GeV}$

 $\mathbf{P b}+\mathbf{P b}$ ("peripheral") $d=E \frac{d^{3} N}{d p^{3}}$
$\mathbf{p + p} \quad f=E \frac{d^{3} \sigma}{d p^{3}}$


$$
x_{F}=\frac{p_{L}}{p_{L}^{M A X}}
$$

## Particle Ratios

## $\pi^{+} / \pi^{-}$ratios



## † $\mathrm{Pb}+\mathrm{Pb}$

- N+N
- $\mathbf{P b}+\mathbf{P b}$ is compared to superposition of nucleon+nucleon ( $\mathrm{N}+\mathrm{N}$ ) collisions
- Neutron fragmentation is obtained from p+p data:
$\mathrm{n} \rightarrow \pi^{+}=\mathrm{p} \rightarrow \pi^{-}$
$\mathrm{n} \rightarrow \pi^{-}=\mathrm{p} \rightarrow \pi^{+}$
"N+N": 40\% protons, 60\% neutrons



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NA49 preliminary

A.Szczurek, A.R.


- Characteristic structure in $x_{F}$ and $p_{T}$
- $\pi^{+} / \pi^{-}$reaches zero at $\mathrm{X}_{\mathrm{F}}=\mathbf{0 . 1 5}=\mathrm{m}_{\boldsymbol{\pi}} / \mathrm{m}_{\mathrm{p}}$



## Implications




## Summary

- New, high precision data on particle production allow a detailed scrutiny of the mechanism of the hadronic interaction, from the elementary to the heavy-ion reaction;
- The heavy-ion collision appears as a mixture of different processes, involving the participant zone as well as the spectator system(s);
-The interplay between the strong and electromagnetic interactions results in visible distortions in ratios of charged particles produced in the collision;
-These distortions may bring new information on the dynamics of the collision.

Thank you!

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## Extra slides



$25 \mathrm{MeV} / \mathrm{c}$
$75 \mathrm{MeV} / \mathrm{c}$
$125 \mathrm{MeV} / \mathrm{c}$
175 MeV/c
$325 \mathrm{MeV} / \mathrm{c}$

