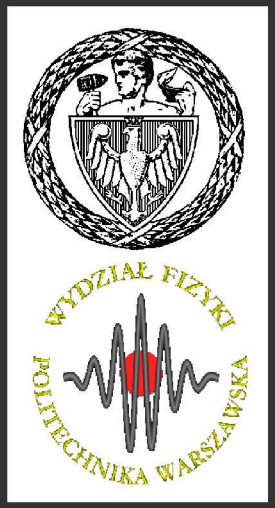
Efficiency, resolution, pulls, dca, fit points in simulated data

comparison: ITTF vs TPT



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Outline:

1. Tracking efficiency: vs. eta, pt
2. Tracking efficiency: multiplicity dependence
3. Resolution study
4. Pull plots: curvature, pt, tan(λ)
5. DCA
6. Fit points study

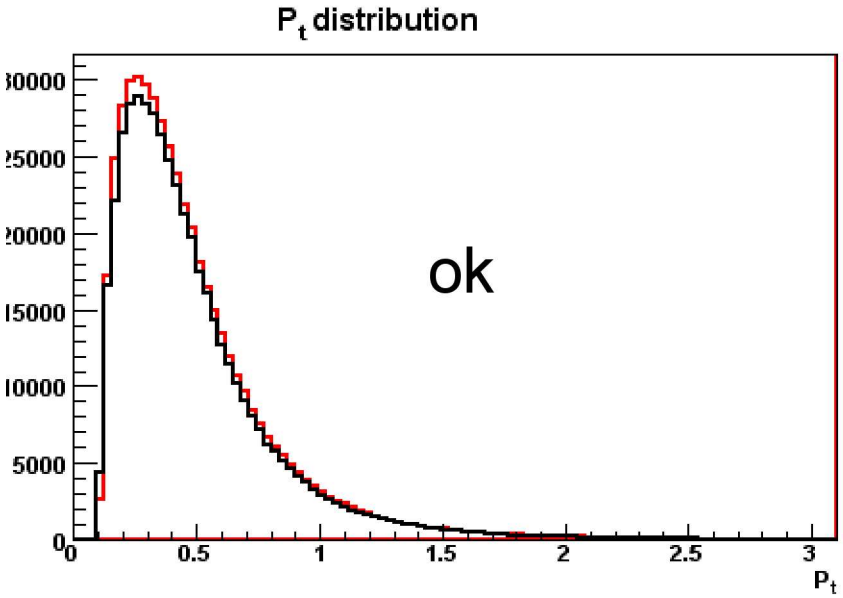
Data sample for comparison of both trackers:

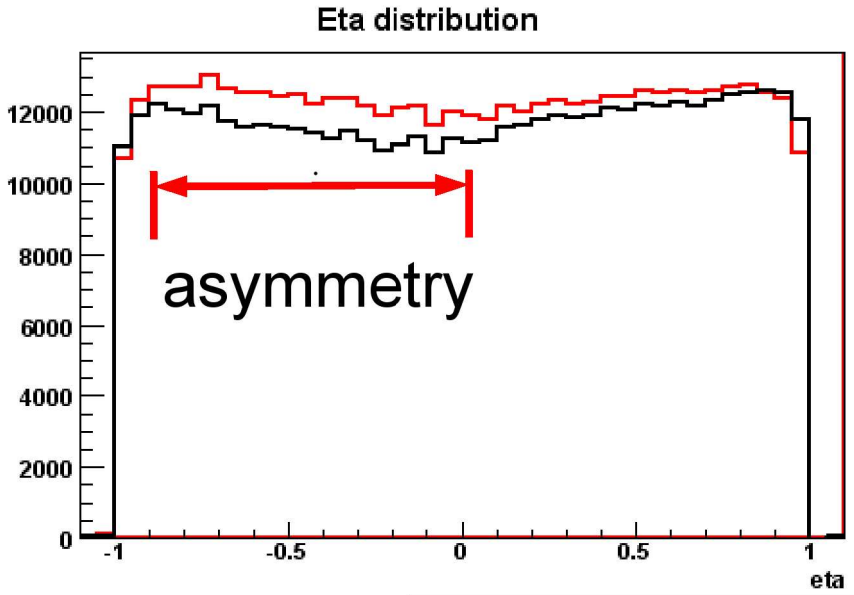
- Au-Au Hijing
- p–p Pythia

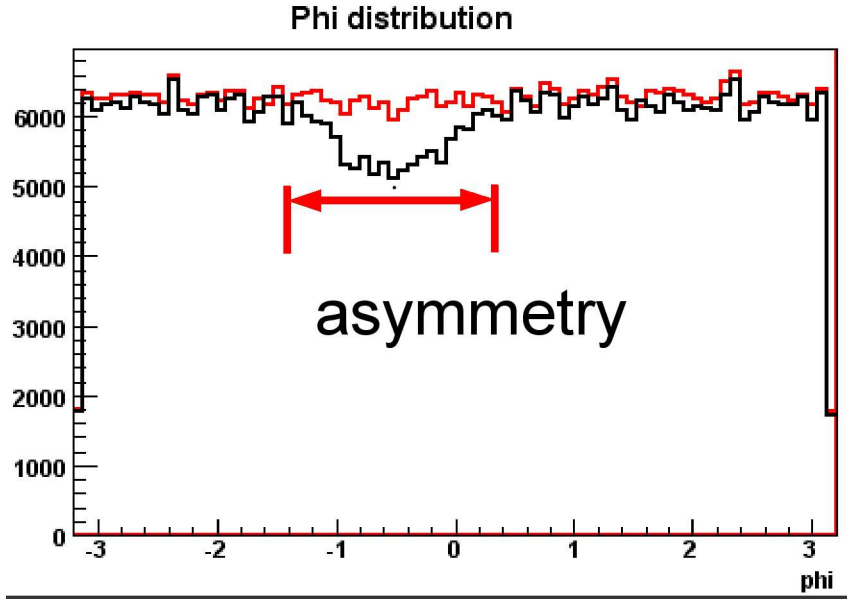
Applied cuts:

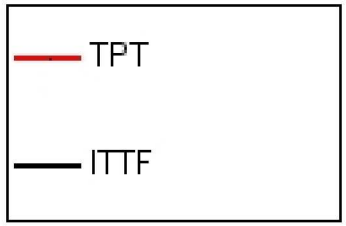
- Cuts on accepted tracks:
  - Mc hits ≥ 10
  - |Eta| < 1.0
- Cuts on matched tracks:
  - Mc hits ≥ 10
  - Fit points ≥ 10 or 15
  - |Eta| < 1.0

Distributions of reconstructed pt, eta & phi:

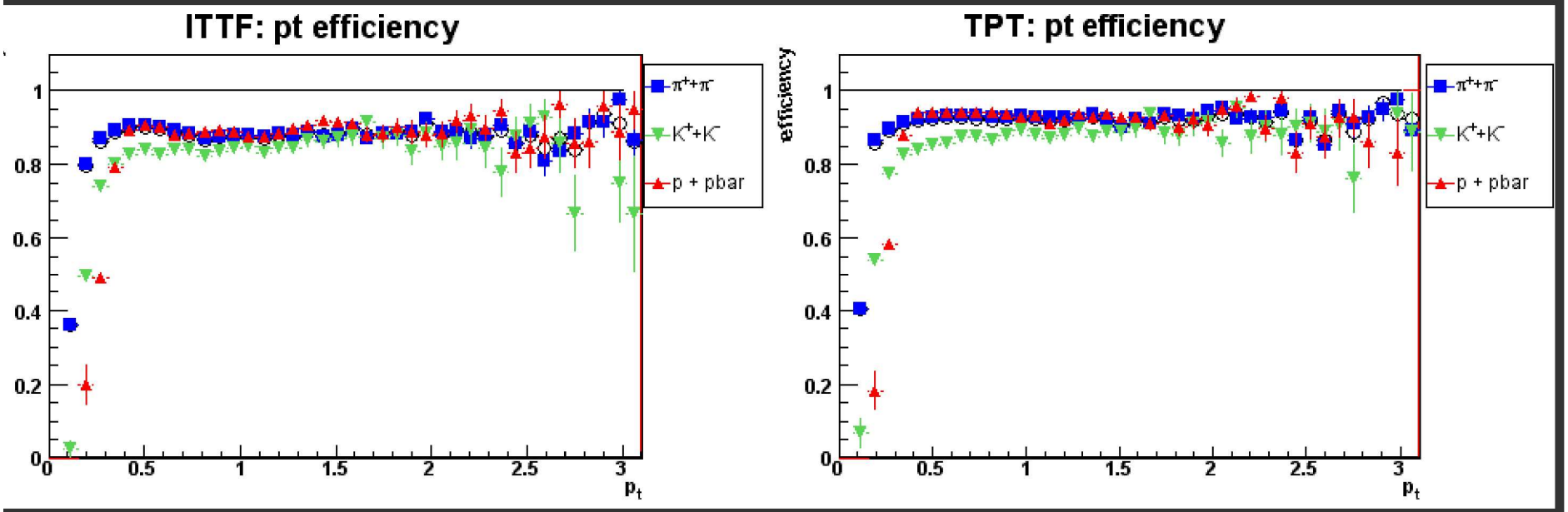








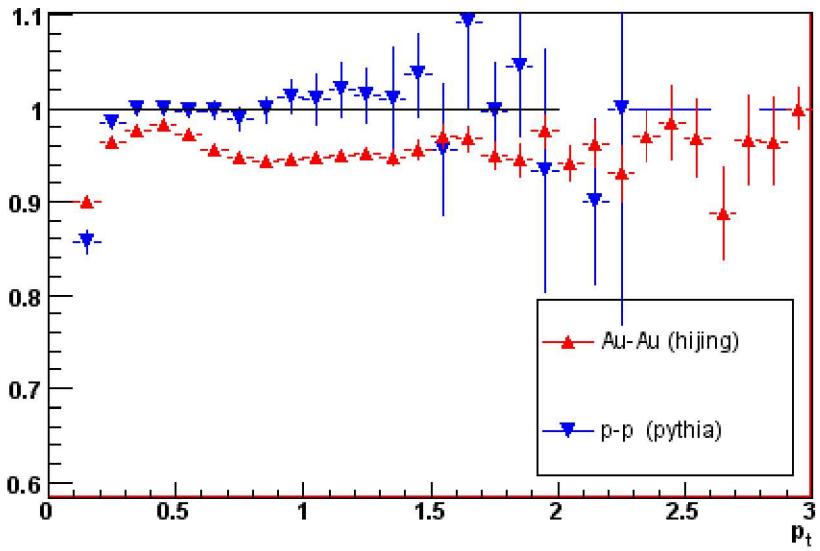
Tracking efficiency vs Pt



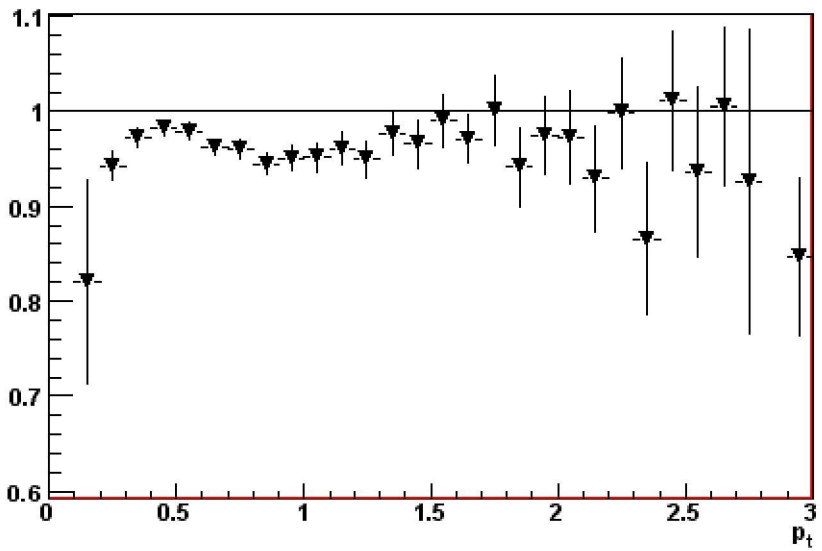
$$Efficiency_{P_t} = \frac{(p_t\ distribution\ of\ matched\ \ particles)}{(p_t\ distribution\ of\ accepted\ \ particles)}$$

Tracking efficiency vs Pt

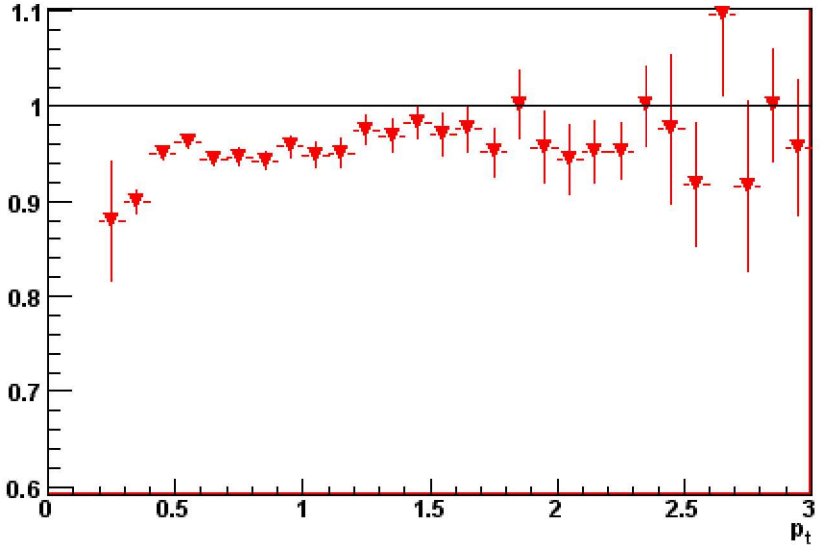
TTF/TPT: Pions



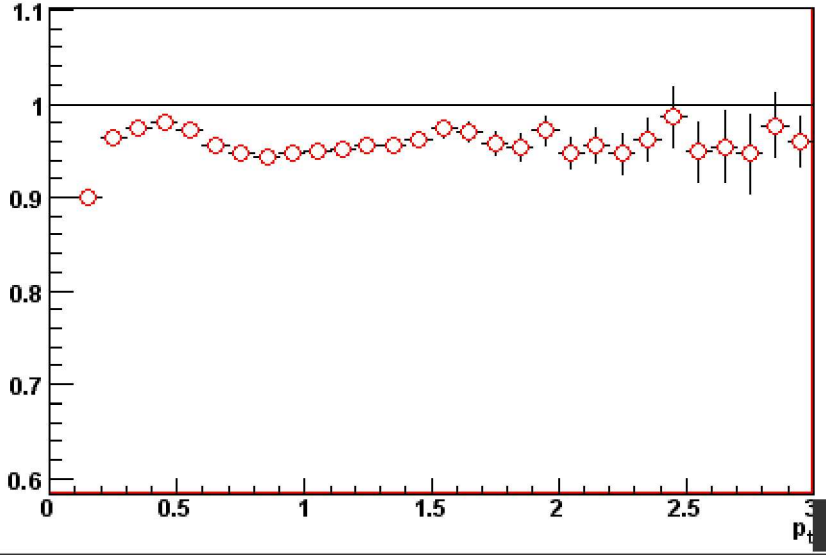
ITTF/TPT: Kaons



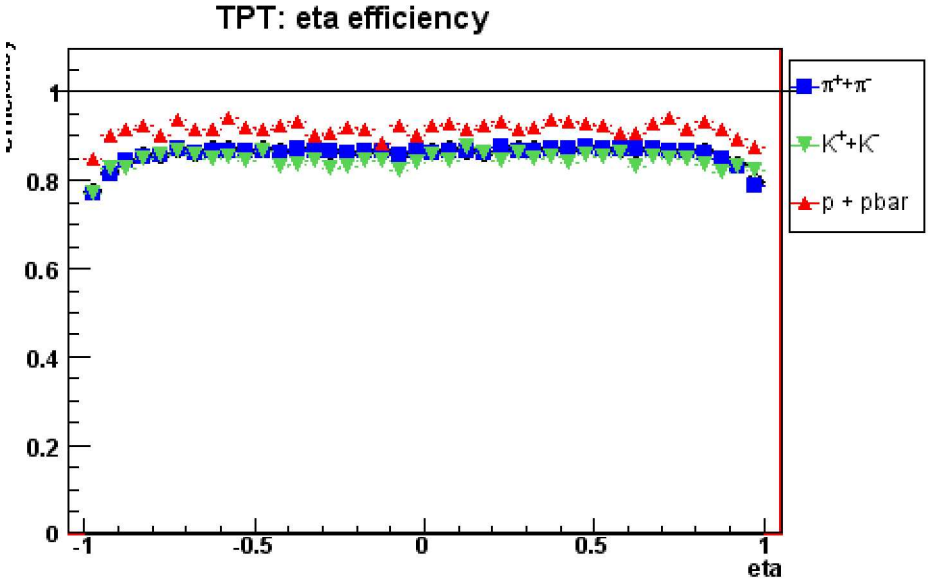
ITTF/TPT: Protons

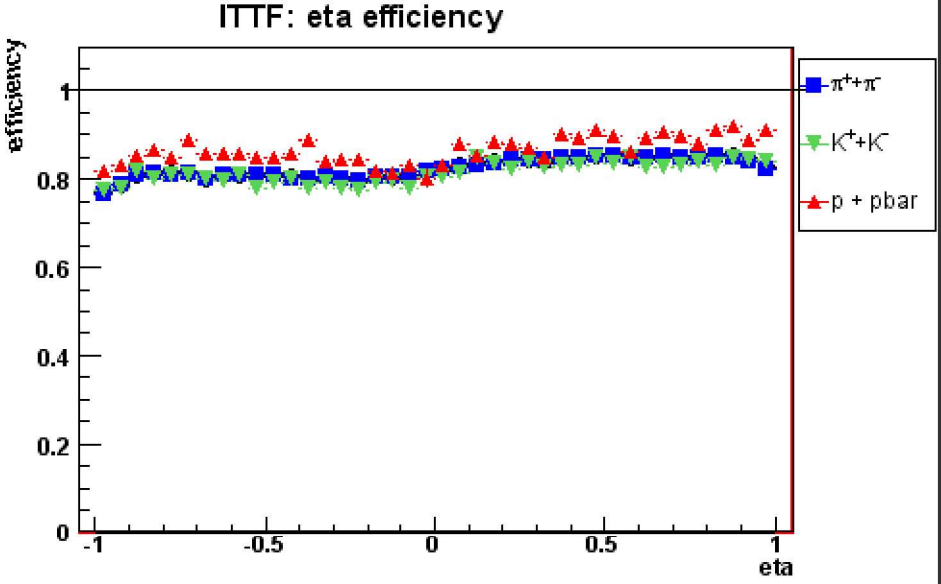


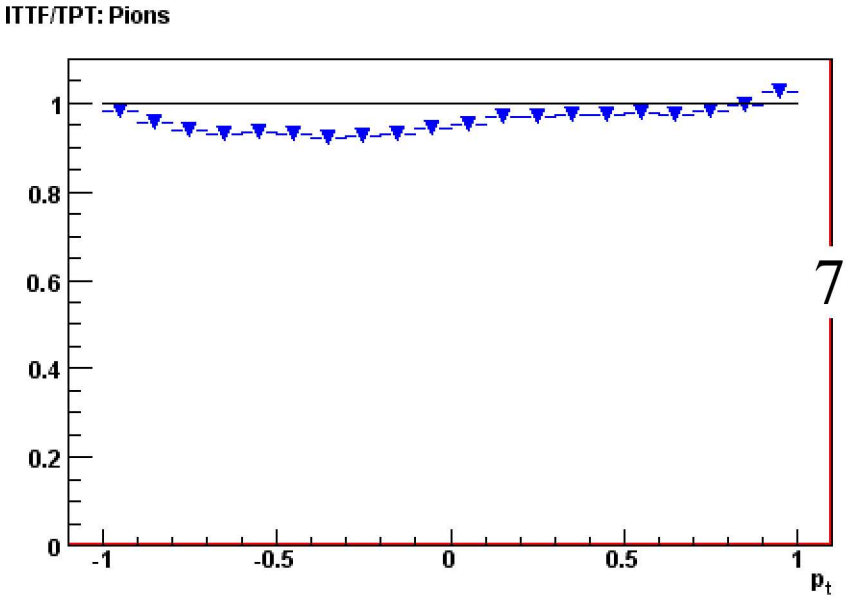
ITTF/TPT: inclusive



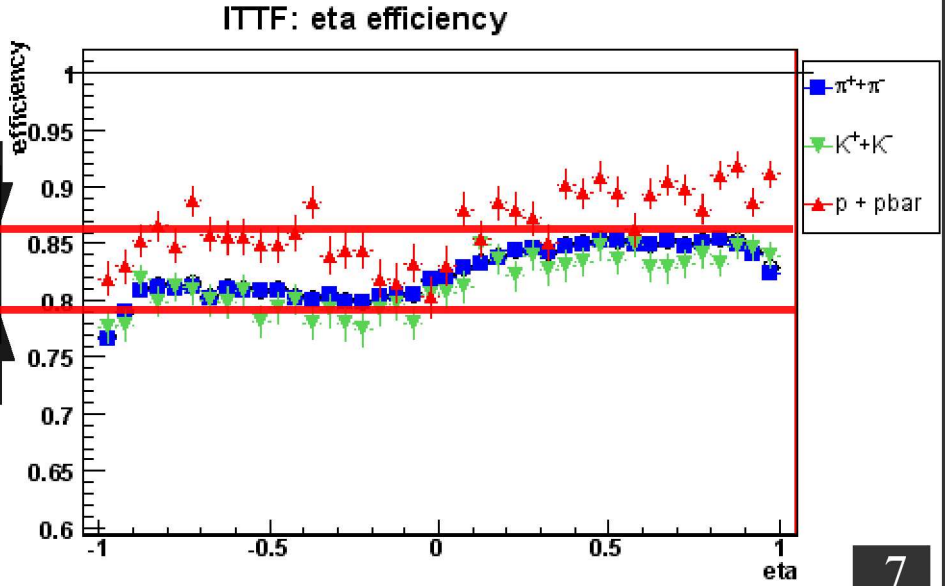
Tracking efficiency vs Eta



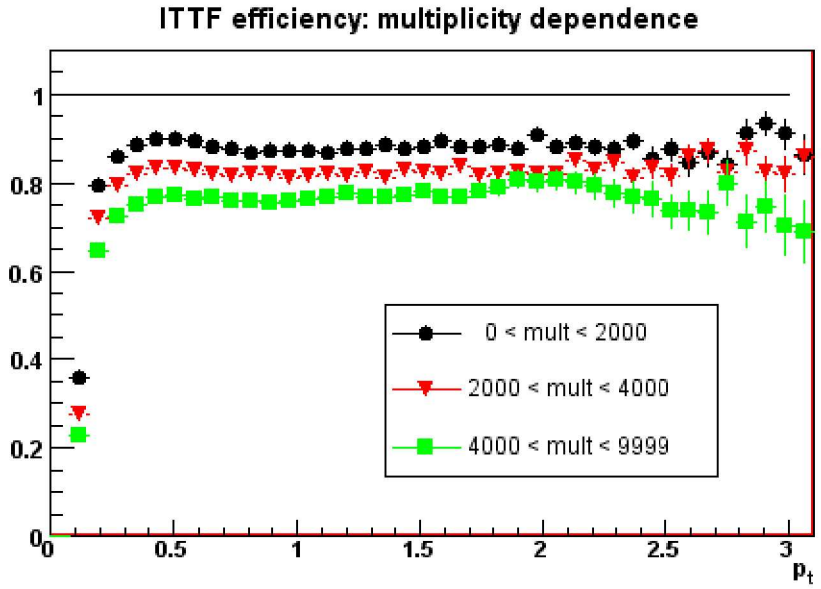


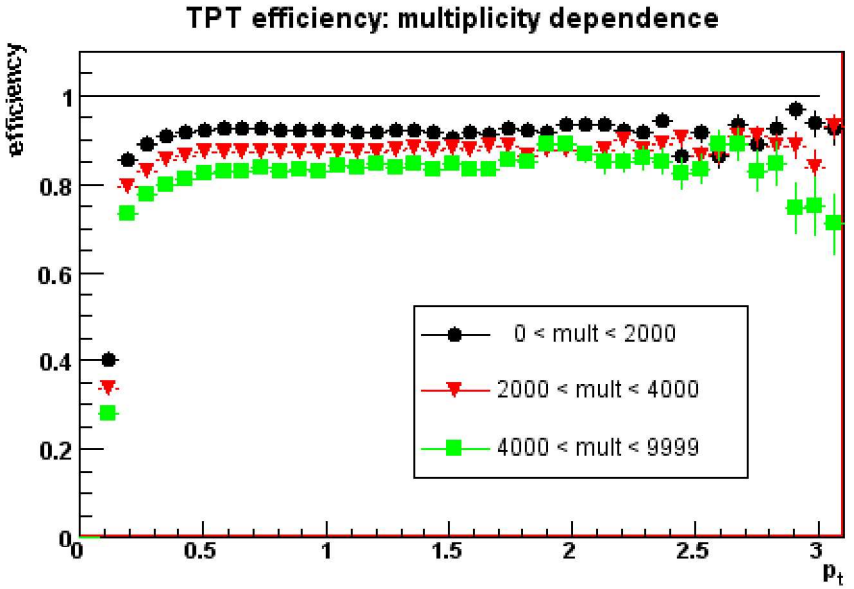


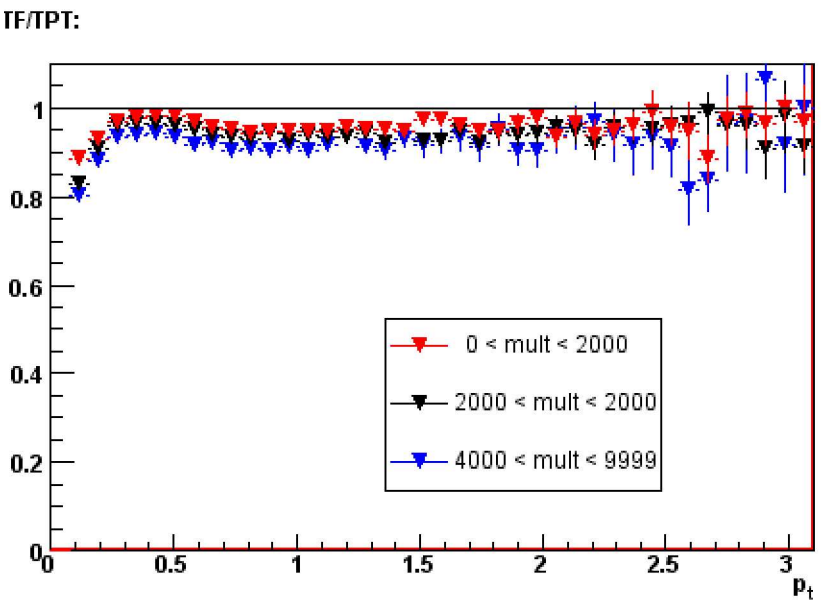
7 %



Tracking efficiency vs. pt: multiplicity dependence



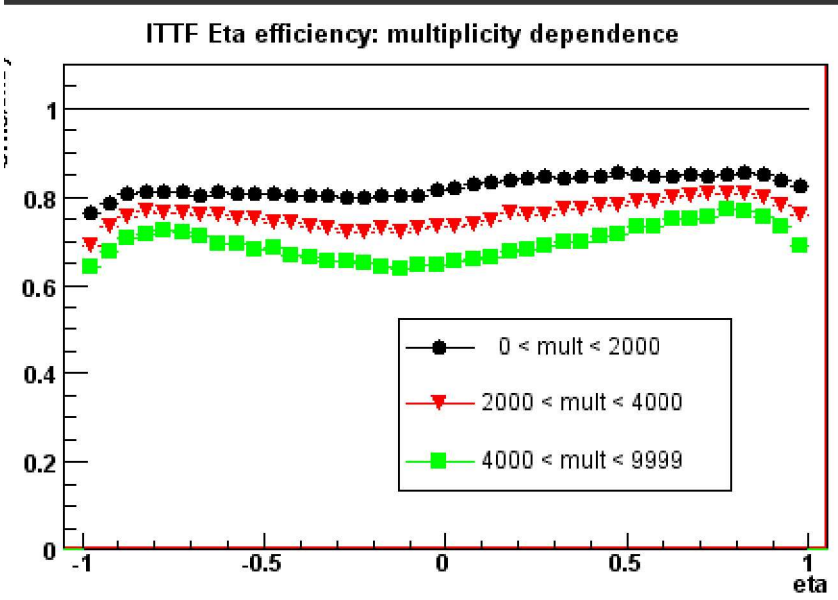


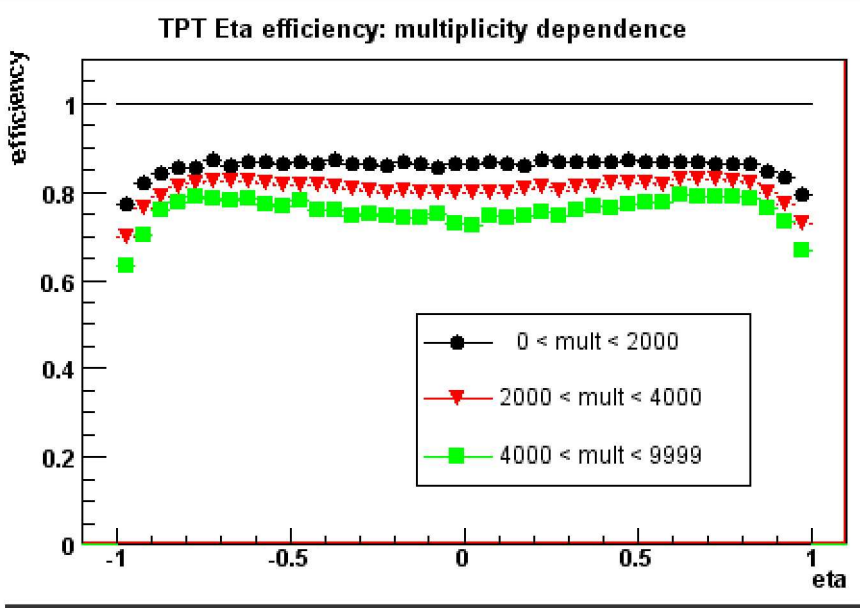


three track multiplicity bins:

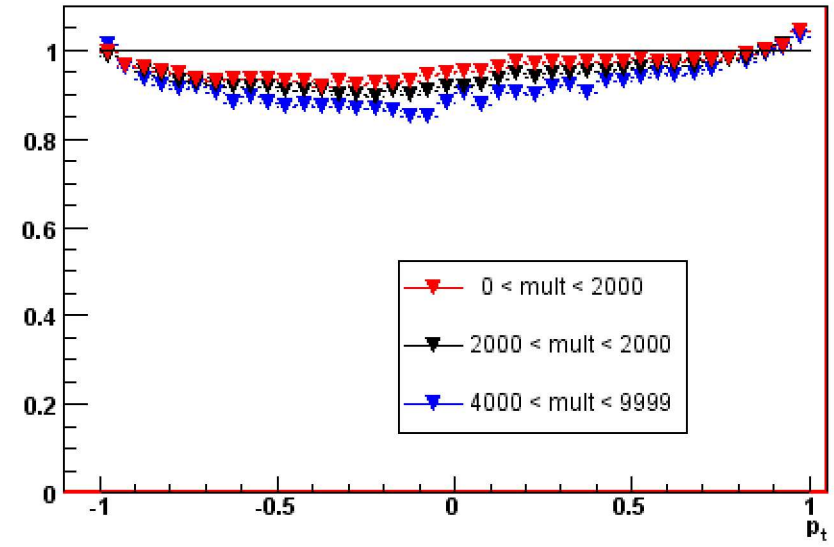
1) 0 < multiplicity < 2000
2) 2000 < multiplicity < 4000
3) 4000 < multiplicity

Tracking efficiency vs Eta: multiplicity dependence





ITF/TPT:



Efficiency study: conclusions

- asymmetry of phi distribution for phi (-0.4 π, 0)
- asymmetry of eta distribution: ~7%
- the tracking efficiency is decreasing with

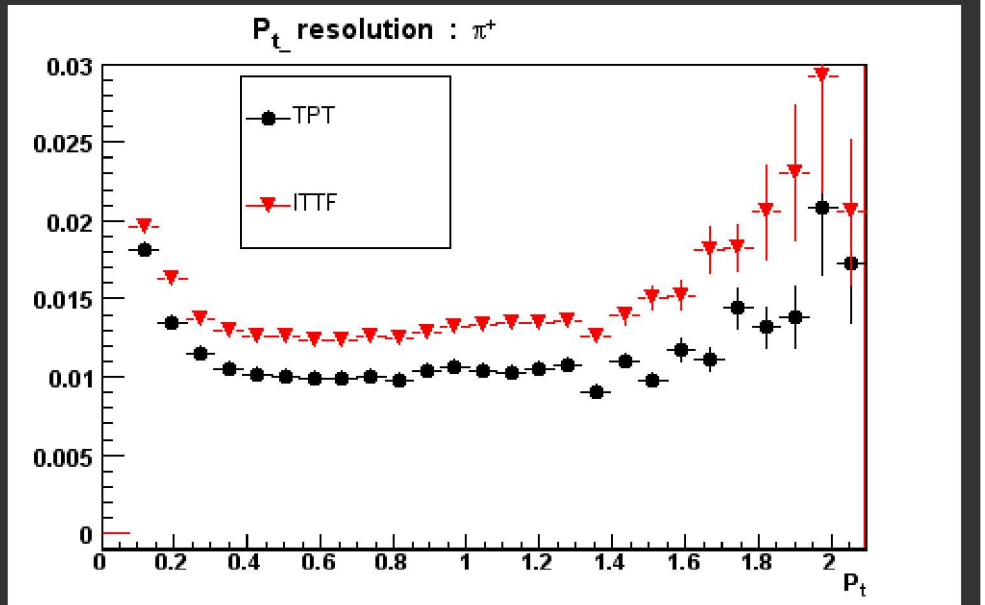
increase of event multiplicity

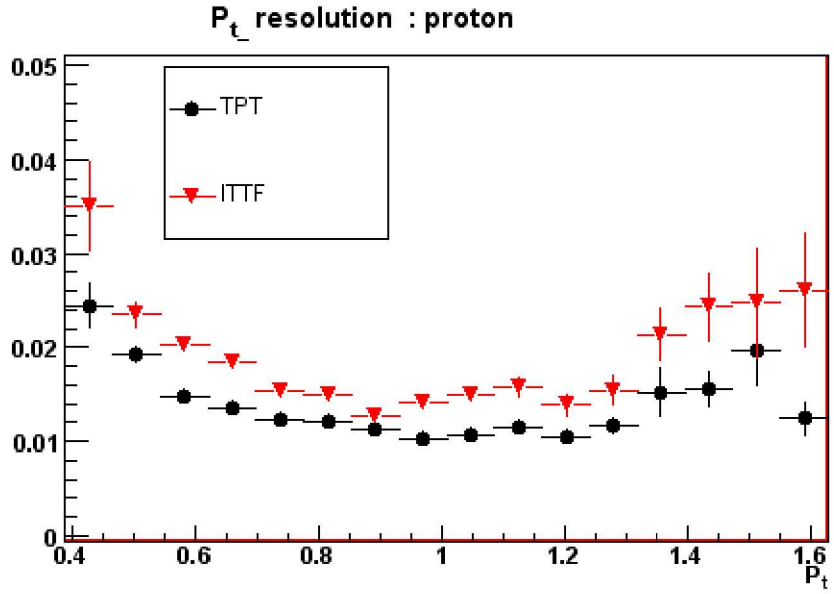
Pt resolution

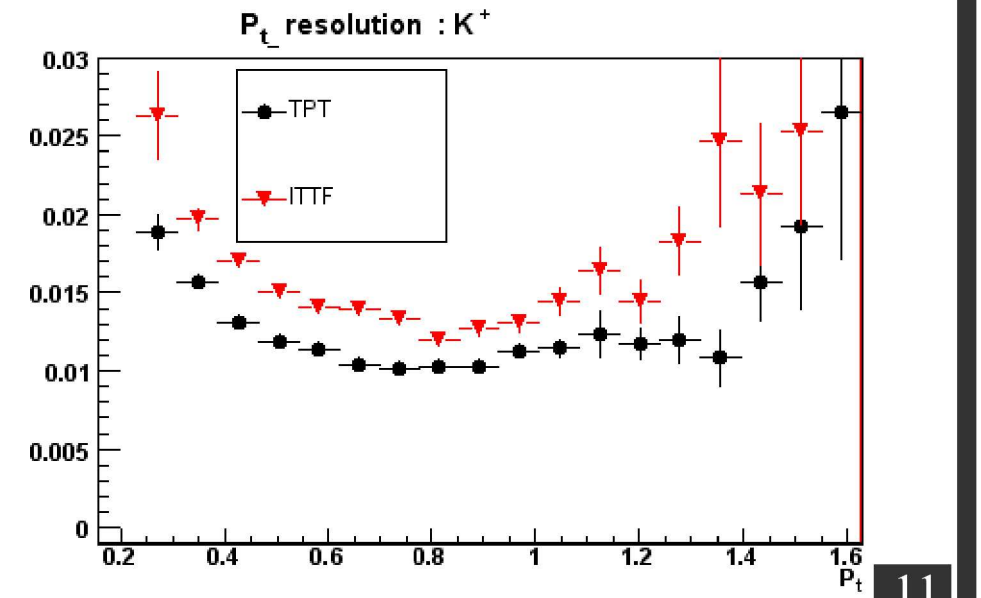
Resolution :

$$RMS\ of\ \frac{(X_{rec} - X_{mc})}{X_{mc}},\ X = p_t, eta, phi$$

TPT resolution is better

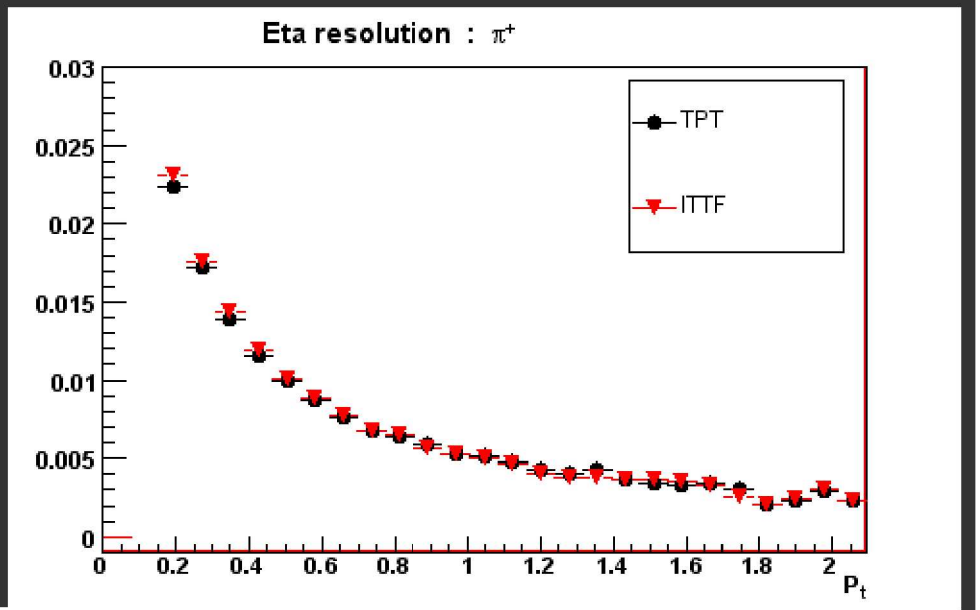


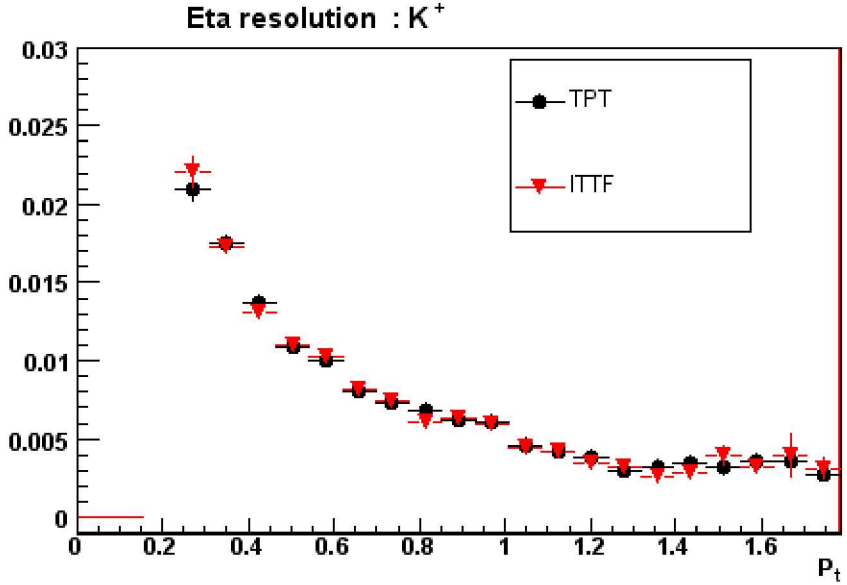


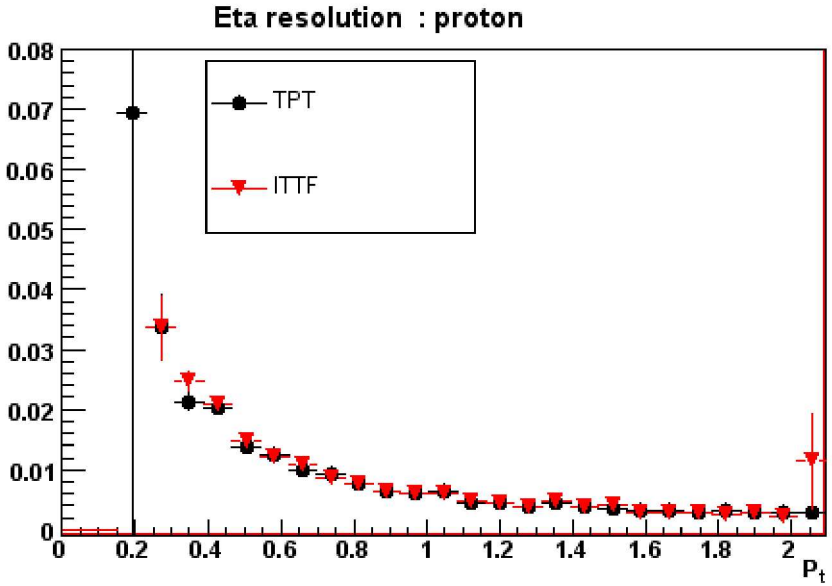


Eta resolution vs. pt

no difference between both trackers

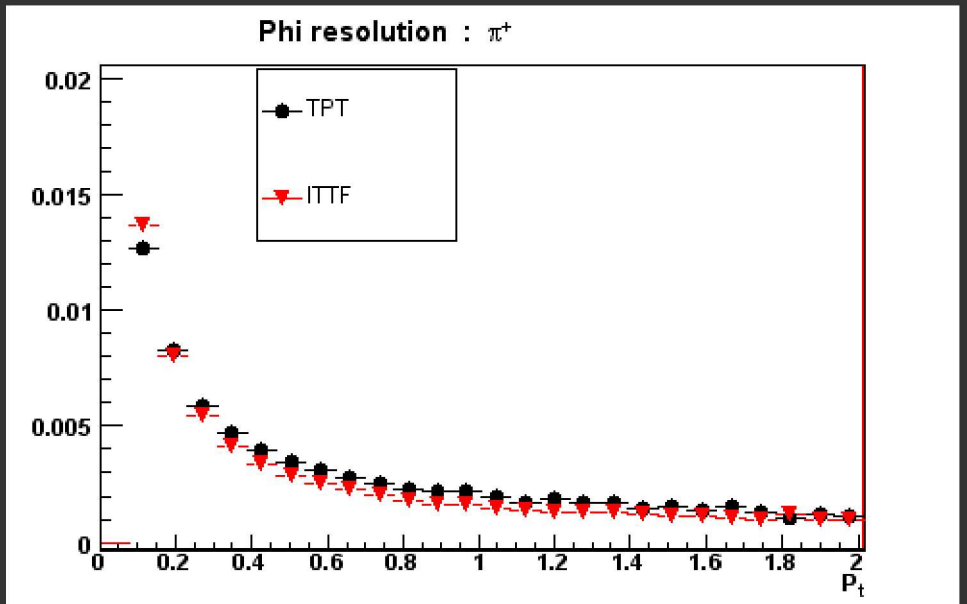


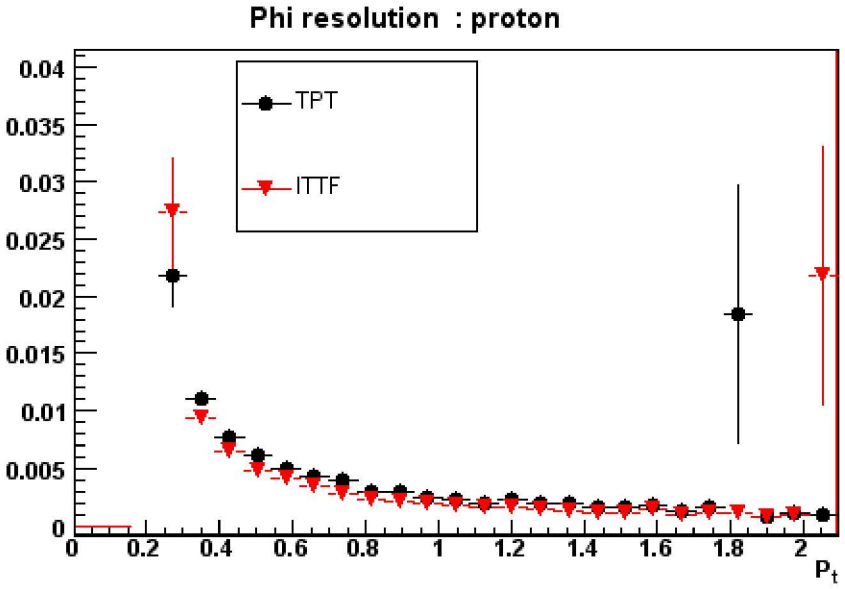


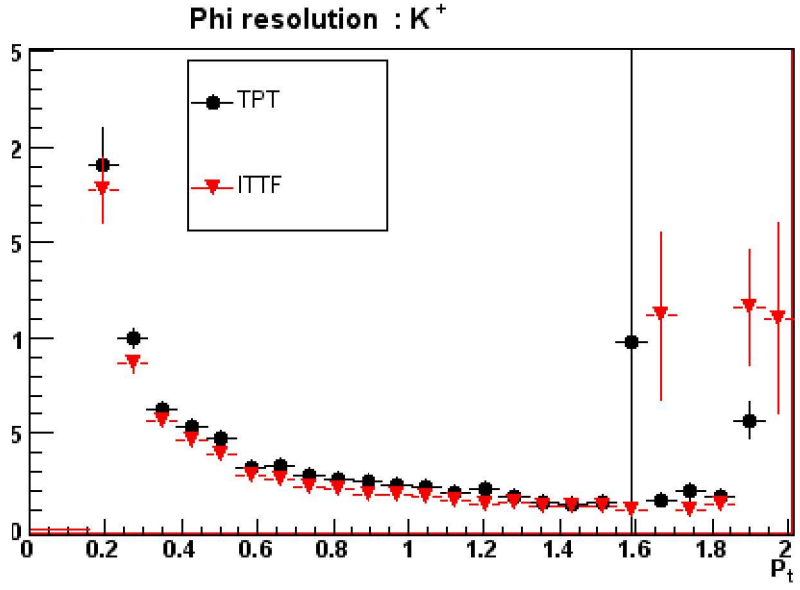


Phi resolution vs. pt

no difference between
both trackers







Pulls

$$curvature\ pull = \frac{(C_{rec} - C_{mc})}{C_{error}}$$

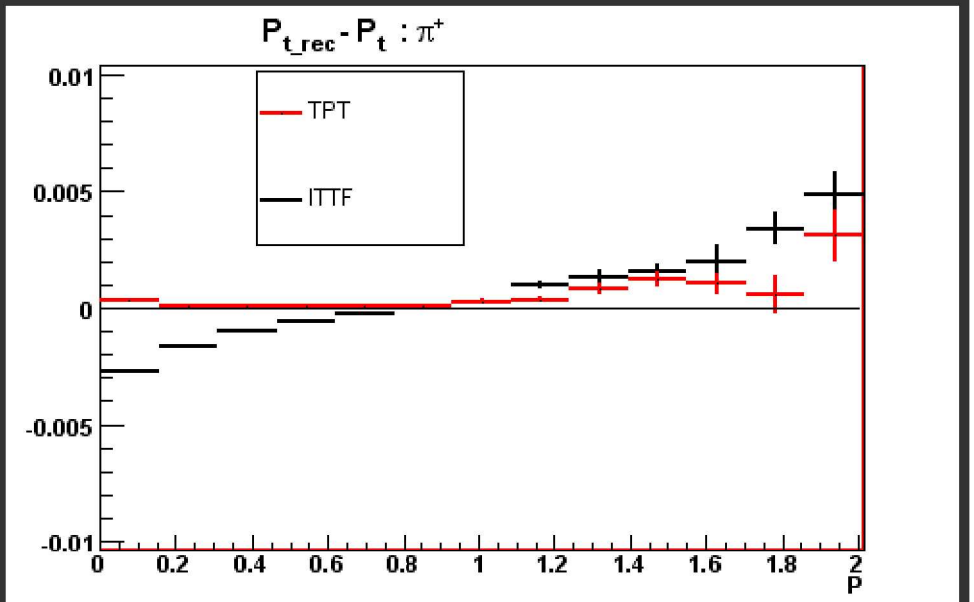
$$p_t\ pull = \frac{(1/p_{trec} - 1/p_{tmc})}{P_{terror}}$$

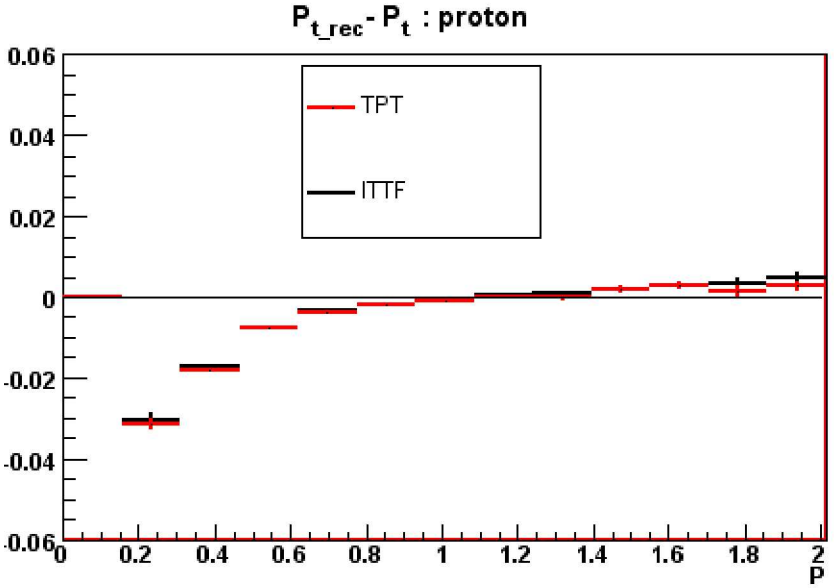
$$tanaa(\lambda)\ pull = \frac{(\tan(\lambda)_{rec} - \tan(\lambda)_{mc})}{(\tan(\lambda)_{error})}$$

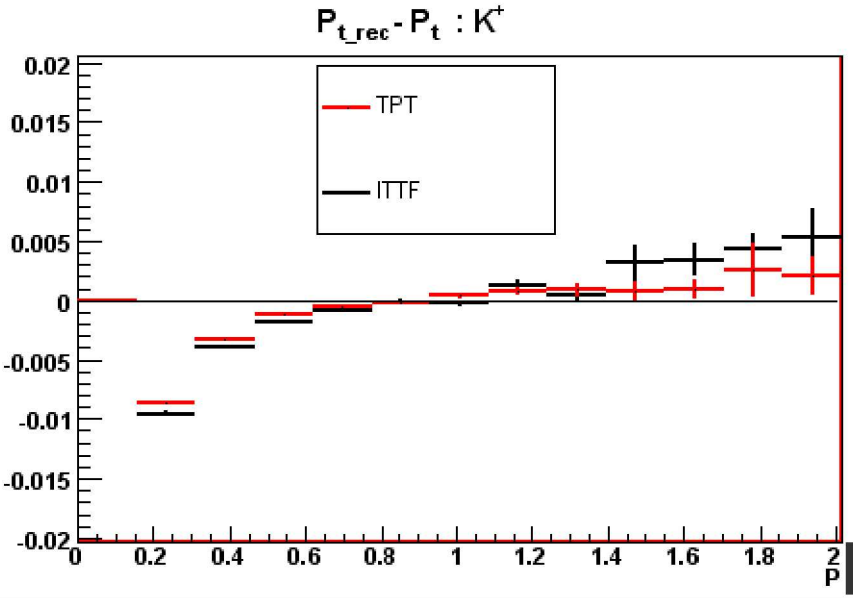
Pt bias:

Profile of (Pt_rec – Pt_mc) vs. Pt

NOTE: different vertical scales

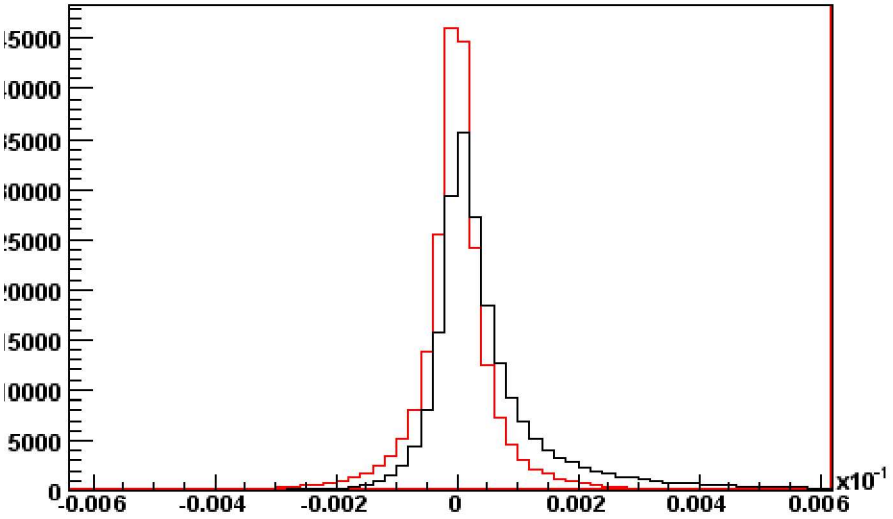




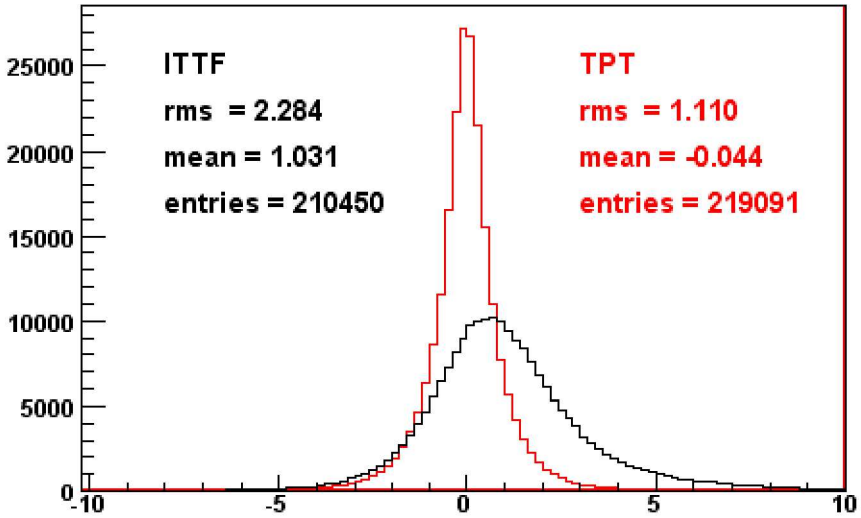


Pull plots: curvature

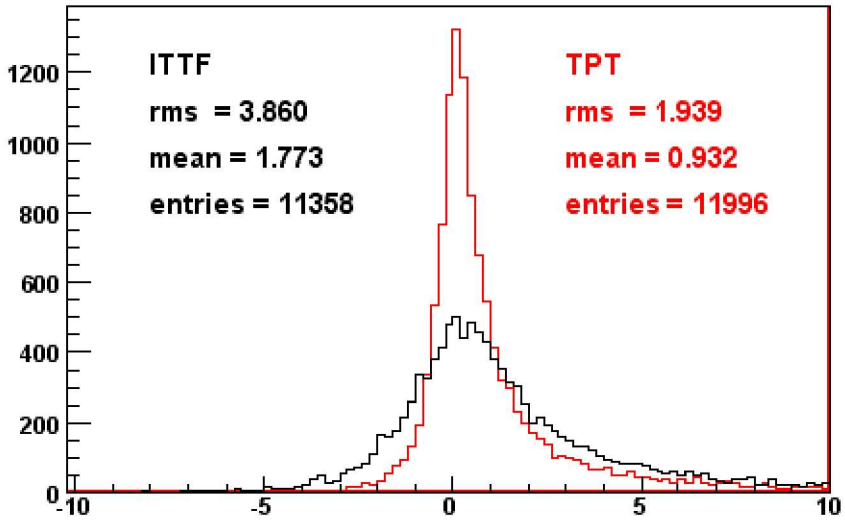
curvature $_{rec}$ - curvature $_{mc}$ (primaries) : π^+



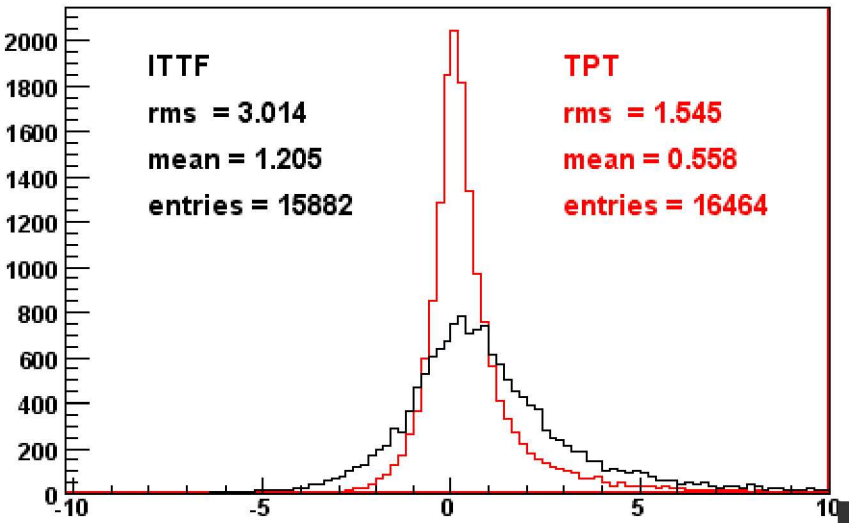
curvature pull (primaries) : π^+



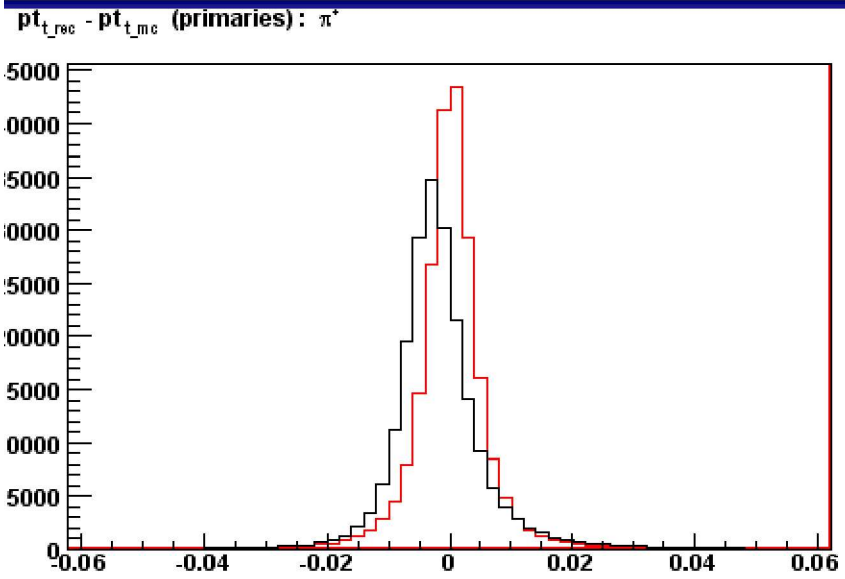
curvature pull (primaries) : proton

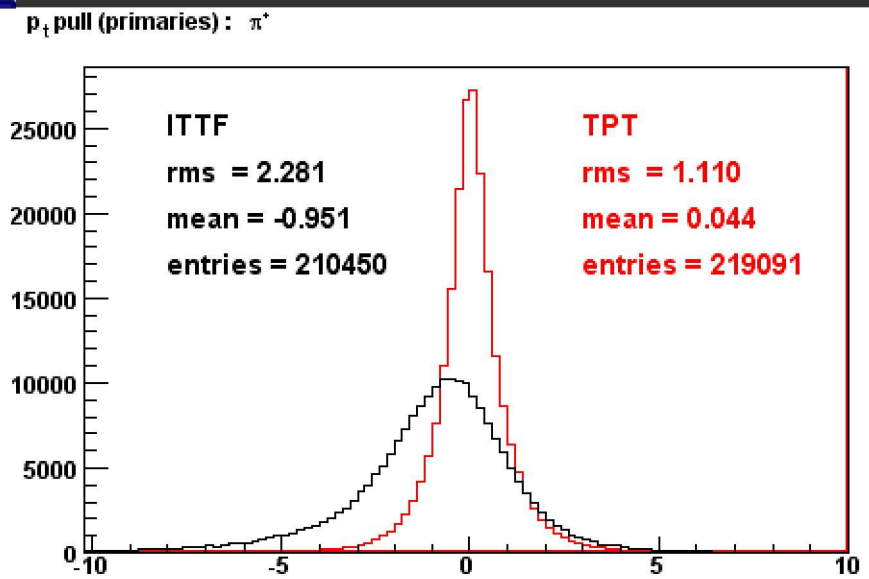


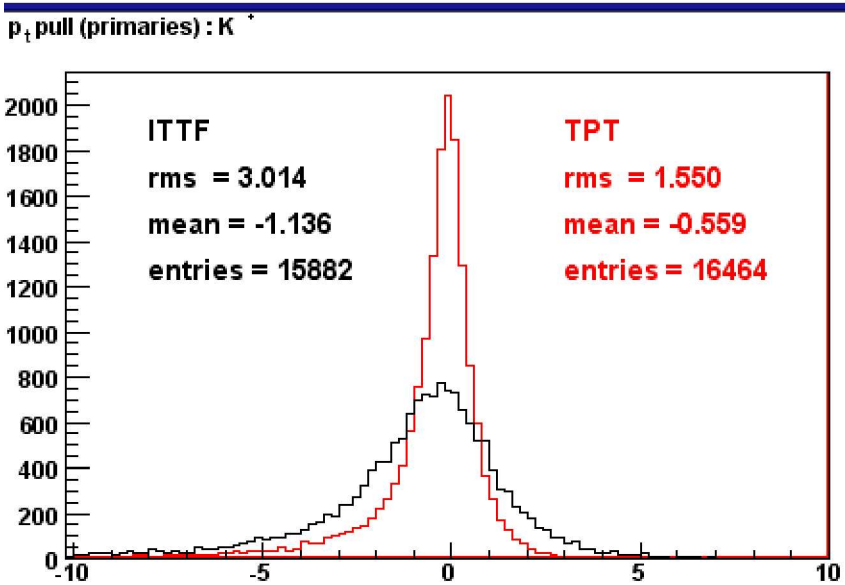
curvature pull (primaries) : K $^+$

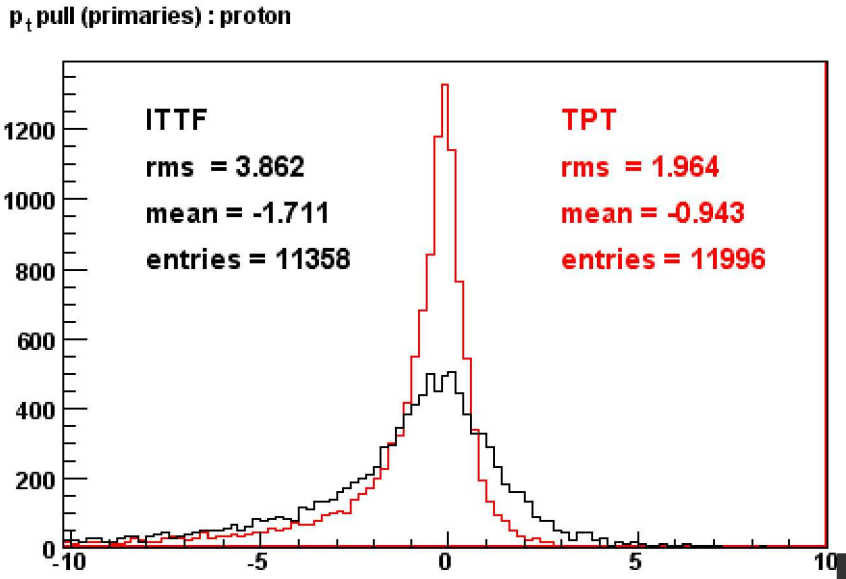


Pull plots: pt

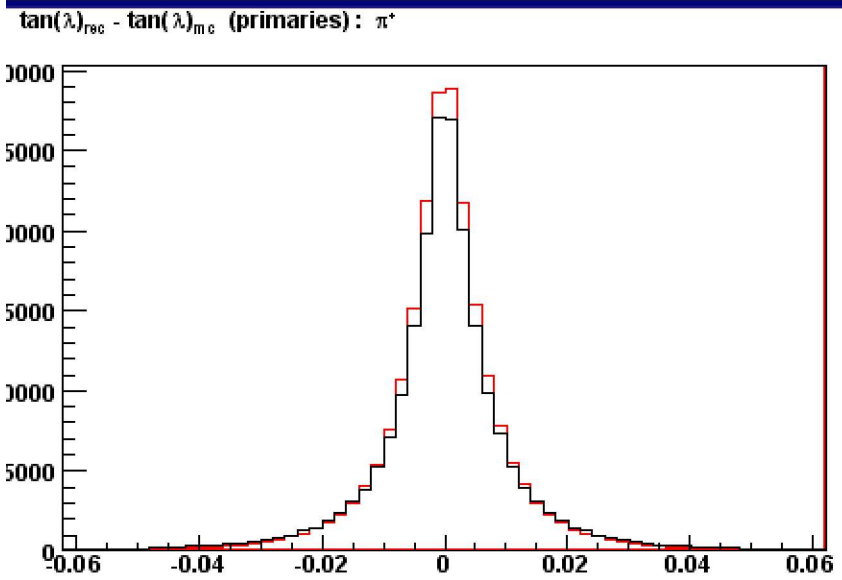


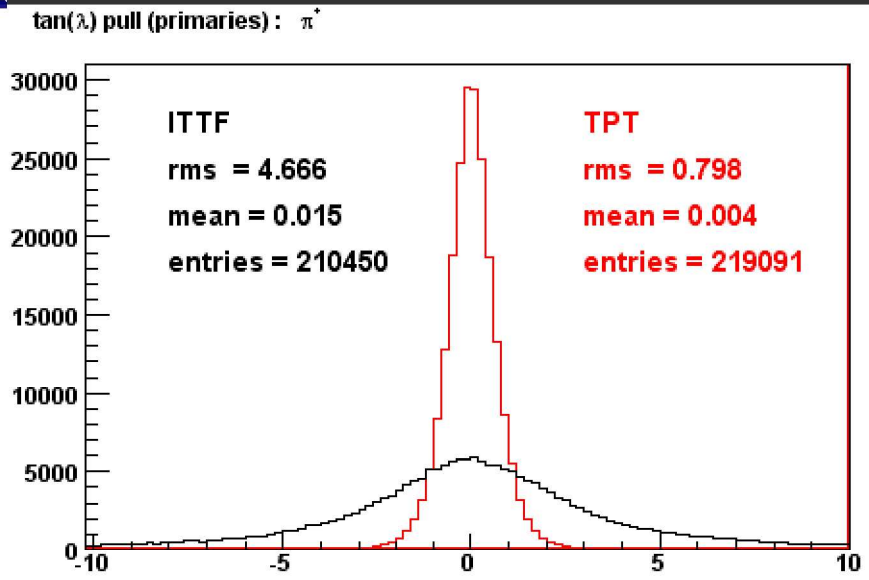


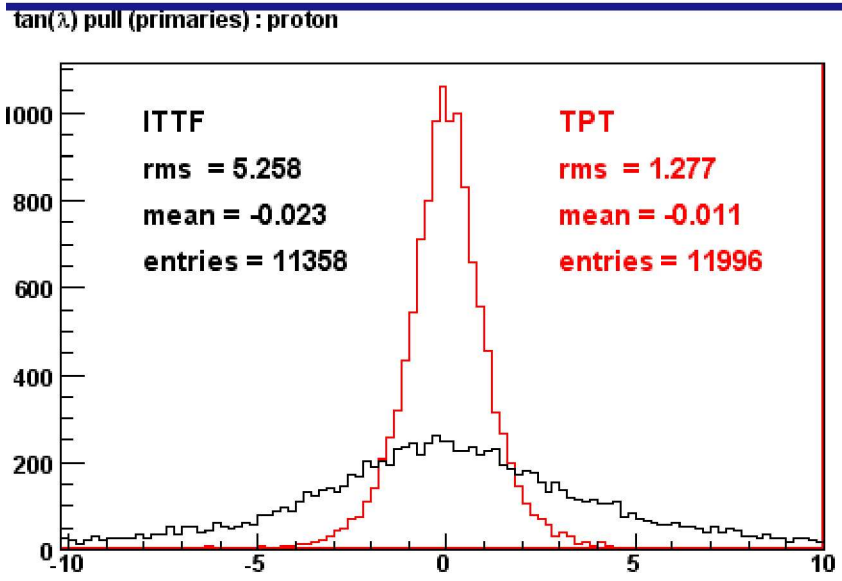


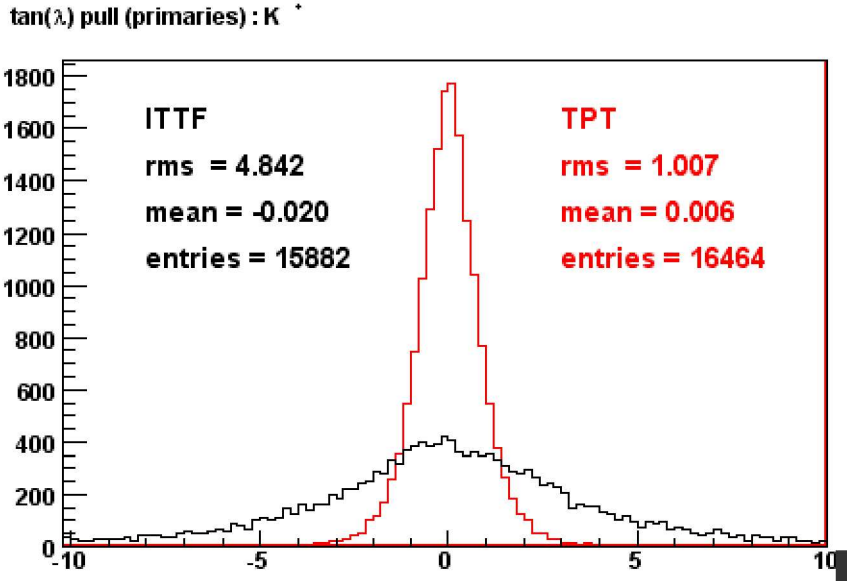


Pull plots: tan(λ)









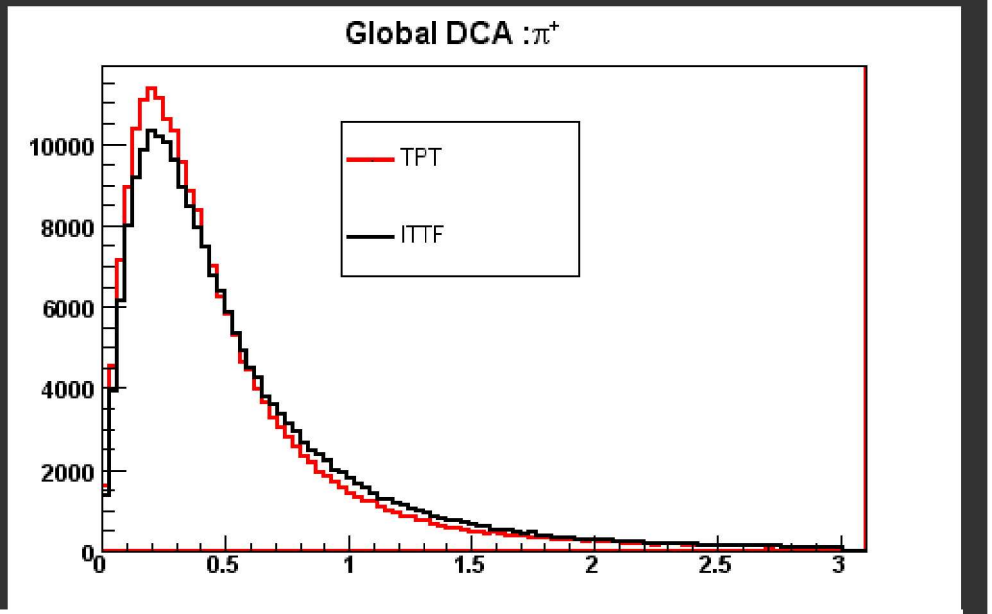
Pulls: conclusions

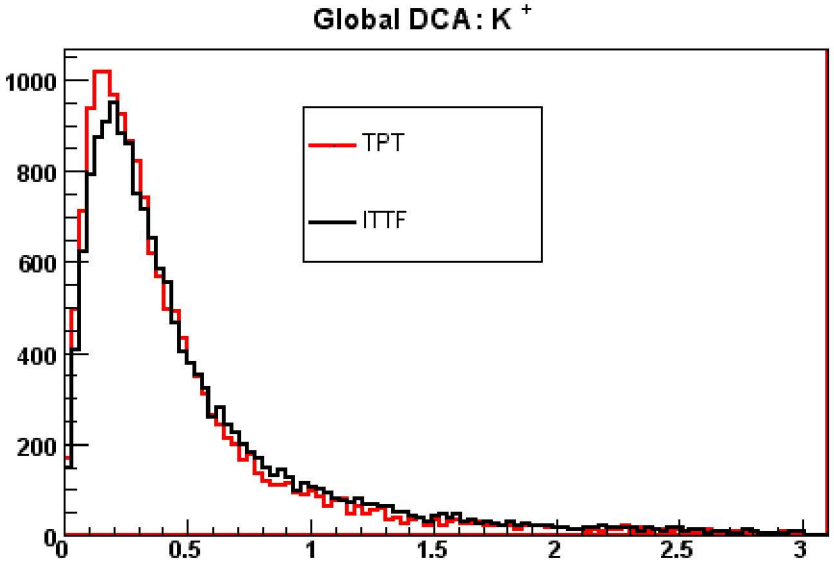
- mean value of pulls is shifted for ITTF tracker
- RMS of pull plots for TPT is ~2-3 times better than for ITTF
- the error calculation is a reason of incorrect RMS for ITTF

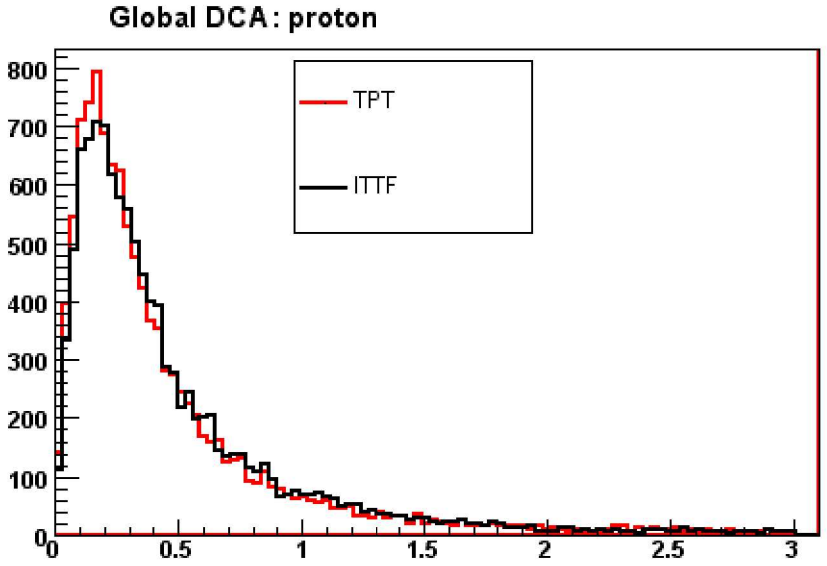
DCA & fit points

DCA: globals

the schape of global DCA distribution for ITTF is very similar to TPT

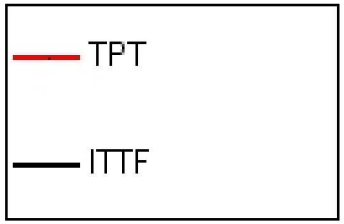


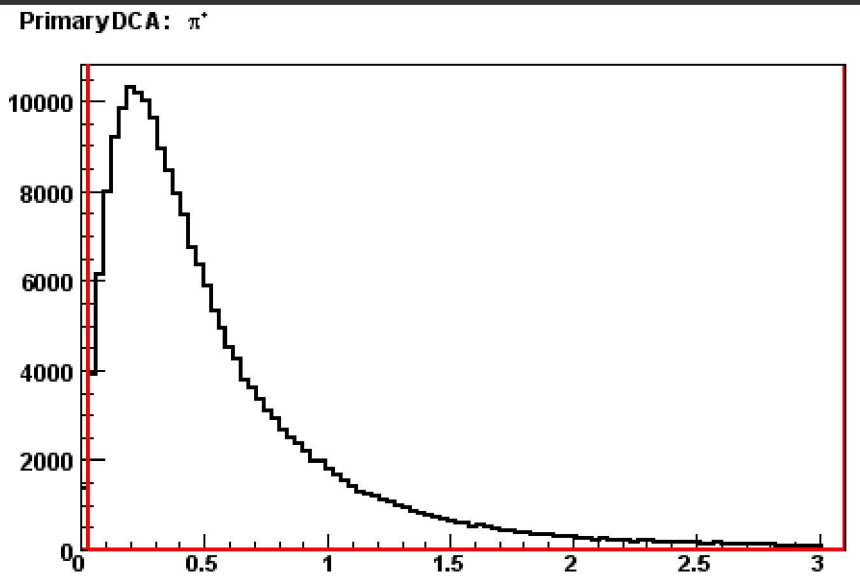


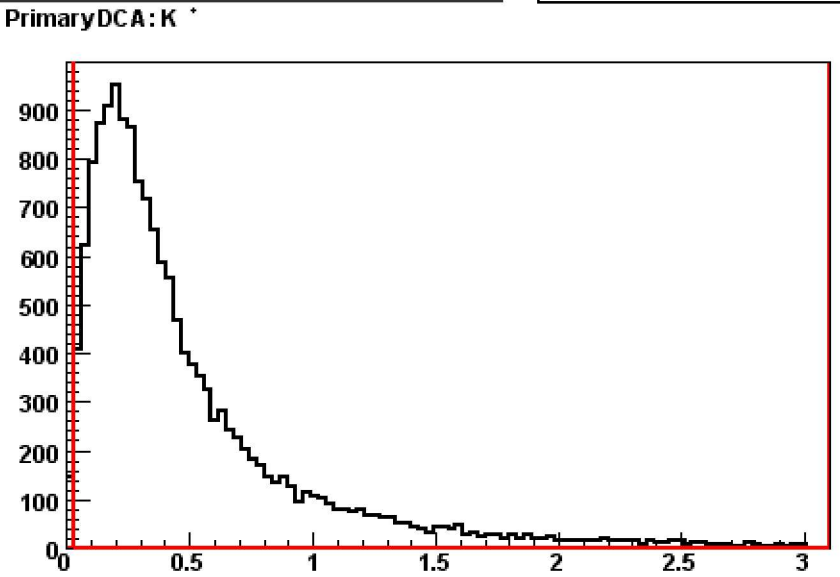


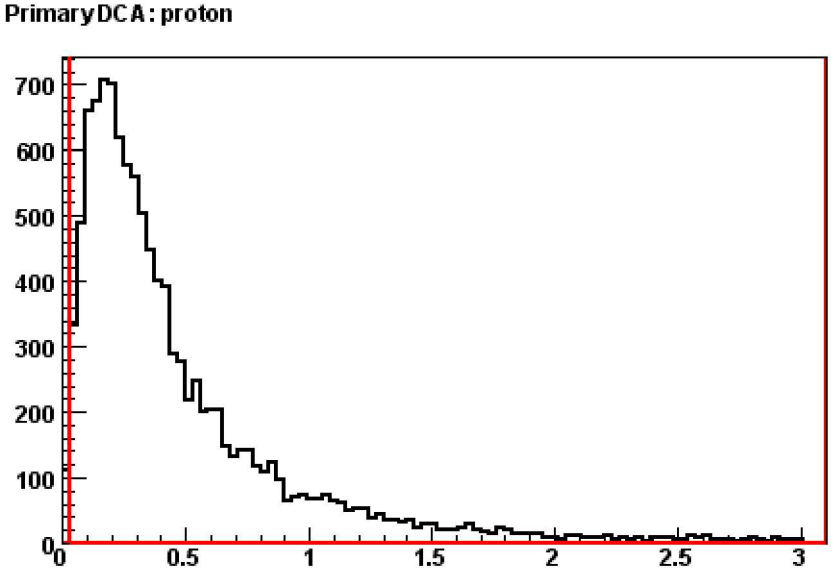
DCA: primaries

primary DCA is incorrect for ITTF

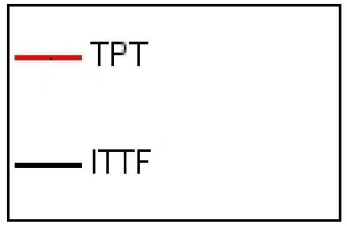


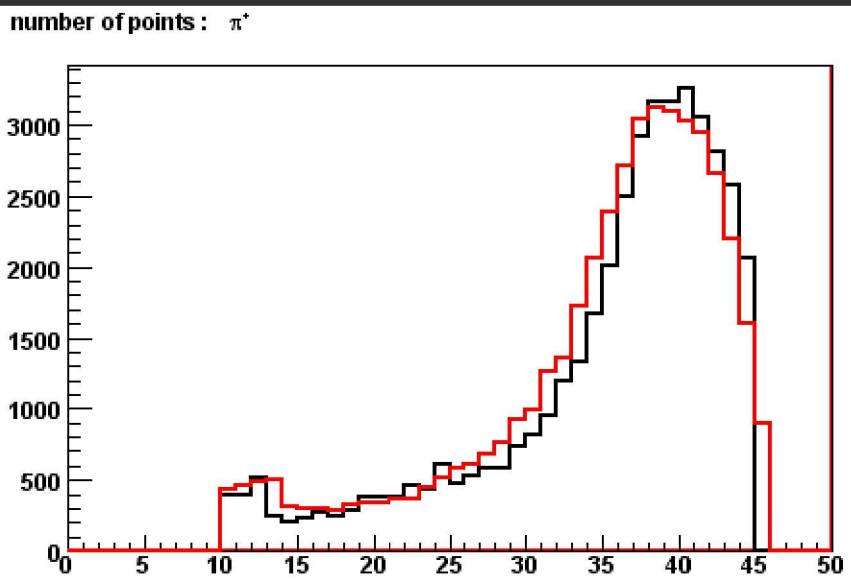


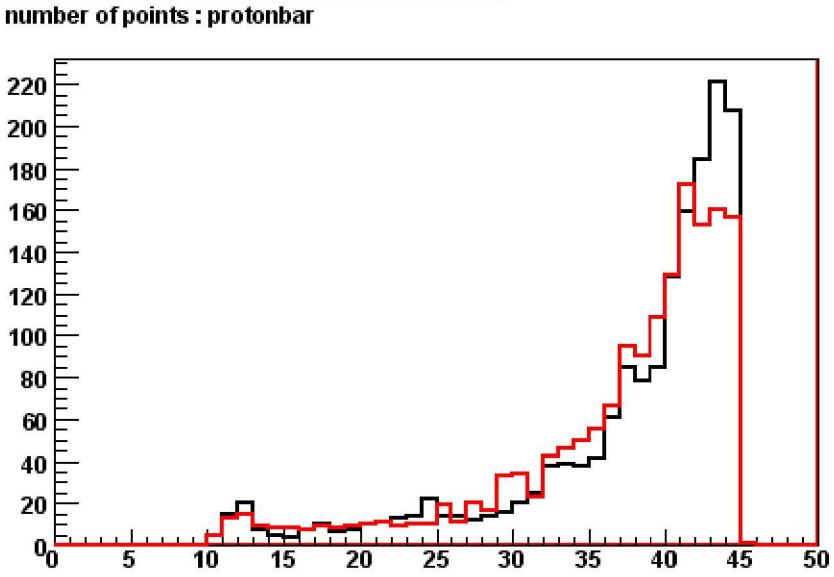


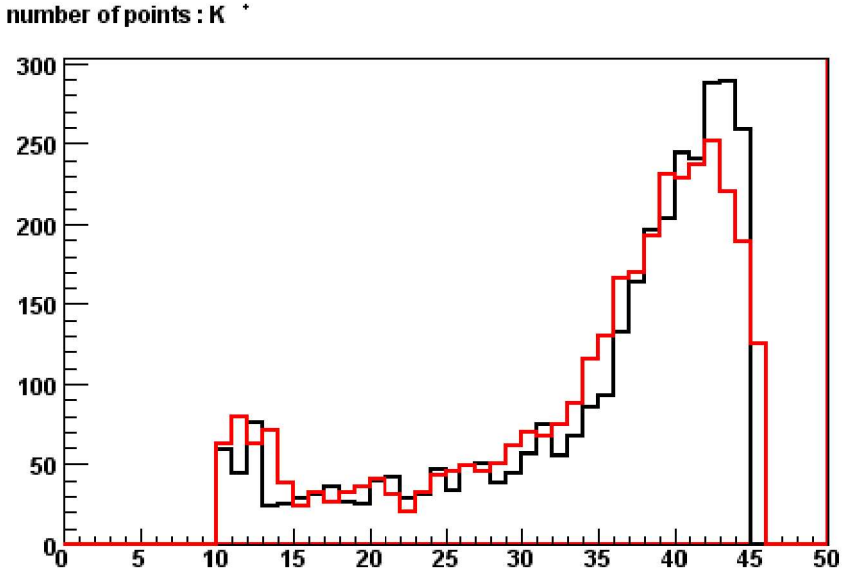


Number of fit points

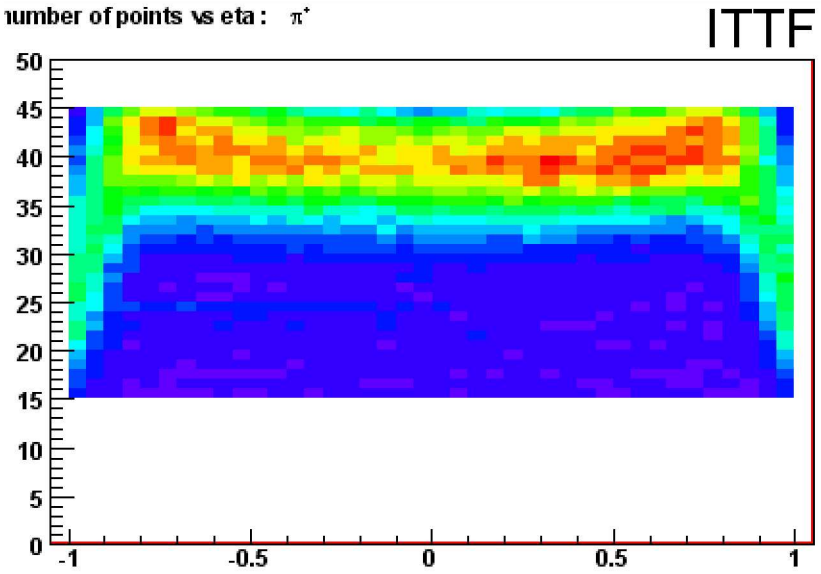


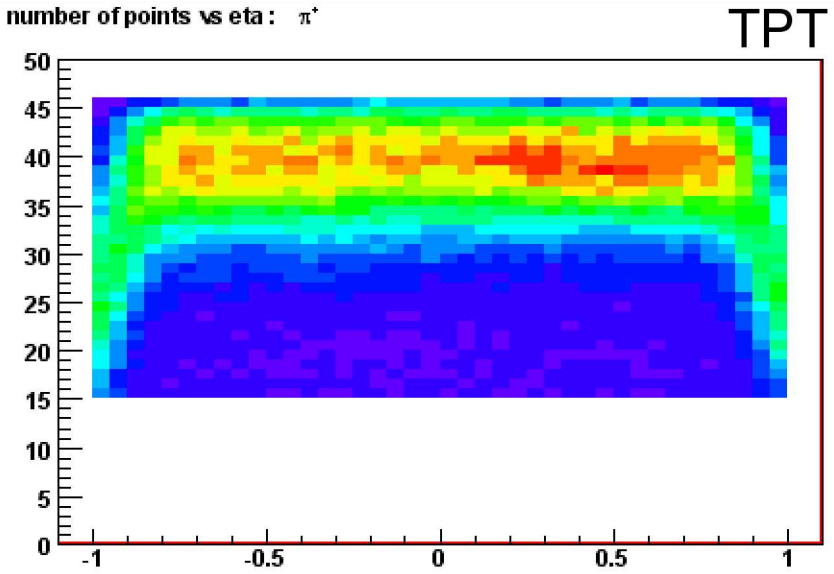


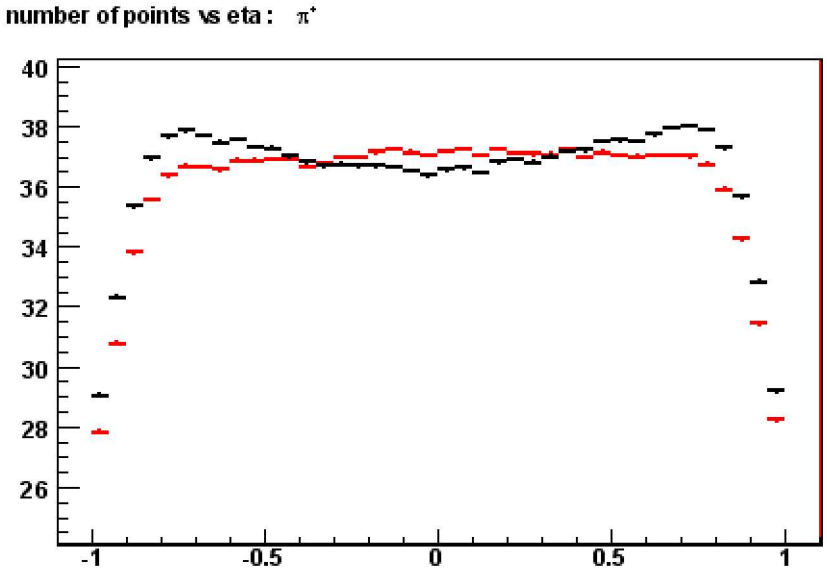


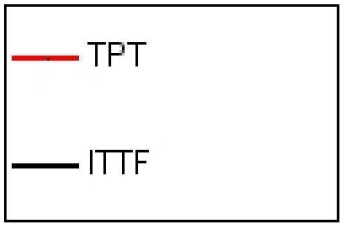


Number of fit points vs Eta









Conclusions:

- both trackers give similar results but the current comparison is in TPT adventage
- the following two issue are needed to be studied and resolved
  - DCA problem for primaries
  - error calculation