Status of CA Track Finder

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[1]Goethe-University Frankfurt am Main
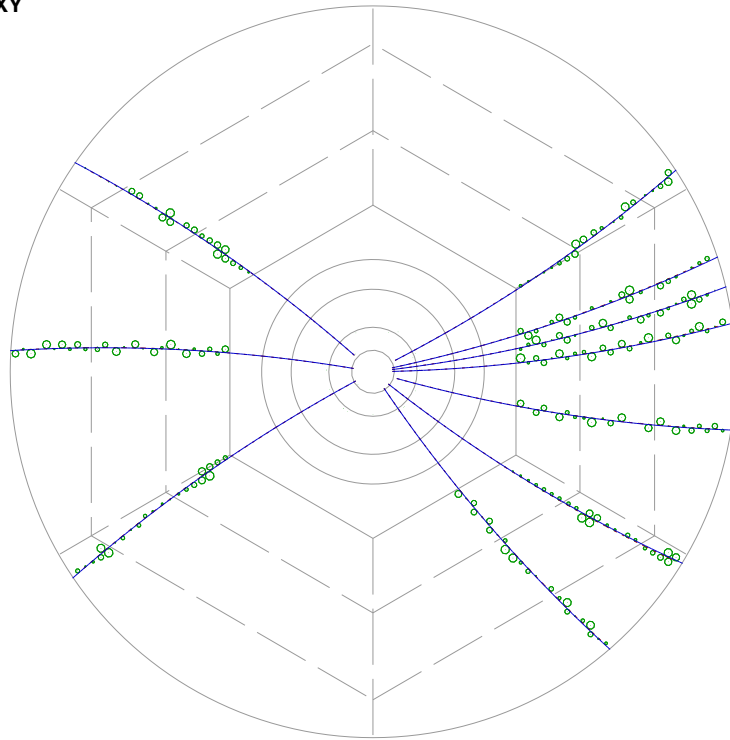[2]FIAS Frankfurt Institute for Advanced Studies
[3]GSI Helmholtz Center for Heavy Ion Research
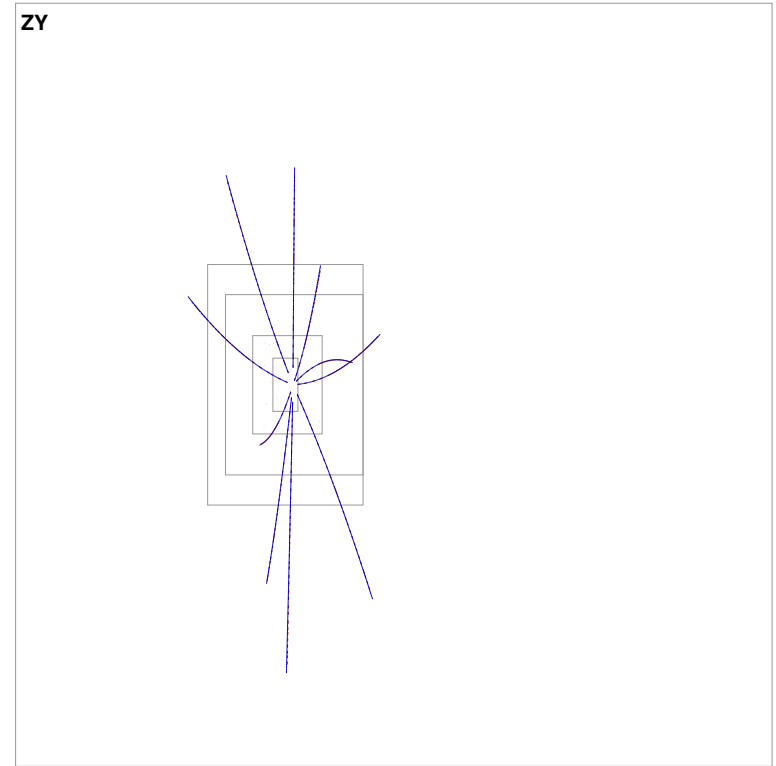[4]Institute for Theoretical and Experimental Physics, Moscow

CA Track Finder in STT and MVD

10 primary tracks with pt = 1 GeV/c

	STT+MVD
Efficiency	100.0
Clone	4.8
Ghost	1.5
Tracks/event	10
Time, ms/event	1

S. Gorbunov, 10.12.2014

Reconstruction Efficiency

Tobias found a problem in the CA TrackFinder:

Overall track finding efficiency was only 42% and no MVD hits

What was done:

1. Corrected normalisation (barrel only) of track efficiency calculation in standard QA (trackingQA)
2. Corrected track finder performance to account for tracks with > 1 hit/layer => QA efficiency = CA Track Finder Performance
3. Adjusted initialisation of the track finder to Panda data (detector geometry, errors on input hits, internal tracking cuts,…)

| Reconstractable track selection	Eff. old 1+2	Eff. new 1+2+3
StandardTrackFunctor: > 3 Hits in MVD or > 5 Hits in (MVD+STT+GEM)	42.3	64.1
OnlyBarrelFunctor: > 3 Hits in barrel MVD and > 5 Hits in (barrel MVD + STT))	57.6	87.3
OnlySttFunctor: > 5 Hits in STT	59.0	88.1
OnlyBarrelFunctor && (p > 0.05)	61.3	92.3
OnlySttFunctor && (p > 0.05)	62.5	92.5
OnlyBarrelFunctor && (pt > 0.05)	62.0	92.7
OnlyBarrelFunctor && (pt > 0.1)	66.9	94.6
(> 5 Hits in (barrel MVD + STT)) && (p >= 0.05)	62.4	92.7
Performance of CA tracker: (> 5 Hits in (barrel MVD + STT)) && (p >= 0.05)	62.5	93.0
Performance of CA tracker: (> 5 rows of hits in (barrel MVD + STT)) && (p >= 0.05)	*65.9*	*96.6*
Performance of CA tracker: (> 5 rows of hits in (barrel MVD + STT)) && (pt >= 0.05)	66.1	96.9

Reconstruction Efficiency

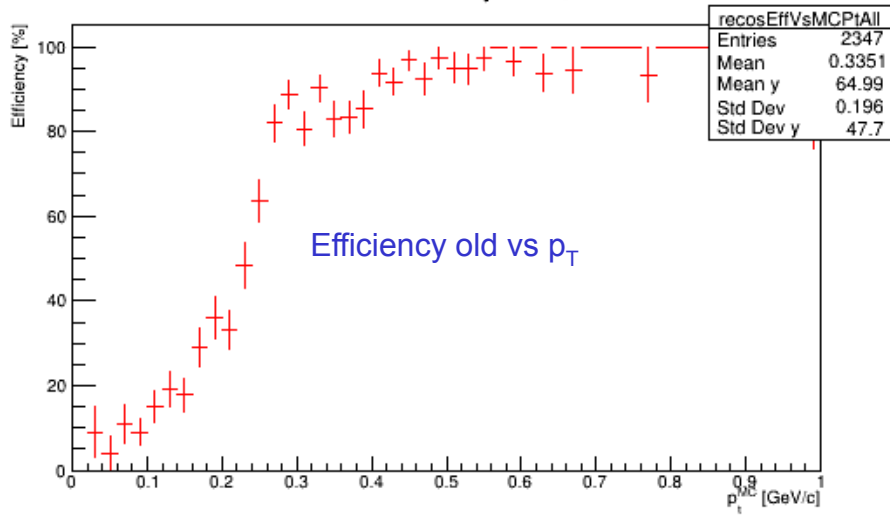| Efficiency, %	Eff. old	Eff. new
High-p primary	97.9	98.1
High-p secondary	91.1	93.3
High-p set	97.3	97.7
Low-p primary	*63.8*	97.7
Low-p secondary	*42.1*	93.0
Low-p set	*57.0*	96.2
All set	***65.9***	**96.6**

Cut on Very Low-Momentum Tracks

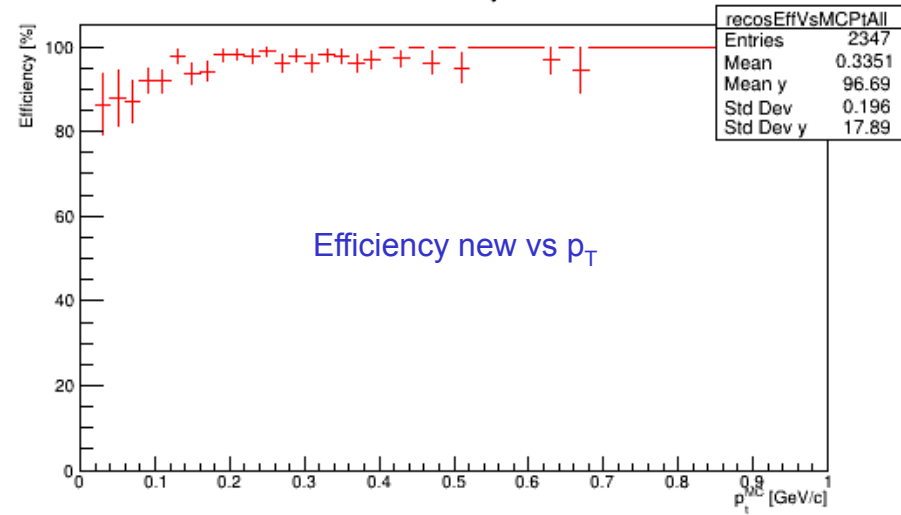A cut p>0.05 has been introduced in the CA performance to remove very low-momentum tracks
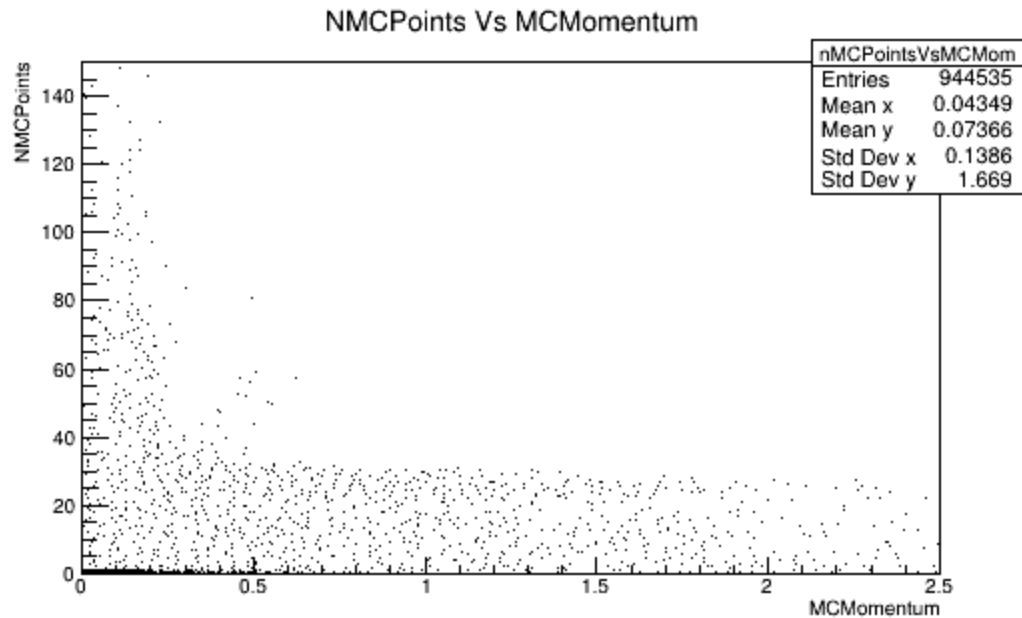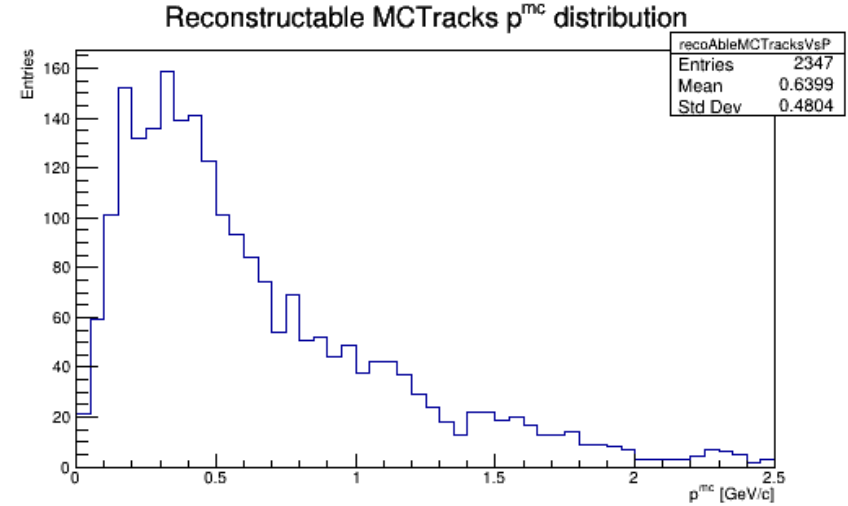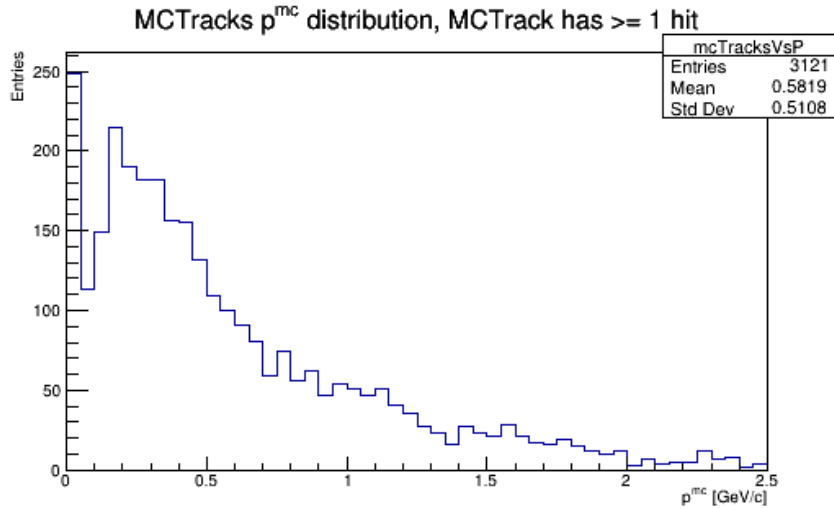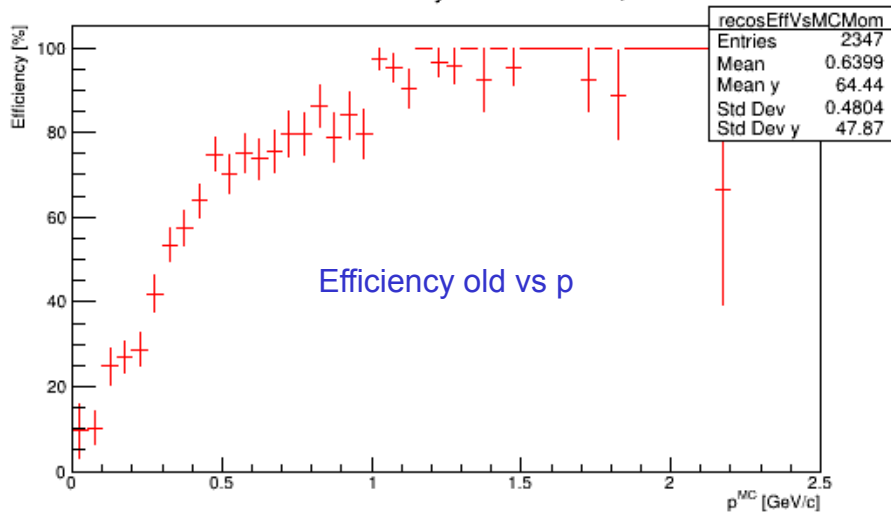
All Set Efficiency vs p_T and p

Event 355

old

XY

new

XY
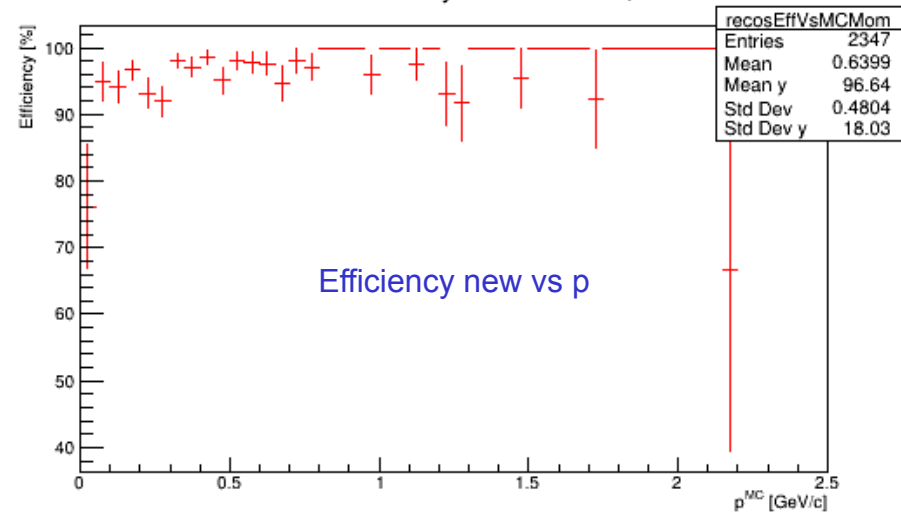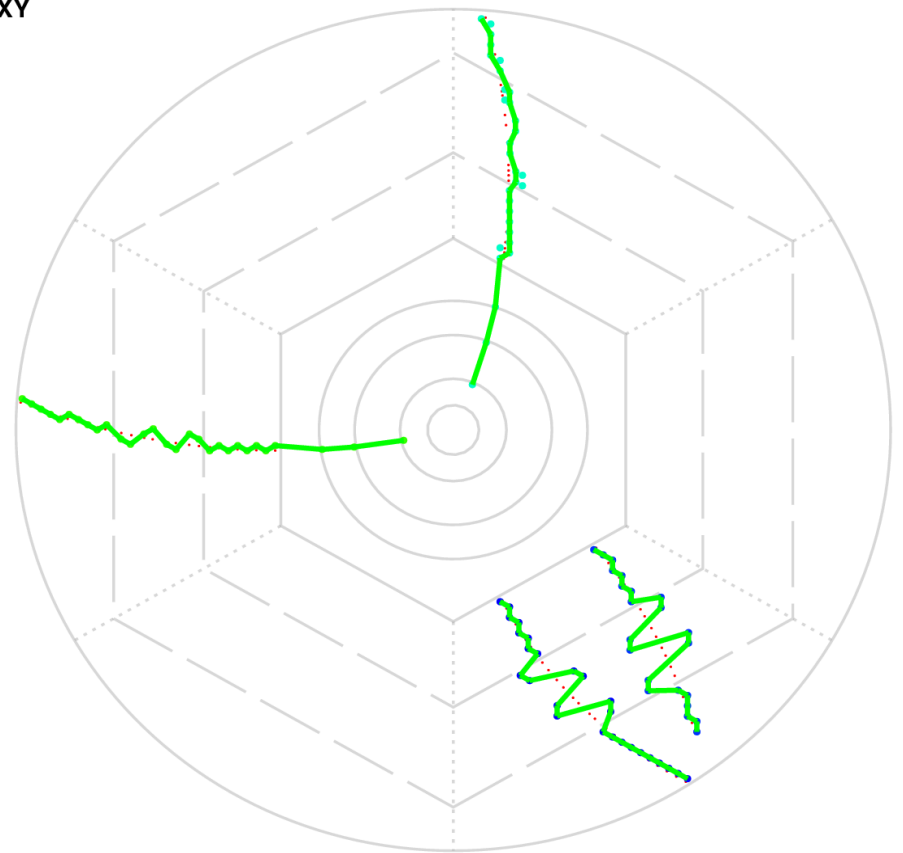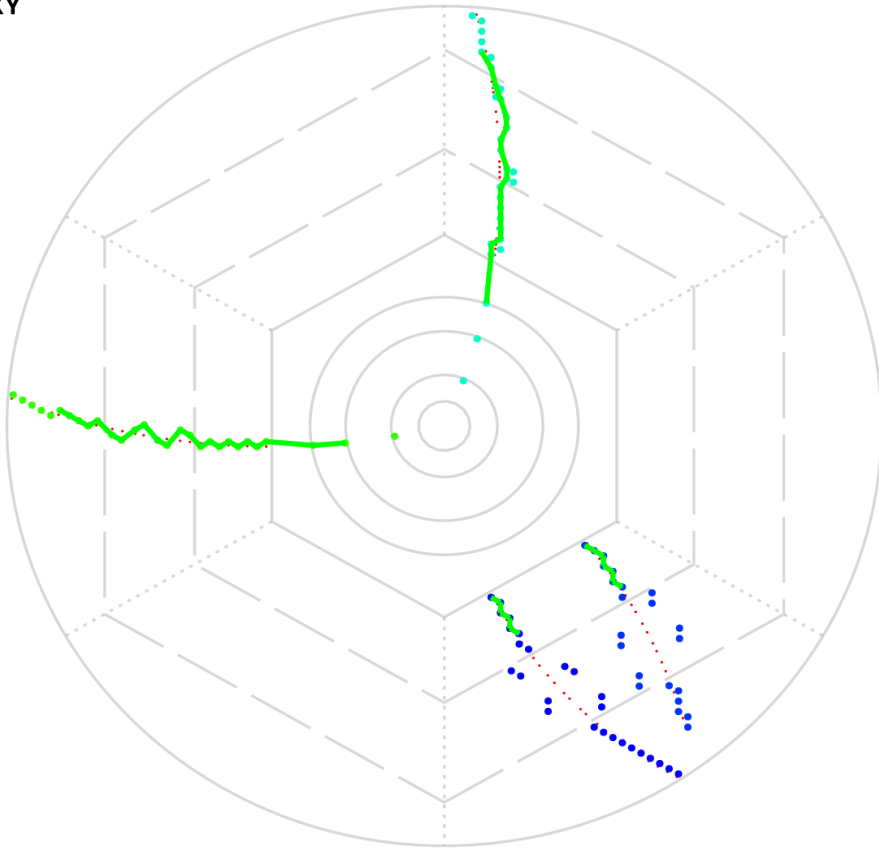
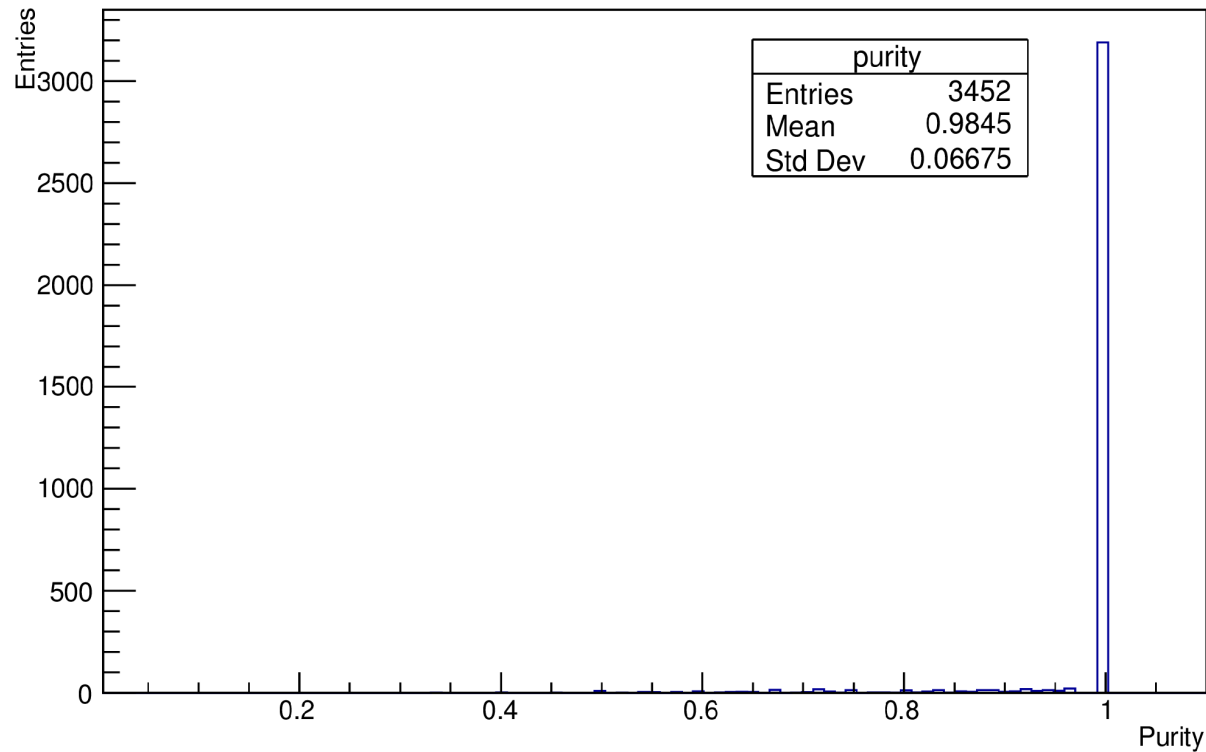MVD pixel hits are now included in tracks

Event 323

old

XY

new

XY
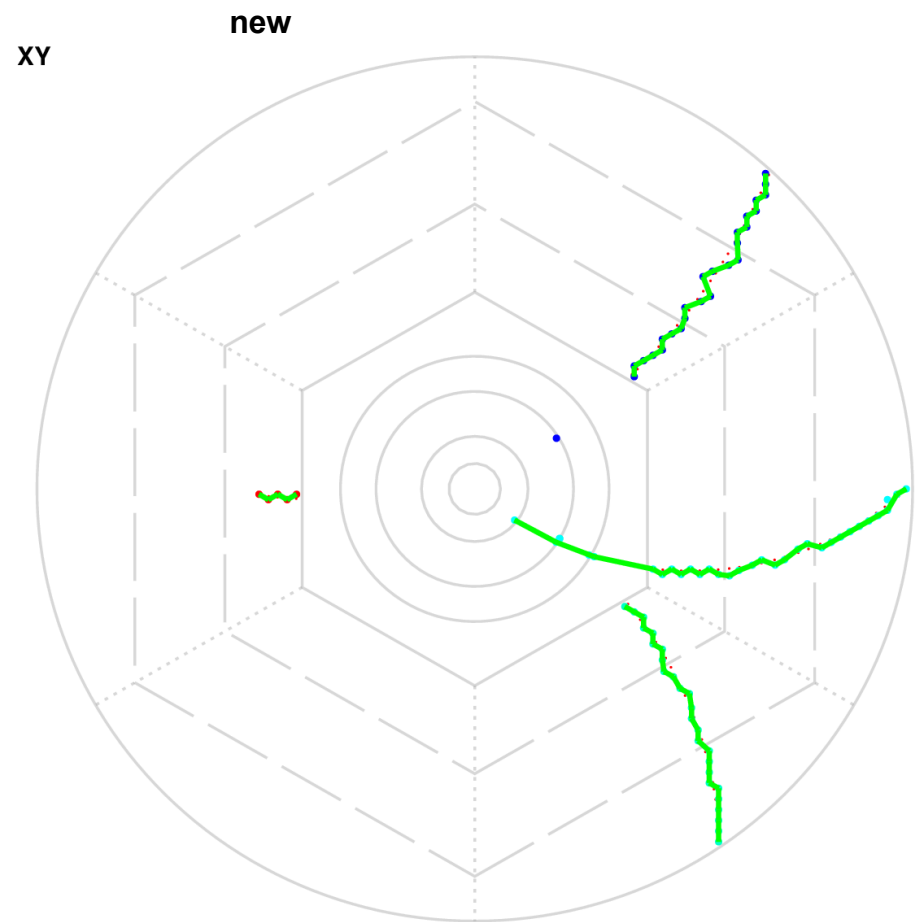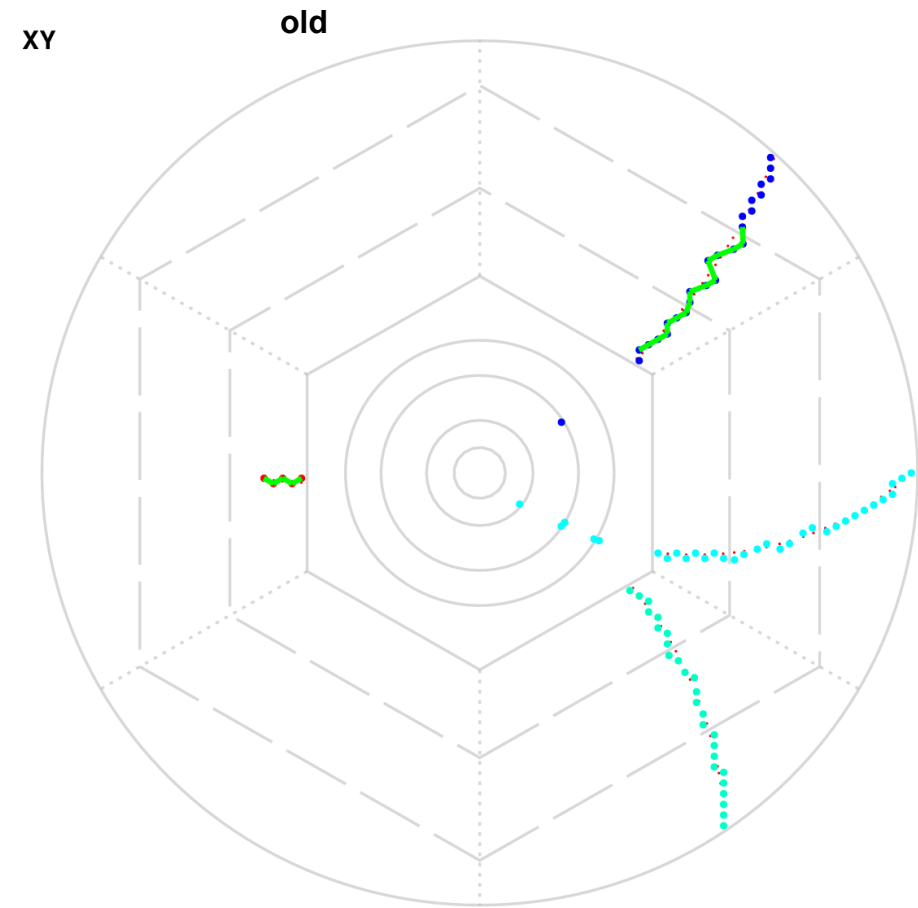
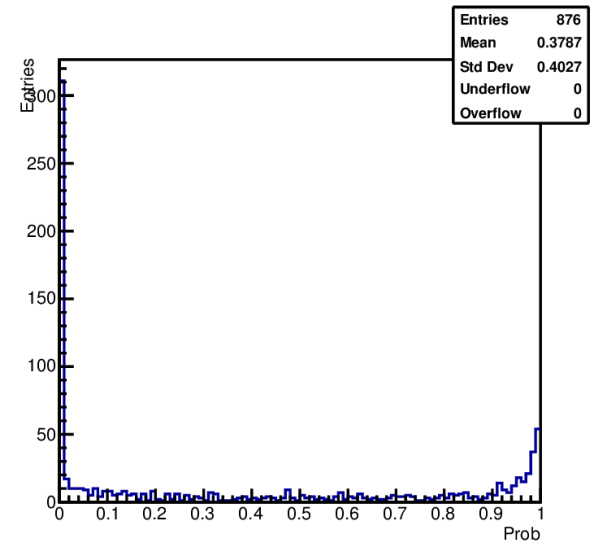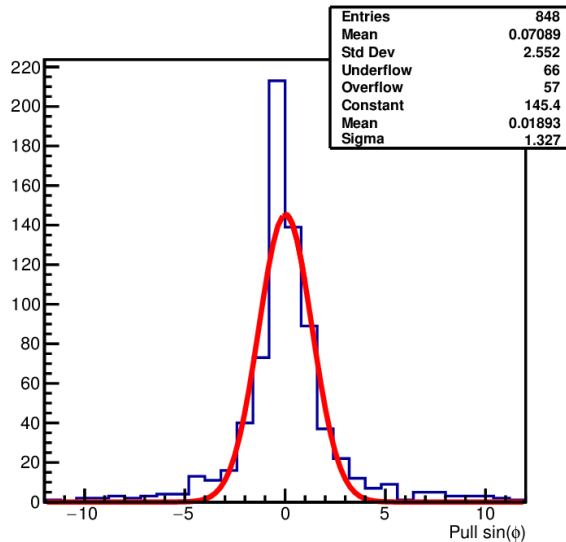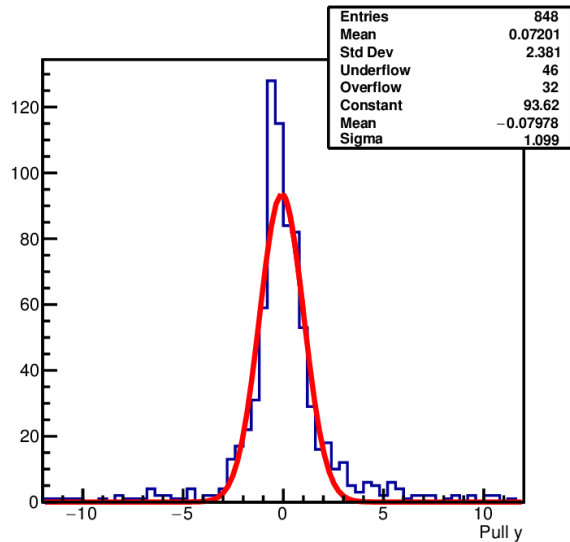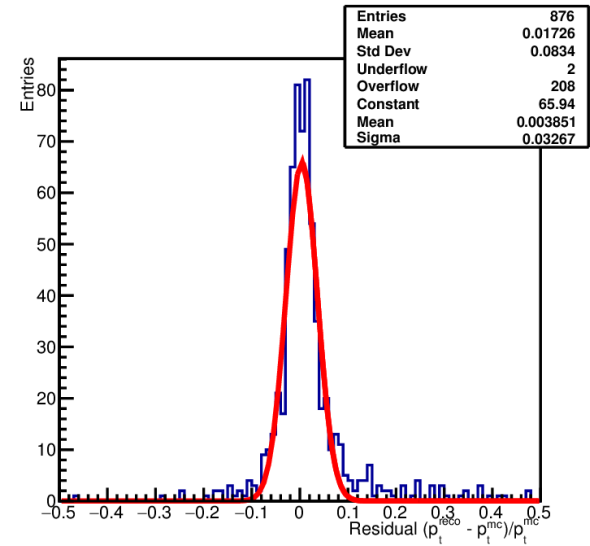MVD pixel hits are now included in tracks and low p_T tracks are reconstructed

Purity of Reconstructed Tracks

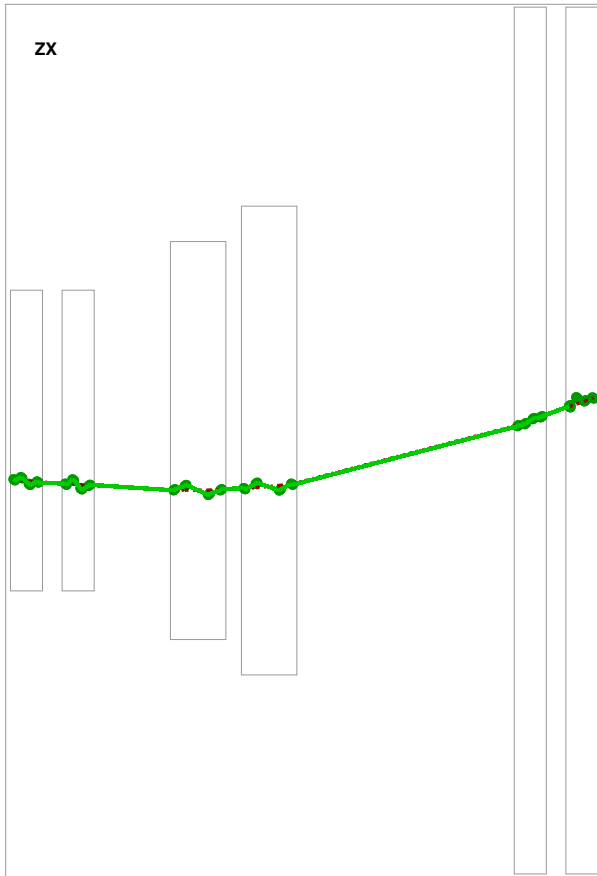| purity	
Entries	3452
Mean	0.9845
Std Dev	0.06675

Purity = Nmc_true_hits / All reco_hits

Residuals and Pulls
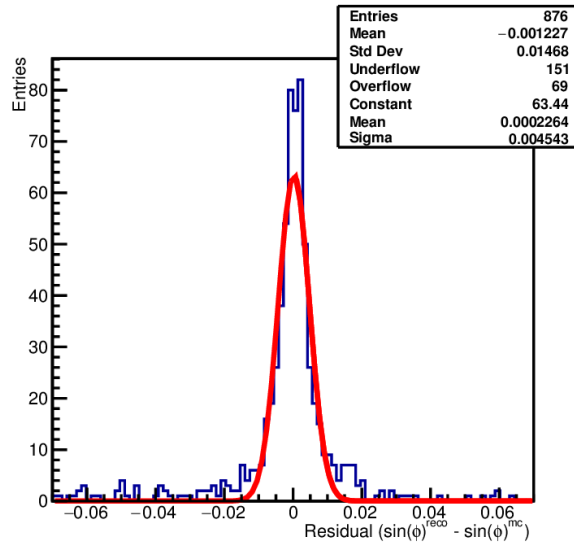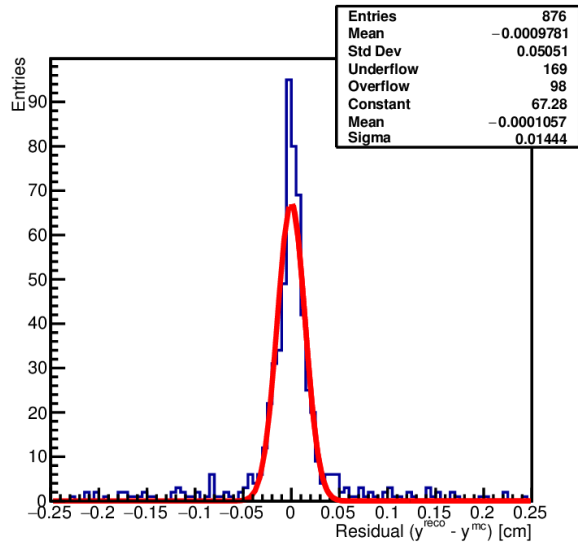
FTS CA Track Finder

STT CA track finder successfully applied to FTS:

- STT CA track finder in conjunction with the KF for the forward track-model.

Track-candidates creation in progress:

- Dropout of hits issue which will be resolved soon.
- Caused by the divergences in the Kalman filter.

- First measurement needs special filtration (because of the initial approximation for covariance matrix tends to infinity)

- In case of big errors in the covariance matrix the equations of filtration are modified by Taylor expansion because of their numerical divergency.

- Under investigation: numerical divergency because of the mixed covariance matrix with small errors on {x,tx} and big errors on {y,ty,q/p}. Appears after filtration of 2 first measurements with the same tube angle.

M. Pugach, M. Zyzak

Summary

- CA track finder modified wrt. the detector geometry, hit errors etc.
- Tracking efficiency in the barrel STT/MVD detectors recovered.
- Kalman filter track fit is under investigation in the barrel and forward parts of the detector system.