

Particle Identification at high p_T with TPC

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Alice Offline Week

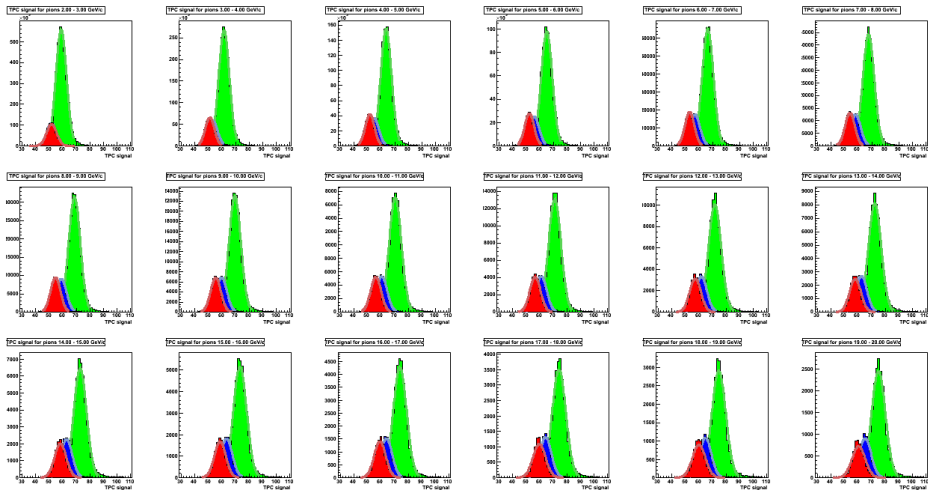
- ▶ Some observations about charged hadron identification with TPC at high momenta (resolutions, separation power)
- ▶ Use of V0 decays for the high p_T PID of pions and protons
- ▶ Analysis carried on ~ 1.5 M PYTHIA jet-jet events (LHC09d8)

TPC performances

Pions

Kaons

Protons



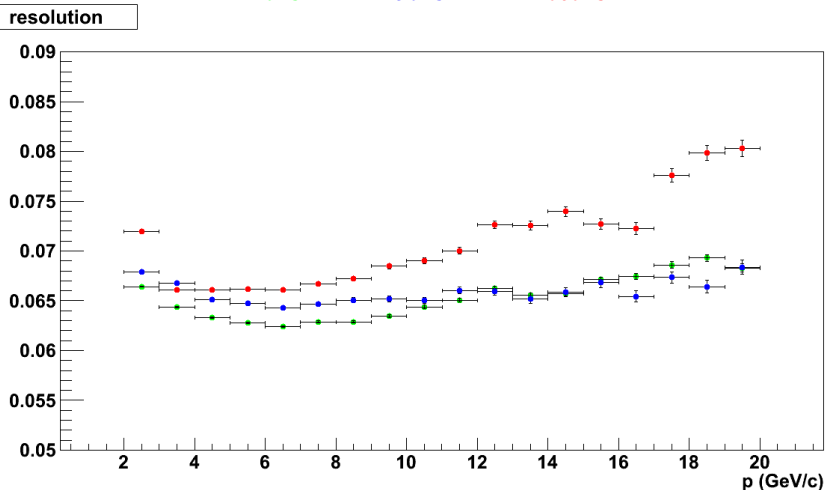
TPC signal, 1 GeV bin

TPC performances – resolution

Pions

Kaons

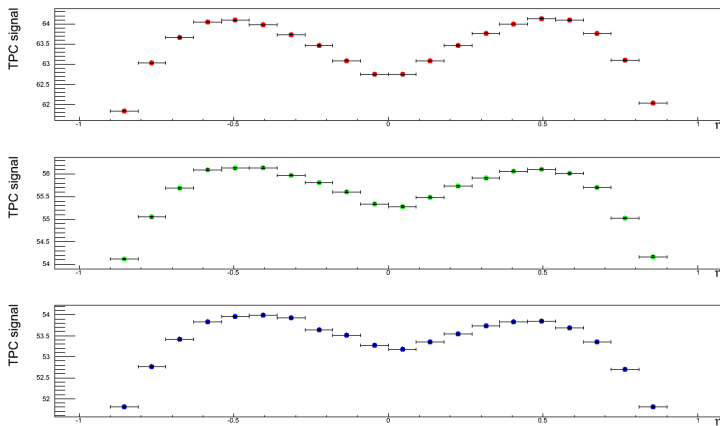
Protons



Resolutions in the order of $\sim 6-7\%$

TPC performances – resolution

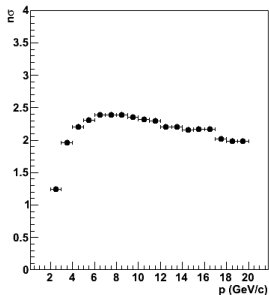
η modulation of in the TPC signal, issue not yet fixed



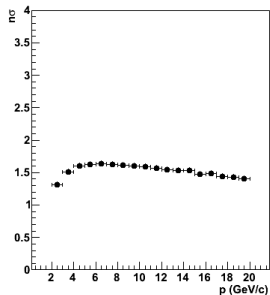
Much better situation than in the past, variations in the order of 3-4%

Separation power

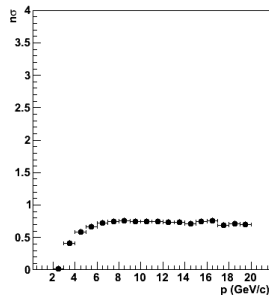
pions-protons separation



pions-kaons separation



kaons-protons separation

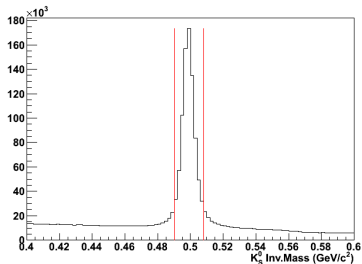
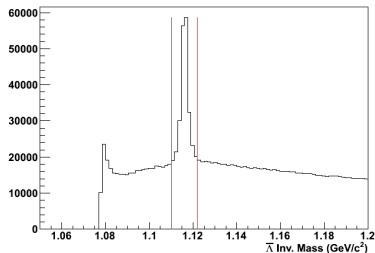
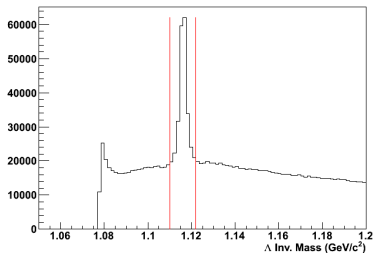


Even if good resolution is reached, it is still difficult to separate kaons from protons (and with real data you cannot fit π , K , p separately...)

⇒ PID on track-by-track basis not feasible

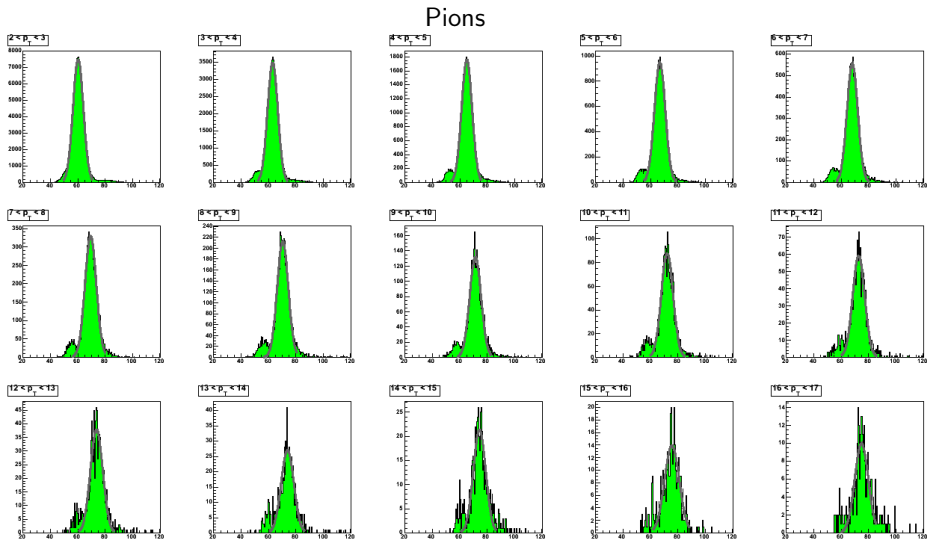
V0 decays for high p_T PID

Use hadrons from V0 decays to extract the parameters of the fits



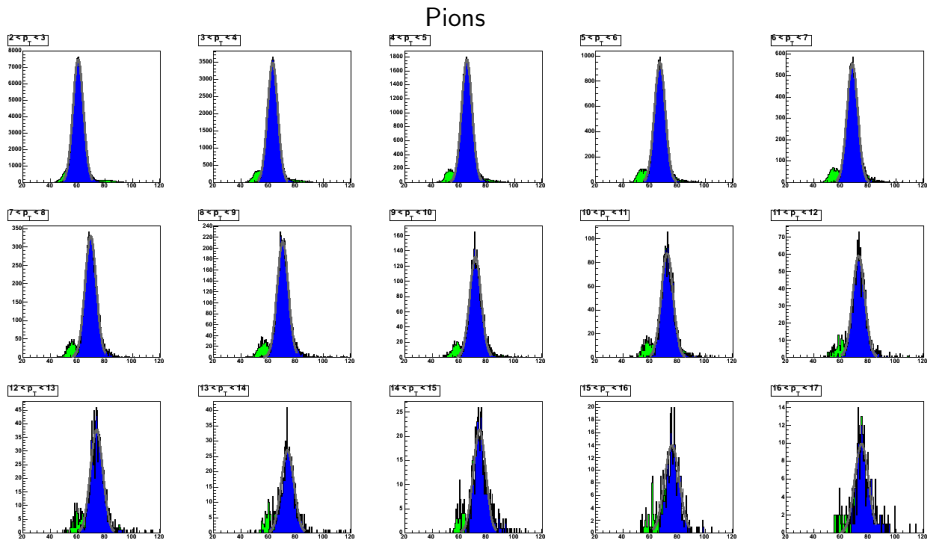
Invariant mass spectra – offline V0 finder. Only V0s in the windows between red lines are selected for the analysis

Pions from V0s – TPC signal



TPC signal, 1 GeV bin

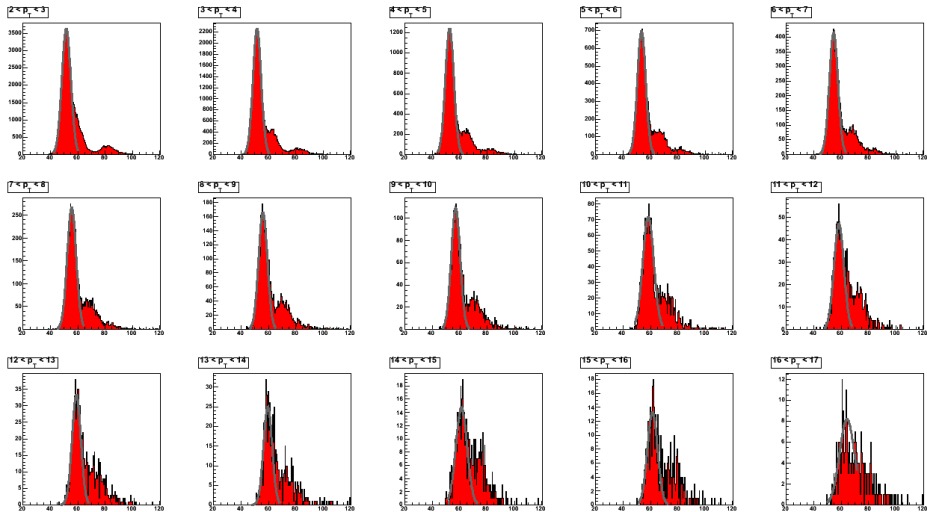
Pions from V0s – TPC signal



TPC signal, 1 GeV bin

Protons from V0s – TPC signal

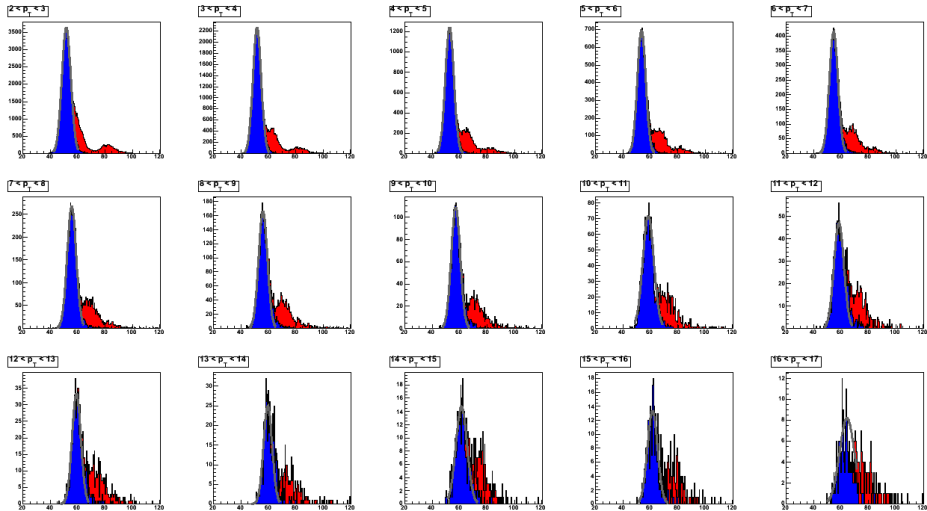
Protons



TPC signal, 1 GeV bin

Protons from V0s – TPC signal

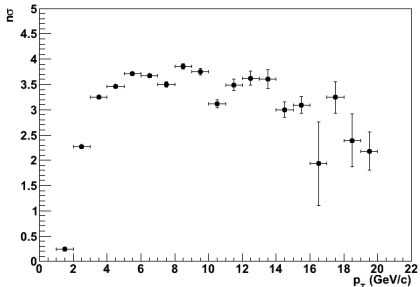
Protons



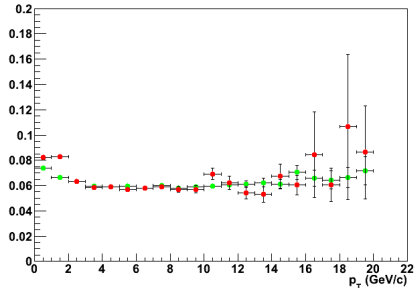
TPC signal, 1 GeV bin

TPC performances

Separation Power



Resolution



Resolutions
and
separation power.

Gaussian fits of the TPC signal distributions

The parameters extracted from the fits were used to fit the overall TPC signal distributions:

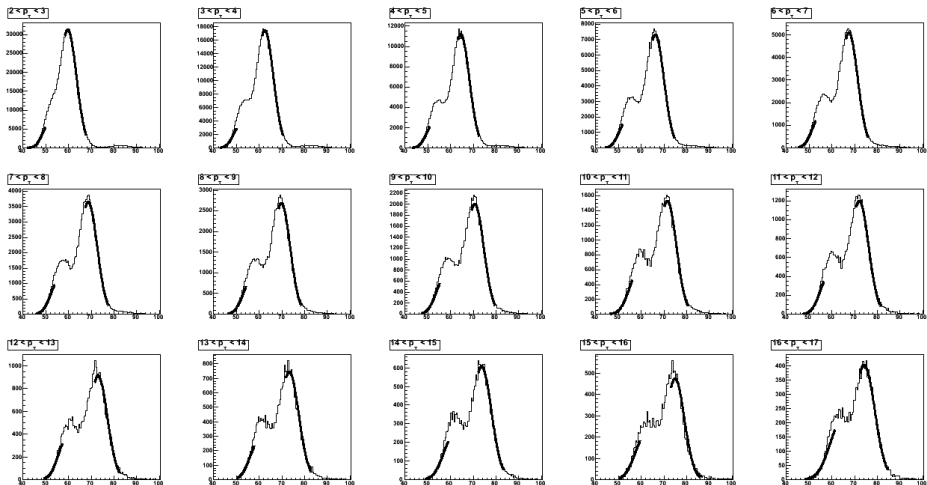
- ▶ Pions:

- 1 Mean and Sigma: Fixed parameter limits ($\pm 1\%$ w.r.t. previous found values).
- 2 Constant: free parameter.

- ▶ Protons

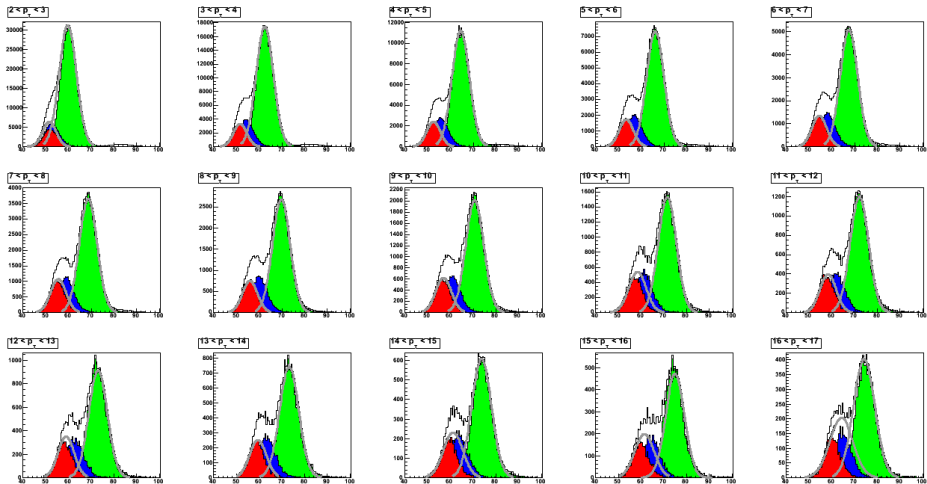
- 1 Mean and Sigma: Fixed parameter limits ($\pm 1\%$ w.r.t. previous found values).
- 2 Constant: scaled from the ratio between the π^{V0}, p^{V0} constants.

Gaussian fits of the TPC signal distributions



TPC signal, 1 GeV bin

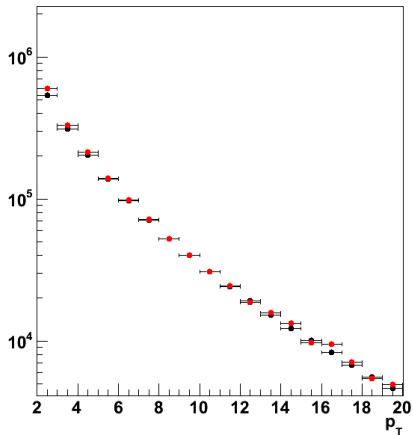
Gaussian fits of the TPC signal distributions



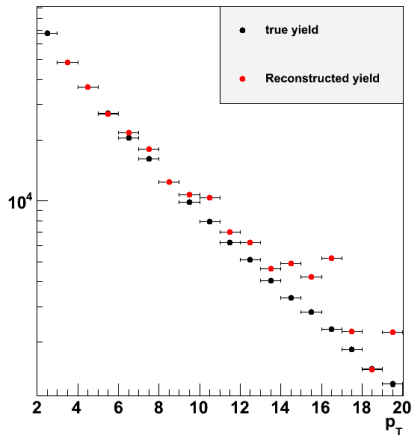
The gaussians fits are in good agreement with the true distributions
(only up to ~ 10 GeV/c for protons)

Reconstructed spectra

Pions



Protons



Very good agreement between true and reconstructed yield for pions.
Fairly good for protons up to $10 \sim 10$ GeV/c

- ▶ TPC performances better than in the past
- ▶ Implemented method to use the V0 decays for PID at high momenta
- ▶ Pion p_T spectrum very well reconstructed up to ~ 20 GeV
- ▶ Proton spectrum reconstructed up to ~ 10 GeV

