Baryon stopping: a link between elementary p+p interactions and controlled-centrality p+A and A+A collisions

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for the NA49 collaboration

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NA49 Collaboration

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Motivation

- Why study
  - Space-time development of strong interaction process
  - Experimental links p+p – p+A – A+A
- Why forward
  - Perfect acceptance and PID in forward
  - p+A: laboratory to study the physics of the projectile, multiple collisions in relatively clean environment

Outline

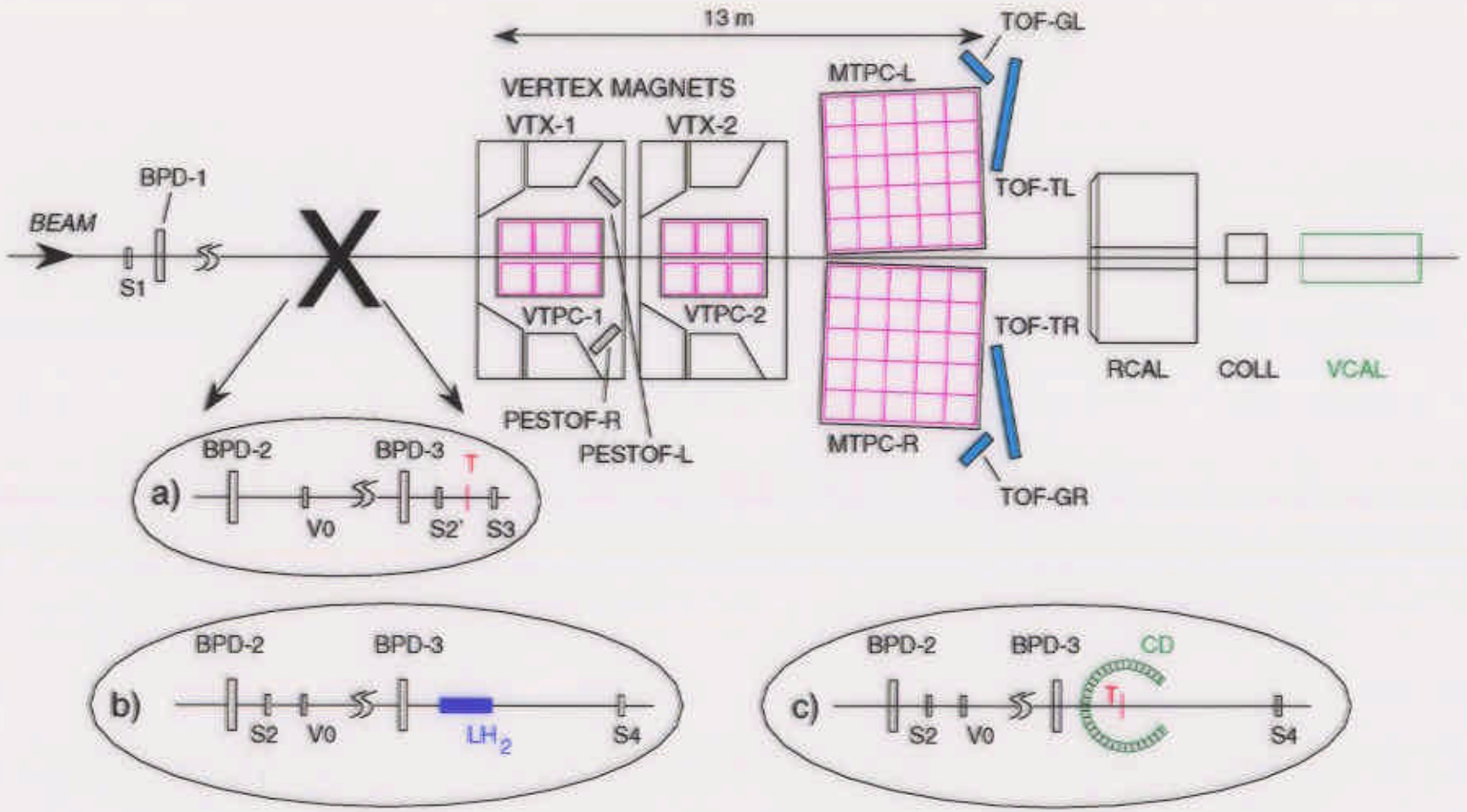
- Reactions: p+p, p+Al, p+Pb, Pb+Pb

◦ Stopping and baryon transfer

◦ Correlations, predictions
  - pion density
  - strangeness

◦ Conclusions and outlook

NA49 experiment



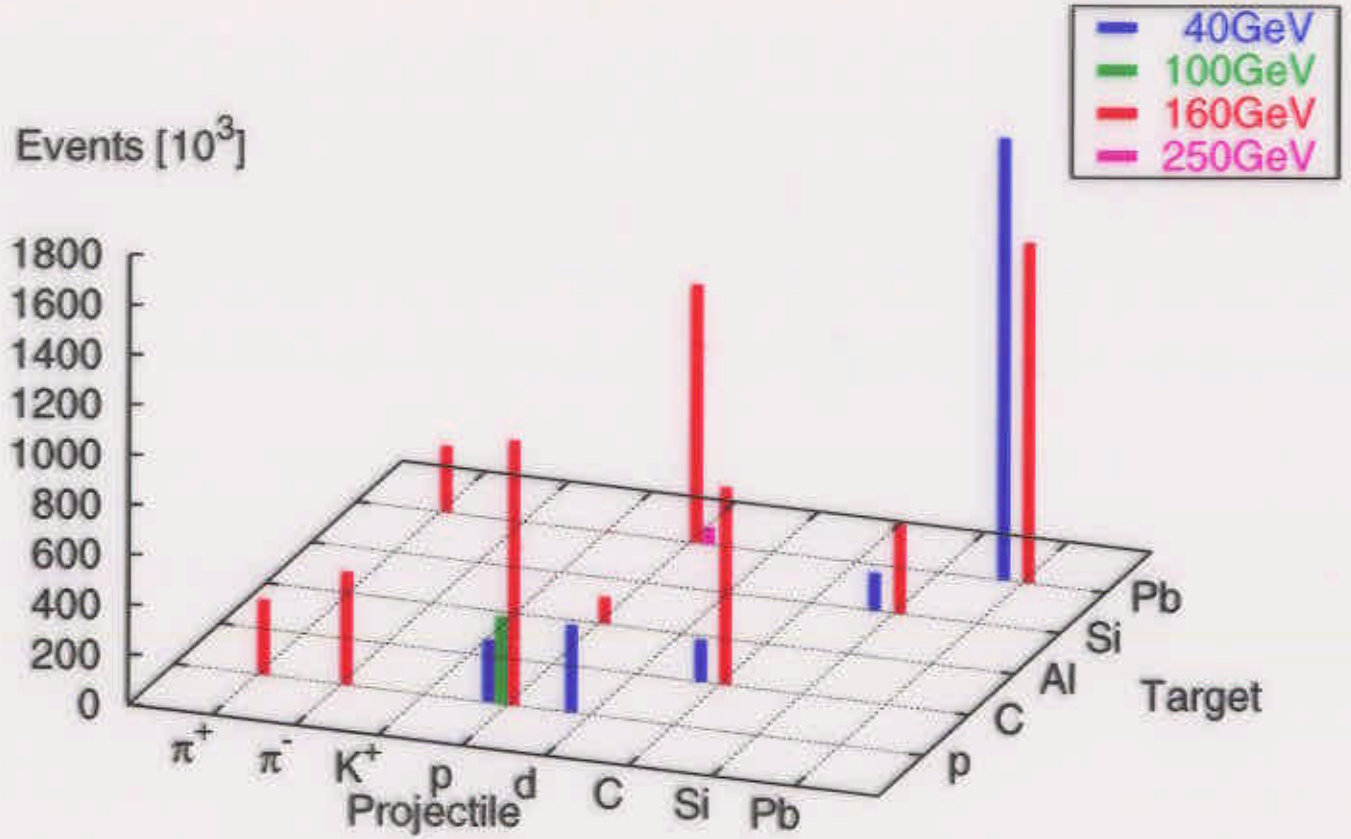
Large acceptance hadron detector

Data sets

Reaction	$\langle N_{grey} \rangle$	Events
p+p		408k
p+Al min.bias	0.7	39k
p+Al peripheral	1.4	55k
p+Al intermediate	3.5	13k
K^++Pb	3.9	3k
π^++Pb peripheral	1.8	11k
π^++Pb min.bias	2.8	38k
π^++Pb intermediate	4.5	32k
π^++Pb central	9.2	35k
p+Pb peripheral	1.8	11k
p+Pb min.bias	3.3	64k
p+Pb intermediate	4.6	42k
p+Pb central	9.5	67k
p+Pb @250 peripheral	1.8	8k
p+Pb @250 intermediate	4.5	26k
p+Pb @250 central	9.6	34k
p+p @100		350k
p+p @40		150k
p+p		650k
π^++Pb	var.	150k
p+Pb	var.	850k
d+p @40		350k
p+p @40		100k
π^++p		300k
π^-+p		400k

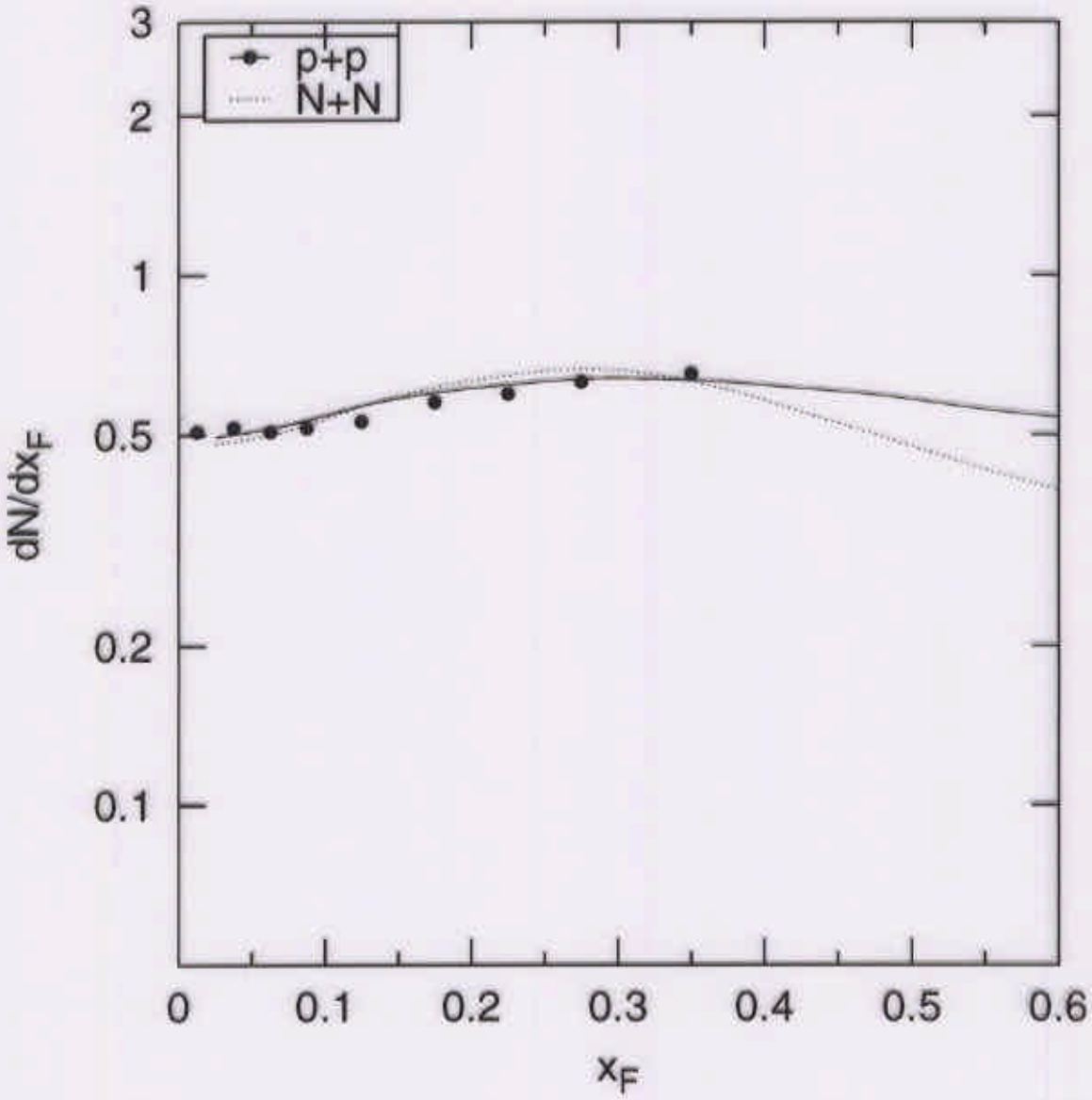
Large samples recorded last year

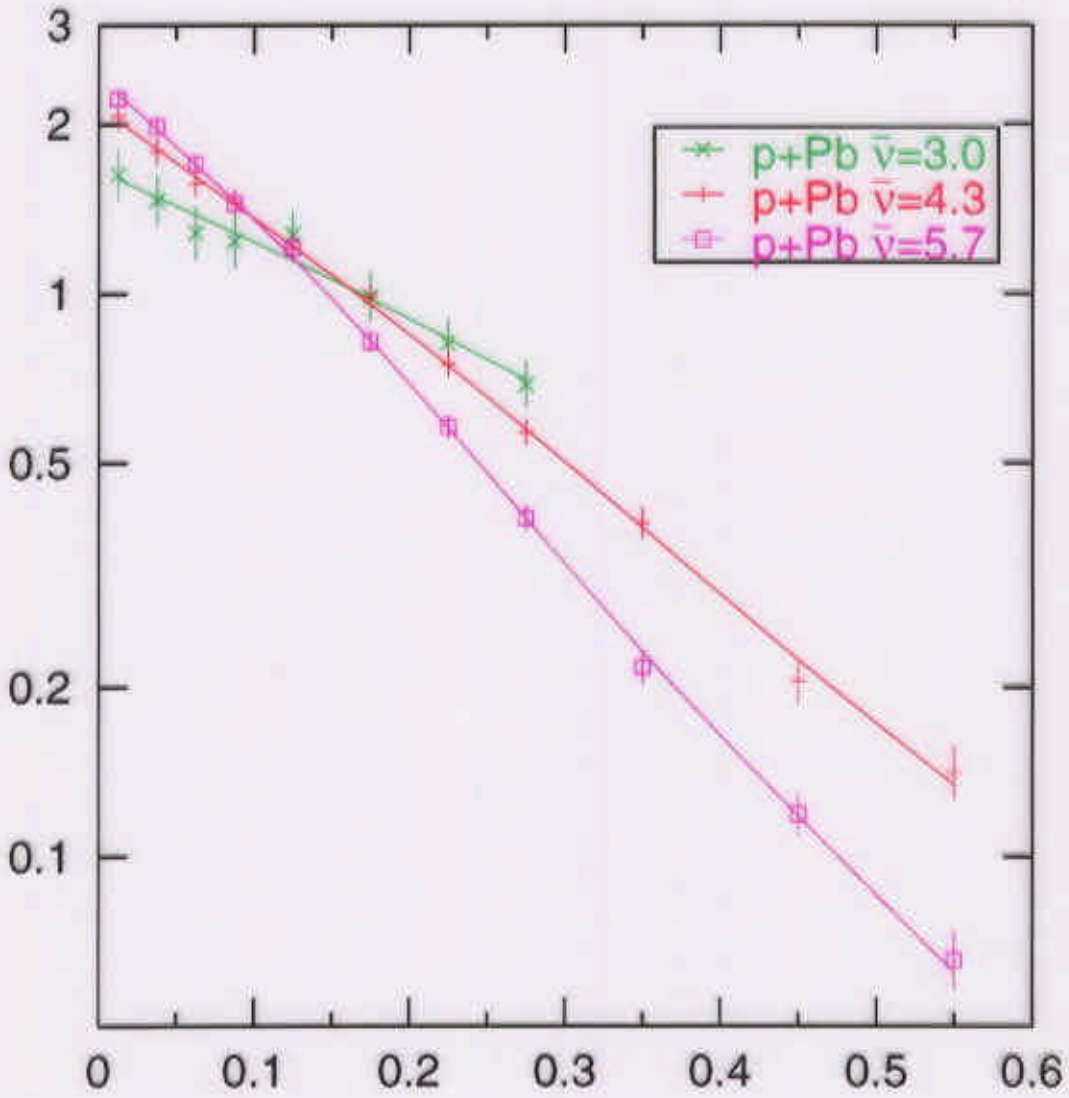
Data sets



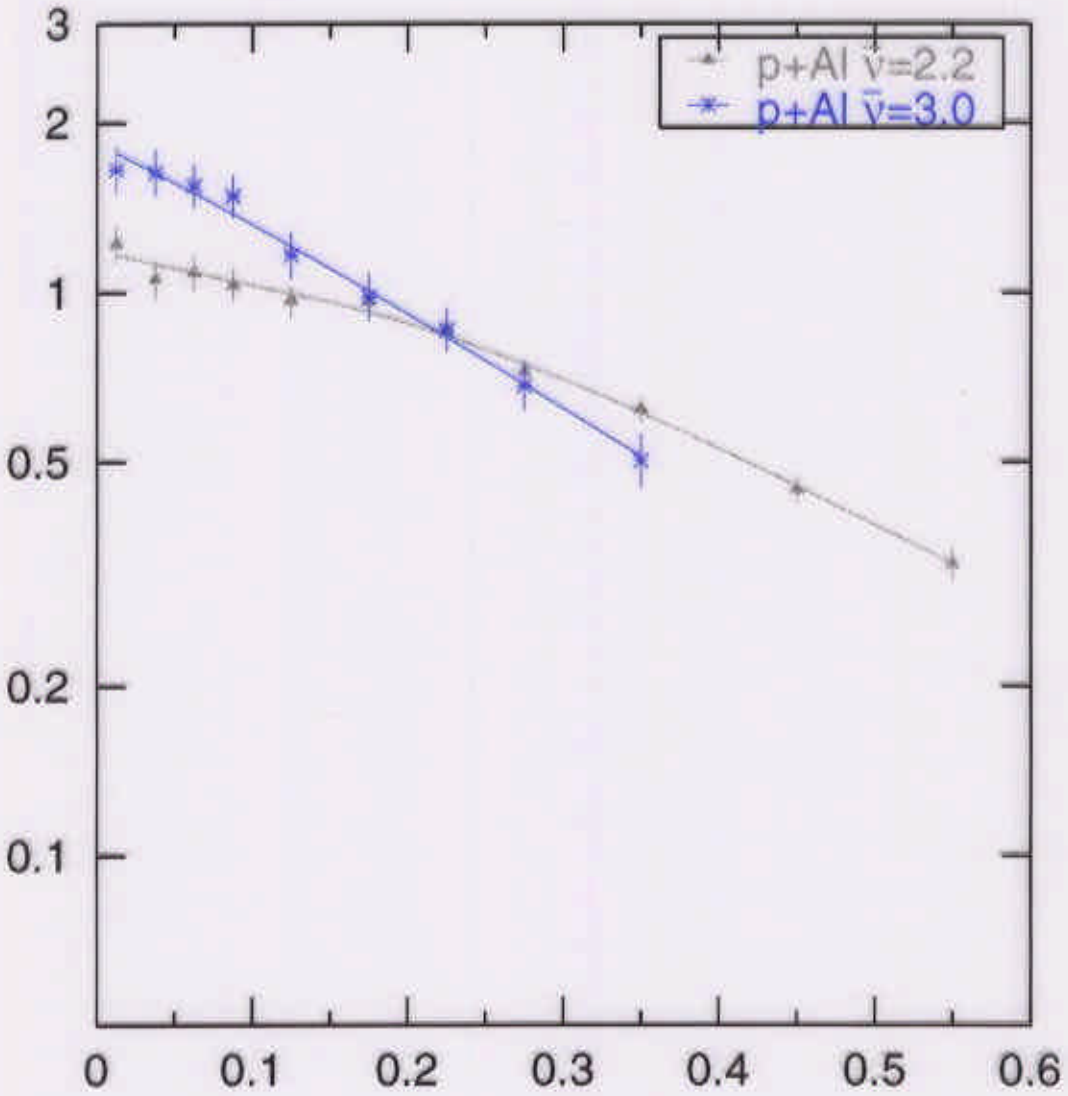
Large samples recorded last year

Net protons

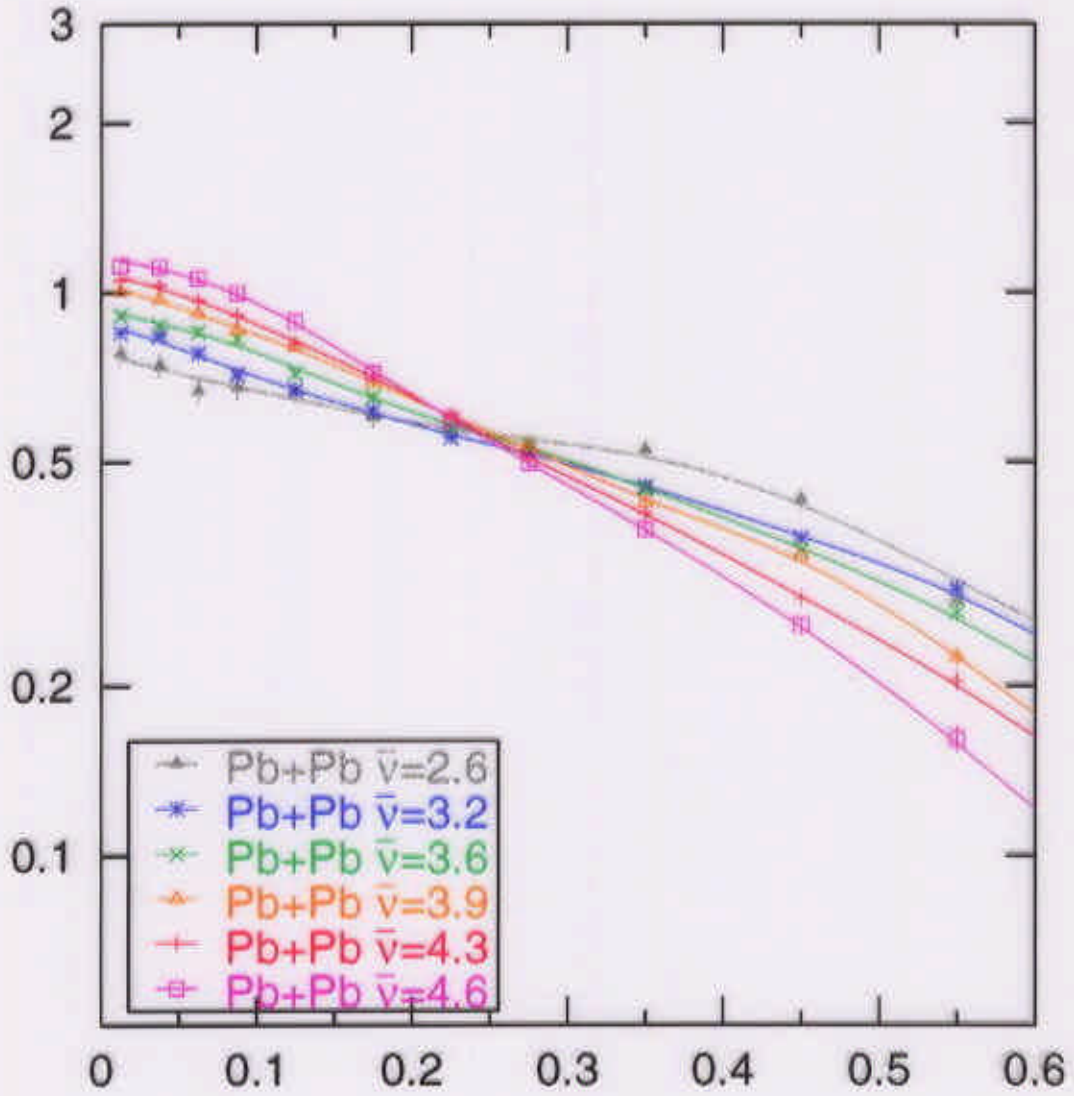




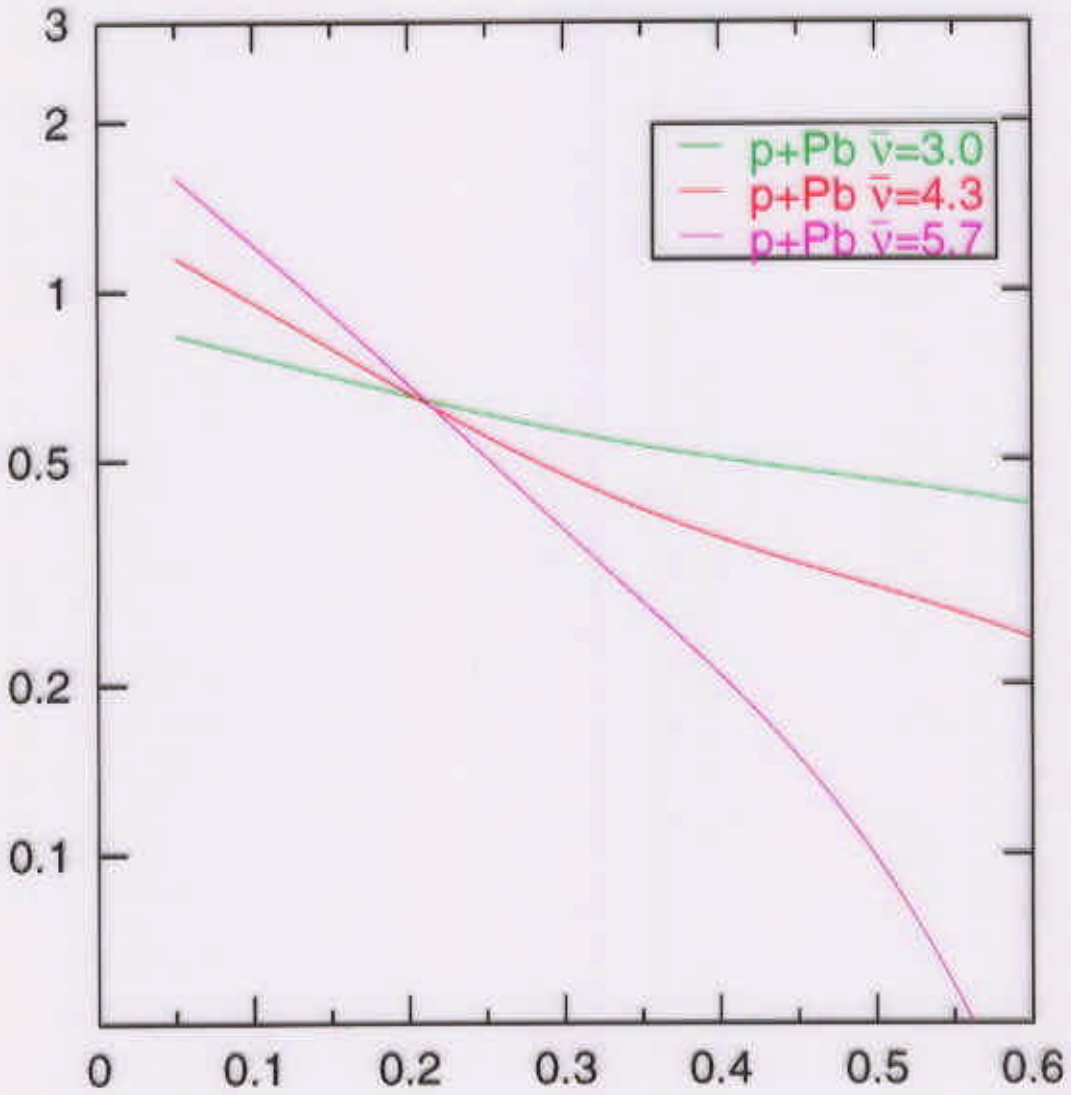
Stopping with increasing number of collisions



Fills the gap, dependence only on $\overline{\nu}$

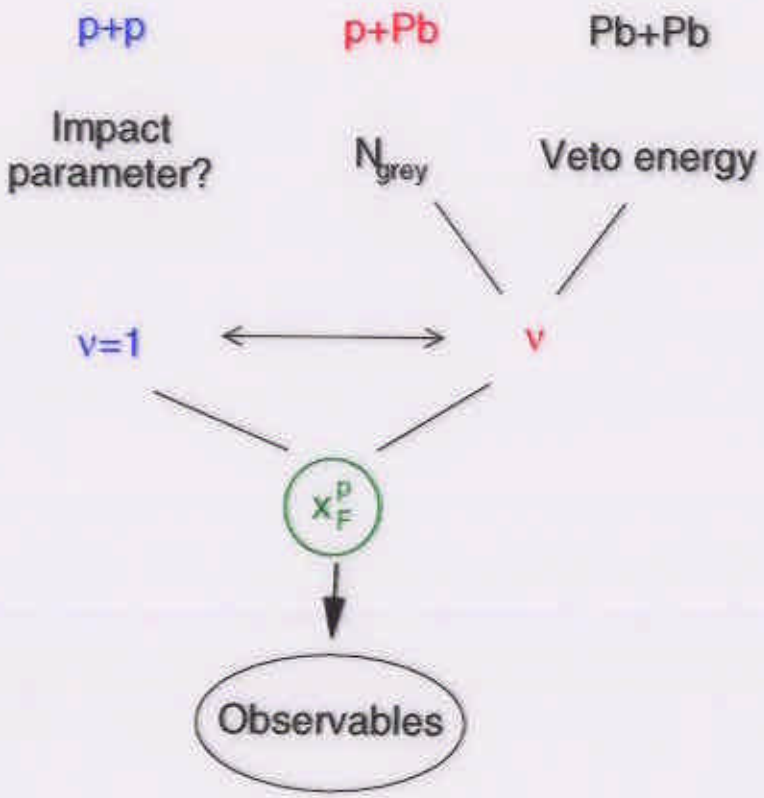


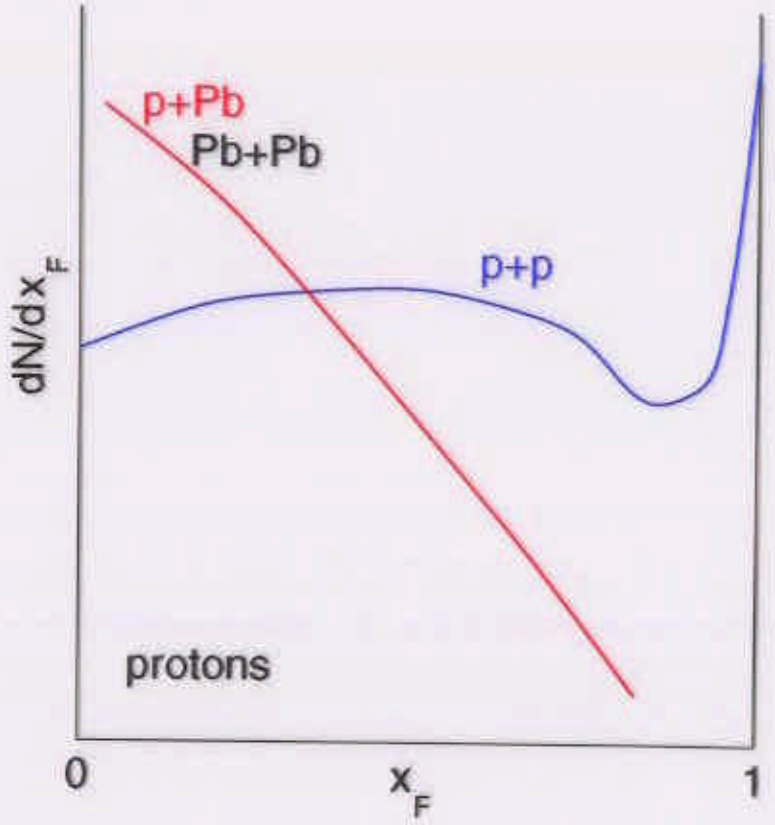
Normalized with number of participant pairs



Attempt for feed-down correction

Correlations



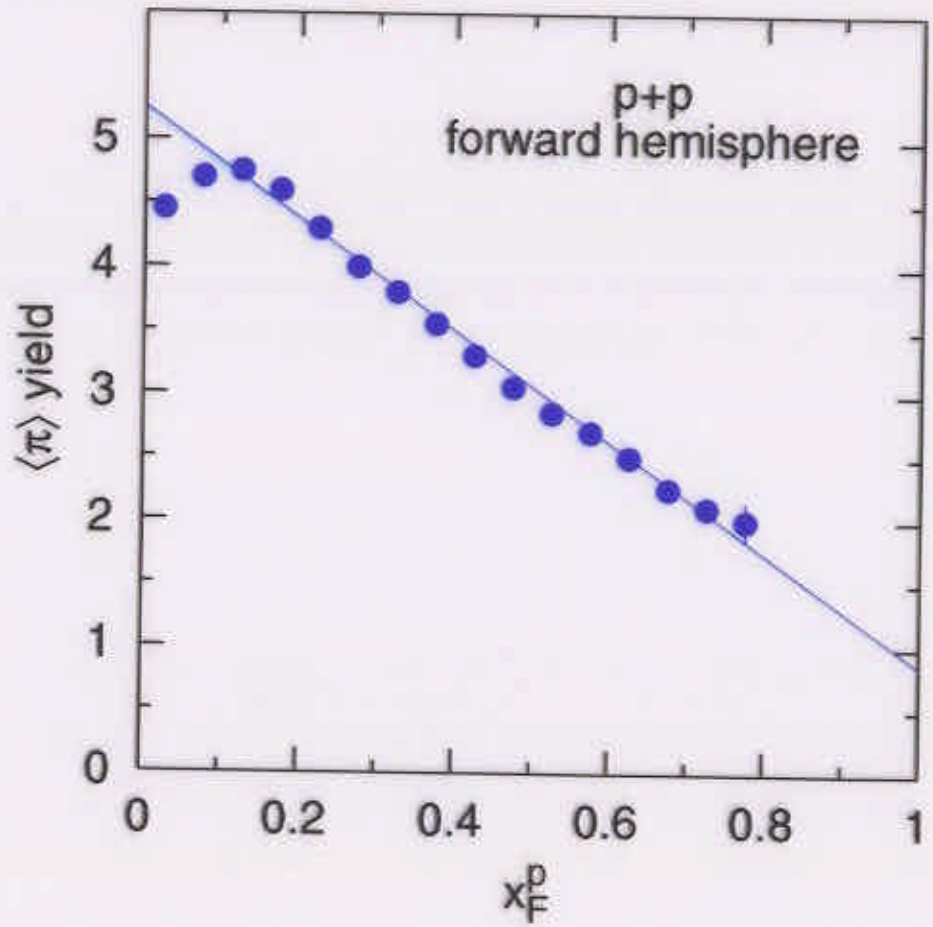


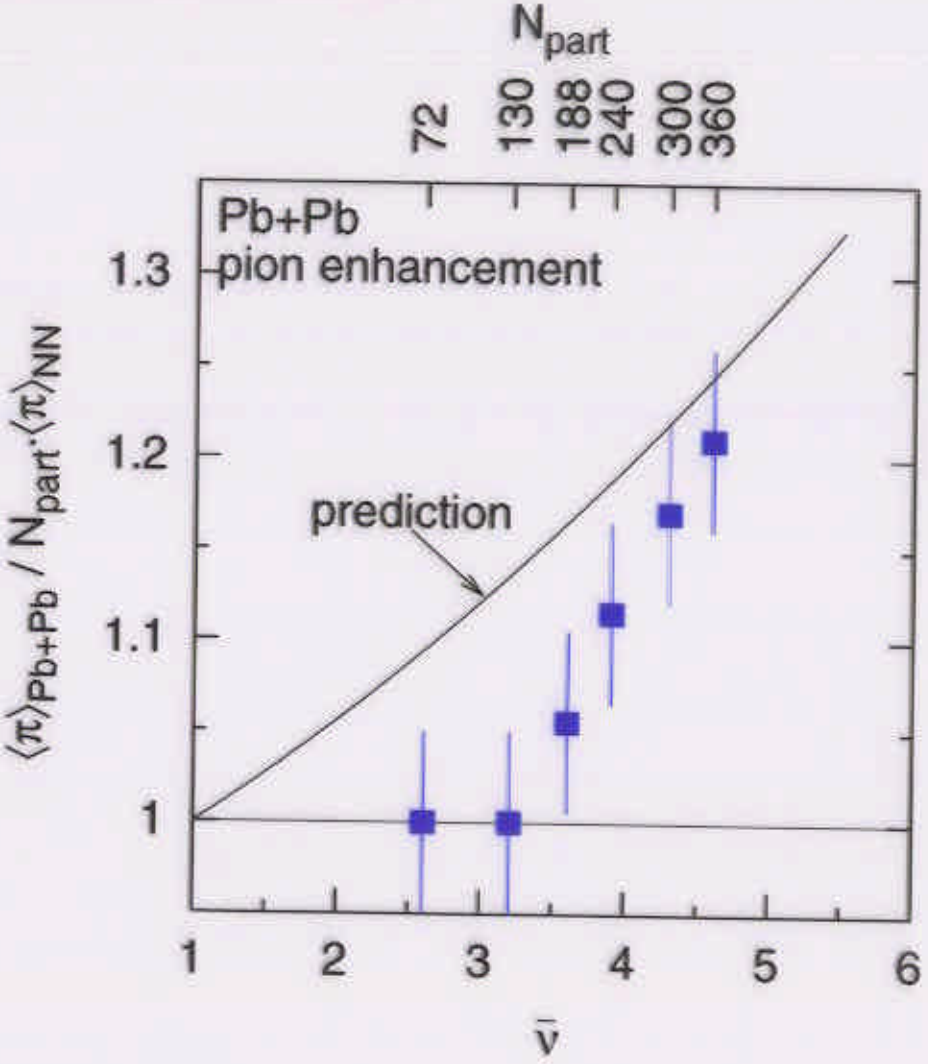
How to connect different reactions?

Linking object: position of the final state proton

Internal structure of p+p → convolute with proton distribution → predictions

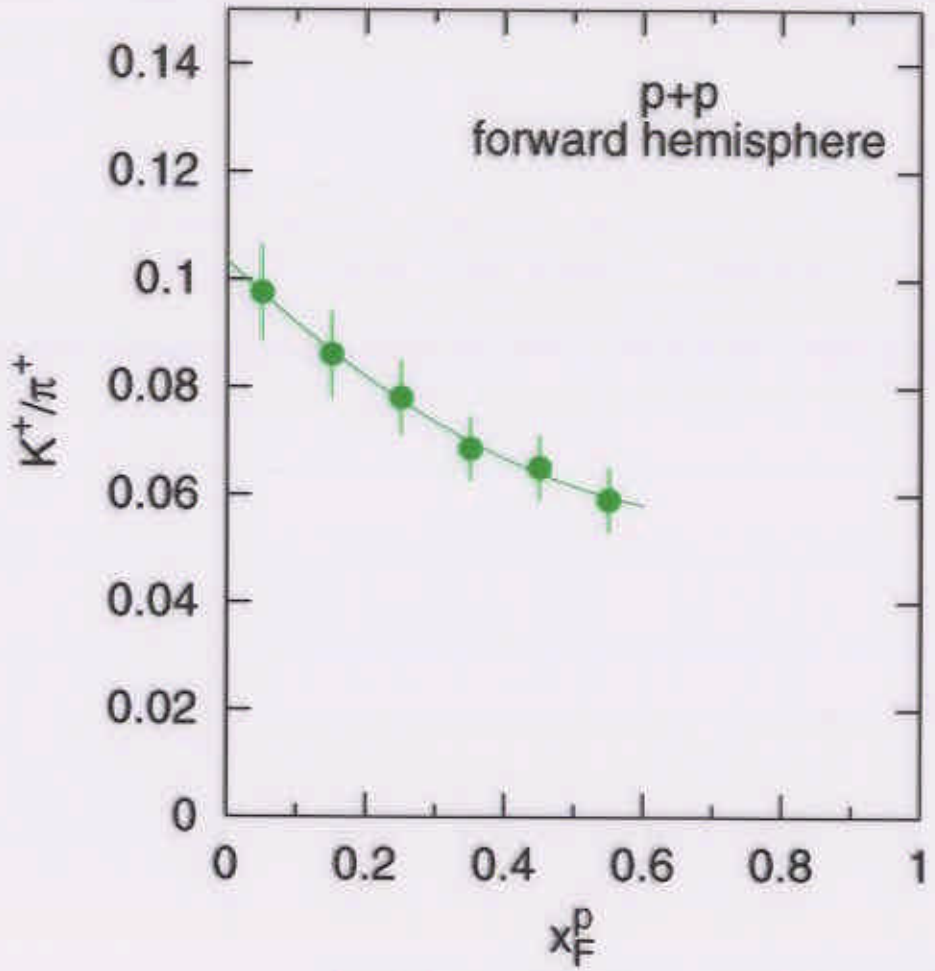
Controlling p+p centrality – pions

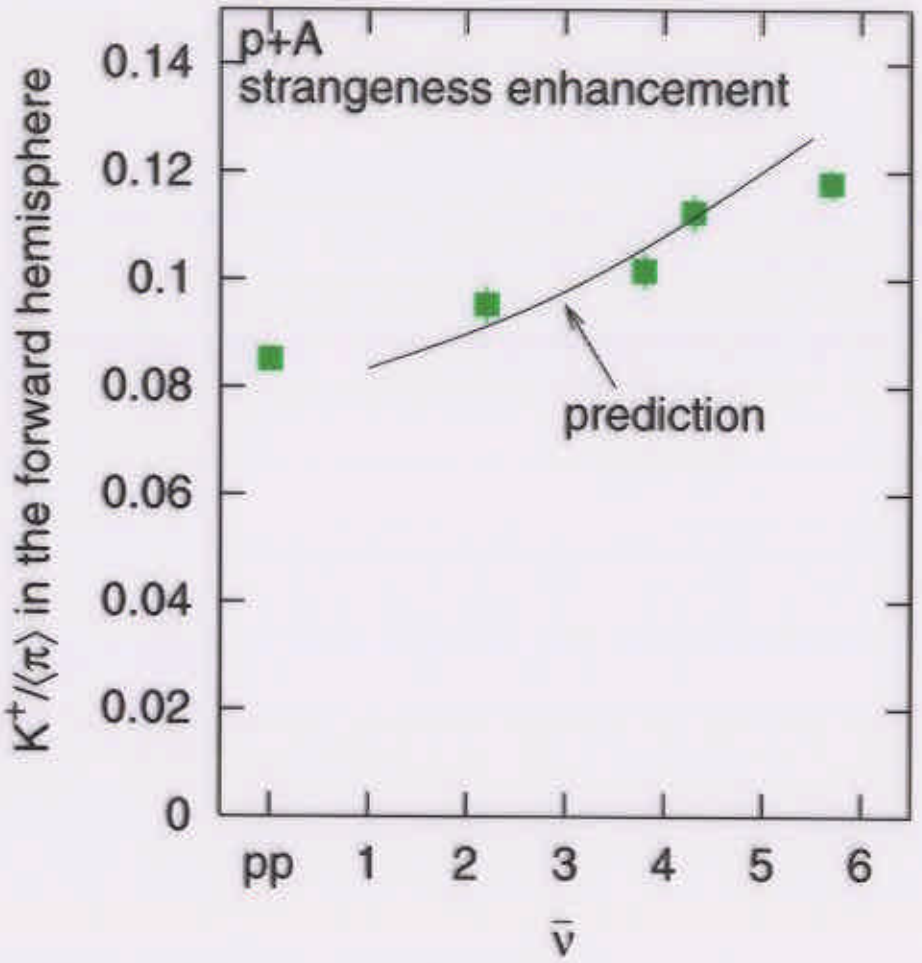




Increase can be predicted

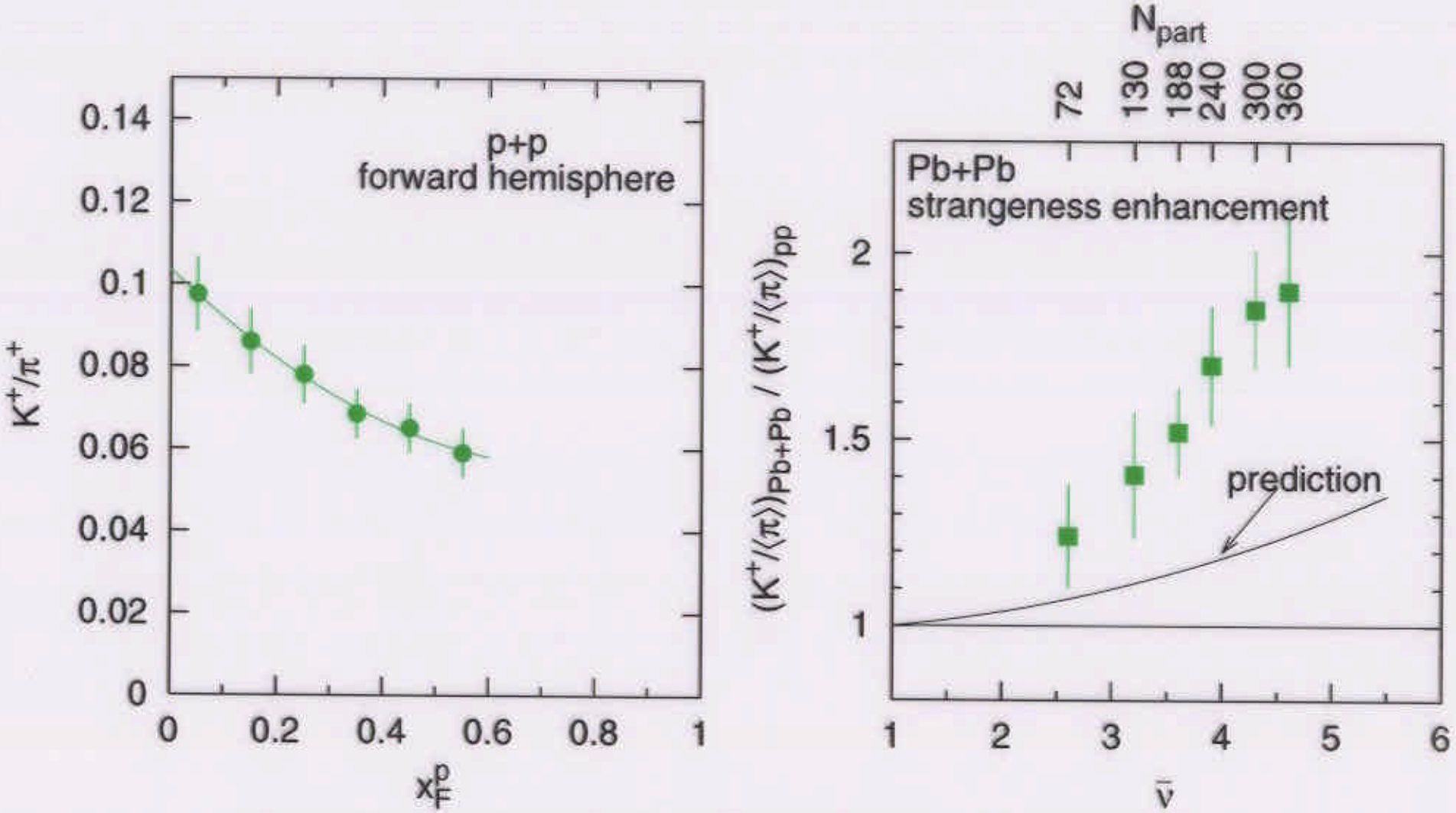
Controlling p+p centrality – kaons





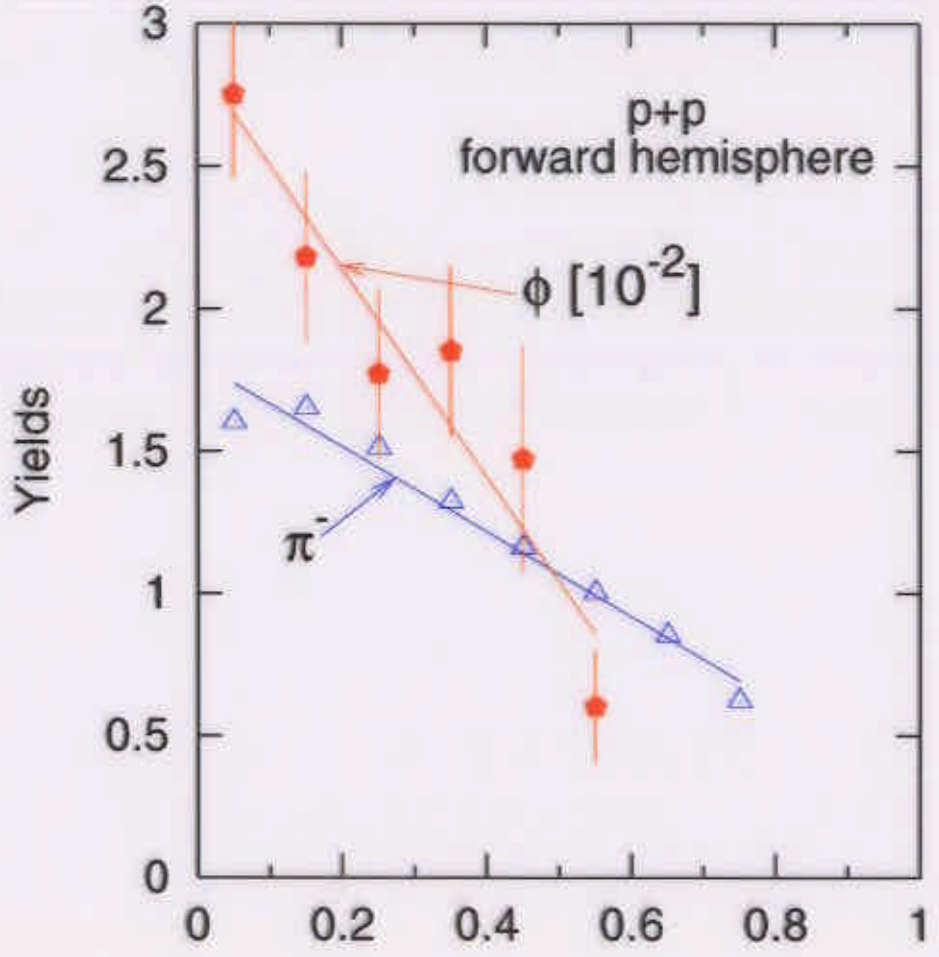
Leading proton correlates with observables → predictions

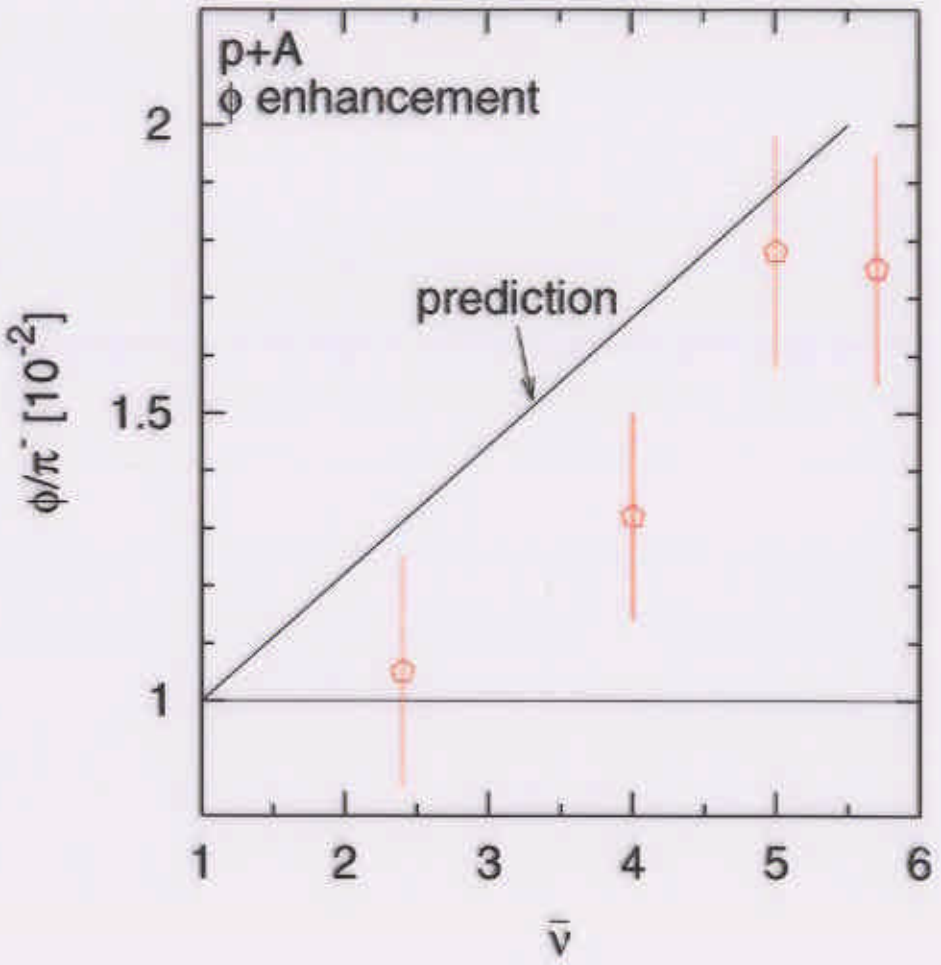
Controlling p+p centrality – kaons



Leading proton correlates with observables → predictions

Controlling p+p centrality – $\phi(1020)$





Increase of ϕ/π with $\bar{\nu}$, can be predicted

Conclusions

- NA49 has identified particles in the forward hemisphere with controlled centrality
- h+A collisions with different target, projectile and energy are studied
- Observables essentially depend on ν
- Leading proton can characterize the event
  Below the level of single,
  double inclusive studies with the outgoing baryon
  Correlations → predictions on p+A and A+A
  Could replace the usual comparison to min.bias

Outlook

- News
  - Forward neutral detection (n, γ, π^0)
  - Study of n+p using d-beam
- Analysis priorities
  - Correlations: extend to more variables
  - High mass spectroscopy:
    key to the understanding of the baryon transfer?
- For this
  - Decisively more statistics needed (several million)
  - Continued operation of the NA49 detector with hadron beams

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03. March 2000

ADDENDUM–5 to PROPOSAL CERN/SPSLC/P264

Status and Future Programme of the NA49 Experiment

Abstract

The status and future programme of the NA49 experiment is presented in two parts. In **Part I** the perspectives of the heavy ion programme with respect to the study of energy dependence and open charm are given. In **Part II** some results illustrating the physics potential of p+p and p+A data are presented and the intention to continue NA49 for a study of hadronic physics with proton and pion beams is outlined.