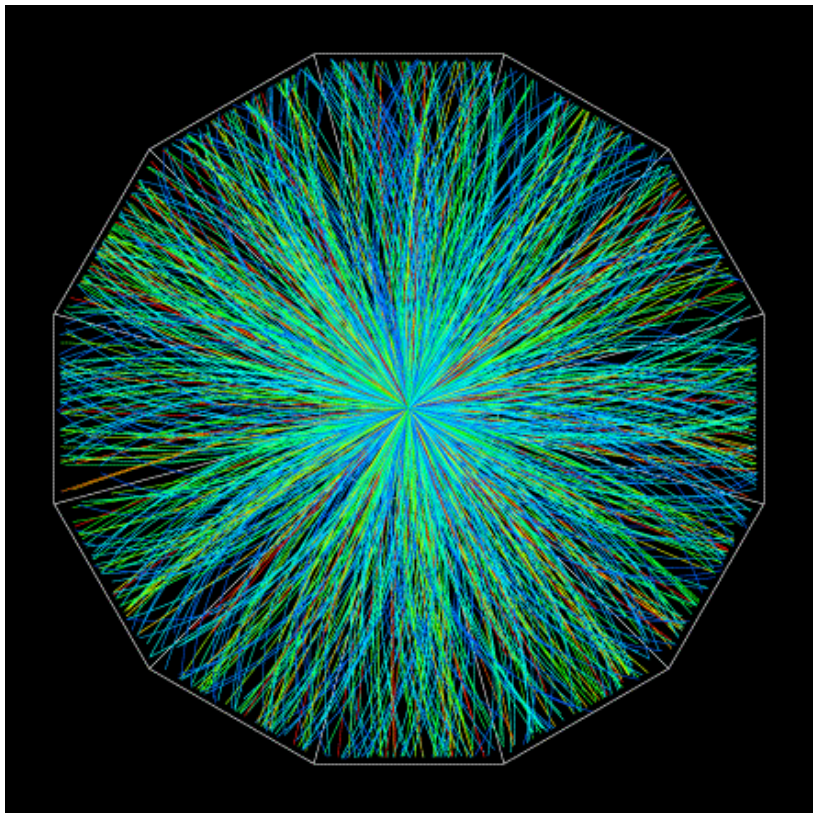
Status of Sti Integration



STAR Collaboration Meeting,
Caltech
Feb 20, 2004

Manuel Calderón de la Barca Sánchez

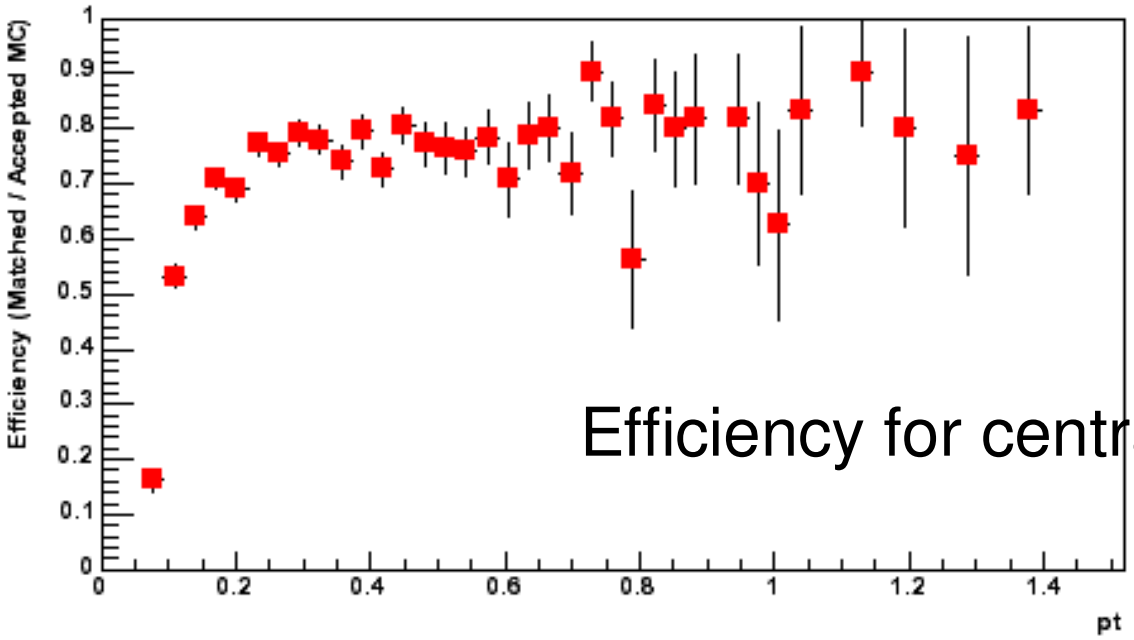
BROOKHAVEN NATIONAL LABORATORY

Reminder

- ITTF - Integrated Tracking Task Force
- Integrated Tracking Package - “Sti”
- Replacement for current Fortran based tracker
- Run IV:
  - Together with DAQ100, really means STAR is undergoing an overhaul of our whole reconstruction chain!

TPC Tuning in Summer

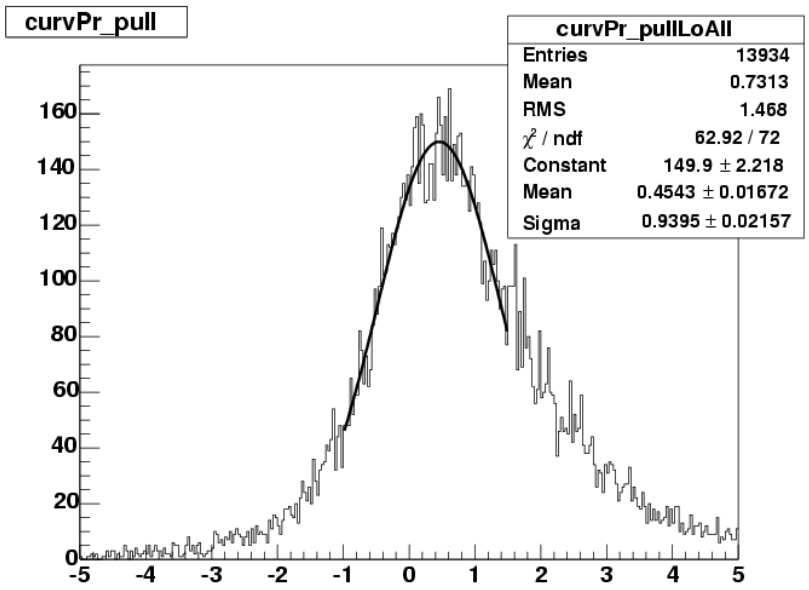
- A. Rose began tuning effort
- Instructions for tuners:
- http://www.star.bnl.gov/STAR/ittf/HOWTO/ITTF_Tuning.html
- Results from summer:
- http://www.star.bnl.gov/~andrewar/ITTF/Tuning.html

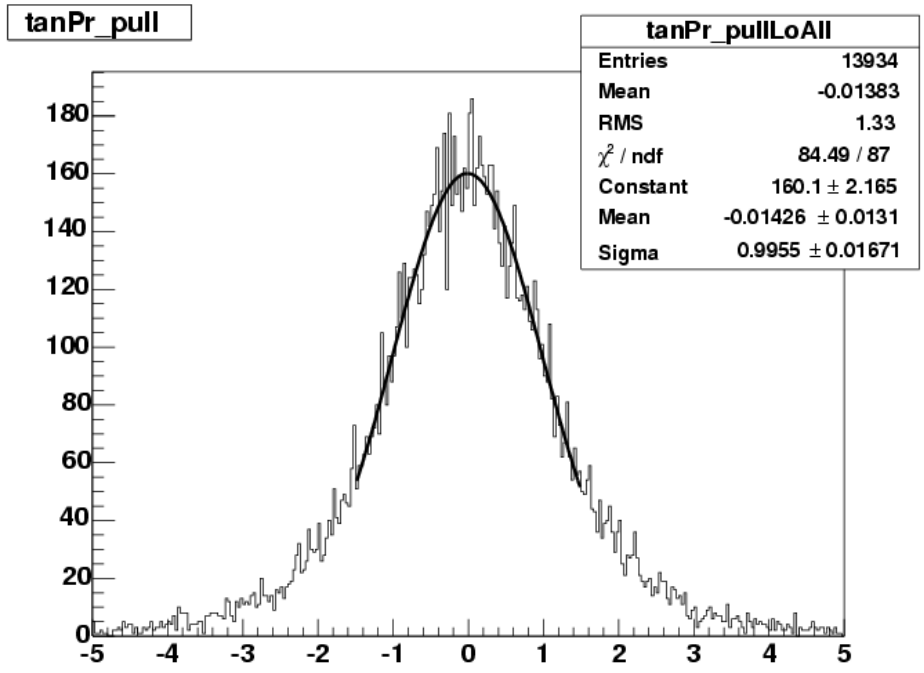


Efficiency for central events

Diagnostics, Pulls…

- Change parameters
- Check efficiencies
- Check pulls
  - ★ Curvature
  - ★ Tan λ
- Repeat…
- Thanks to Andrew had a good set of parameters already





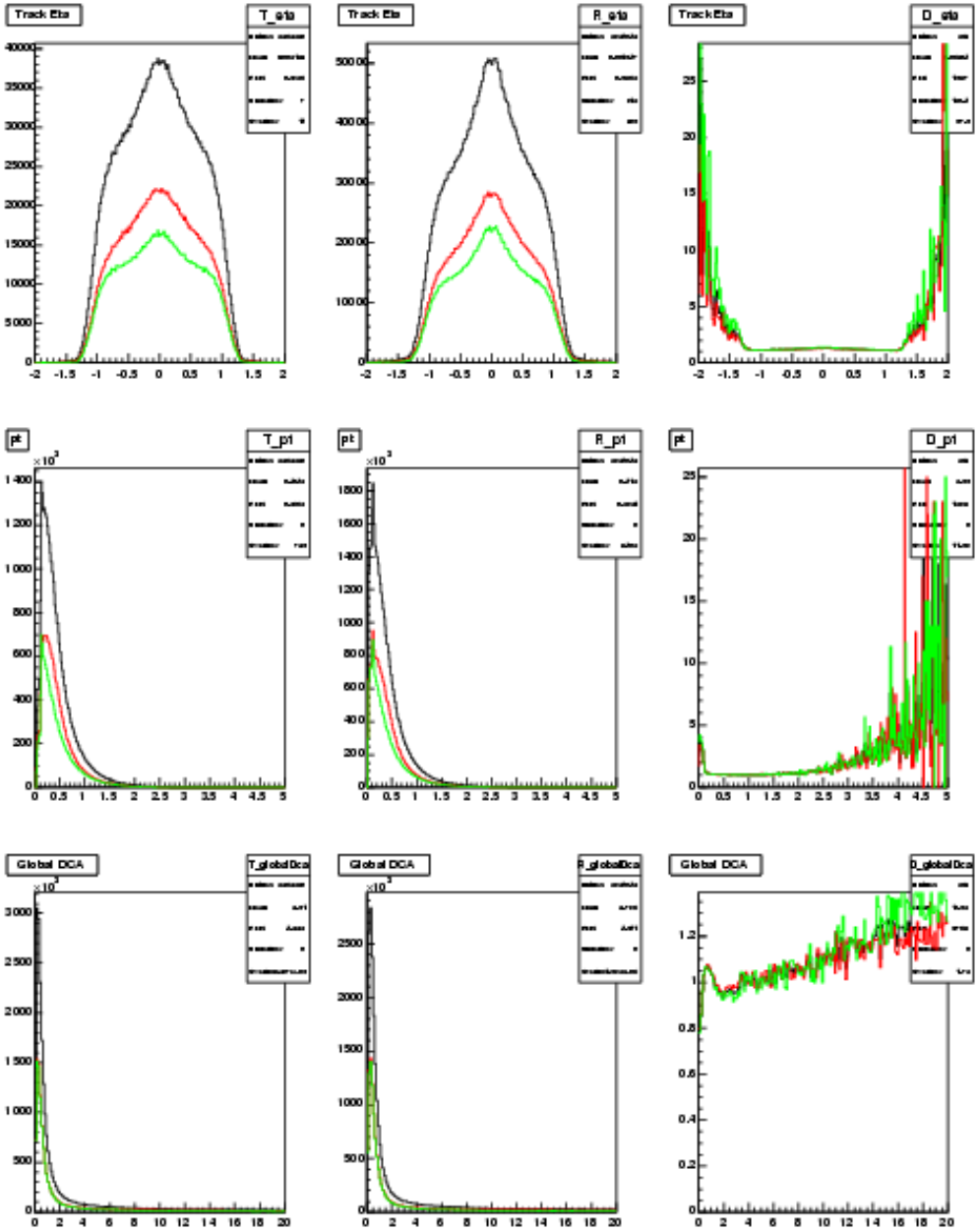
TPC Tuning currently

- B. Hippolyte (originally signed up for SVT tuning)
  - Lots of work to automate the tuning process
  - Double check residuals
    - *compare to Fabrice' s and Andrew' s results*
    - *Compare Sti to Tpt residuals*
  - Tuning with real data
  - Baseline: use previous tracker and make comparisons

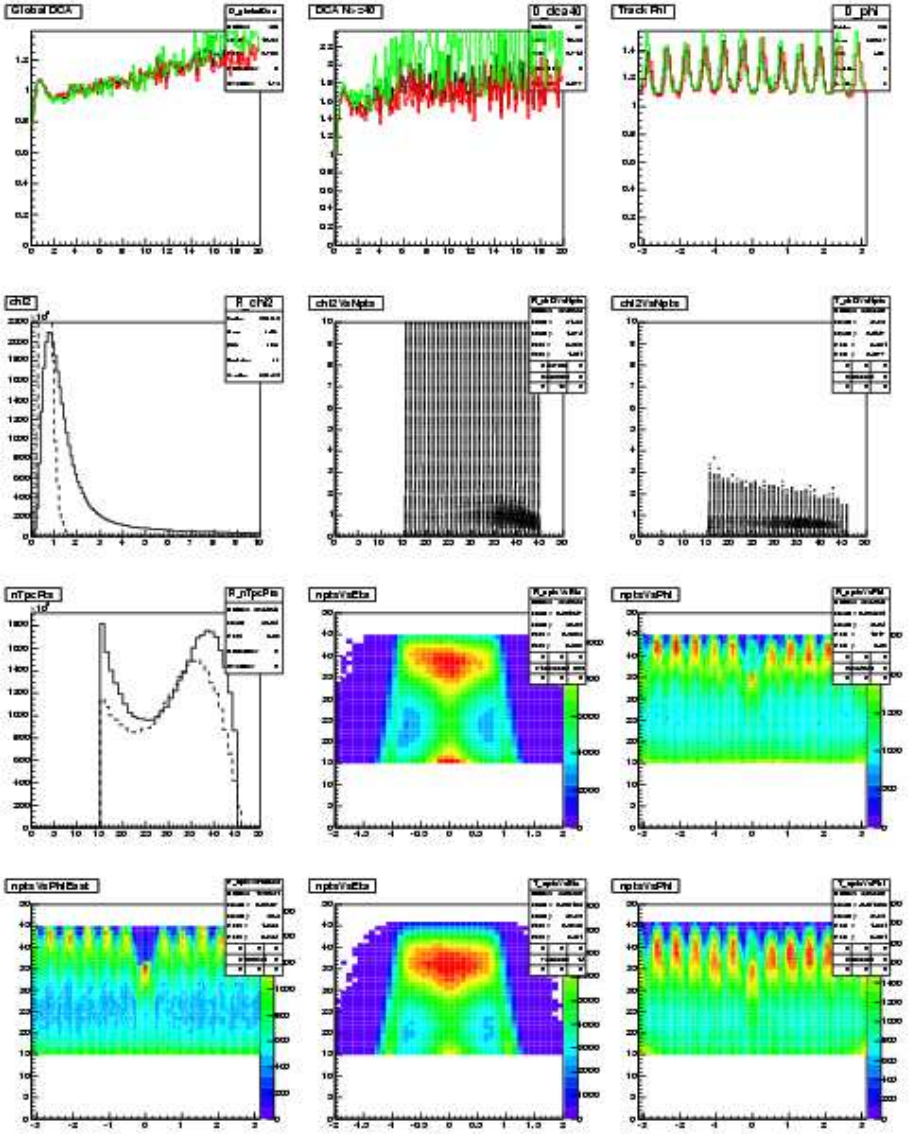
    http://www.star.bnl.gov/protected/strange/hippolyt/Tuning/tuning.html

Boris' s comparisons

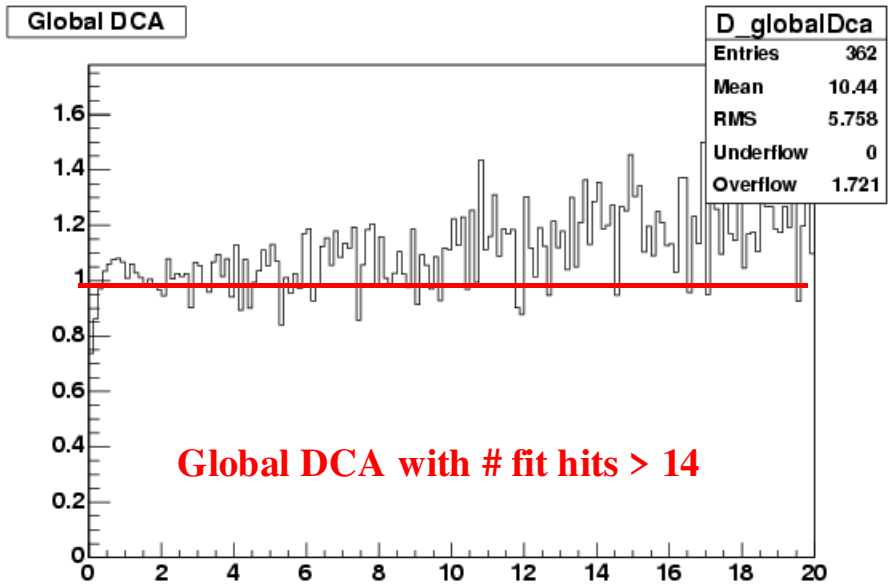
Eta, Pt and Dca Histograms

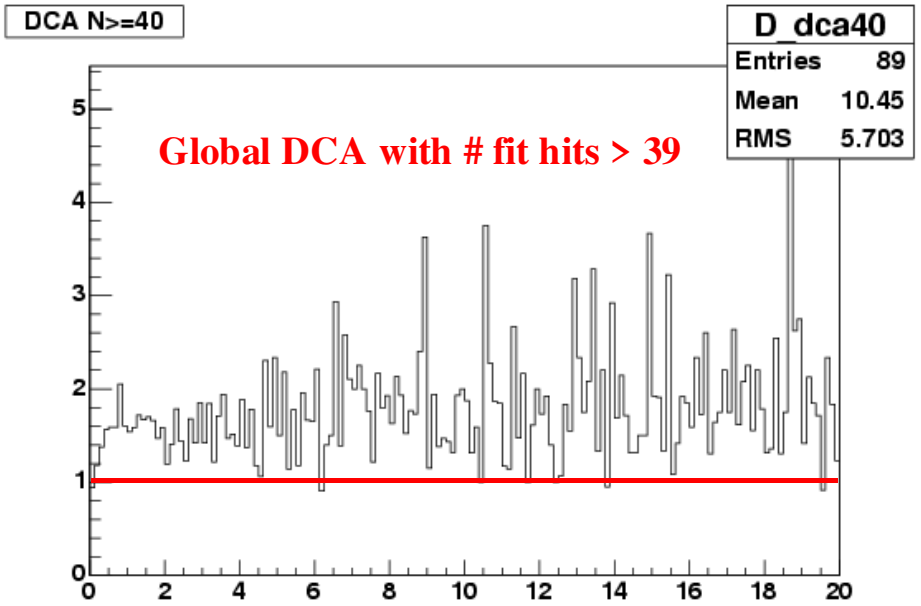


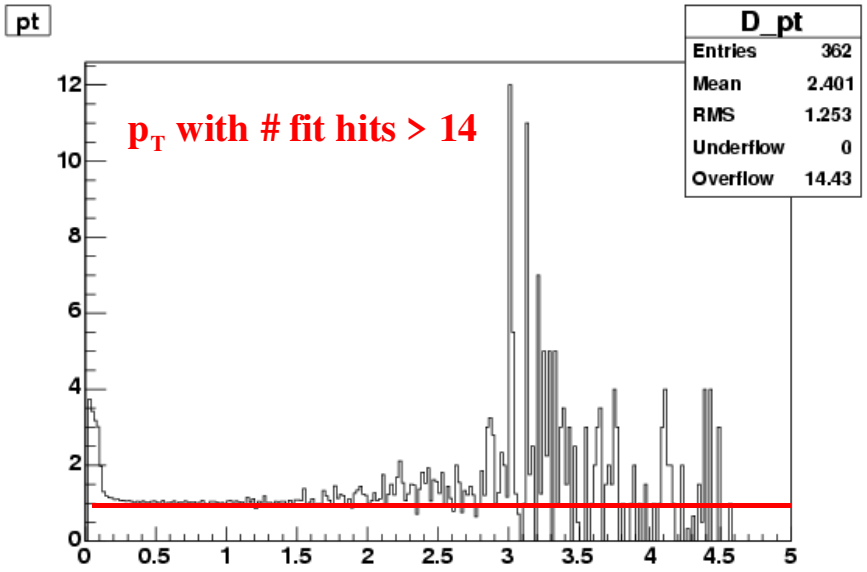
Basic Comparisons



Ratio STI/TPT for Global Dca and P_T distributions







Ratio > 1 so STI is more efficient… if splitting is not a problem.

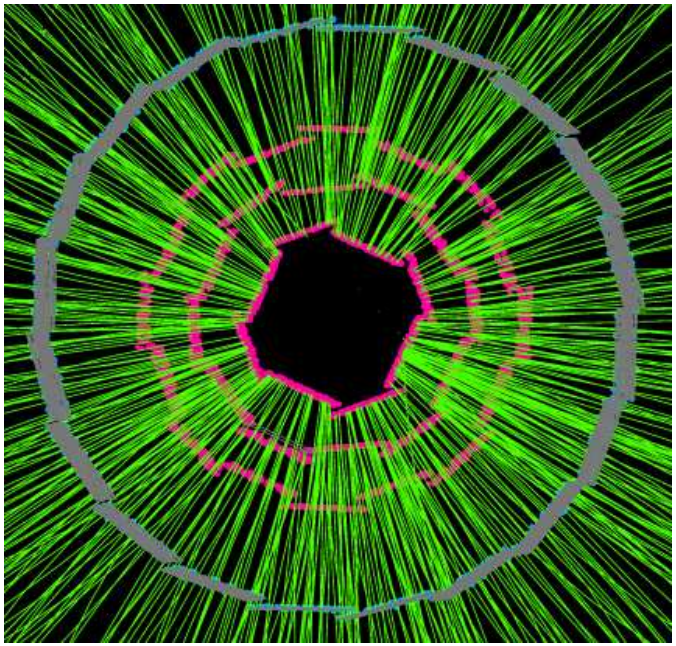
B. Hippolyte

Splitting/Merging

- Thanks Mercedes!
  - Q: Does track excess come from splitting?
  - Boris + Mercedes, blind test
    - *3 sets of data, one with large window*
    - *Mercedes finds splitting in that set (blind test)*
    - *Does not find splitting in the others!*
  - A: They don' t!
- Merging:
  - Significant number of pairs with low q but large " entrance separation"
  - Possble explanation: primary track cuts were open
- http://www.star.bnl.gov/protected/hbt/mercedes/ITTF/Jan04.html

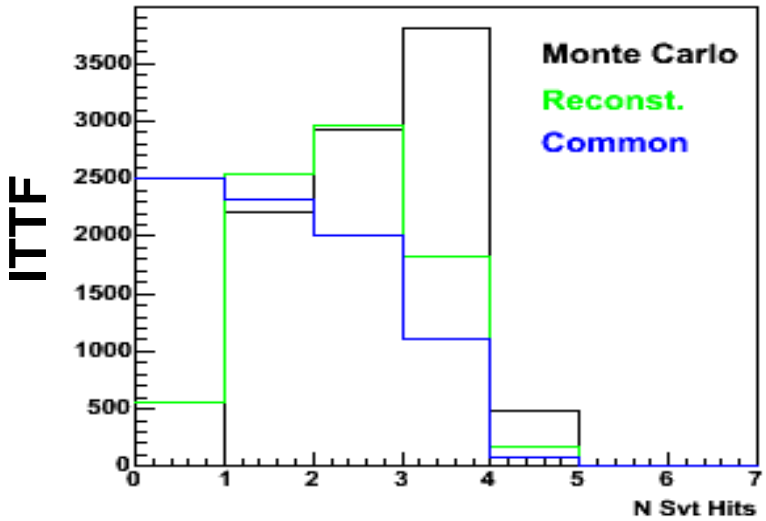
Svt Tracking Performance Comparison

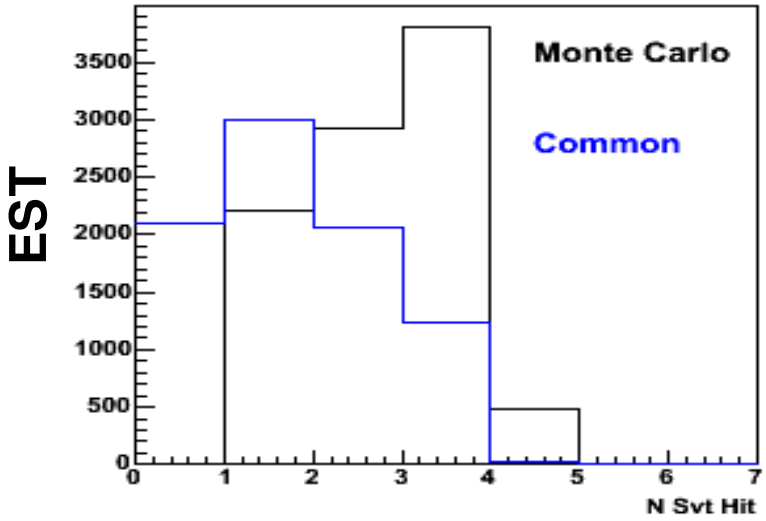
- THANKS to Helen and Marcelo for helping smooth out remaining issues with ITTF & Svt
- Svt tuning currently ongoing (Sevil)
- Code changes to SVT code in Sti:
  - *Geometry fixes, selection of hits using SVT flags*
  - *Mainly cosmetic changes (but they add up!)*



Svt Hits

- ITTF and EST
  - *N MC Svt Hit >0*
  - *Mc Pt >.3 GeV/c*
  - *-.5 < eta < .5*
  - *10 < N MC Tpc Hits < 55*
- " Common Hit" study
  - ★ hits shared by MC track and reconstructed track
- Est has better matching;
  - ★ (Common spectrum peaks higher)
- ITTF **Untuned**; should only get better





no information on EST N Rec Svt Hits

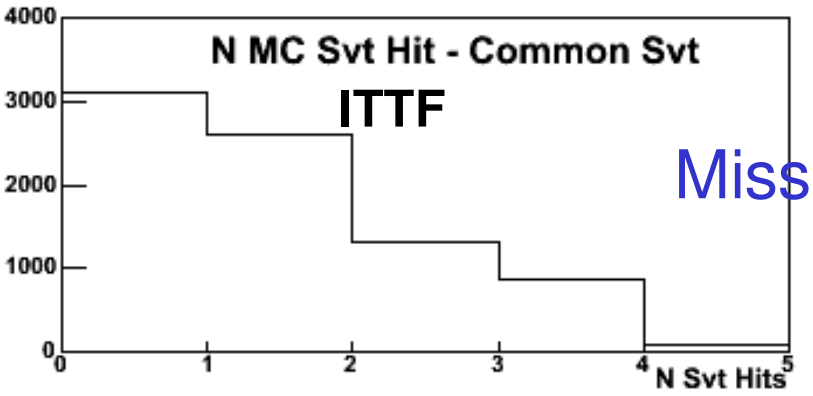
Efficiency and Purity, differences

- Efficiency of adding the right hits

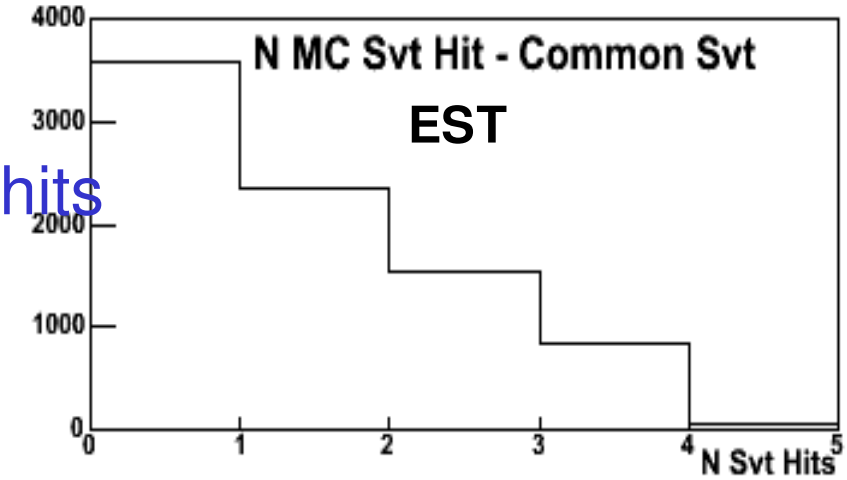
  Monte Carlo – Common = number of **right** points do you **miss**

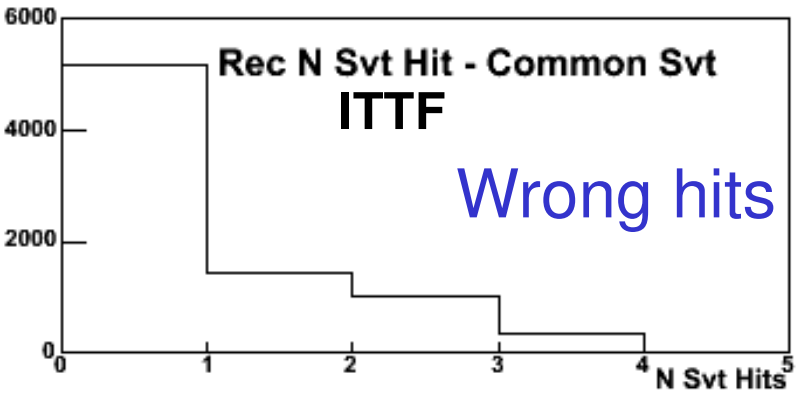
- Purity of hits added

  N Fit – Common = number of points on track that are **wrong** (ie, not from matched track)



Missed hits





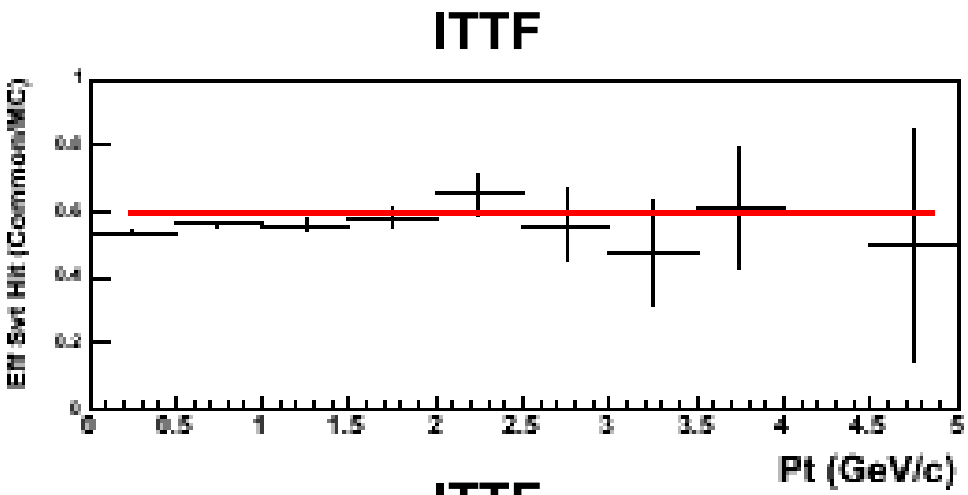
Wrong hits

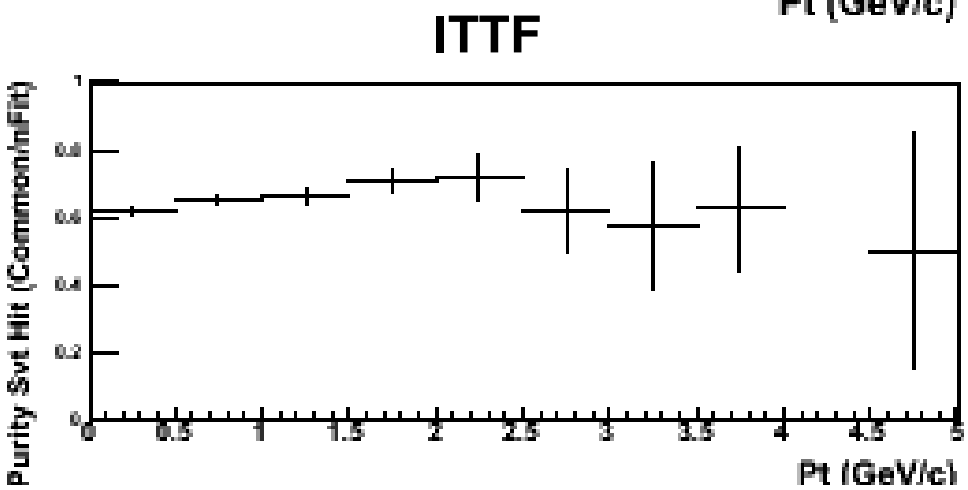
Cuts:

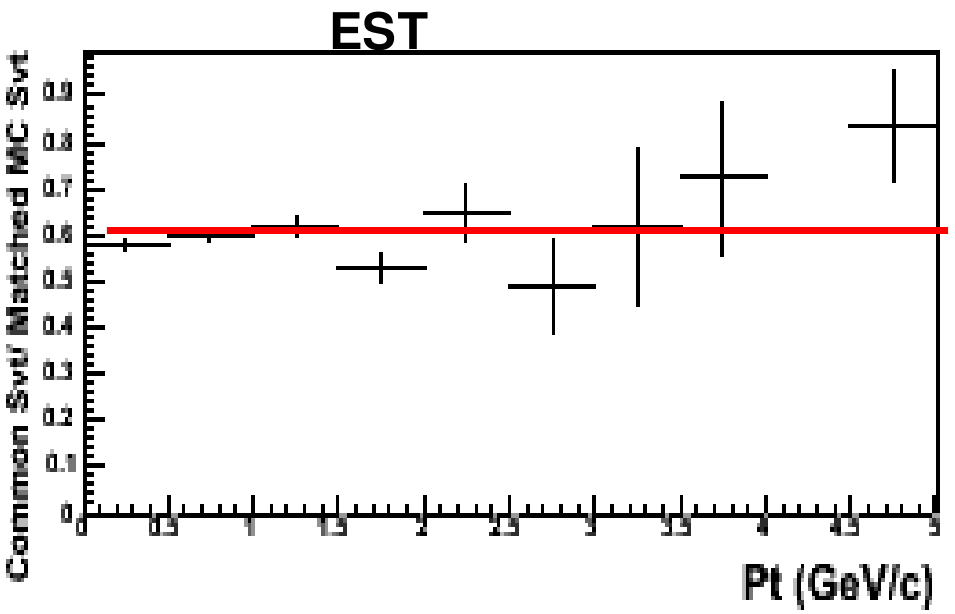
- N MC Svt Hit >0
- Mc Pt >.3 GeV/c
- -.5 < eta < .5
- 10 < N MC Tpc Hits < 55

Efficiency and Purity, ratios

- Efficiency of adding the right hits: Common / MC = Fraction of **right** hits found
- Purity of hits added: Common / nFit = Fraction of hits on track that are **right**







Cuts:

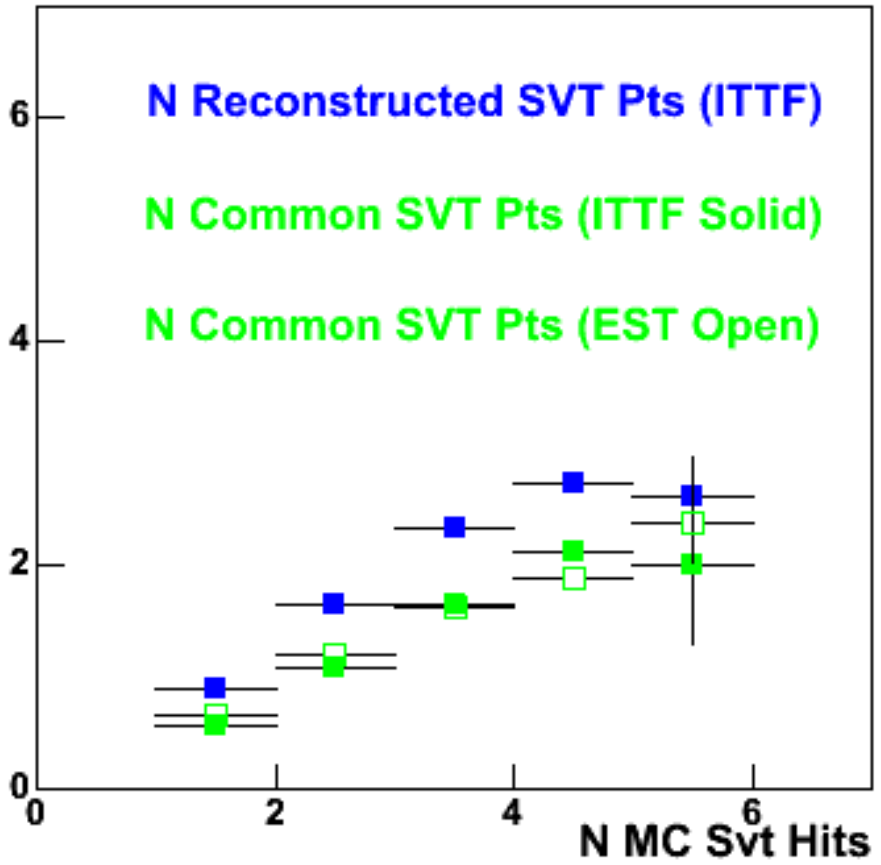
- N MC Svt Hit >0
- Mc Pt >.3 GeV/c
- -.5 < eta < .5
- 10 < N MC Tpc Hits < 55

Performance vs. MC Hit

Cuts:

- *N MC Svt Hit >0*
- *Mc Pt >.3 GeV/c*
- *-.5 < eta < .5*
- *10 < N MC Tpc Hits < 55*

- Efficiency
  - (N Common vs MC) Similar for EST and ITTF
- ITTF Svt Pts (blue)
  - indicate impurity
  - to be addressed through tuning



SVT Status

- ITTF Successfully Matching to Svt in Monte Carlo, at the level expect for the current tune parameters
  - hit error ~1mm, large search window (can lead to impurity)

- ITTF and EST show similar trends for finding the correct hit, and fraction of correct hits found.
  - EST is slightly better.
  - ITTF is not pure
    - *adds incorrect hits at a rate of ~35% (over all mult.).*
    - *Should improve with realistic hit errors (~150μ) and tune parameters.*

Other Integration issues

- Claude, Yuri, Michael, working on DB integration
  - Geometry is loaded from db
    - *Using bfc can pick up the right time-stamp*
  - Tracking parameters kept in db for production
    - *Allows to document what was used for a given production*
  - Claude also implemented a solution for quick reading of parameters for tuners
- Lee, working on Vertex integration
  - Comparions…
    - *Old tracks-new vertex finder*
    - *New tracks-new vertex finder*

Plan for Final Approach to Integration

- Experience with last "crash-effort" meeting was encouraging.
  - Work got done, communication is better in person.
    - *Big pieces of the to-do list were dealt with*
    - *Need to focus now on getting the pieces working together.*
- Still tasks to do. Jerome proposes another "crash" meeting
  - March 15 - code is frozen and moved to 'new'
  - 'dev' becomes the test-bed for integration crash-effort

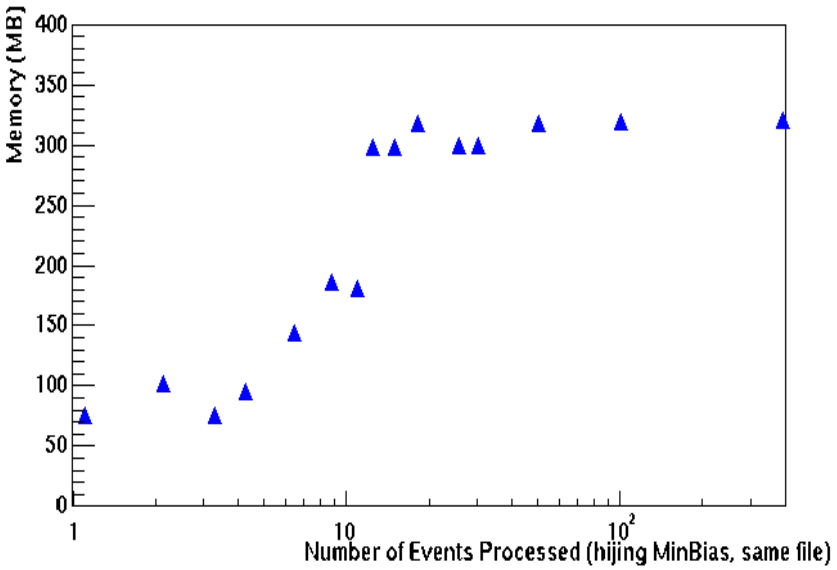
Next crash-effort

- Goal: finalize a production version of bfc.
  - Begins with a daq file
  - Creates a minimal StEvent (Trigger Info mainly)
  - Hits are filled into StEvent
    - *TPC (fcf, StTpcHitMoverMaker), SVT, FTPC*
  - Tracking in Sti
    - *Global tracking pass, filling of StGlobalTracks*
    - *Call to vertex finder*
    - *Primary tracking pass, filling of StPrimaryTracks*
  - V0, Ξ, Kink finders, (C++ , StEvent based)
  - Sub-system reco software, dEdx, etc.

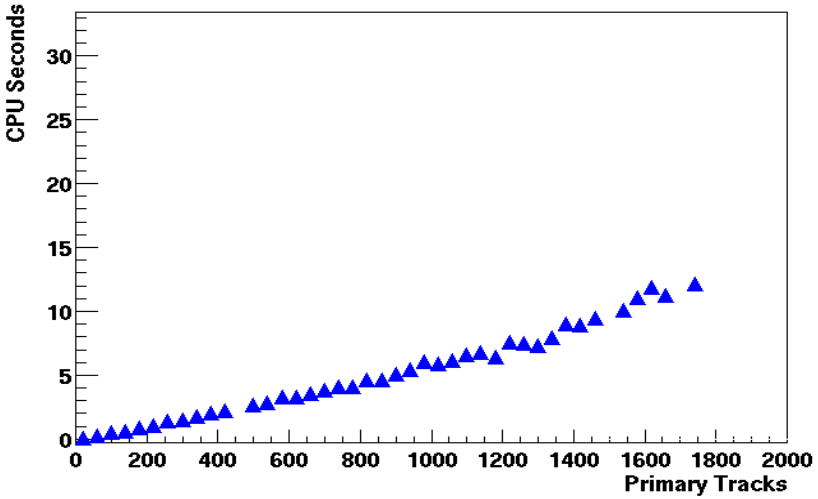
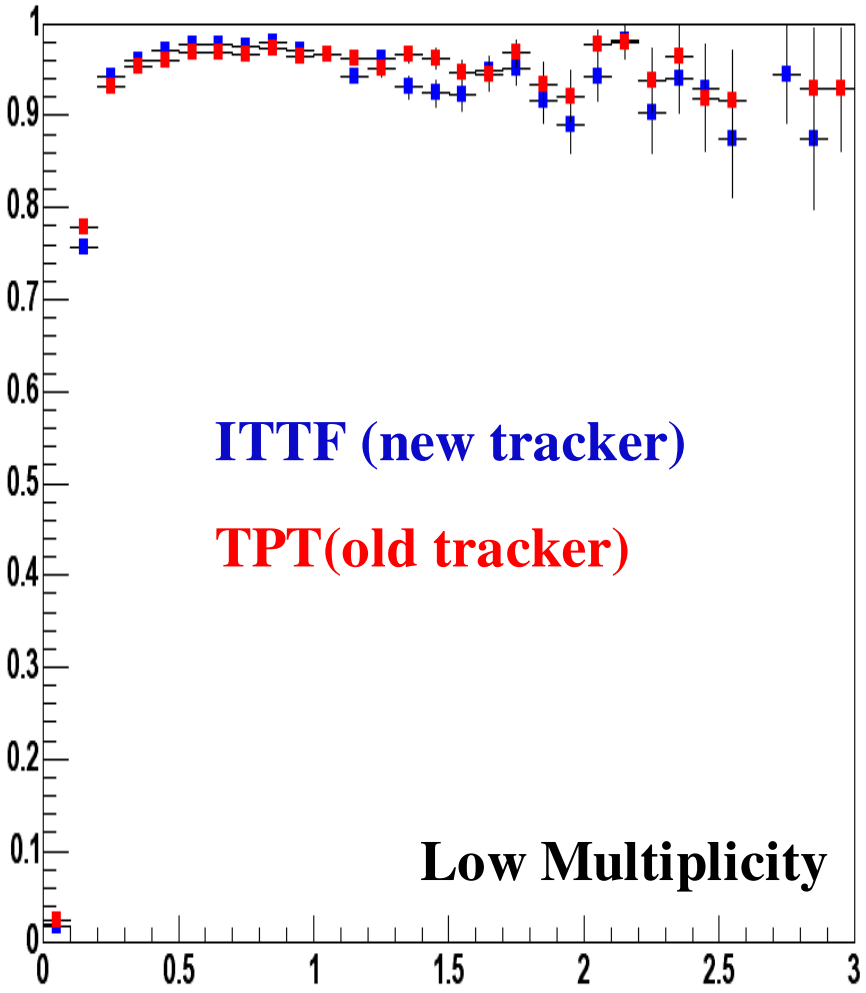
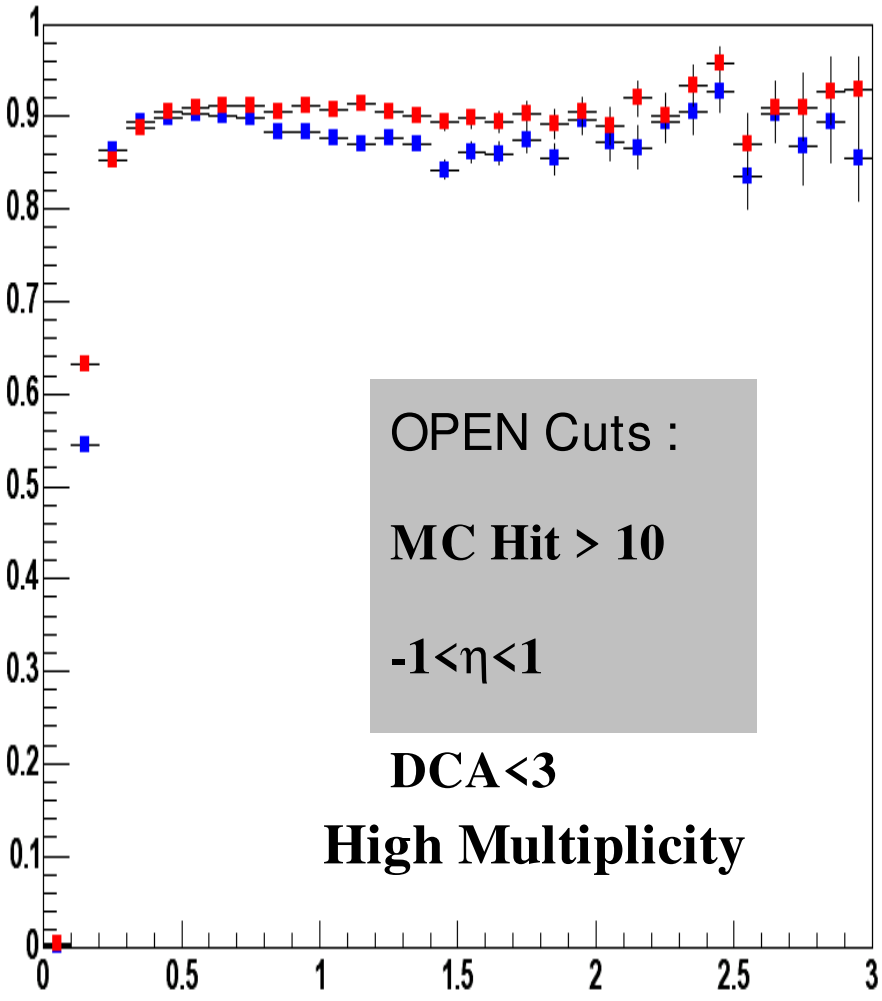
Additional Slides…

ITTF Last Review: Computing Resources

- Memory Footprint
  - Up to 7000 Tracks in a central event,
  - Up to 55 Hits/track.
  - Footprint < 350MBytes



- Tracking time
  - Scale linearly with number of tracks
  - Central Au+Au : 10 s.
  - ~ 5 faster than previous STAR tracker



ITTF Last Review: Efficiencies vs p_t