High-p_T suppression of Λ and K^0_s in Pb-Pb collisions at $\sqrt{s_{NN}}$= 2.76 TeV with ALICE

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Quark Matter 2011, Annecy

Outline

- Motivation
- Λ and K^0_s reconstruction
- Nuclear modification factors:
  - R_{CP}
  - R_{AA}
- Comparison to RHIC results

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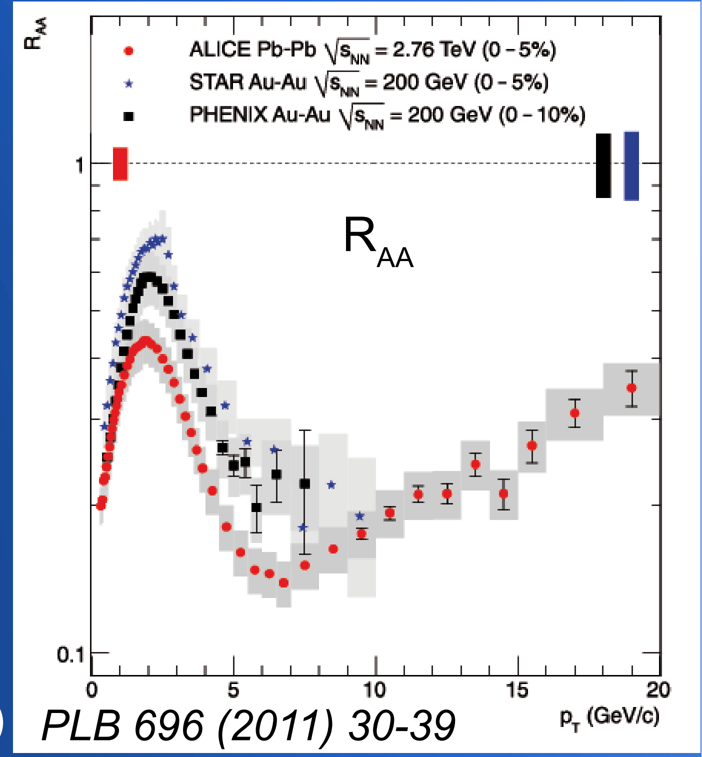
Sub-detectors of interest in this talk: ALICE TPC and ITS

Motivation

- **Why looking at high pt?**
  - Diagnostic potential to probe the created medium e.g the QGP via
    - the measurement of yields and particle ratios
    - comparison between AA and *pp* collisions

→ Parton energy loss as probe of the medium

- **Charged particle R_{AA}:**
  - Strong suppression in Pb-Pb collisions compared to *pp* around 6-8 GeV/c in p_T
  - Rise towards high p_T
- **Identified particles?**
- **Baryons vs mesons?**

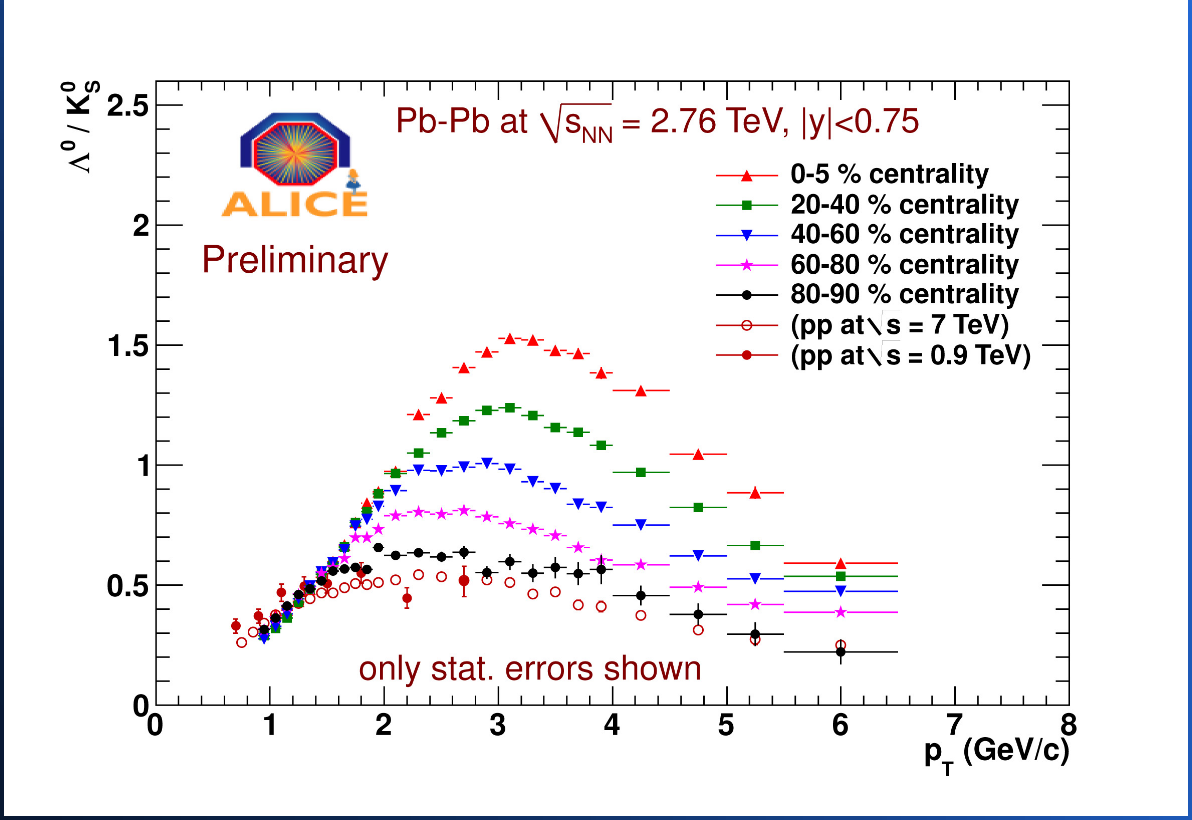


(J. Otwinowski (ID 548))

PLB 696 (2011) 30-39

Motivation

- Baryon meson anomaly for strange particles (Talk by J. Belikov (ID497))



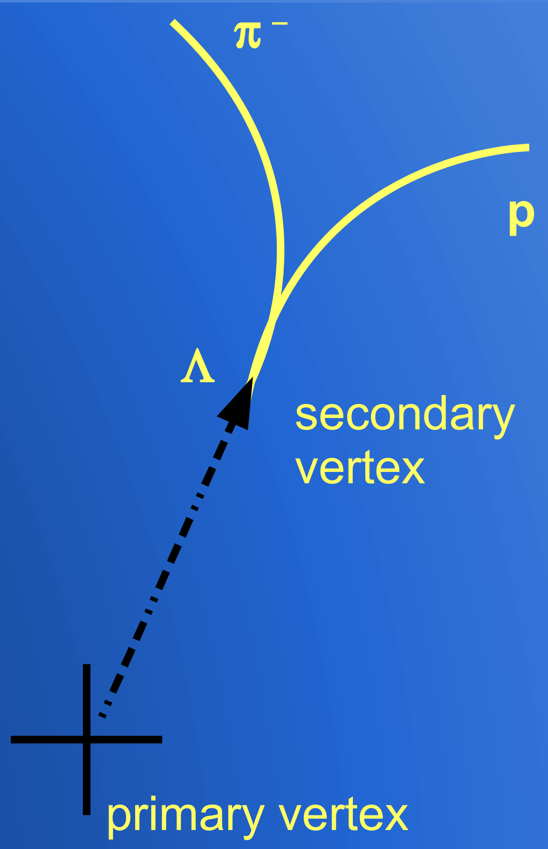
- What is the effect on R_{CP} and R_{AA}?

Motivation

- Measurement of identified particles at high p_T
  - Λ and K^0_s
  - No requirement of dedicated PID detector
- Reconstruction via week decay products:

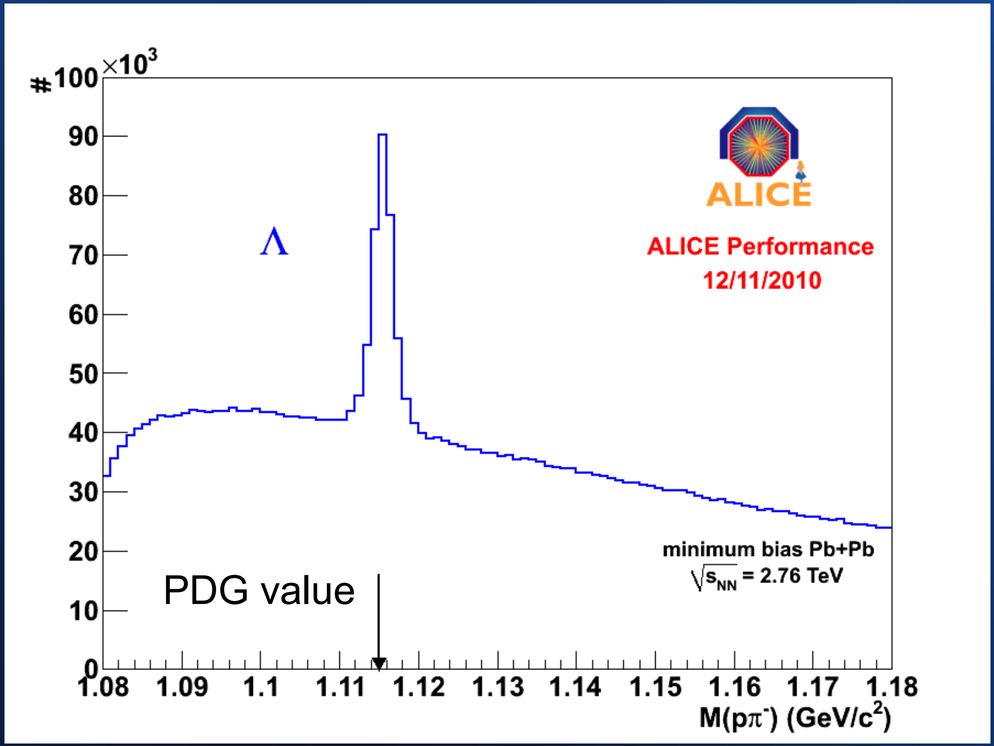
$$K^0_s \to \pi^+ \pi^- \qquad \Lambda \to \pi^- p$$

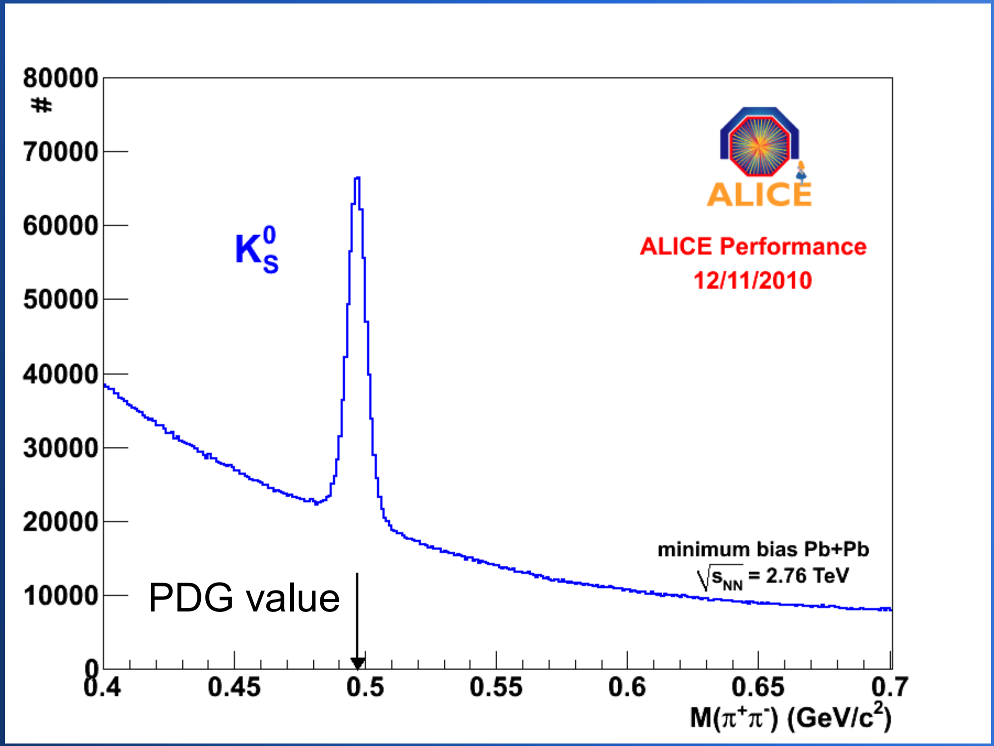
- Invariant mass analysis



Masses and width

Our “standard candles” for calibration of p_T scale and p_T resolution.



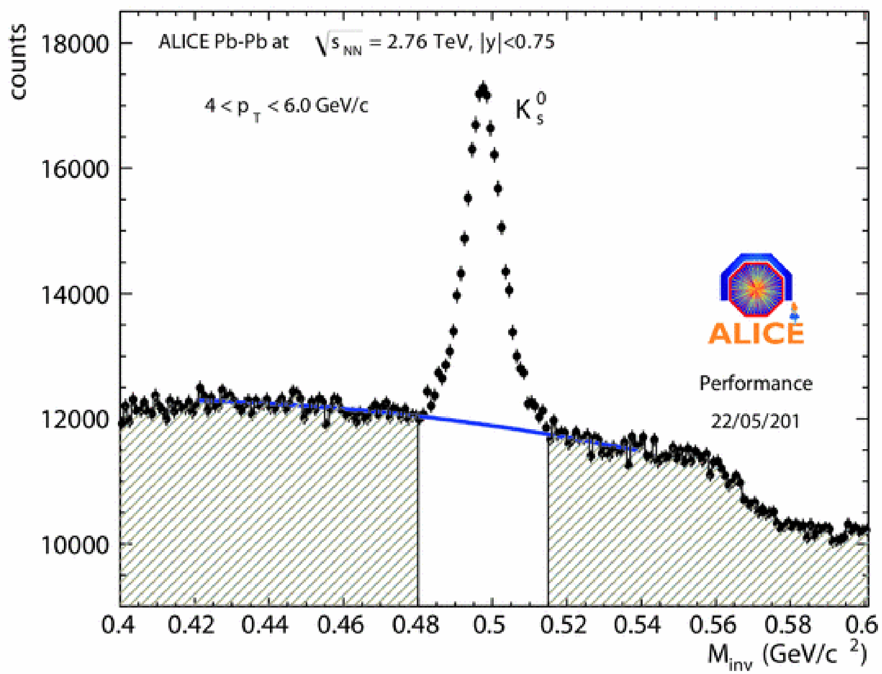


Masses and width

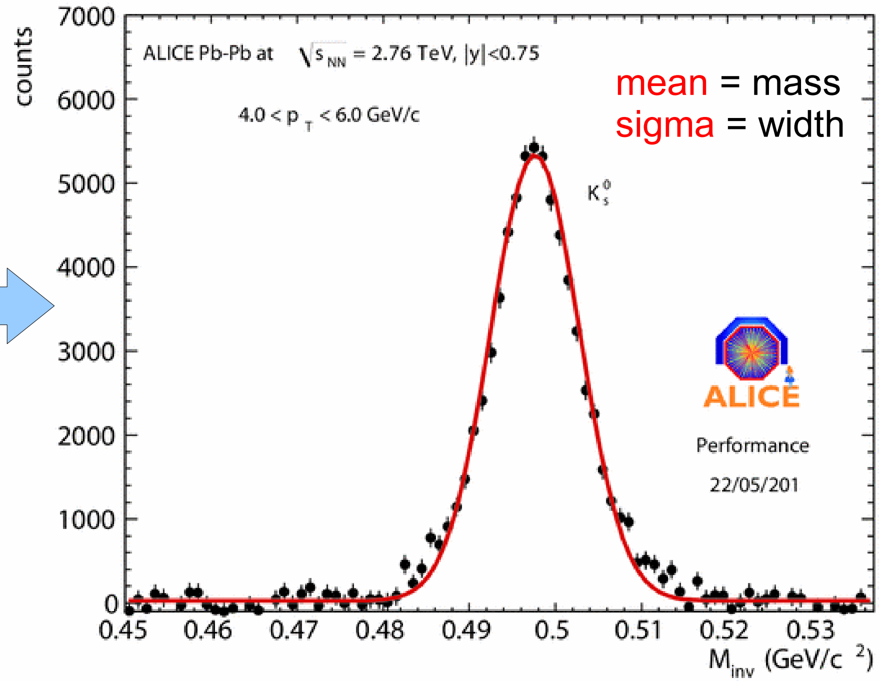
Fit of the background

Fit of the peak for mass and width extraction

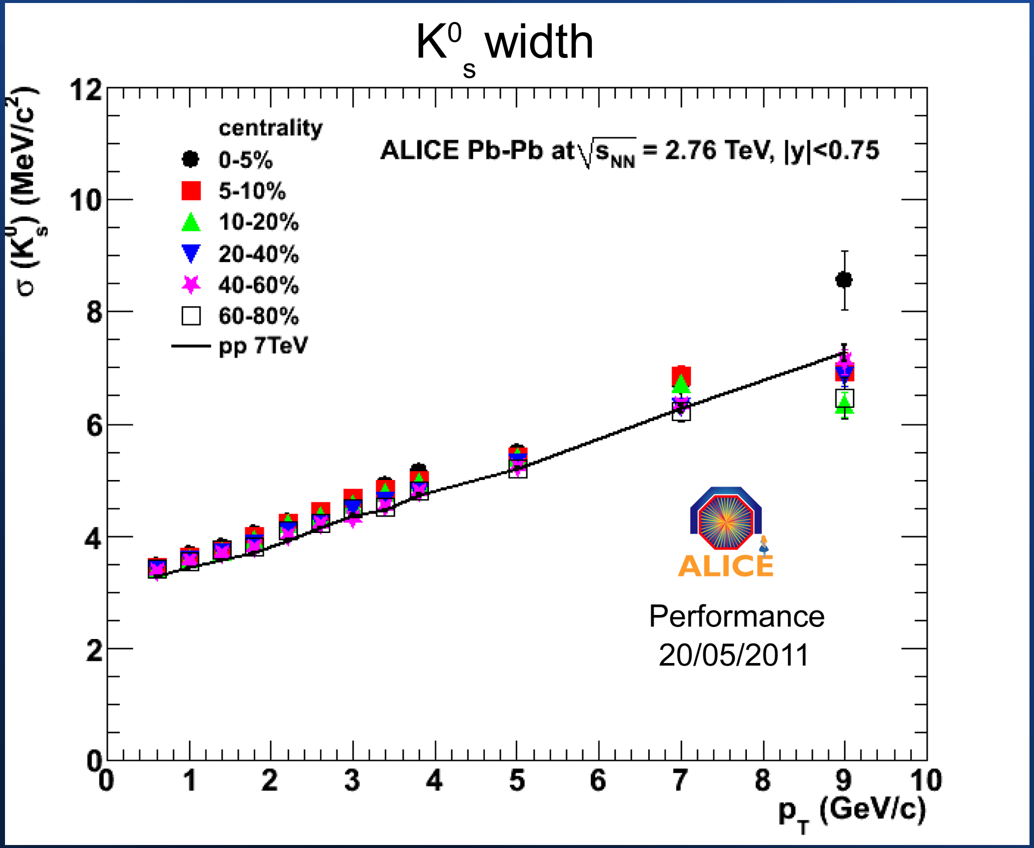
Function: polynomial of 1st or 2nd order

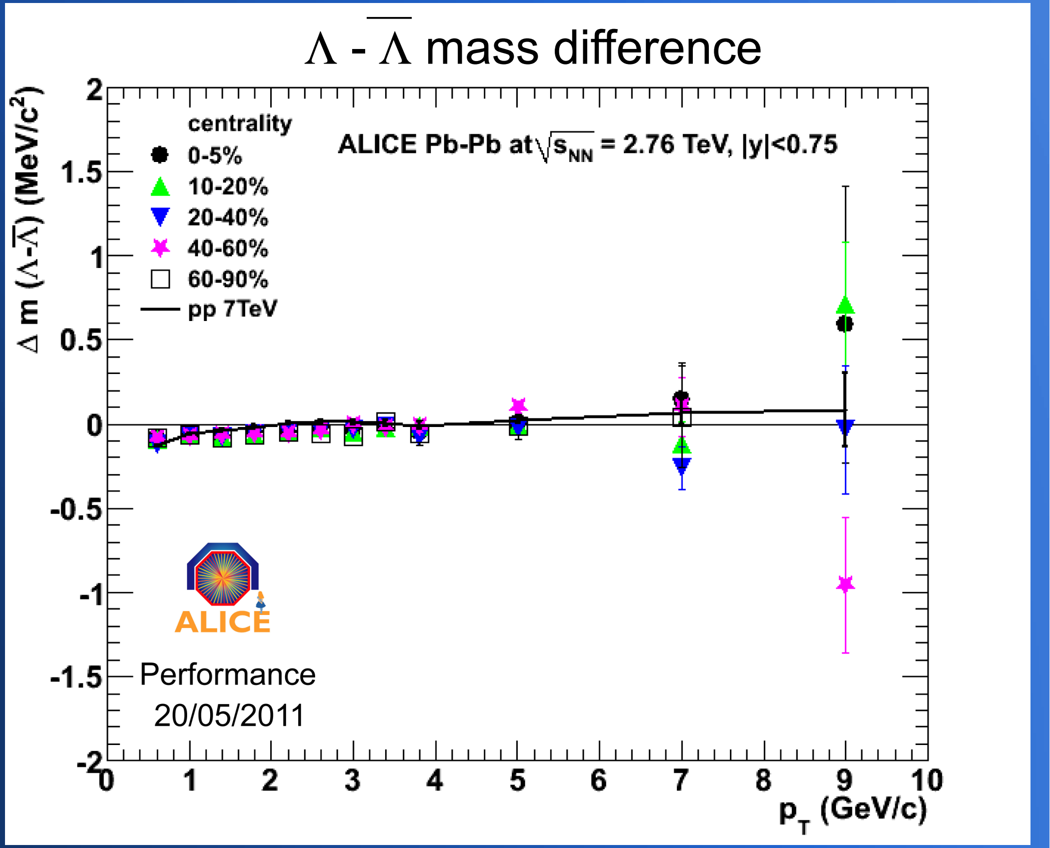


Function: Gaussian + polynomial of 1st order



Masses and width



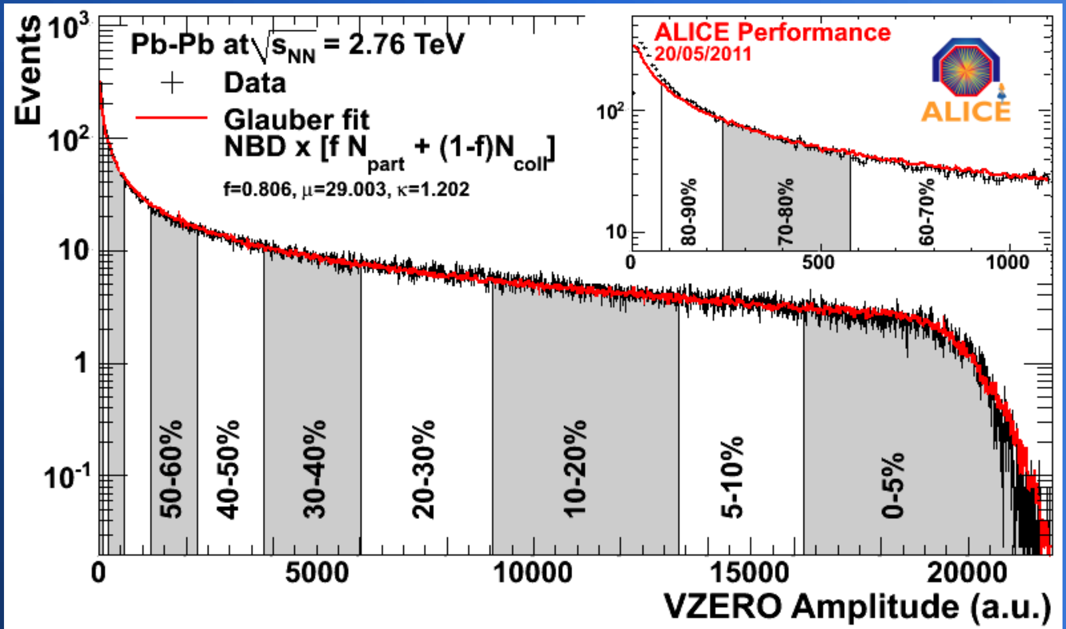


Analysis

- Data sets:

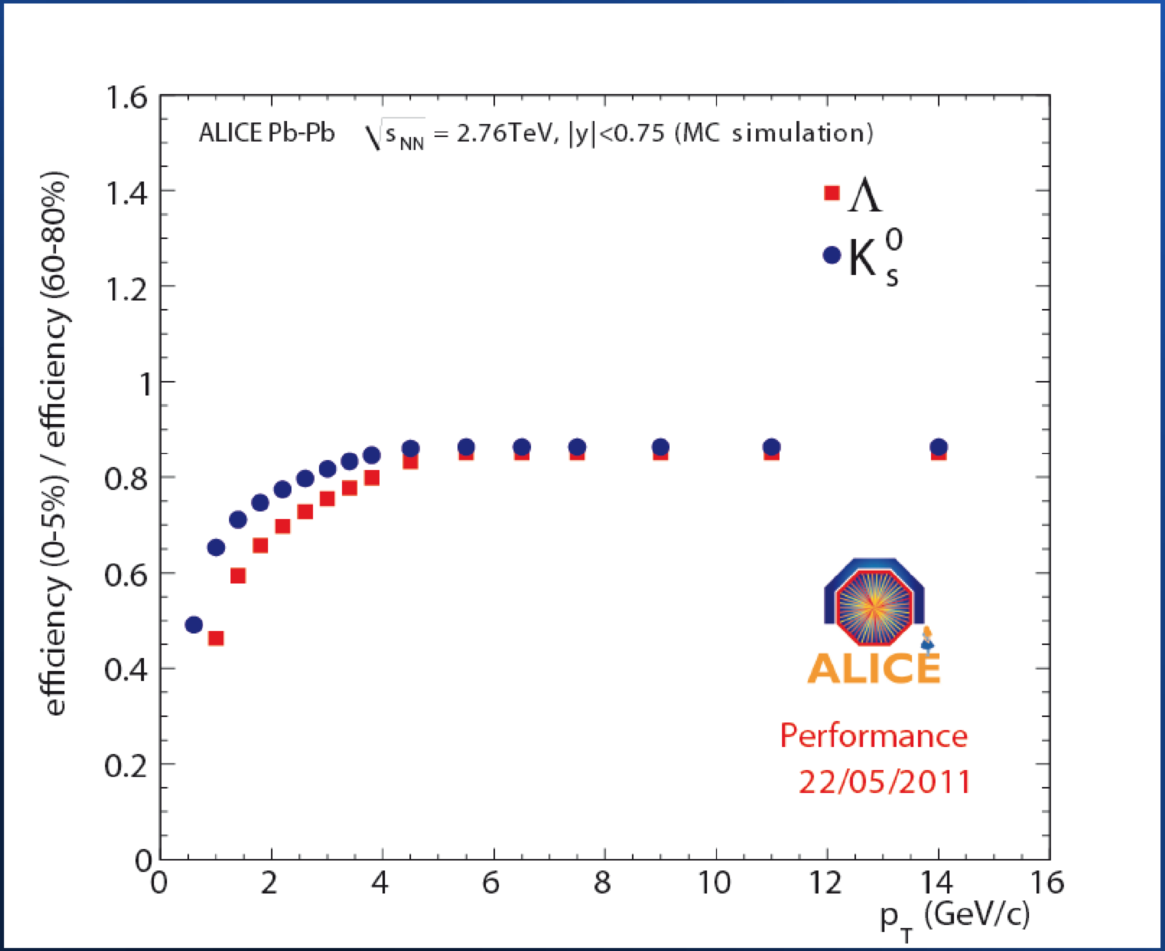
Centrality bin	Number of events
0 - 5%	876,896
60 - 80%	3,478,958
pp	16,627,679

- Acceptance cuts:
  - mother rapidity < 0.75
  - daughters $|\eta| < 0.8$



Talk by A. Toia (ID 72)

Efficiency and systematics



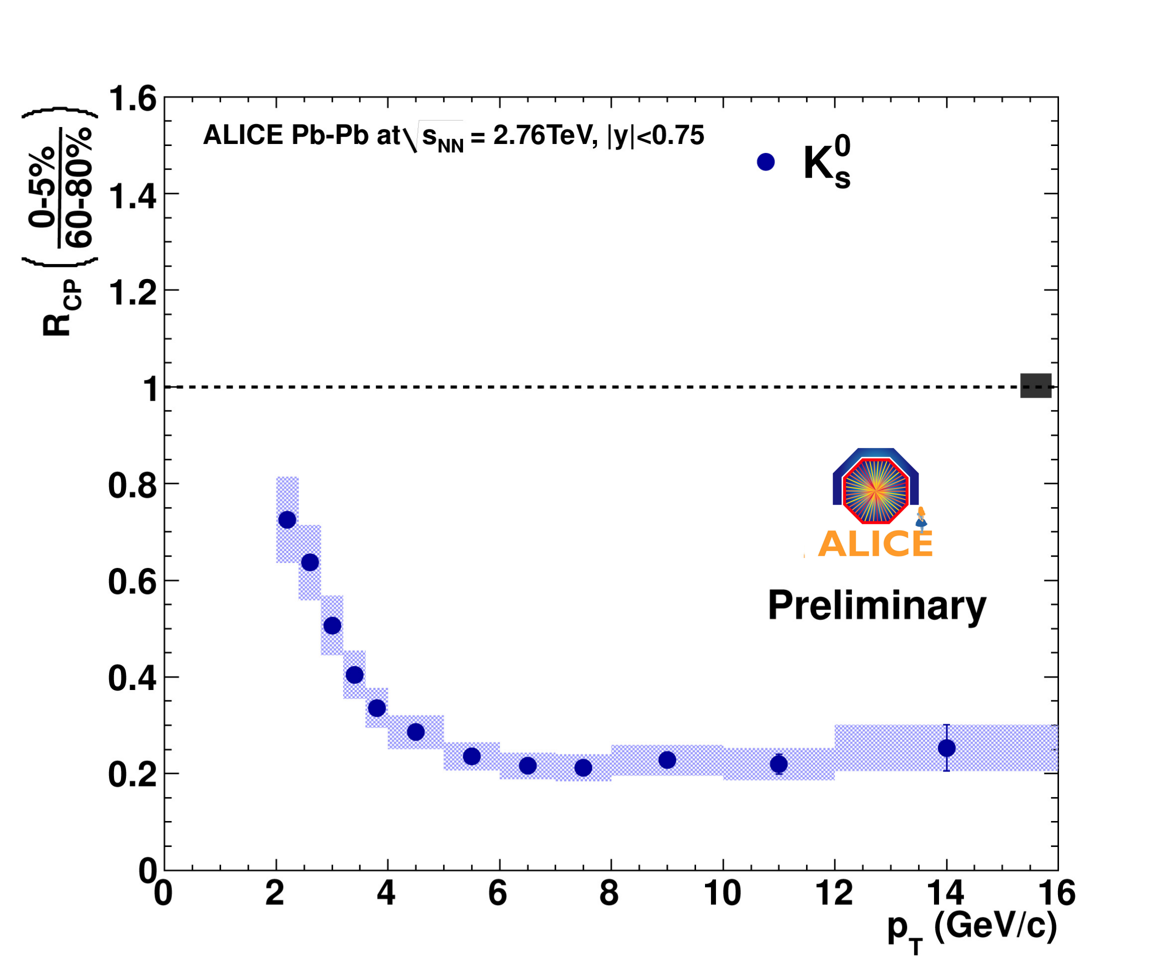
- Most of the systematics cancel in spectra ratios
- Ratio of efficiency for 0-5% and 60-80% enters into the systematic errors of R_{CP} and R_{AA}
- Feed down correction is applied for Λ

  → contribution to the systematic error at lower p_T

R_{CP}: K^0_s (0-5%)/(60-80%)

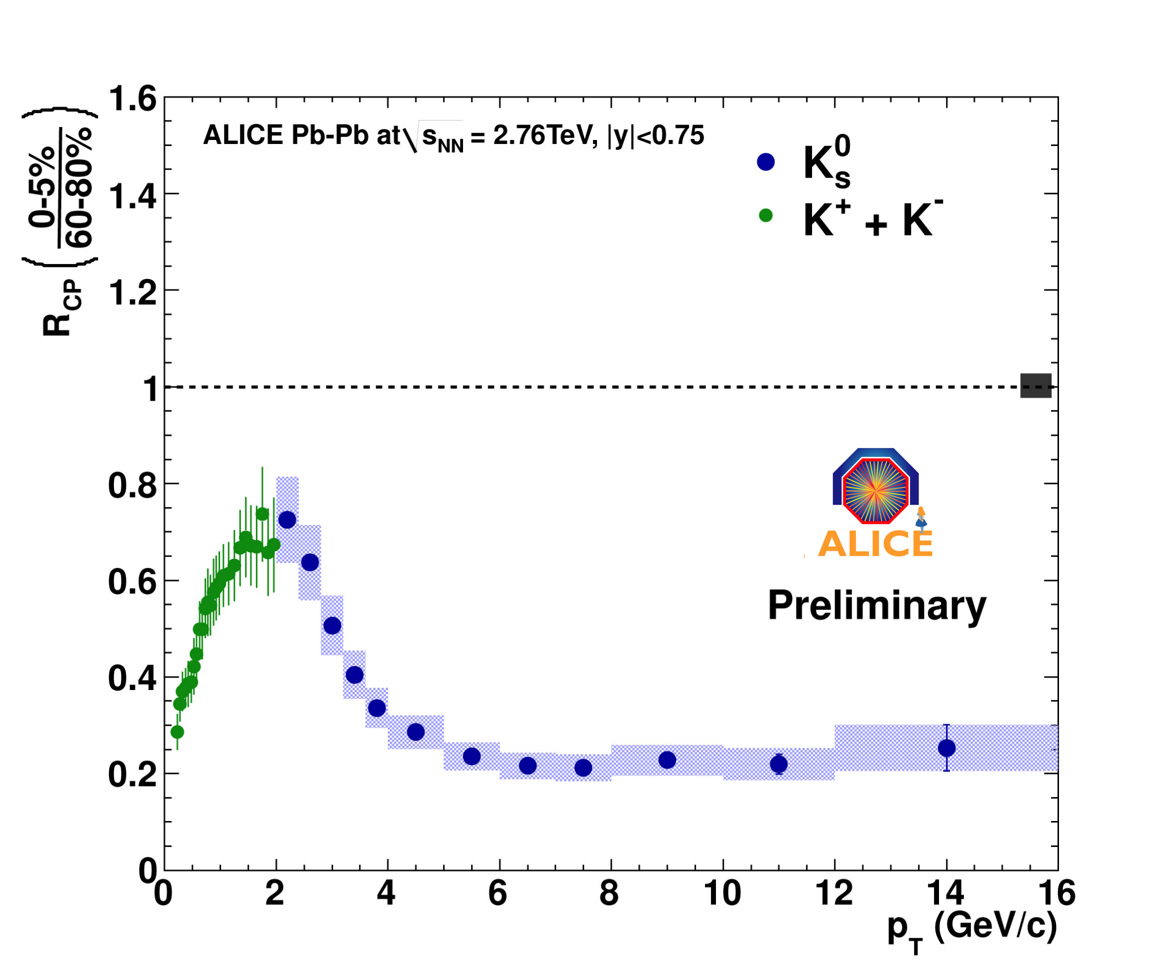
$$R_{CP} = \frac{dN_{central}/dp_T}{dN_{periph}/dp_T} \cdot \frac{\langle N_{coll} \rangle_{periph}}{\langle N_{coll} \rangle_{central}}$$

R_{CP}: K^0_s (0-5%)/(60-80%)



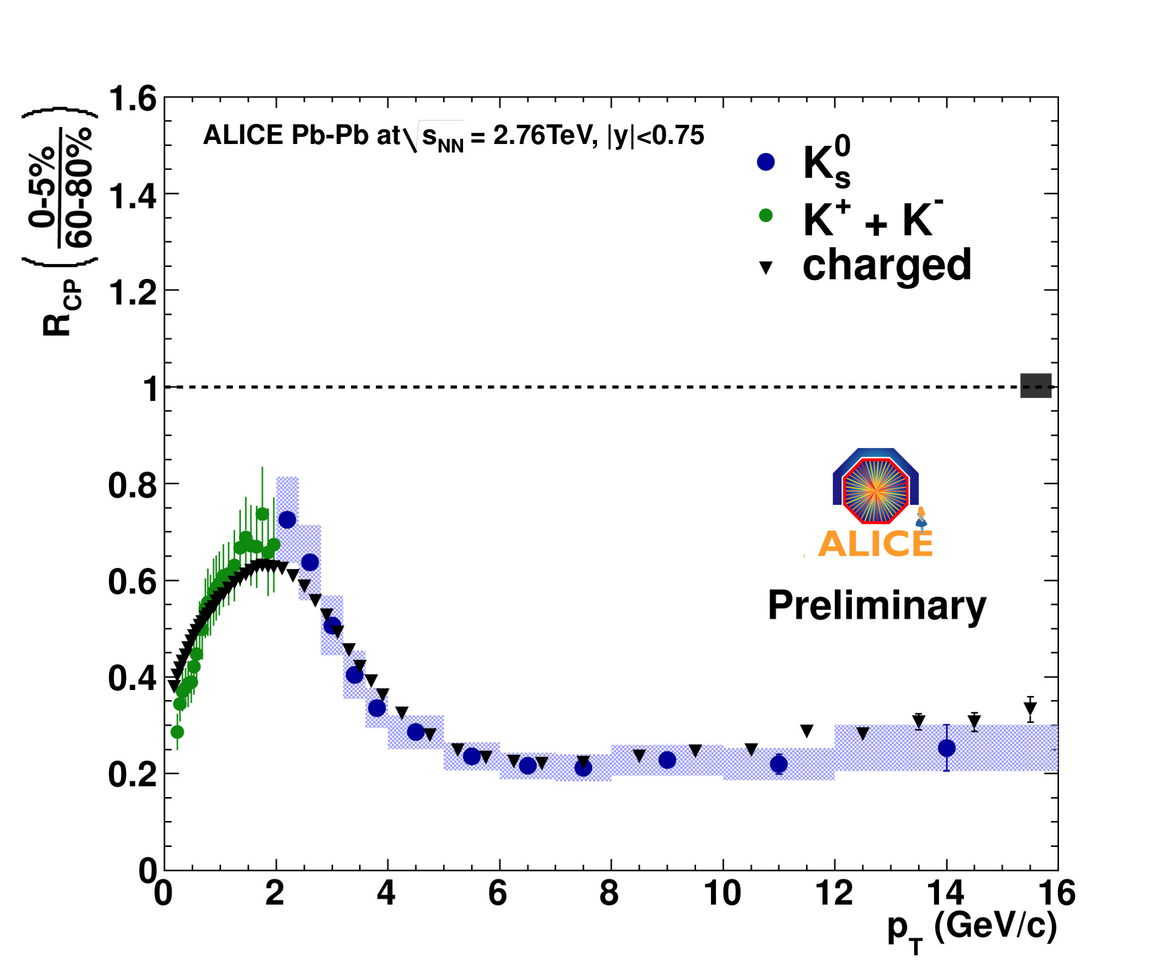
$$R_{CP} = \frac{dN_{central}/dp_T}{dN_{periph}/dp_T} \cdot \frac{\langle N_{coll} \rangle_{periph}}{\langle N_{coll} \rangle_{central}}$$

R_{CP}: comparison K^0_s – K^{+-}



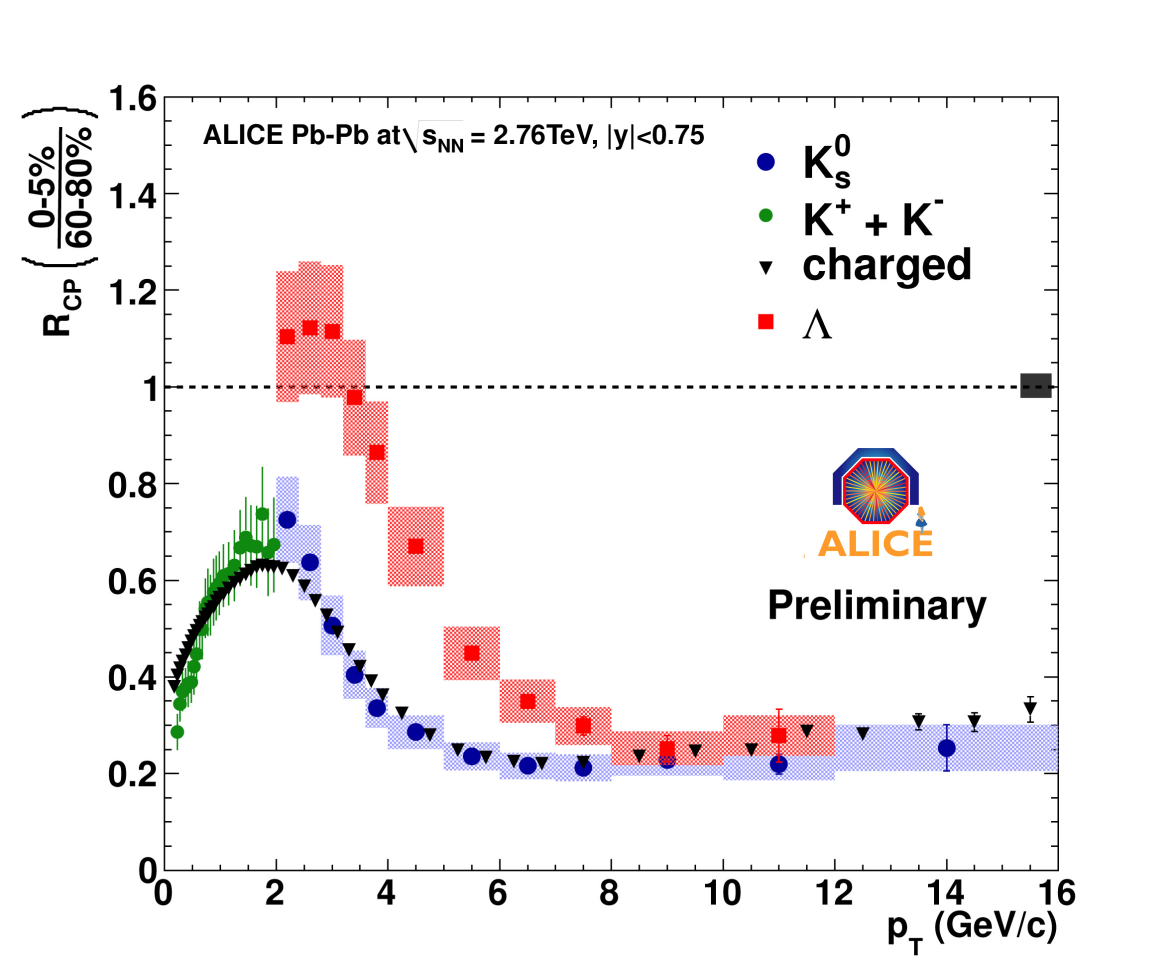
- Charged Kaons match the K^0_s at low p_T

R_{CP}: comparison K^0_s – charged



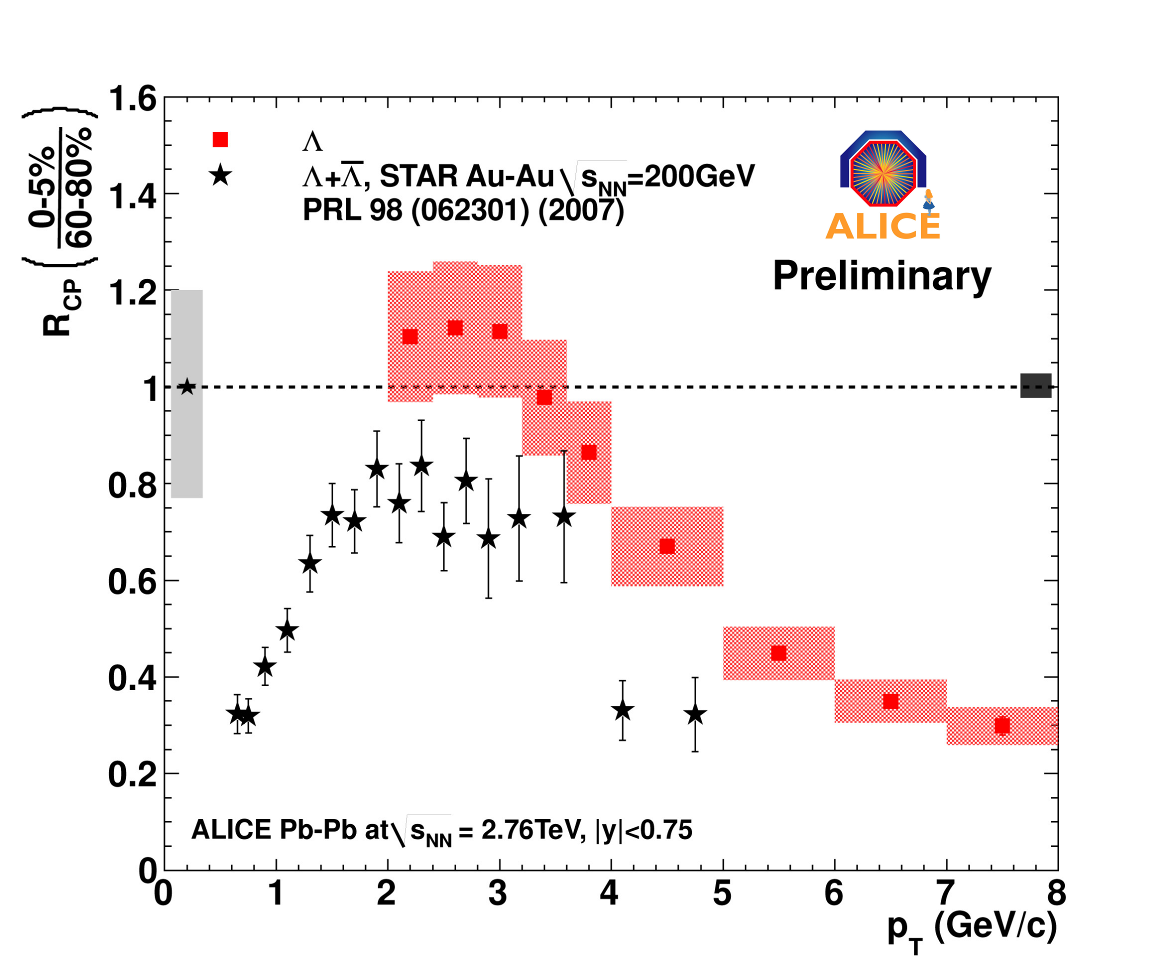
- Charged Kaons match the K^0_s at low p_T
- R_{CP} similar for charged particles and K^0_s
- Strong suppression of K^0_s at high p_T

R_{CP}: $K^0{}_s$ and Λ



- Low p_T: Λ enhanced over $K^0{}_s$ (baryon to meson anomaly) up to p_T = 8 GeV/c
- High p_T :
  - R_{CP} for Λ and $K^0{}_s$ compatible
  - Similar to R_{CP} of charged particles

R_{CP}: comparison to STAR ($\Lambda+\bar{\Lambda}$)

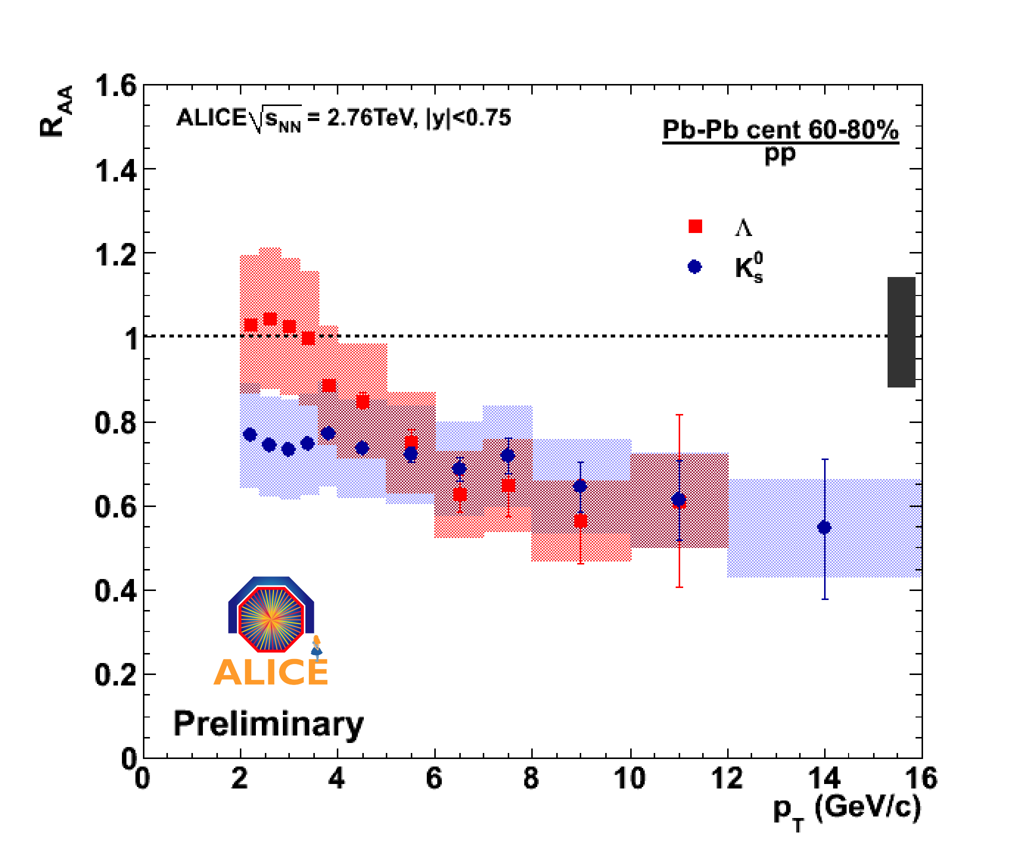


- R_{CP} slightly higher than STAR measurement
- Λ enhancement extended to higher p_T

R_{AA}: peripheral Λ and K^0_s

$$R_{AA} = \frac{dN_{AA}/dp_T}{dN_{pp}/dp_T} \cdot \frac{1}{\langle N_{coll} \rangle_{AA}}$$

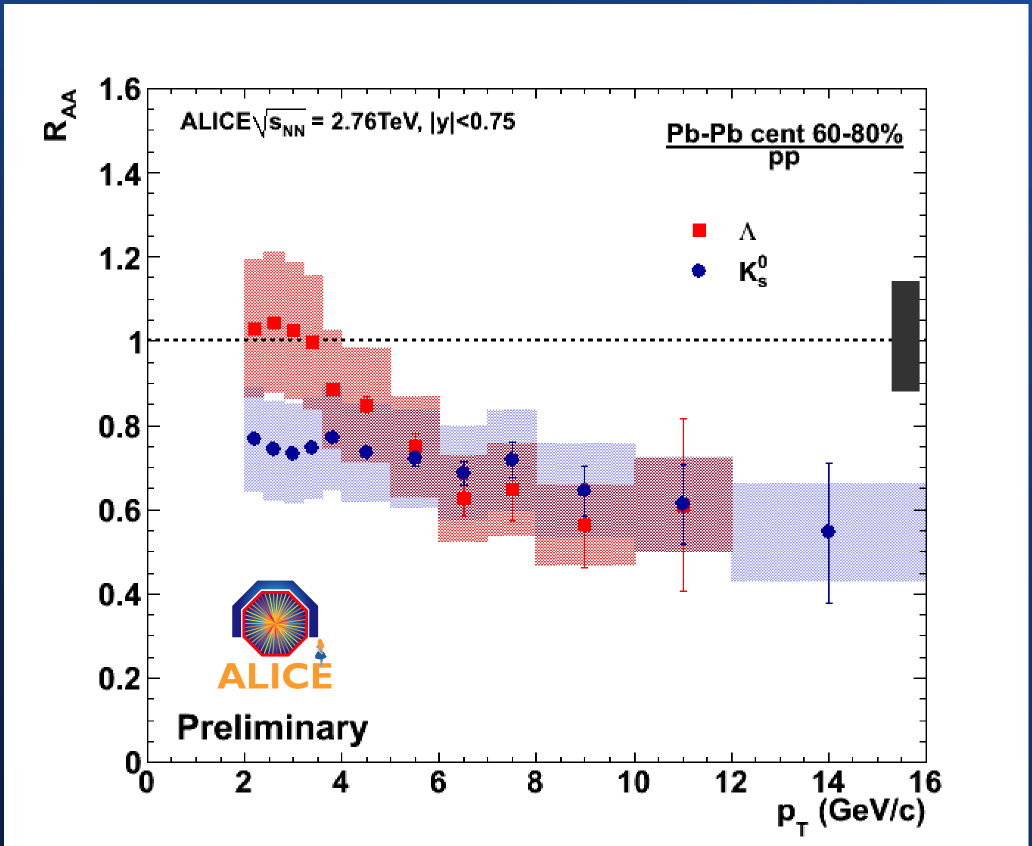
R_{AA}: peripheral Λ and K^0_s

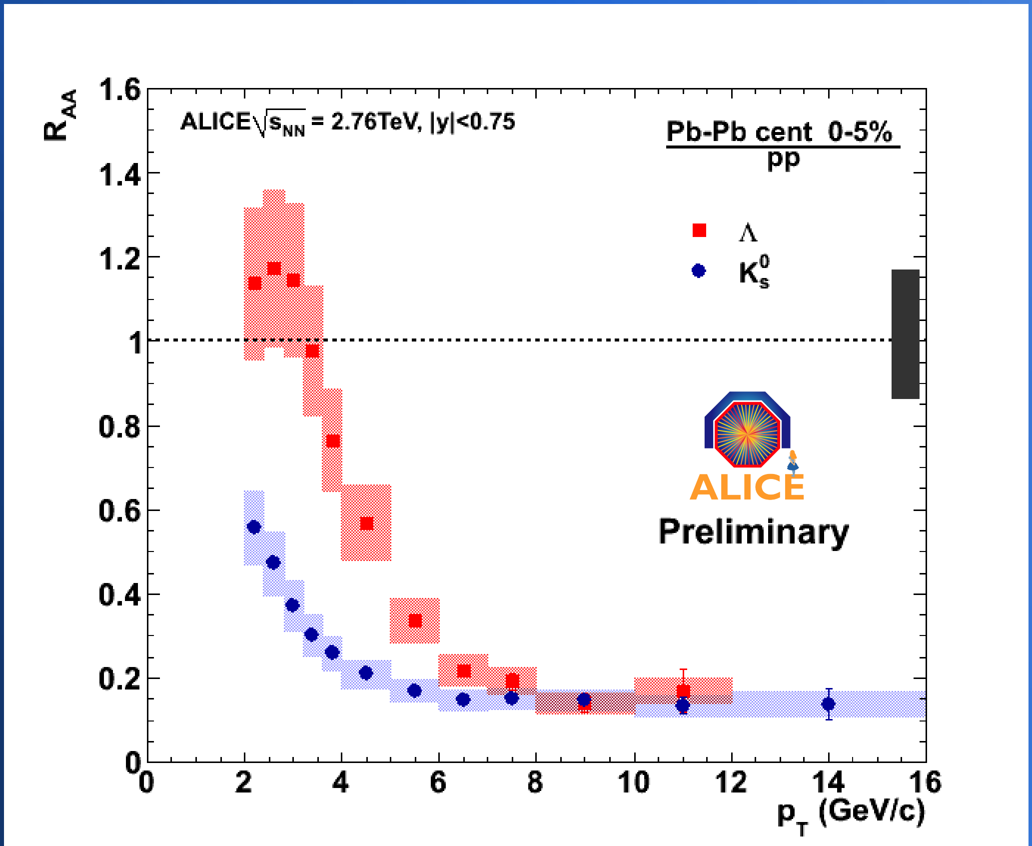


$$R_{AA} = \frac{dN_{AA}/dp_T}{dN_{pp}/dp_T} \cdot \frac{1}{\langle N_{coll} \rangle_{AA}}$$

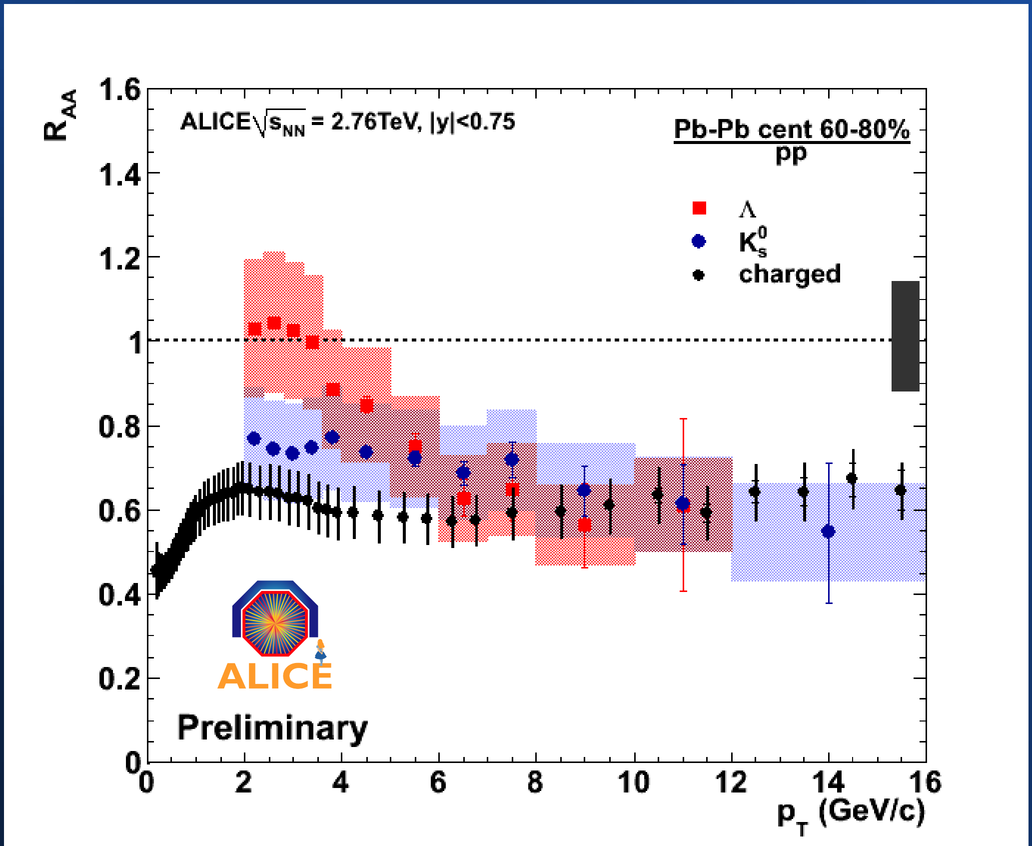
- Low p_T:
  - Λ consistent with unity
- High p_T :
  - Λ and K^0_s are suppressed similarly

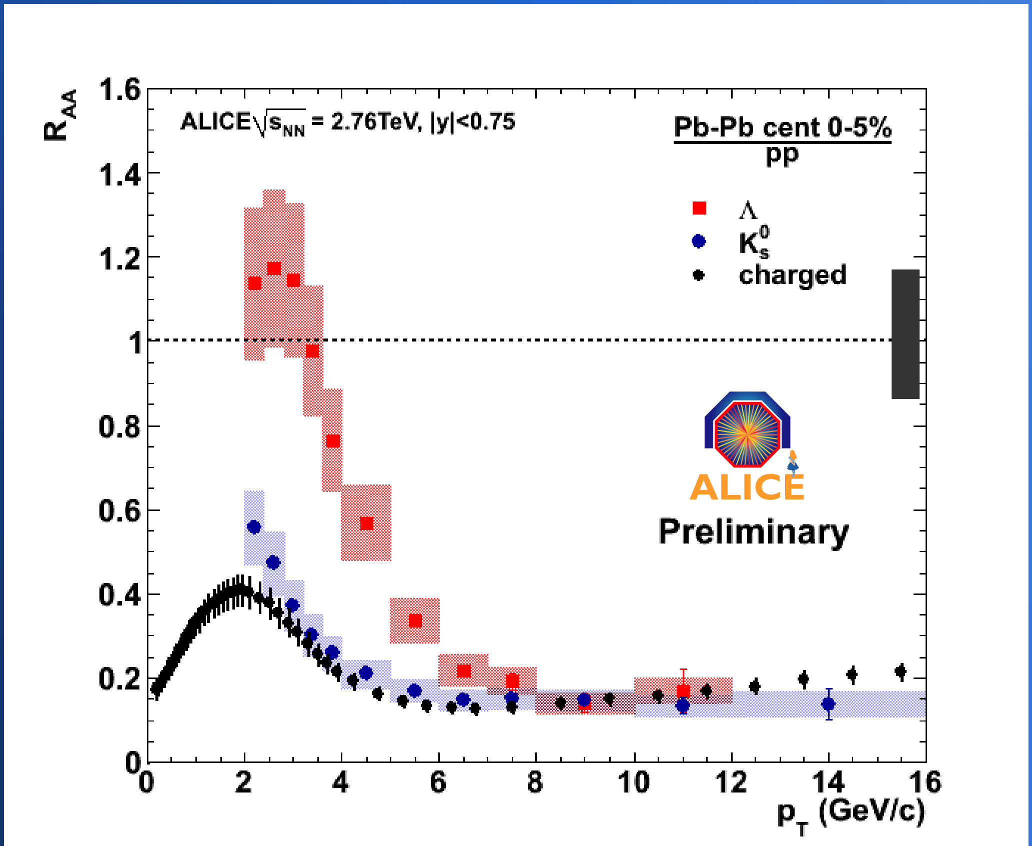
R_{AA}: central vs peripheral



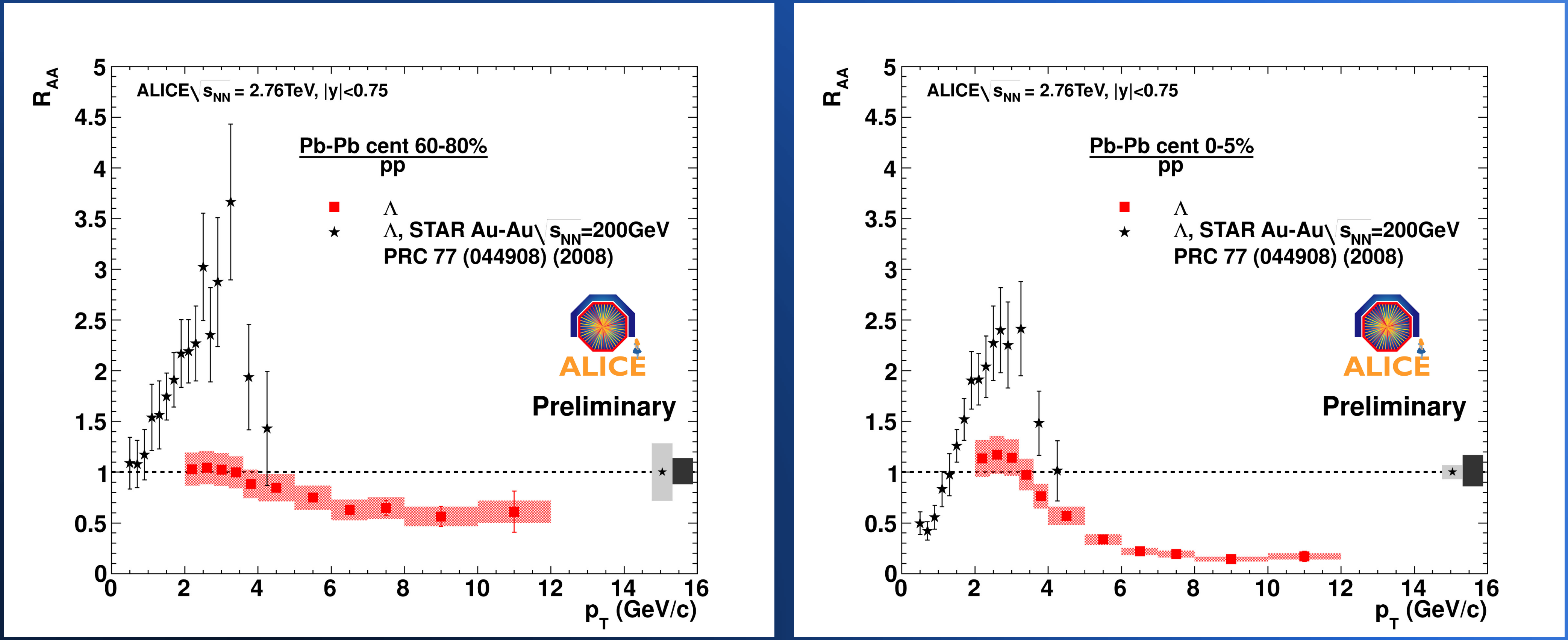


R_{AA}: comparison to charged





R_{AA}: comparison to STAR (Λ)



Summary

- Λ and K^0_s R_{CP}, R_{AA} measured in Pb-Pb and *pp* at $\sqrt{s_{NN}}$= 2.76 TeV up to 16 GeV/c in p_T
- Strong suppression observed at high p_T (p_T > 8 GeV/c)
  - Λ and K^0_s compatible
  - Similar to charged particles
- At lower p_T (p_T < 5 GeV/c) Λ and K^0_s different in R_{CP} and R_{AA}
  - Baryon meson anomaly
  - ALICE R_{AA} at maximum much smaller than STAR measurements

R_{dAu} - STAR results