Strangeness production associated to a high-p_T particle in Pb-Pb collisions with ALICE

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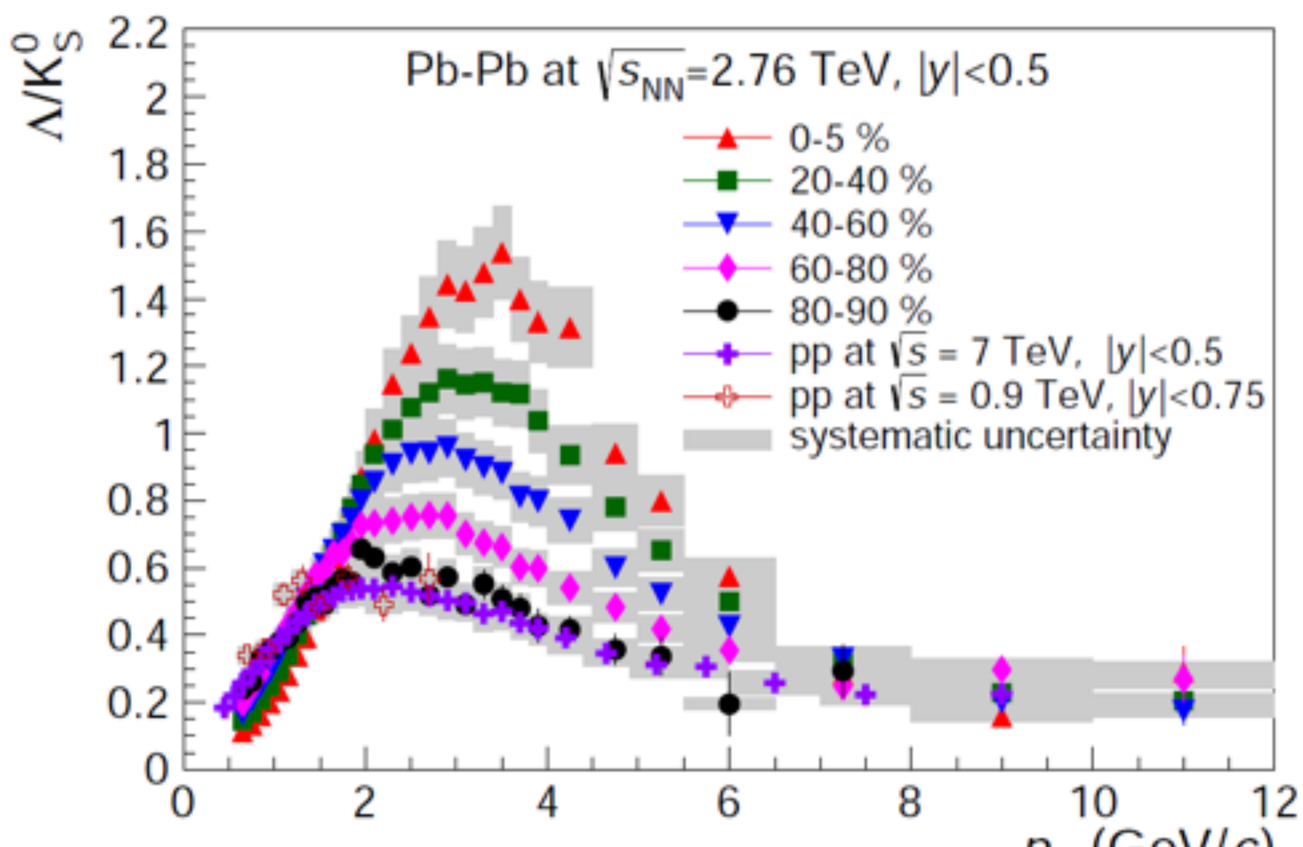
Outline

- Motivation
- ALICE detector
- Strange particle reconstruction.
- $h^{\pm}$-V0 correlations
  - Jet-like production
  - Bulk production
- Summary

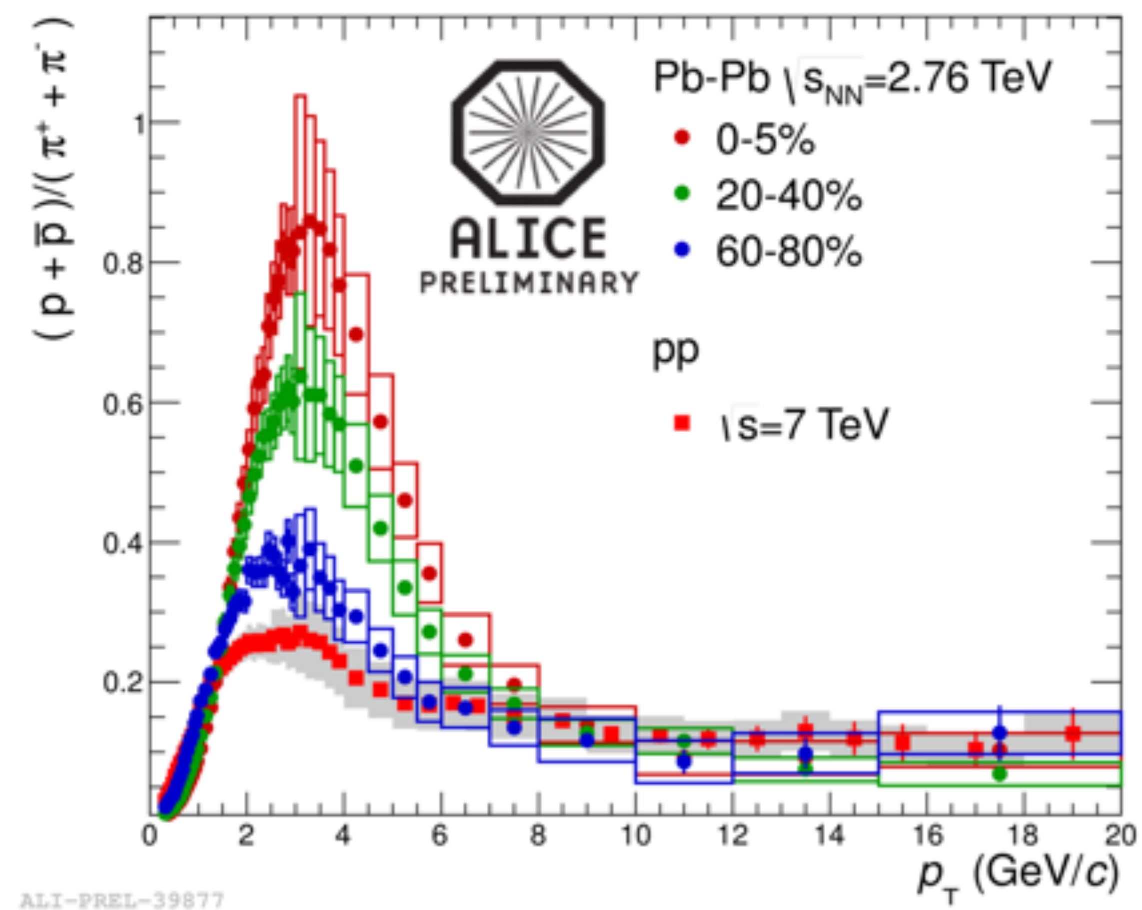
Λ/K^0_S in bulk and peak

Motivation

- Is the baryon/meson enhancement a consequence of bulk collectivity?
  (radial flow or/and parton coalescence, ...?)

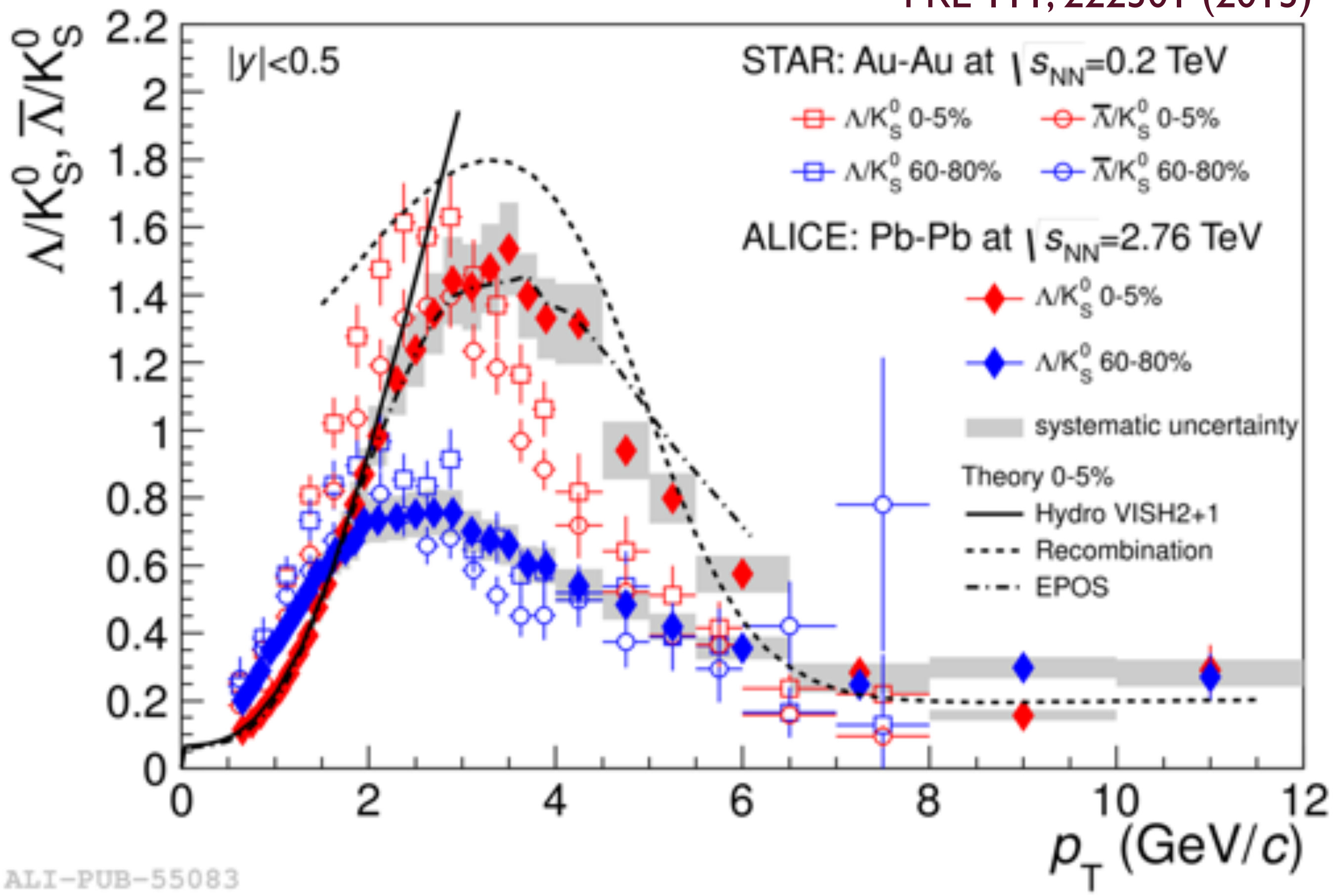


PRL 111, 222301 (2013)



More about Λ/K^0_S

PRL 111, 222301 (2013)



-Low p_T

-Described by Hydrodynamical model calculation (up to 2 GeV/c) C. Shen, U. Heinz, P. Huovinen and H. Song, Phys. Rev. C **84**, 044903 (2011).

- Intermediate p_T

-Recombination model

Overestimates the Λ/K^0_S enhancement. R. Fries, V. Greco, P. Soresnen, Annu. Rev. Nucl. **58**, 177 (2008).

-EPOS

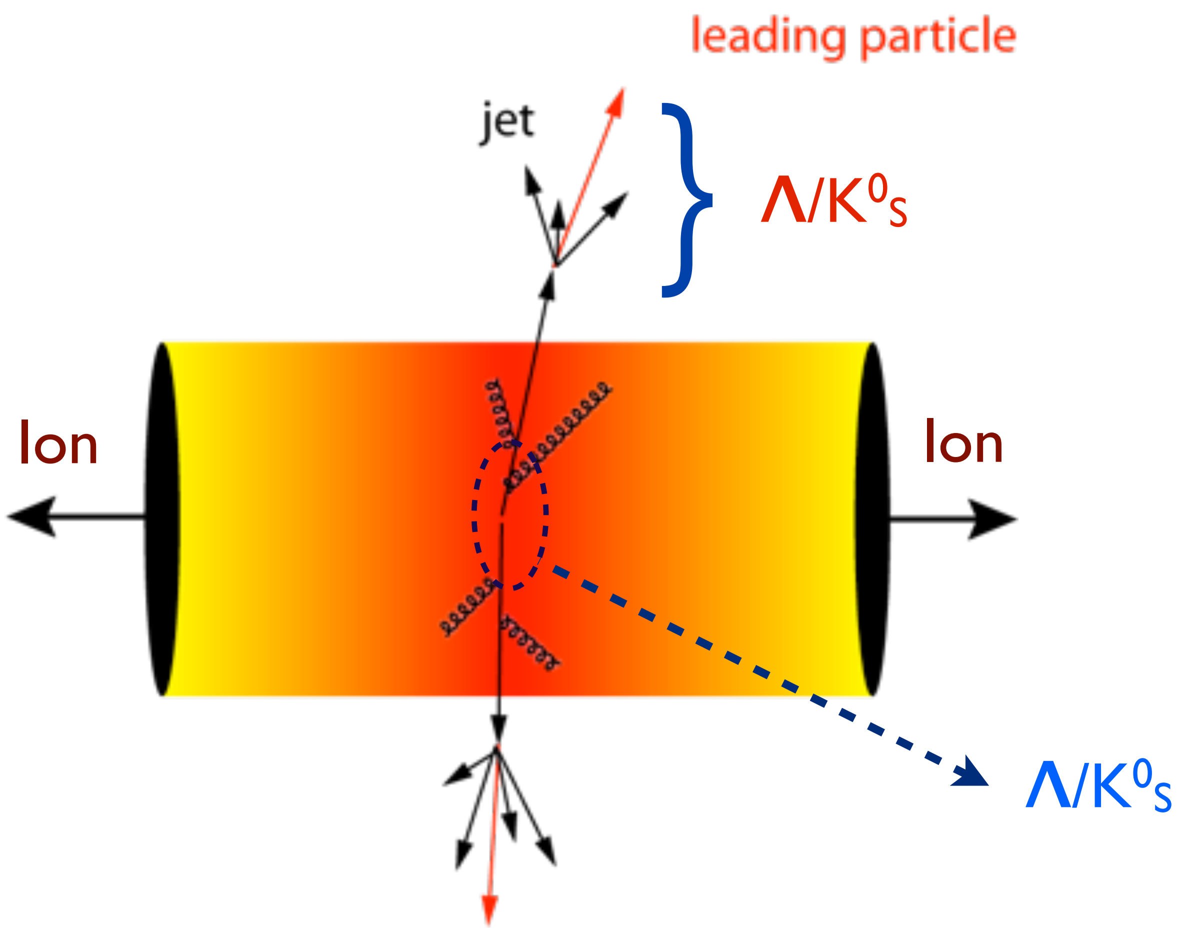
Interaction between jets and a hydrodynamical expansion of the system. Qualitatively ok, it reproduces the maximum. K. Werner, Phys. Rev. Lett. **109**, 102301 (2012).

- High p_T

-Parton fragmentation regime

Values are similar to the ones in proton-proton collisions

We want to understand the origin of the Λ/K^0_S enhancement by separating the hadrons produced in correlation with a high-p_T particle from the ones produced in the thermalized bulk.



Is the baryon/meson enhancement related to the collectivity effects in the plasma phase or is there also an effect due to jet fragmentation modification in the medium?

ALICE

VZERO

-Trigger

-Centrality

ITS

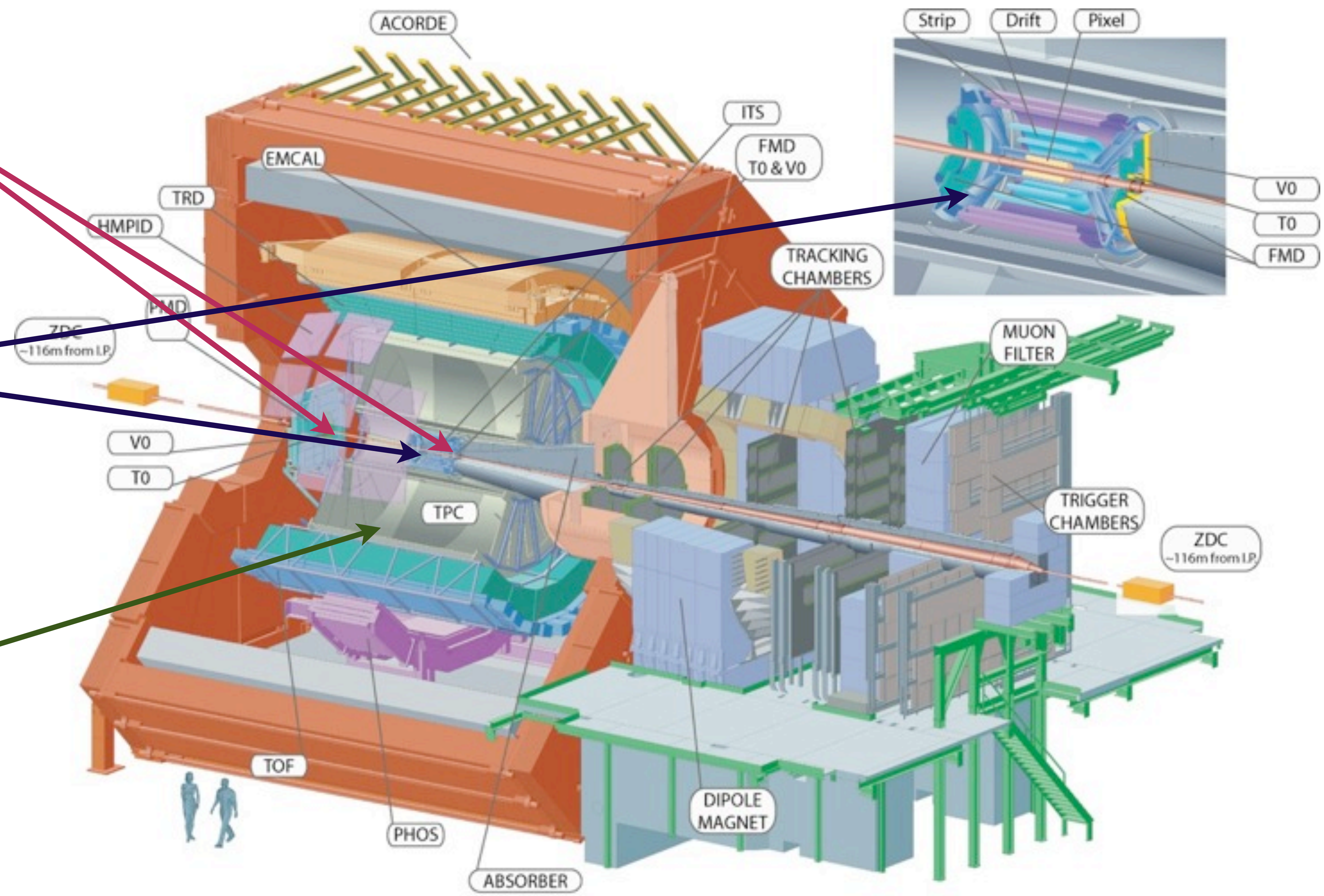
-Vertexing

-Tracking

TPC

-Vertexing

-Tracking



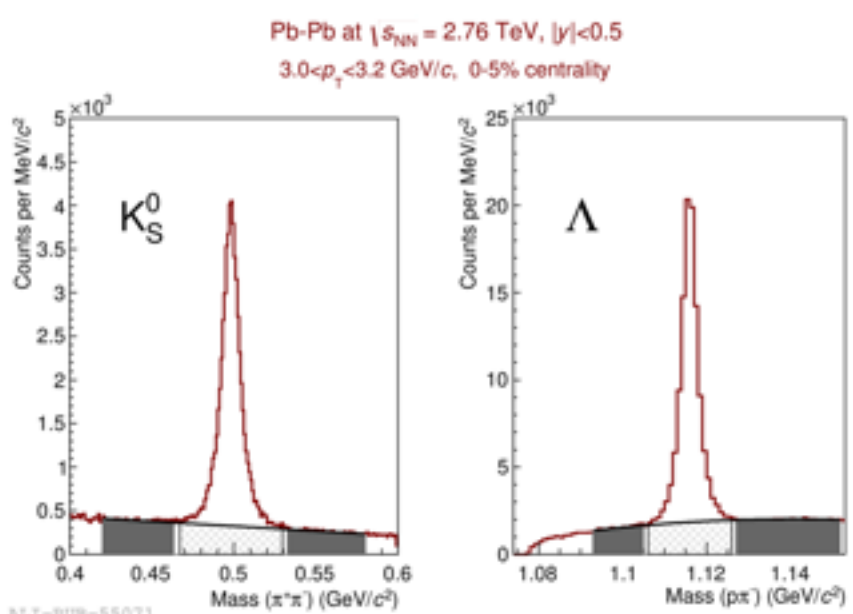
Strangeness in ALICE

The strange hadrons (K^0_S, Λ, Ξ, Ω) are reconstructed using the kinematical and topological properties of their decays products.

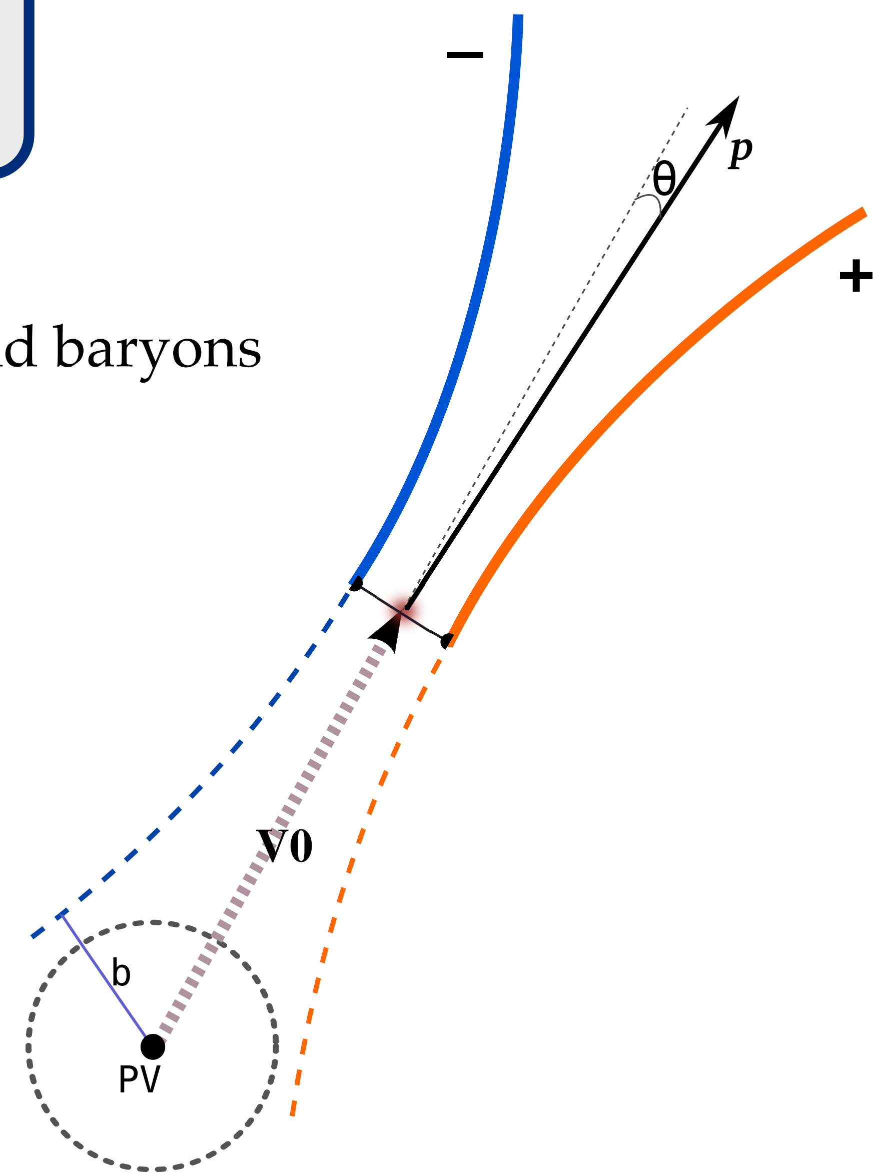
$K^0_S \rightarrow \pi^+\pi^-$ (B.R. 69.2%)
$\Lambda \rightarrow p\,\pi^-$ (B.R. 63.9%)

Single reconstruction technique allows for:

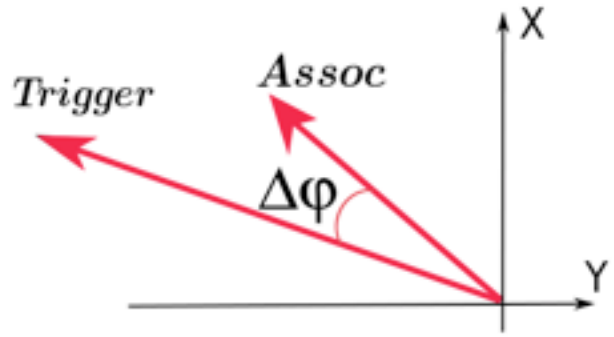
- Reconstruction of both strange mesons and baryons
- Wide transverse momentum range
- Good control of systematic uncertainties



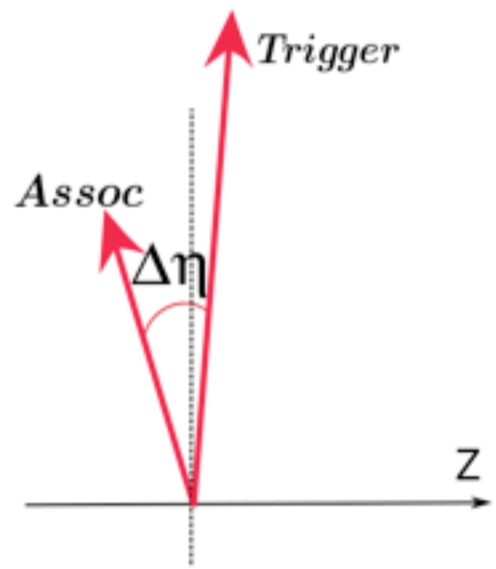
arXiv:1307.5530 [nucl-ex]



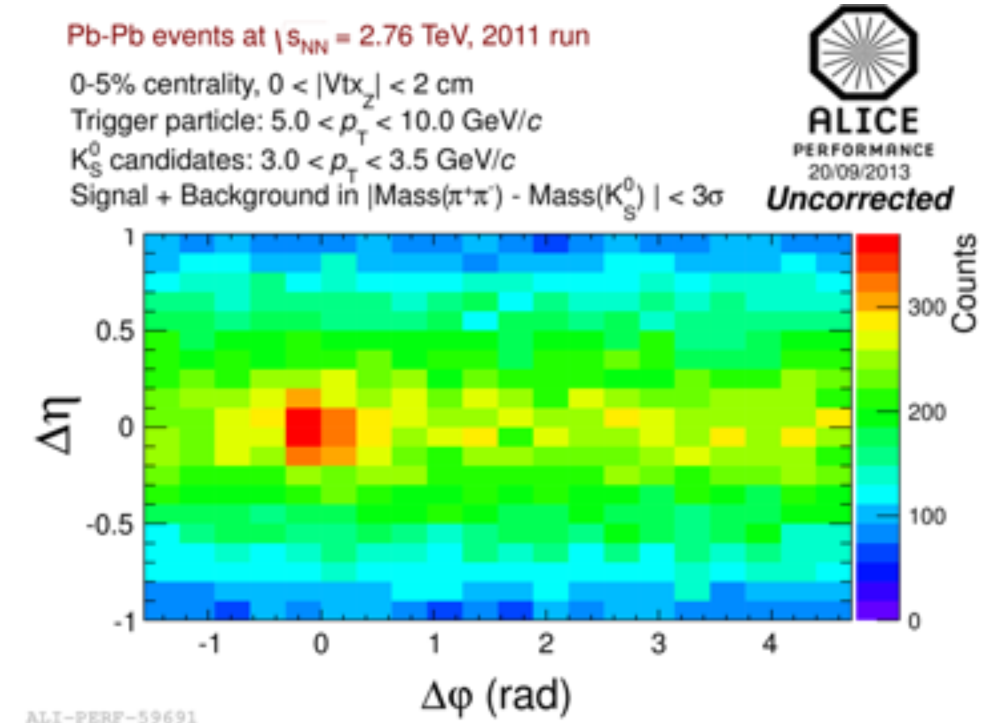
Hadron-V0 correlations



$\Delta\varphi = \varphi_{Trig} - \varphi_{Assoc}$



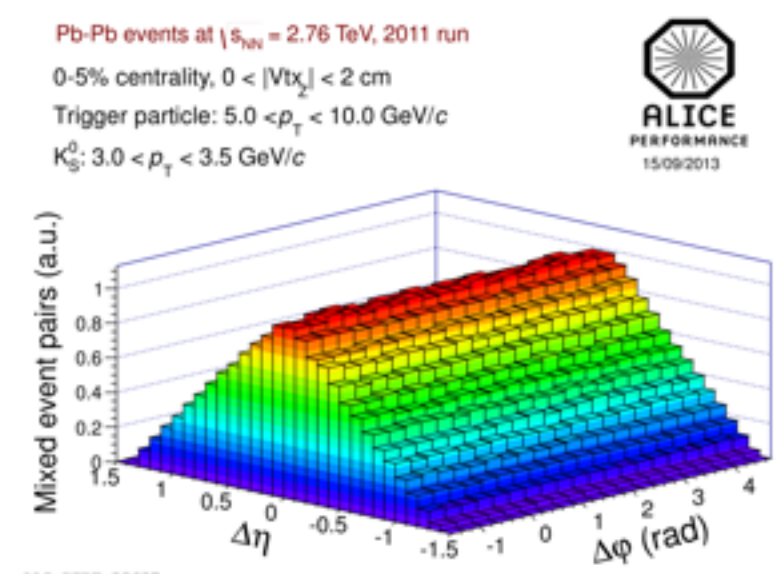
$\Delta\eta = \eta_{Trig} - \eta_{Assoc}$



Trigger particle:
all charged particles within
$5 < p_T < 10$ GeV/c

Associated particle:
K^0_S and Λ in the range
$2 < p_T < 7$ GeV/c

Detector acceptance is taken into account with the **mixed-event correction.**



Hadron-V0: bulk and jet

$$\frac{1}{N_{Trig}}\frac{d^2N_{assoc}}{d\Delta\phi\Delta\eta} = \frac{S(\Delta\phi,\Delta\eta)}{B(\Delta\phi,\Delta\eta)}$$

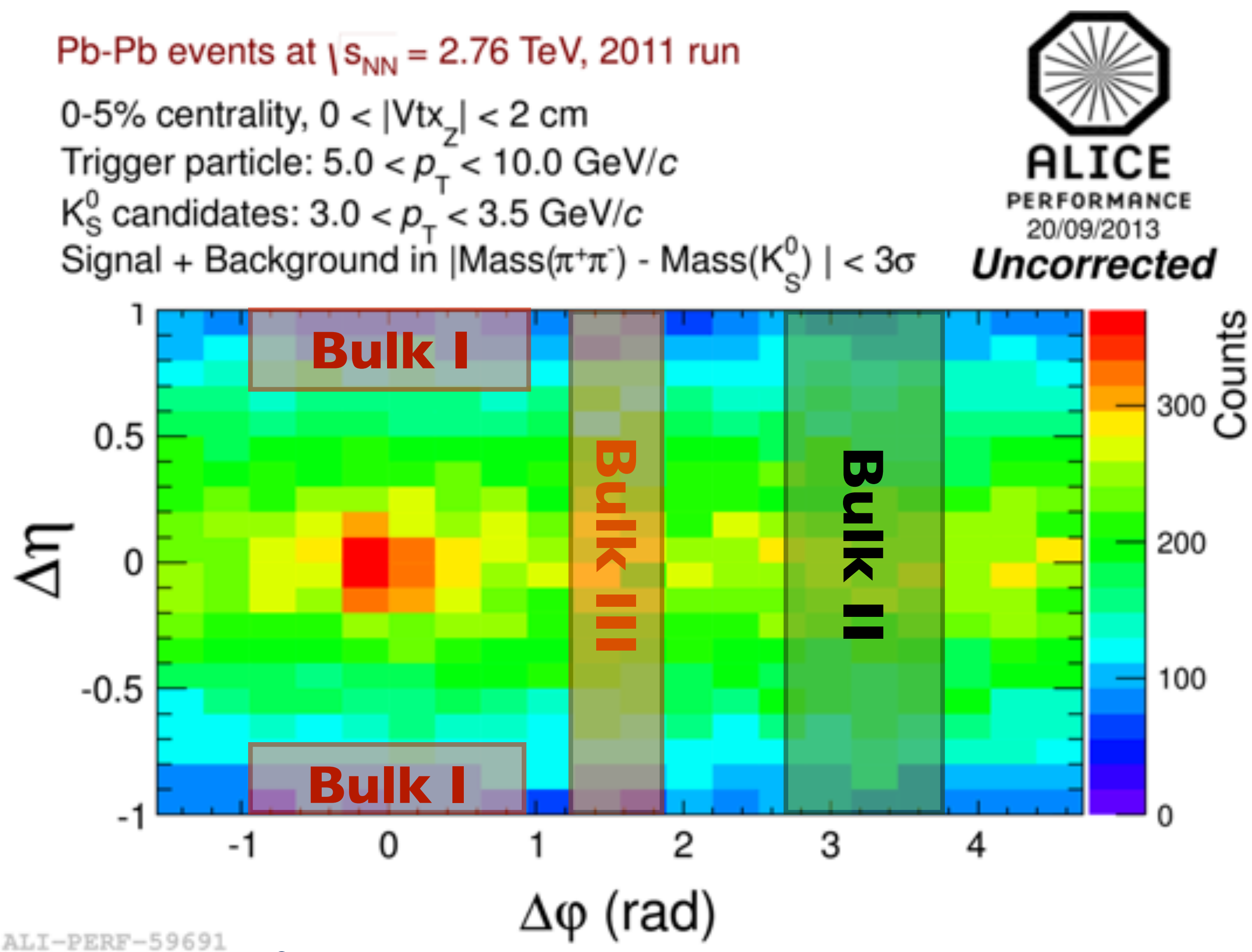
$$\begin{cases} S(\Delta\phi,\Delta\eta) = \dfrac{1}{N_{Trig}}\dfrac{1}{\epsilon(p_T)}\dfrac{d^2N_{same}}{d\Delta\phi\Delta\eta} \\ B(\Delta\phi,\Delta\eta) = \alpha\dfrac{d^2N_{mixed}}{d\Delta\phi\Delta\eta} \end{cases}$$

Jet production:

1) Projection in $\Delta\eta$
2) Projection in $\Delta\varphi$

Bulk production:

We can test several samples according to the physics involved: ridge, away-side area.



Summary

- It is possible to compare the **Λ/K^0_S** associated to **the bulk** and the **Λ/K^0_S** obtained with particles produced in **association to a high-p_T particles**.

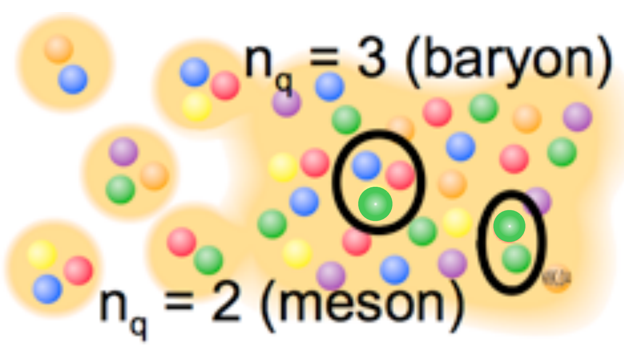
- This study can help to understand better the origin of the baryon/meson enhancement.

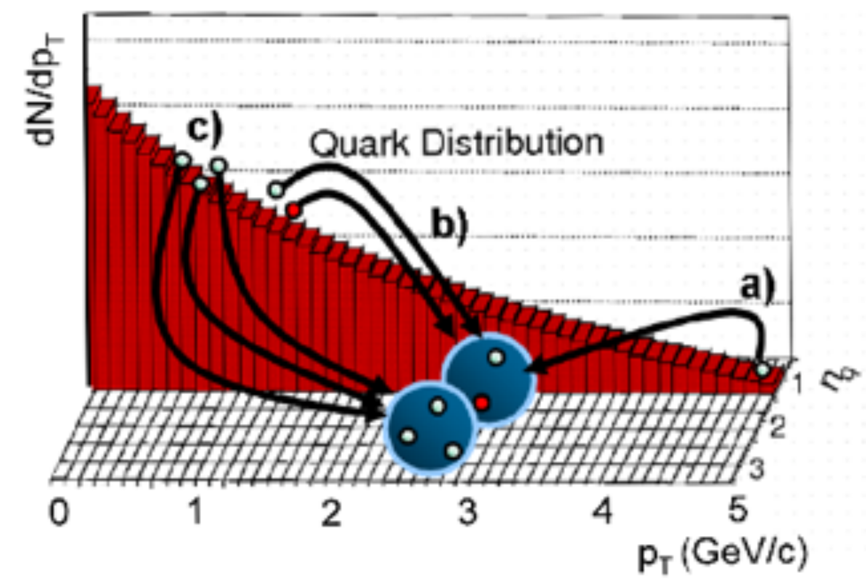
Back Up

Hadronization mechanisms

Low p_T

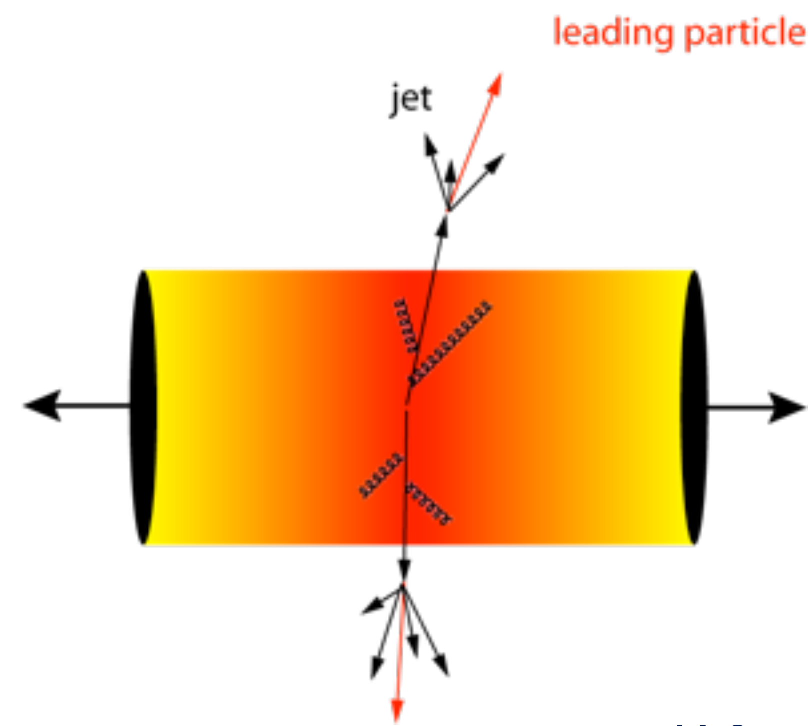
- Parton coalescence
  - The hadronization by coalescence requires that two (three) partons from the QGP are close in phase-space to form a meson (baryon).





- Parton fragmentation
  - At high values of p_T, partons are produced from initial hard processes.

High p_T

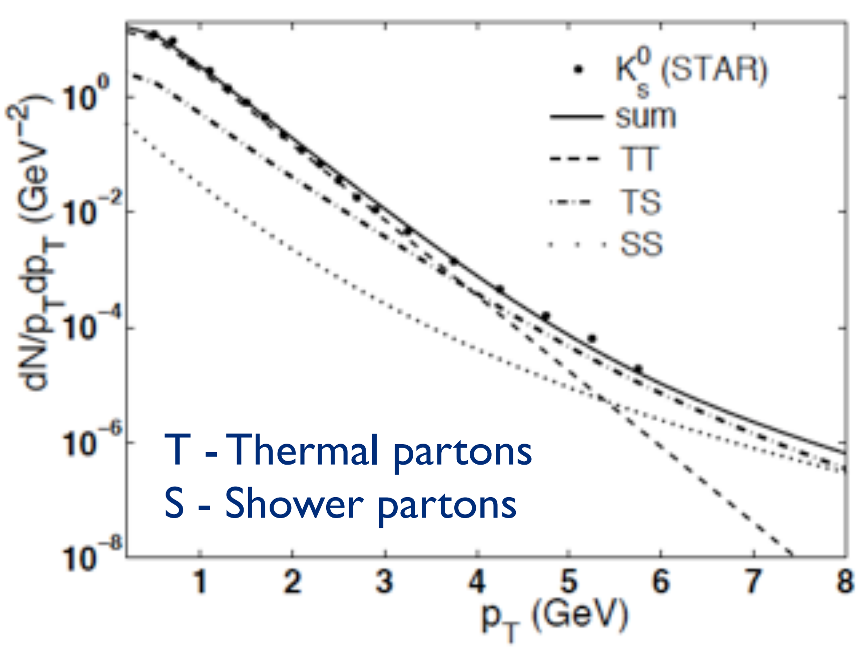


More hadronization mechanisms

At intermediate p_T:

A more advanced model of coalescence allows
for the recombination between partons from jets
with partons from the thermalized bulk.
[PRL 90, 202302 (2003), Phys.Rev. C73 (2006) 064904 , Phys.Rev. C75 (2007) 054904]

Au-Au collisions at $\sqrt{s_{NN}}$ = 200 GeV



Phys.Rev. C75 (2007) 054904