Muons Reconstructed in Data

Frédéric Déliot, CEA-Saclay

- reconstruction overview
- muons in data:

  → differences with MC

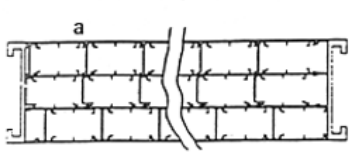
  → basic cuts to select *good* muons

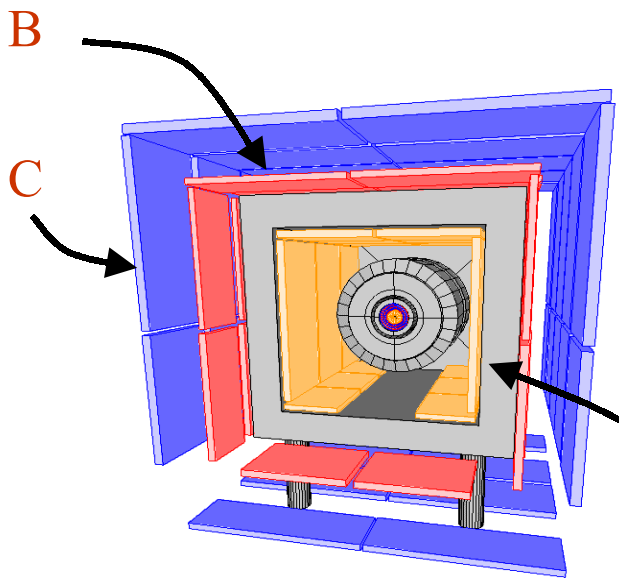
- detector status overview
- muons in J/ψ
- high Pt muons:

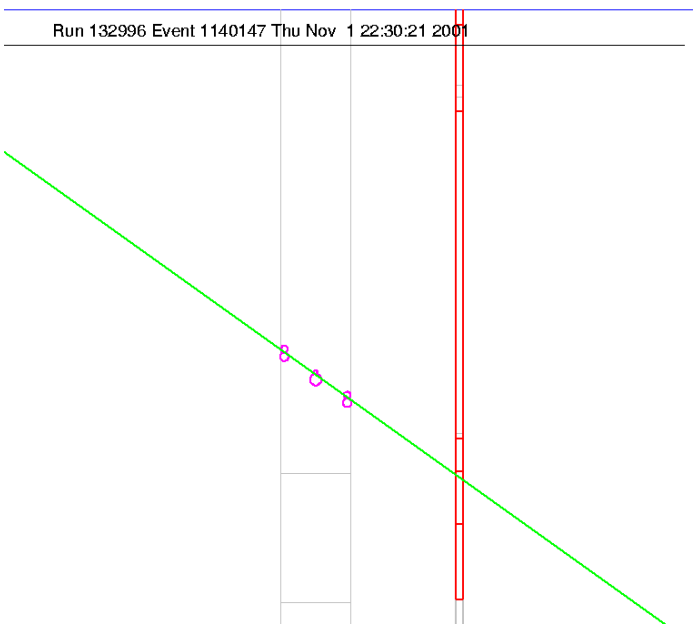
  → selection for W/Z

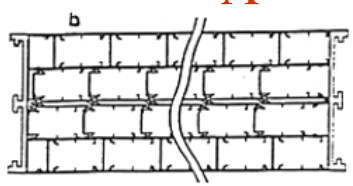
Reconstruction Overview

hits → segments → local track → matching with central track → Muon Id



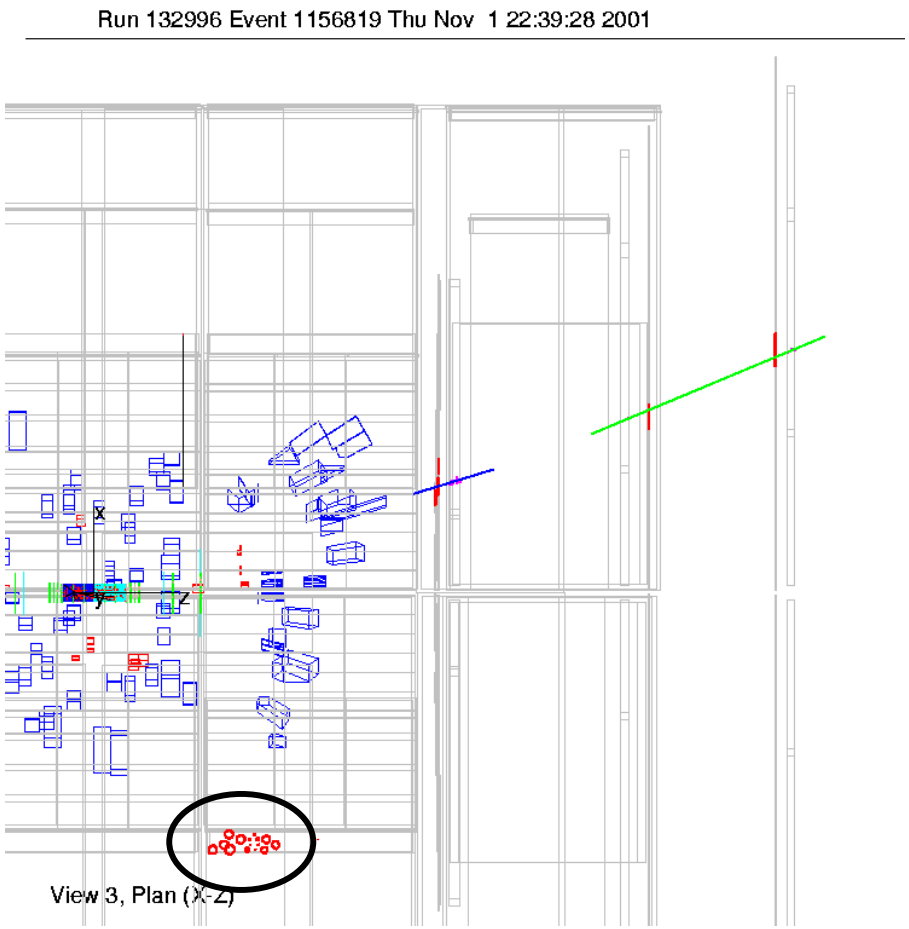


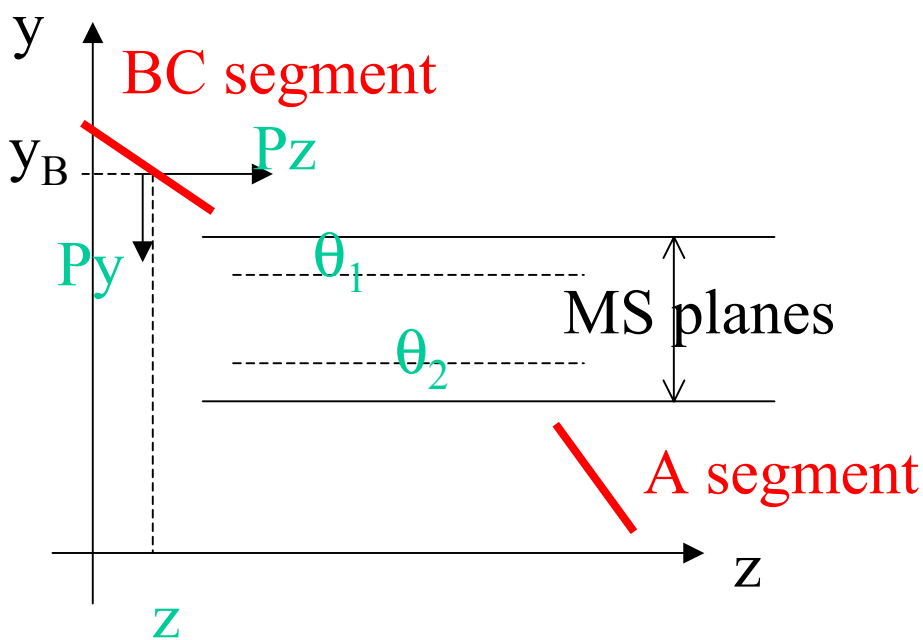




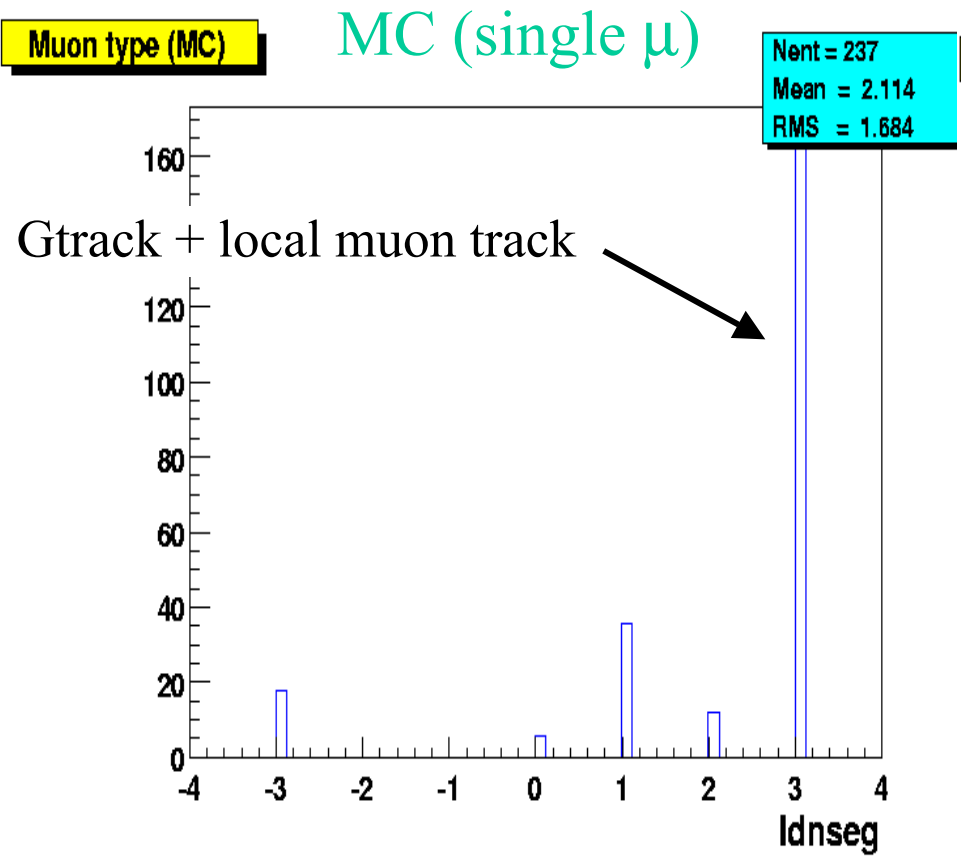
Reconstruction Overview (2)

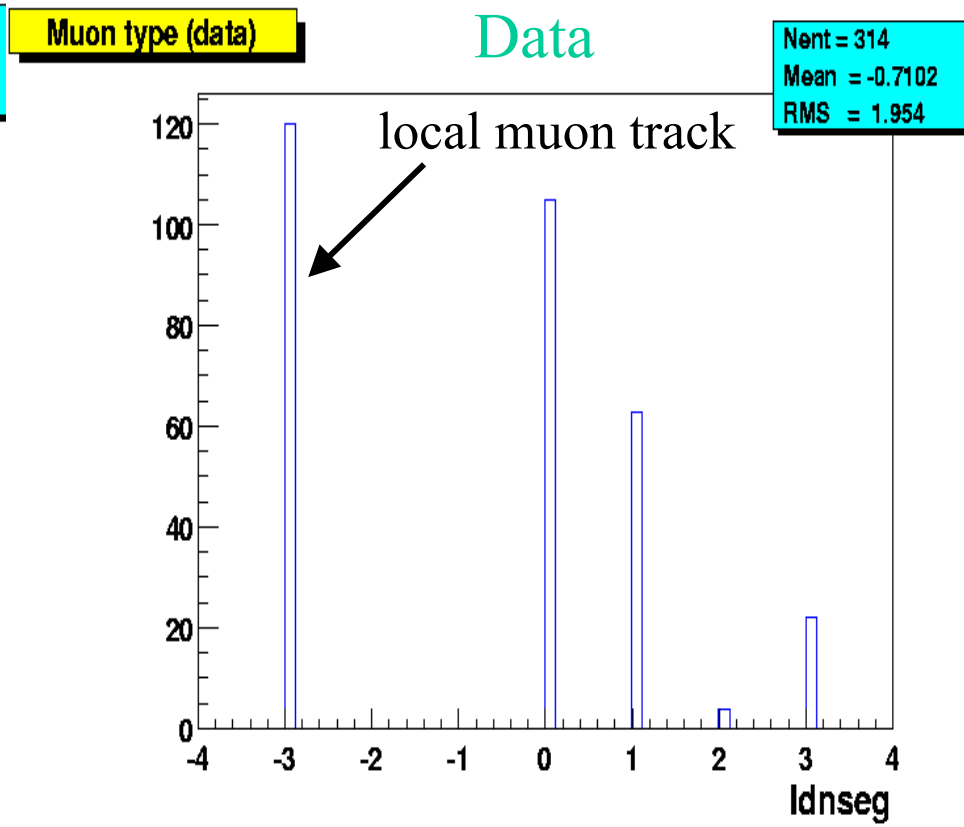
hits → segments → local track → matching with central track → Muon Id





Muon Type

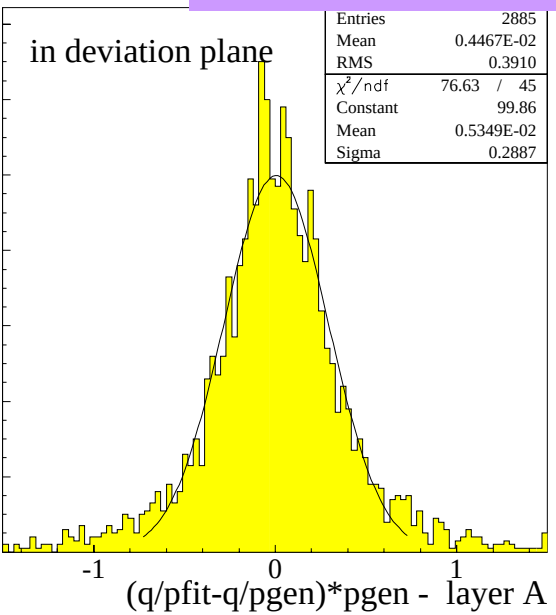


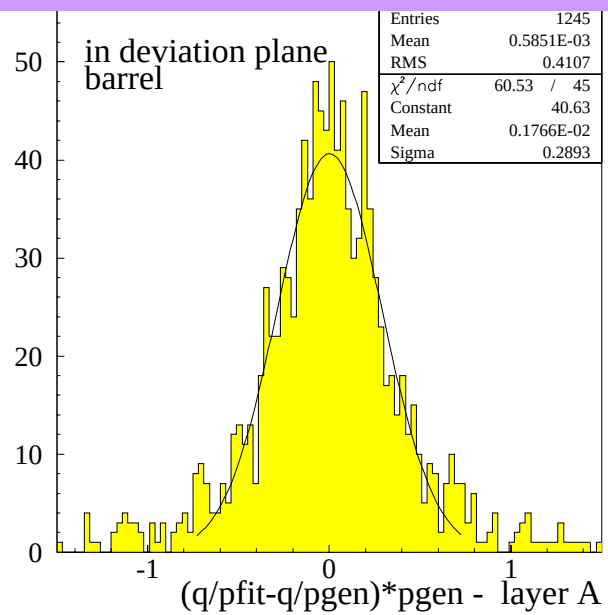


→ selection in data mainly based on local muon tracks

implicit cut: $p \geq 4$ GeV

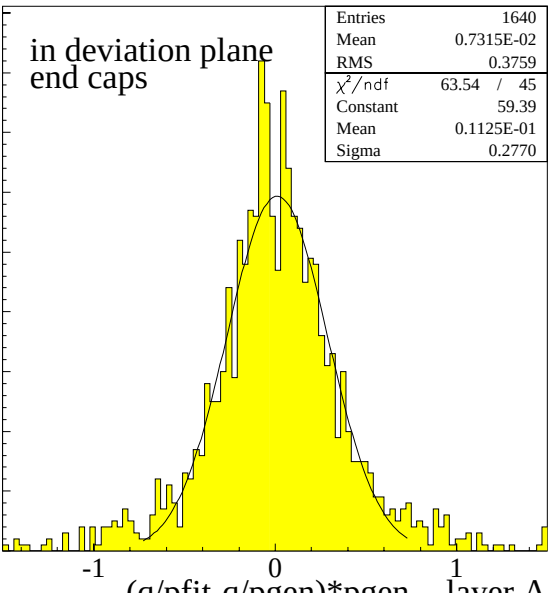
Local Tracking Resolution

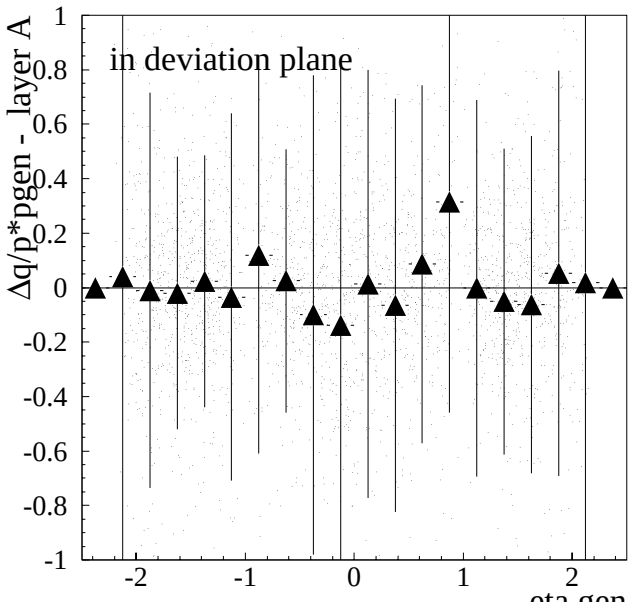




$\Delta(q/p)*p \approx 27\%$

$\Delta pt/pt \approx 20\%$





Overview of Detector Status

- forward: OK
- central:

  → A-layer commissioning

  → readout cabling fixed

  → hot cells repair in progress

  → scintillators: A+C layer trigger timing improved

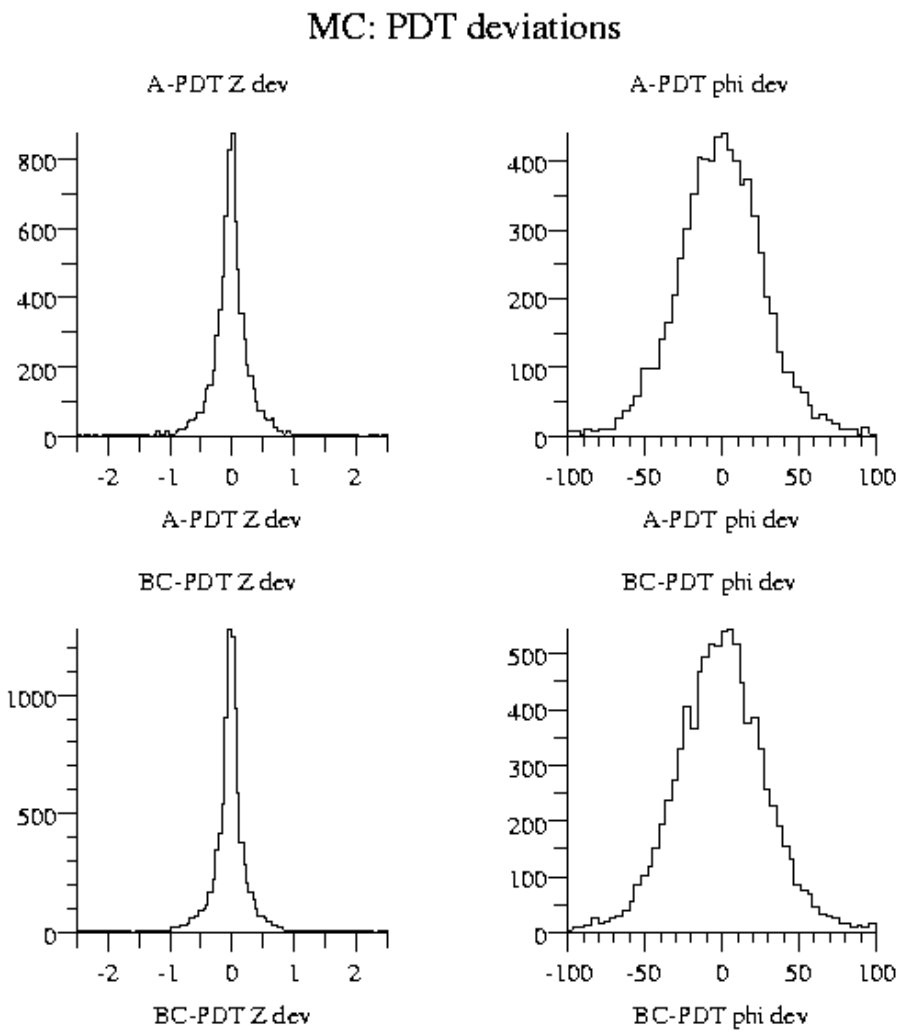
  → PDT geometry fixed in reco (4 PDTs upside down)

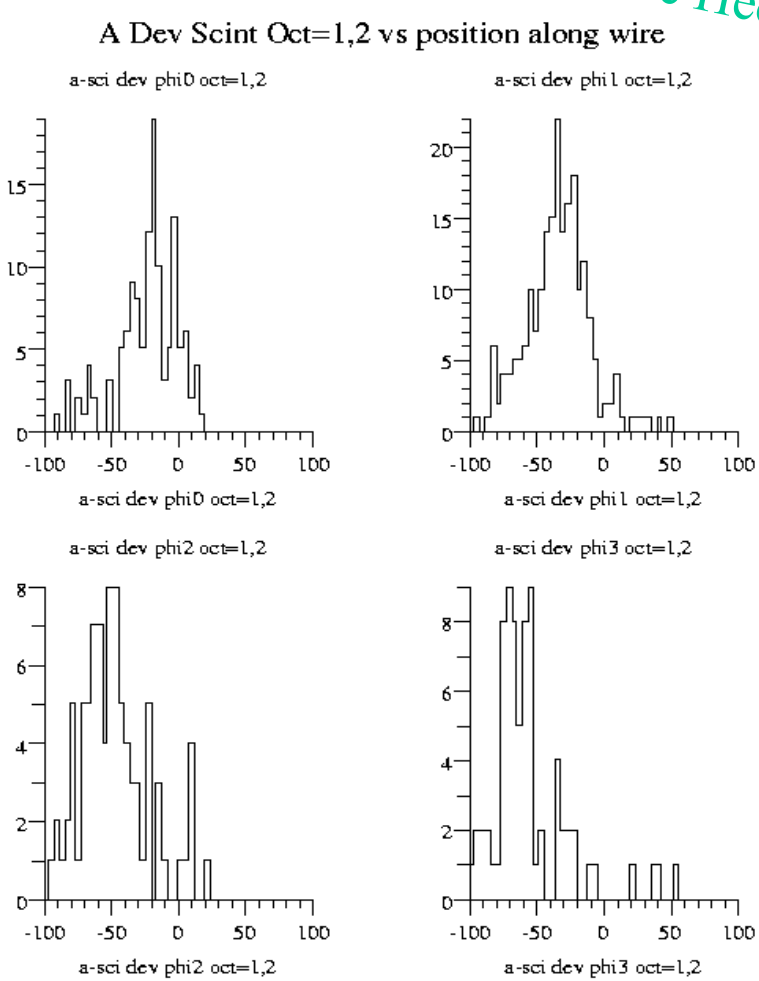
  → drift-time-to distance not implemented in farm reco

Overview of Detector Status (2)

- PDT response not exactly the same as 10 years ago!

Dave Hedin





Muon Triggers

http://physics.arizona.edu/~robmcc/muid-10-01.pdf

- mu1cmsc_fz: matched A & C central scintillators
- mu1pix_fz: matched A & B pixels

} prescaled

- mu2pix_fz: 2 singles in same forward regions (N or S)
- mu2cmsc_fz: 2 singles in central region
- mu2all_fz: 2 singles in different regions

} 1.5 week of running

- mu1cmsc_j5_fz: muon central + jet ≥ 5 GeV
- mu1cmsc_j10_fz: muon central + jet ≥ 10 GeV

no Pt cut at the trigger level

Basic cuts

- based on reconstructed quantities:

  → chi2>0 (remove fits which didn't converge)

  → nb of wire hits in A > 2

  → nb of wire hits in BC > 2

  → nb of scint. hits in A > 0

  → nb of scint. hits in BC > 0

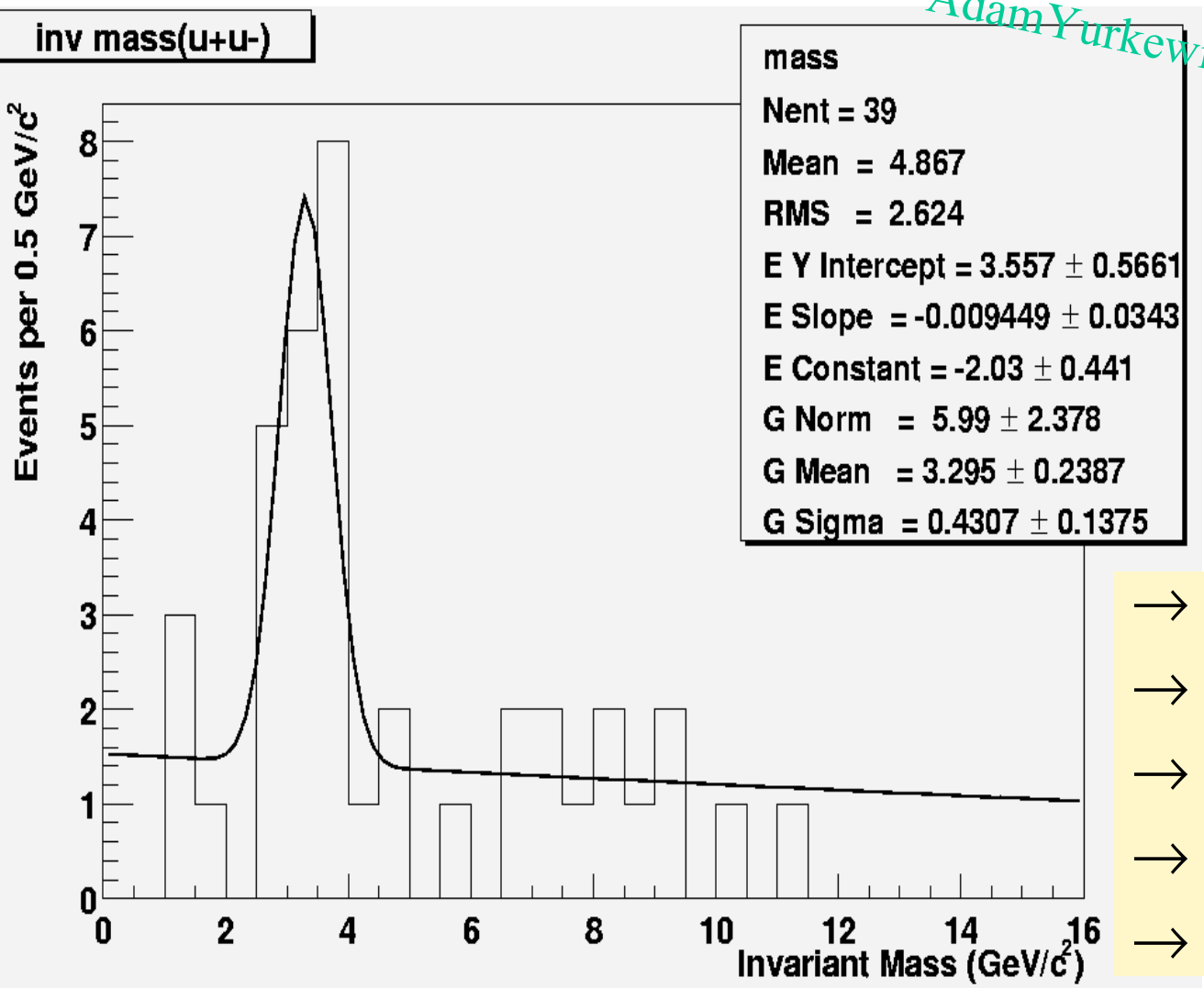
- processed Runs from 130294 to 133023 (not all of them) reconstructed with p10.07.01:

  → 1246039 events, 194 files for J/ψ selections

  → 911119 events, 142 files for high pt muon selections

J/ψ muons

Adam Yurkewicz



- Runs >= 131776,

~ 900K events

→ 1 < abs(eta) < 2

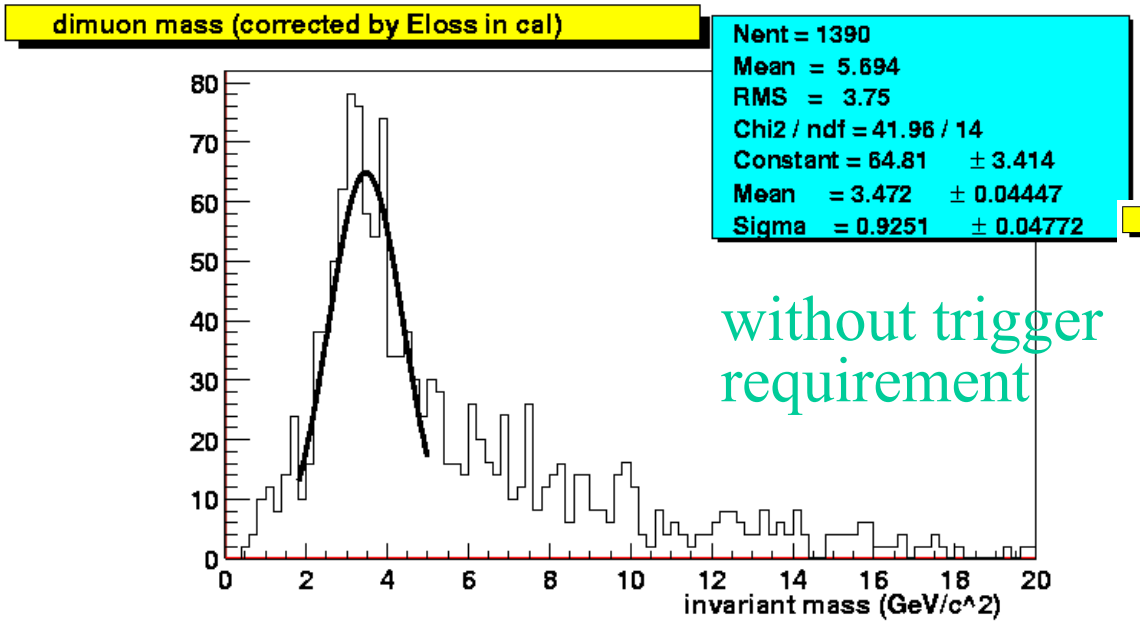
→ trigger mu2pix_fz only

→ more than 2 hits in A

→ more than 3 hits in BC

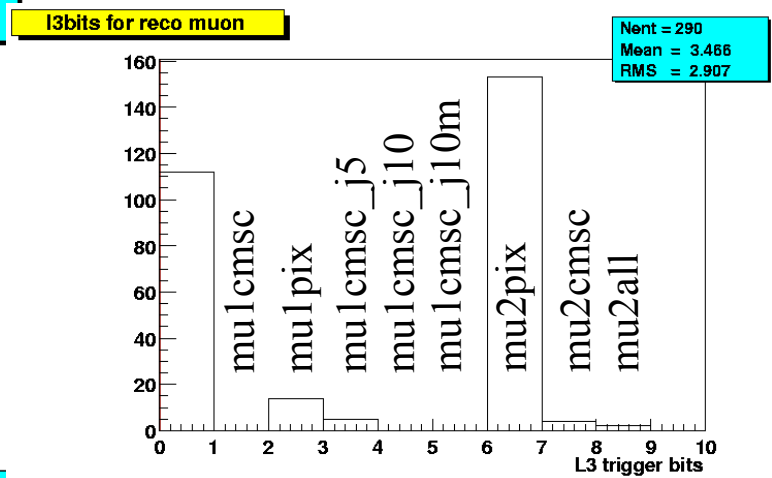
→ momentum less than 15

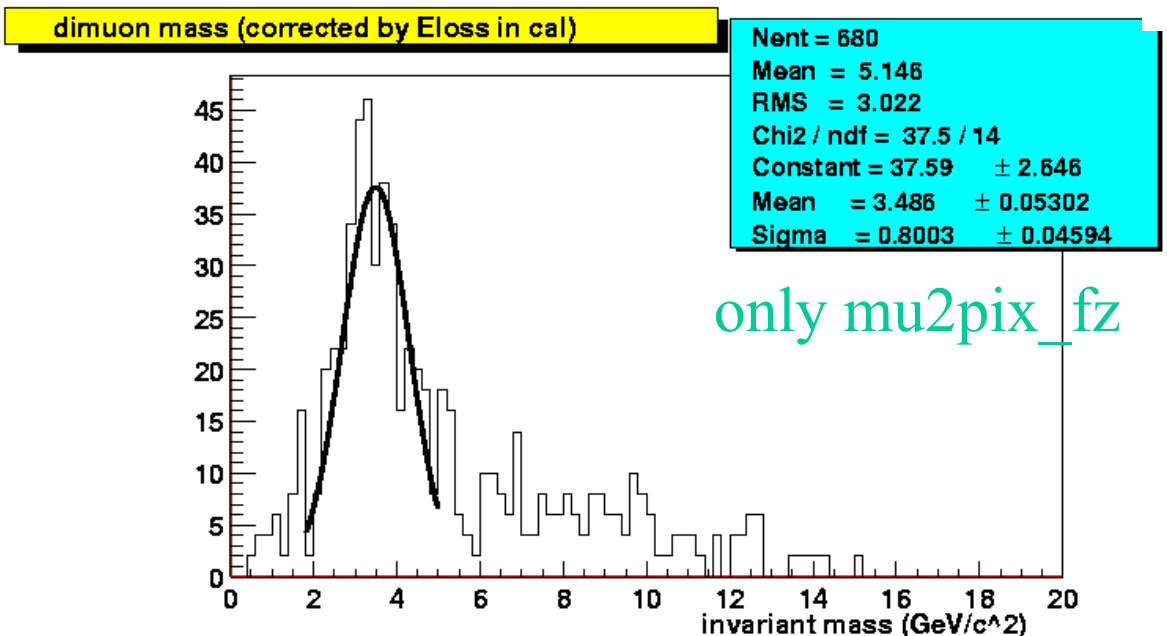
J/ψ muons (2)



without trigger requirement

- Runs >= 130294,
- ~ 1,2 M events





only mu2pix_fz

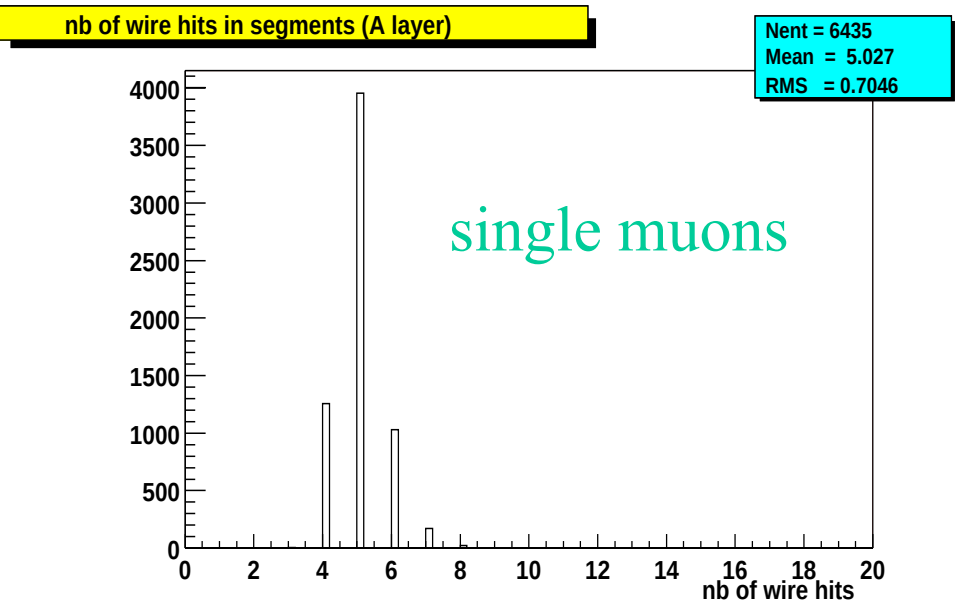
→ 1 < abs(eta) < 2

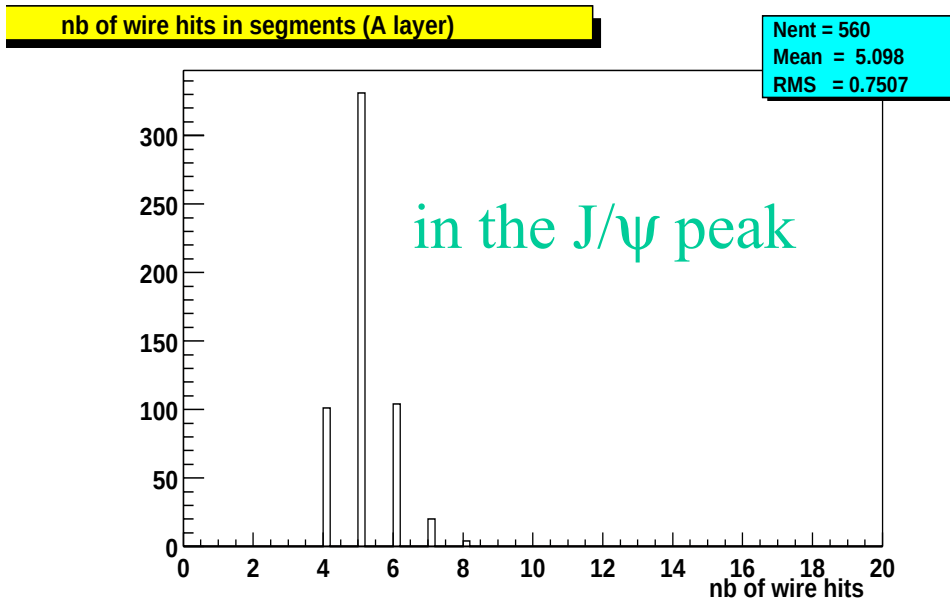
→ more than 2 hits in A

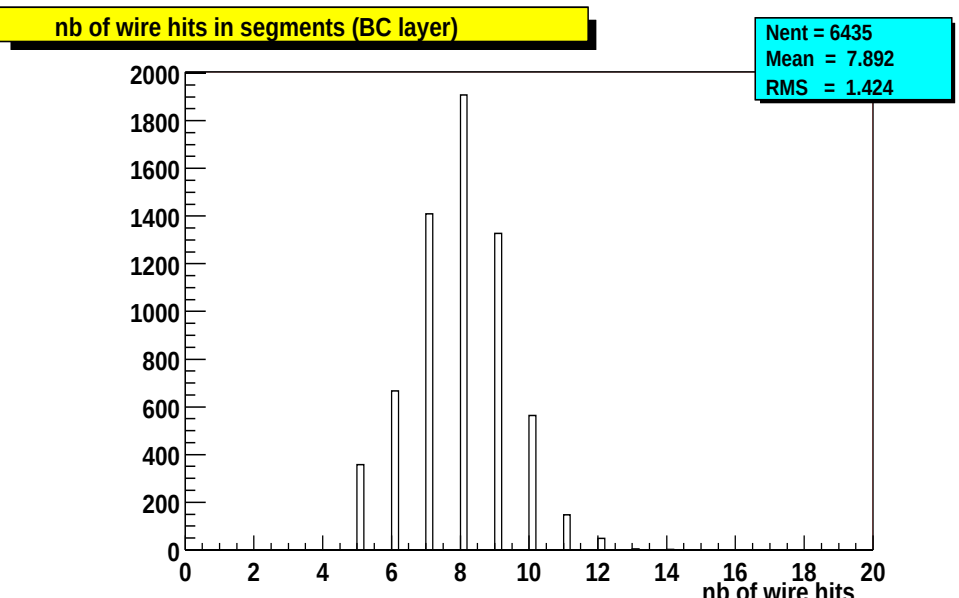
→ more than 3 hits in BC

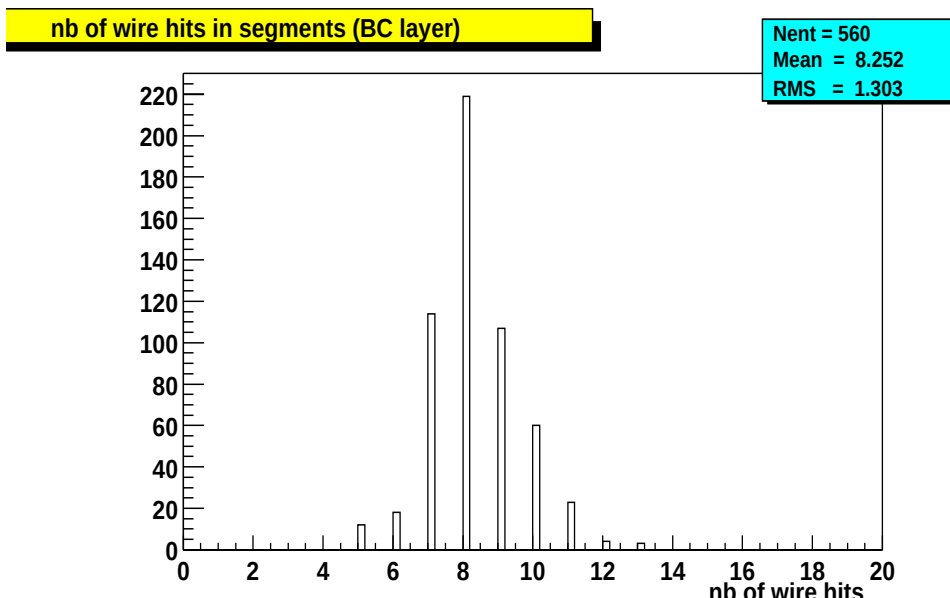
→ momentum less than 15

J/ψ muons (3)


nb of wire hits in segments (A layer)
Nent = 6435
Mean = 5.027
RMS = 0.7046
single muons
nb of wire hits


nb of wire hits in segments (A layer)
Nent = 560
Mean = 5.098
RMS = 0.7507
in the J/ψ peak
nb of wire hits


nb of wire hits in segments (BC layer)
Nent = 6435
Mean = 7.892
RMS = 1.424
nb of wire hits


nb of wire hits in segments (BC layer)
Nent = 560
Mean = 8.252
RMS = 1.303
nb of wire hits

High Pt muons

- find WZ→ μ:

WZ to muon Subgroup: A. Askew, L. Christofek, F. Deliot, T. Diehl, G. Hesketh

I) *tight* muons:

→ chi2>0 (remove fits which didn't converge)

→ nb of wire hits in A > 2

→ nb of wire hits in BC > 2

→ nb of scint. hits in A > 0

→ nb of scint. hits in BC > 0

→ Pt > 8 GeV

→ isolation: dR>0.5 (0.5 cone jets)

II) *loose* muons:

→ BC segment (Pt estimation with vertex)

→ Gtrack

High Pt muons (2)

- type I will be on the (WZ) machine next Monday

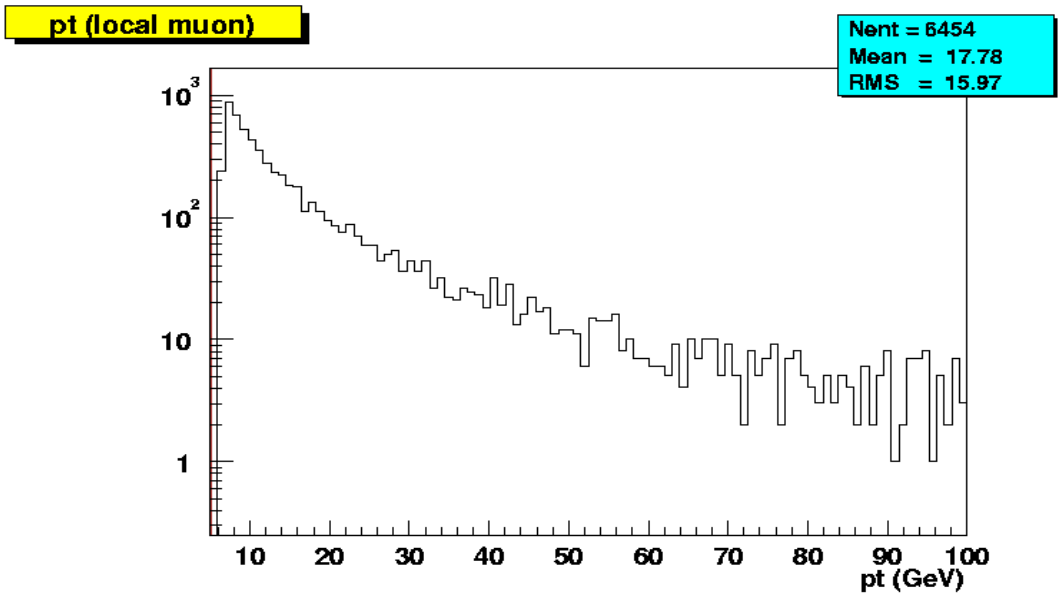
  → select events with at least one type I muon

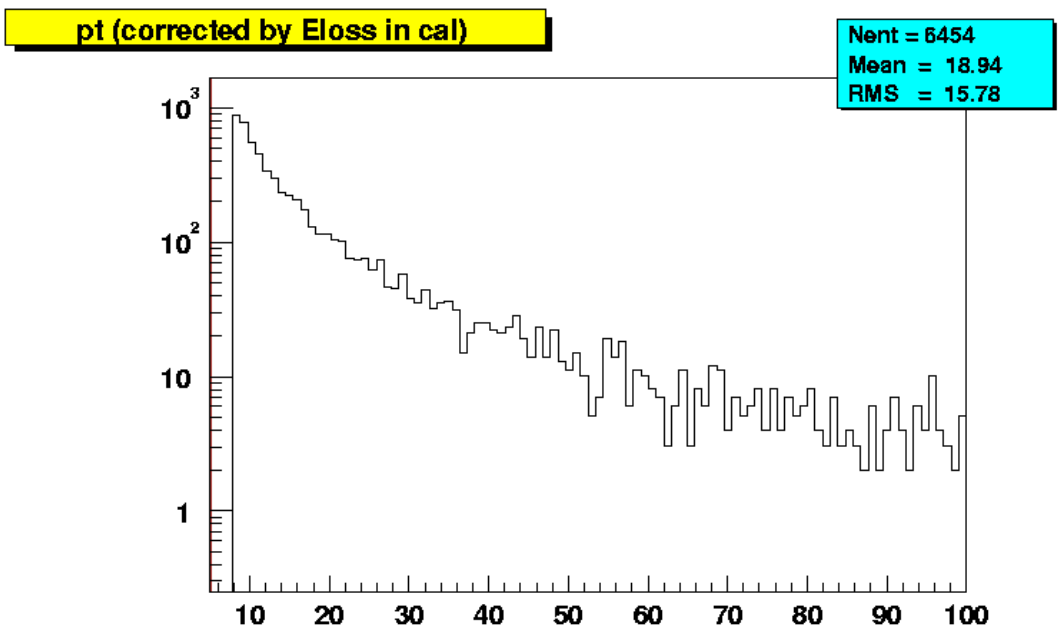
  → isolated and not isolated

  - cut tests:
    - 911119 events processed: 6413 type I remained
    - test requiring 2 type I muons: 19 remained

- type II is under development (at the root-tuple level)

Pt distributions



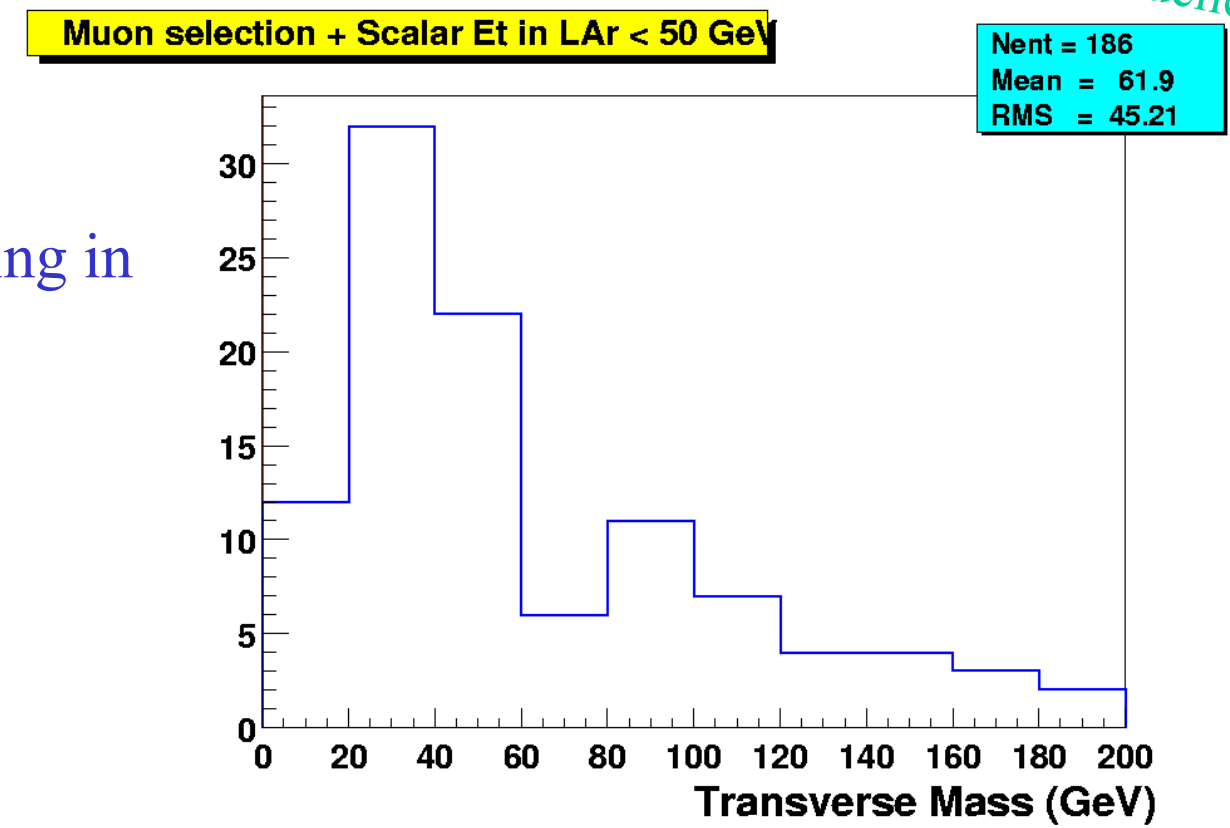


Single Muon

→ recalculation of Etmis from Root-tuple removing cells flagged by NADA

→ Et tot in calo < 50 GeV

Emmanuelle Perez



• need scint. timing in selection

Conclusion

- sample of good muons (J/ψ) to first look at efficiency:

  $\rightarrow$ extrapolation of central tracks to the muon system: efficiency, alignment

- $W/Z \rightarrow \mu$ hunt continues:

  $\rightarrow$ process all p10.07.01 data with the machine

  $\rightarrow$ improve cuts to reject cosmics (timing, impact parameter, …)

- waiting for after shutdown data:

  $\rightarrow$ triggers with PDTs

  $\rightarrow$ better central detector

  $\rightarrow$ CFT tracks