SMT only tracking in data, comparisons with gtr/htf

Valentin E. Kuznetsov

Univ. of Califirnia, Riverside

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Outlines:

- review of existing algorithms
- recent innovations
- current performace
- global tracking and real data
- summary

Review of existing algorithms

A modular design of DØ software allows to develop a different tracking algorithms. They can be run simultaneously/separetly to achive a best performance for different physics tasks. Currently a four different algorithms are under investigation:

- Road approach uses a specific paths (roads) during track finding, e.g. start from outermost CFT layer and find tracks follow towards the beam;
- HTF histogramming track finder is sensitive to vertex position;
- Elastic reco is another HTF implementation based on Ghostbuster Histogramming method (can be used on top of GTR and/or after vertex reco and/or run in stand-alone mode);
- SBF (silicon barrel finder) uses a four random points to create a track candidate and select tracks based on χ^2 cut (no knowledge about vertex position).

Variety of track reconstruction algorithms allow us to perform a cross-check of tracking performance of DØ detector on MC and real data samples.

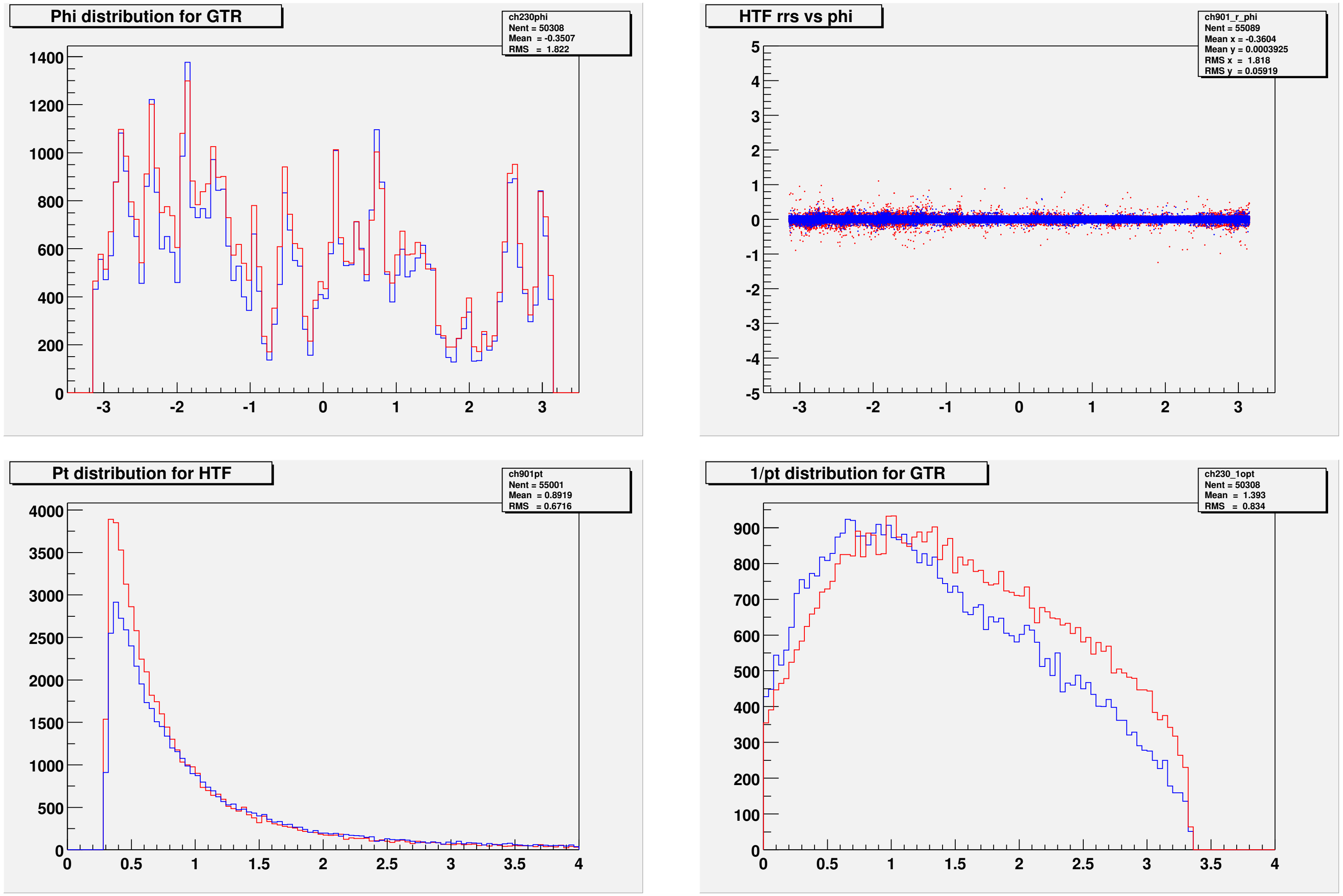
Recent innovations:

- GTR tracking has been modified to handle beam offset (includes propagator modifications);
- new pedestals;
- DCA has been defined to any position in space (for data we use vtx=(0.435, 0.505))
- integration of different tracking algorithms into unique working structure;
- design and implementation of analysis tools.

Performance:

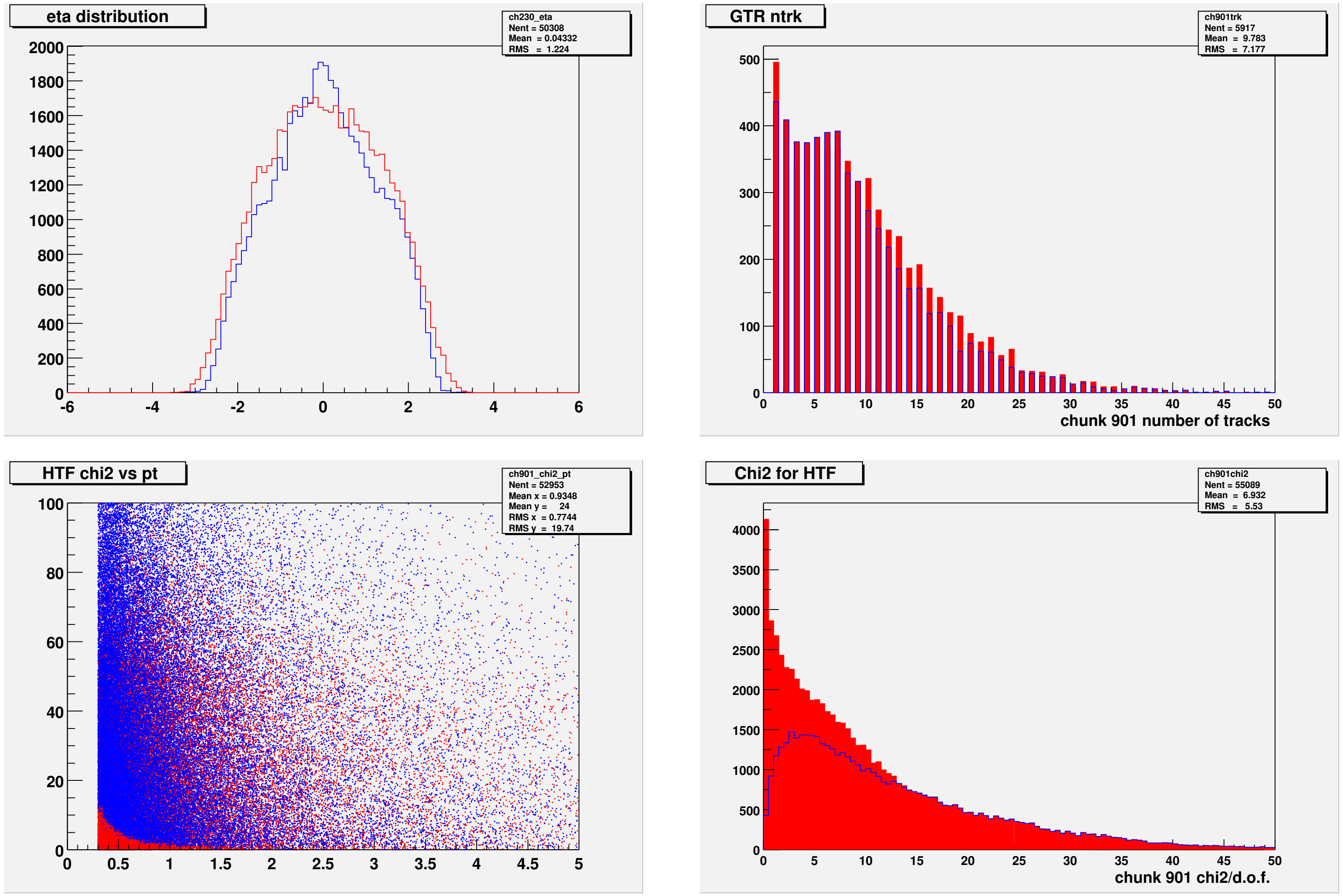
- GTR and HTF take approximately $\sim$ 4 sec/event.
- total number of tracks are $\sim$ 9/event;
- Eff $\sim$ 60%, fake/(fake+found) $\sim$ 30%, misreco $\sim$ 15%;

Run 132947, GTR, HTF tracking, new pedestals, DCA to vtx=(0.435 0.505)



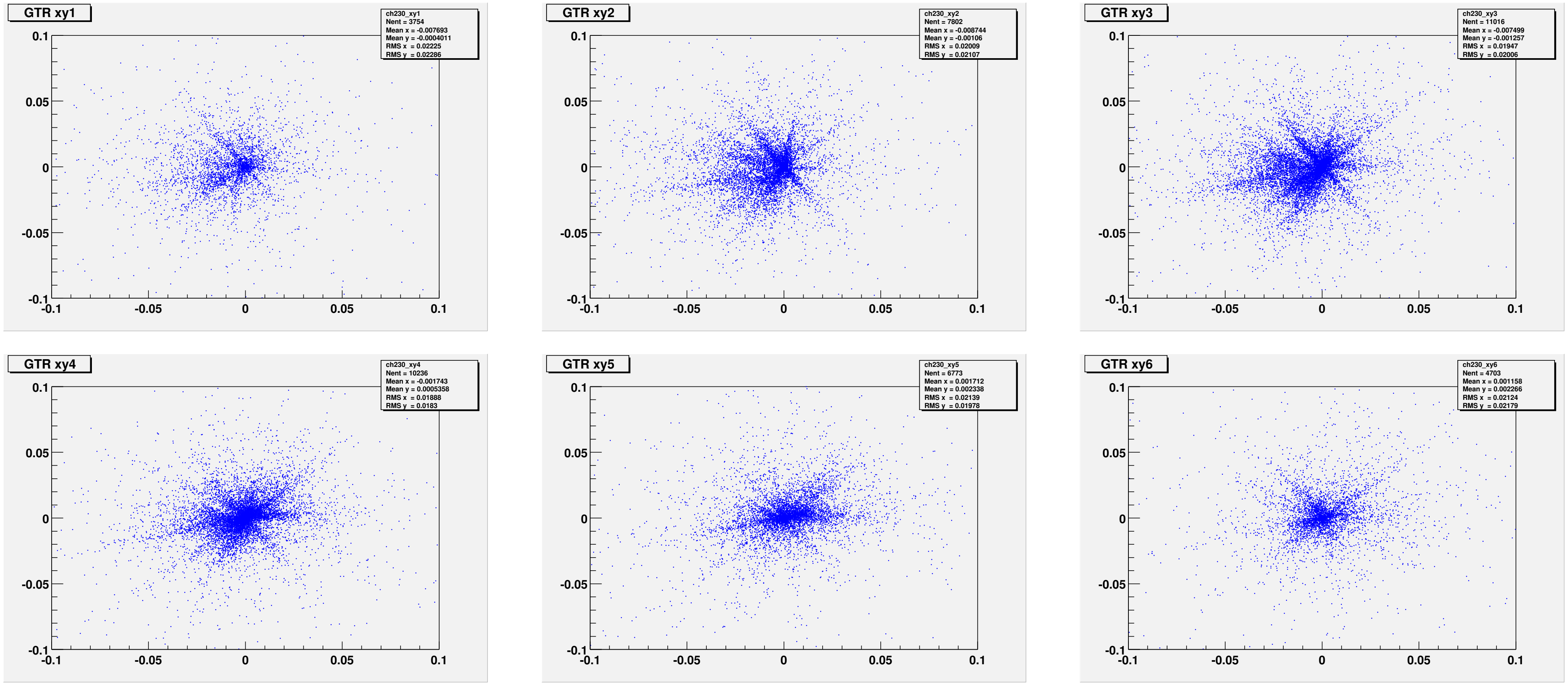
φ, DCA vs φ, $p_T < 4$ GeV, $1/p_T$, GTR - blue, HTF(smt) - red.

Run 132947, GTR, HTF tracking, new pedestals, DCA to vtx=(0.435 0.505)



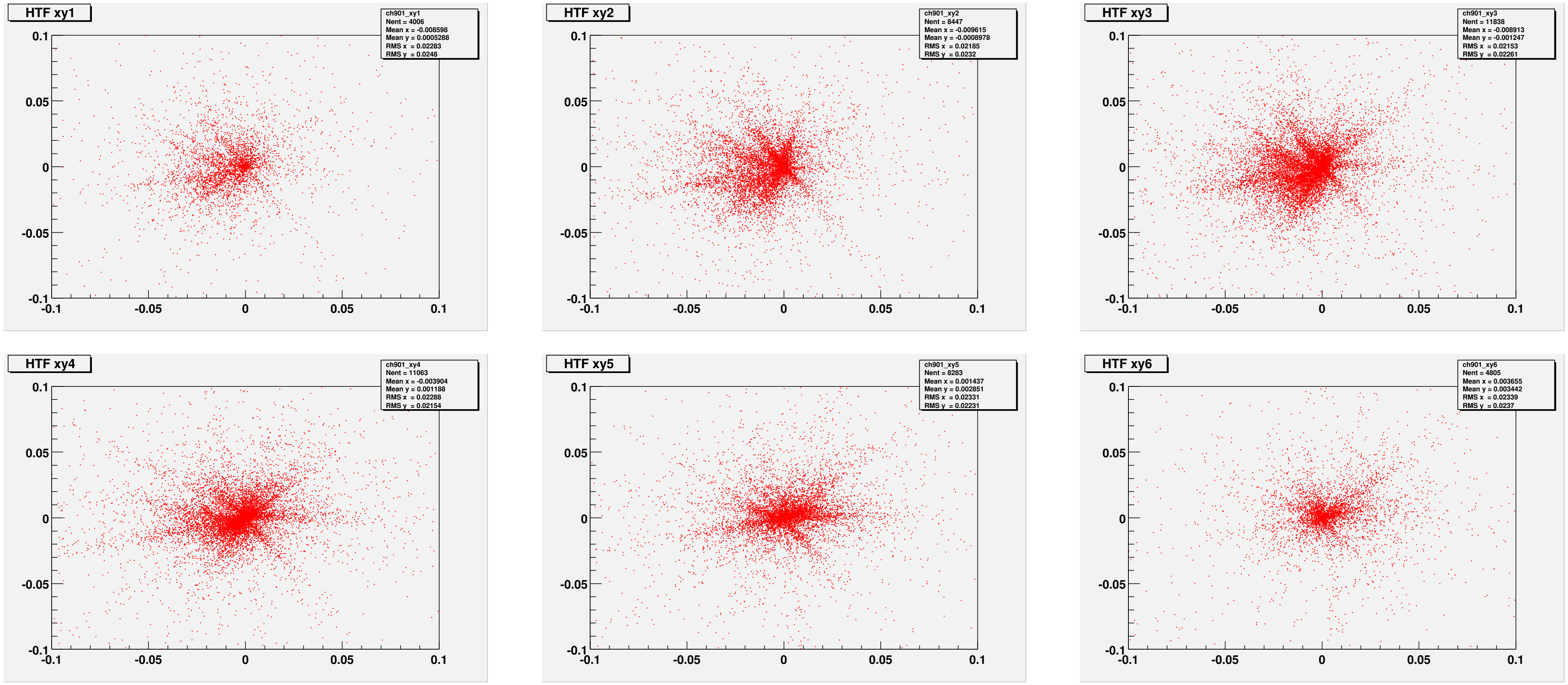
η, number of tracks, χ^2, $\chi^2/d.o.f$, GTR - blue, HTF(smt) - red.

Run 132947, GTR, HTF tracking, new pedestals, DCA to vtx=(0.435 0.505)



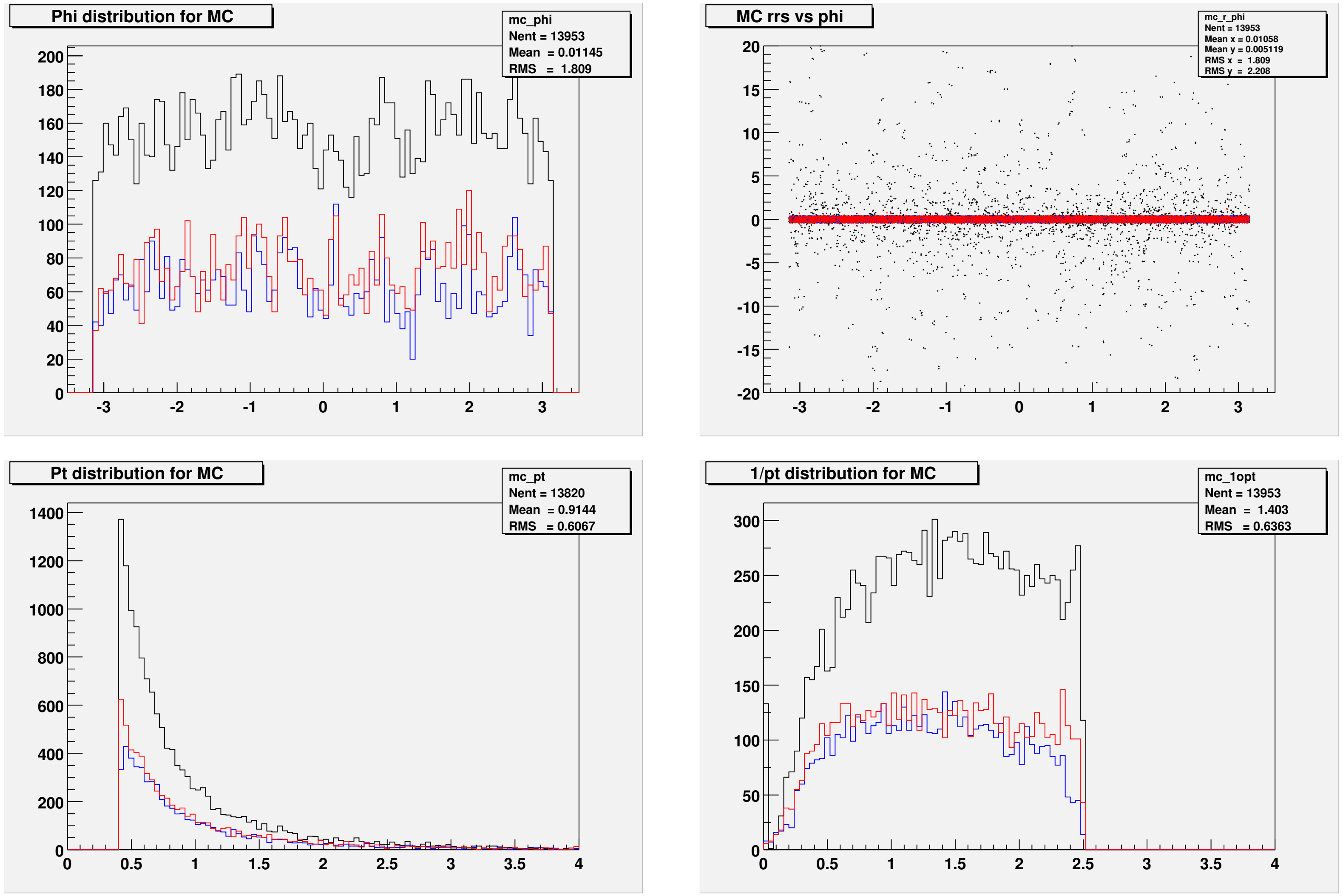
y vs x for each barrel, GTR - blue.

Run 132947, GTR, HTF tracking, new pedestals, DCA to vtx=(0.435 0.505)



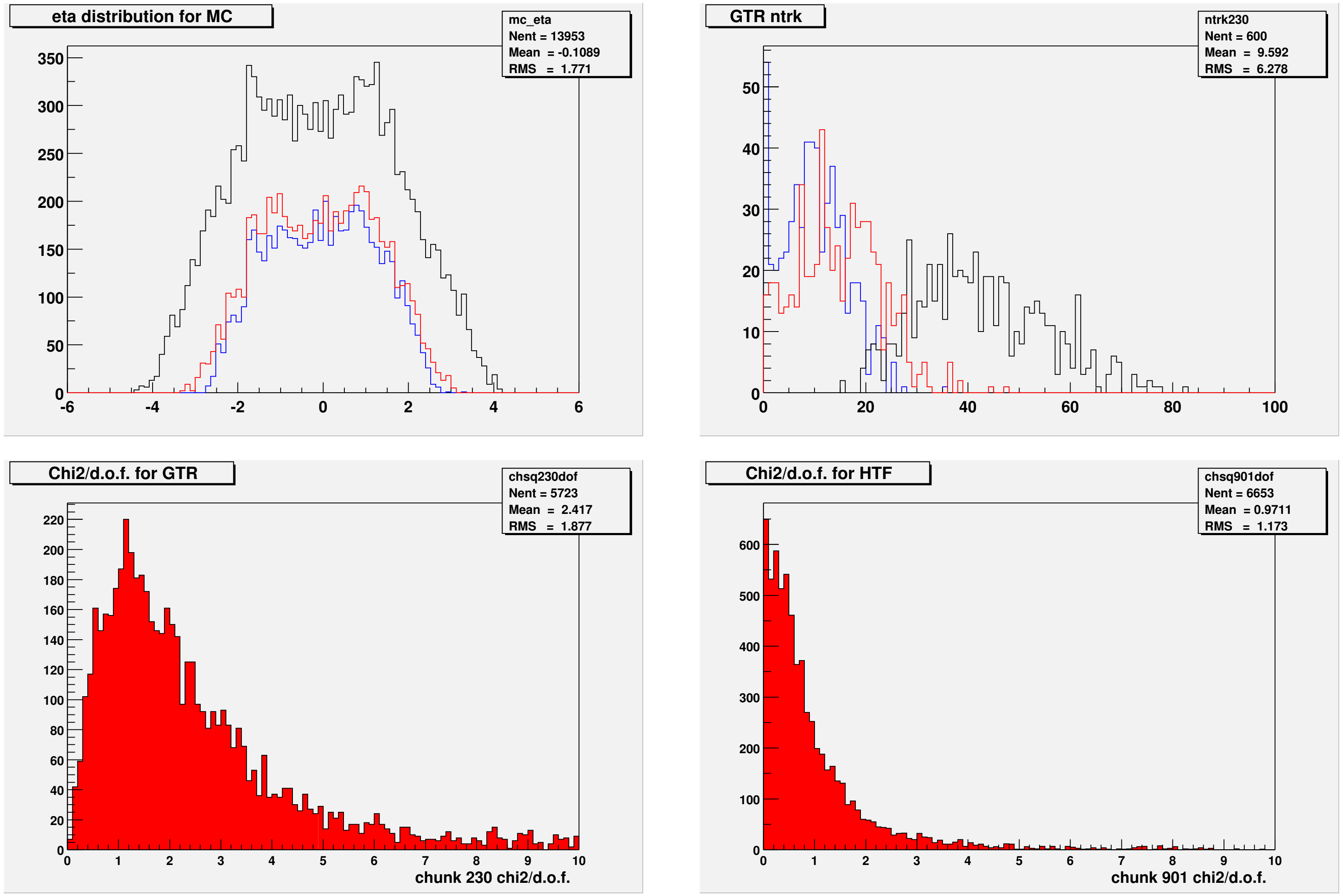
y vs x for each barrel, HTF - red.

MC QCD, correct beam spot, DCA to vtx=(0.435 0.505)



φ, DCA vs φ, $p_T < 4$ GeV, $1/p_T$, GTR - blue, HTF(smt) - red.

MC QCD, correct beam spot, DCA to vtx=(0.435 0.505)



η, number of tracks, χ^2, $\chi^2/d.o.f$, GTR - left, HTF - right.

Summary

We are able to reconstruct data using two different algorithms.

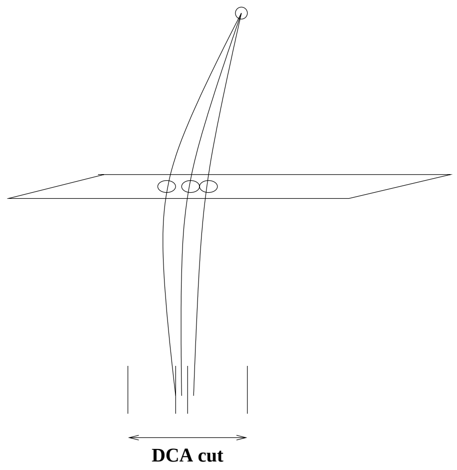
Current performance for SMT only tracking gives:

GTR and HTF take approximately ~ 4 sec/event;

total number of tracks are ~ 9/event;

$\sim 60\%$ for efficiency, $\sim 30\%$ fake rate and $\sim 15\%$ of misreconstructed tracks.

Both algorithms show approximately same behaviour, but quality of GTR tracks depends on DCA sig. cut.



- DCA sig. cut significantly clean up GTR sample, default cut = 1000, I used 10.
- Total number of tracks remains the same.
- number of tracks attached to vtx is increased.
- It is important during track finding and we would like to get results for both cuts asap.