

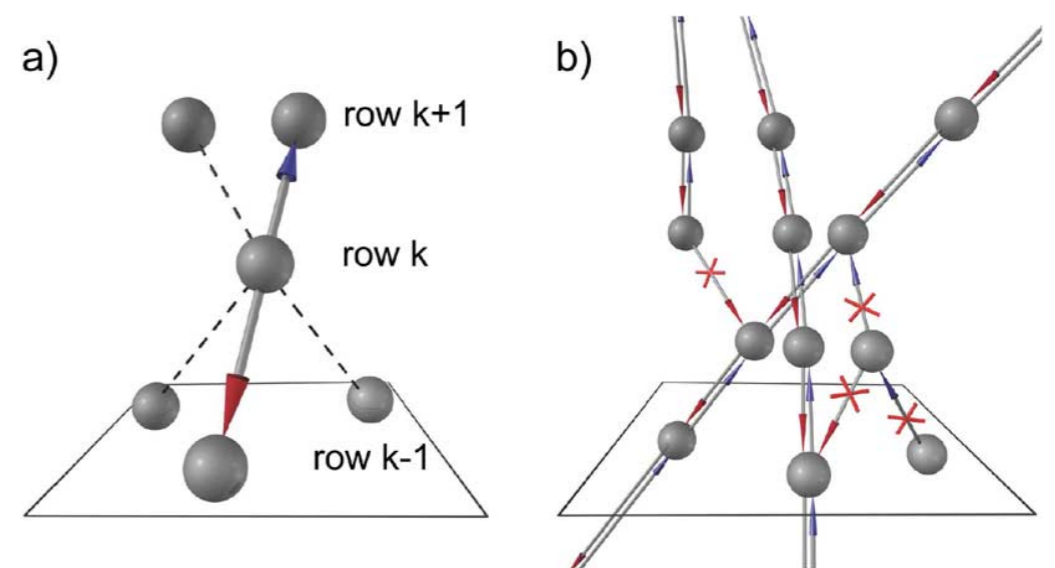
Sti and StiCA Performance Comparison

Yuri Fisyak and Hongwei Ke

What is different between Sti and StiCA?

Sti: Find seeds in individual TPC sectors starting from the outer part and extend tracks to the inner part of TPC and HFT if it exists. Favor seeds in the outer TPC.

StiCA: Use CA as seed finder in TPC, i.e. seeding everywhere in each sector. Send tracklets to Sti to fit and extent to HFT if it exists.



a) Neighbors finder. b) Evolution step of the Cellular Automaton.

† The difference between Sti and StiCA is the seeding strategy.

Scanning Efficiency

- Use Sti and StiCA to reconstruct the same data sample
- Two independent tracker with efficiency ε_1 and ε_2
- Number of reconstructable tracks is N
- N usually smaller than the number of real tracks
- ε_1 and ε_2 will be larger than the real efficiency, which needs MC to obtain
- Scanning efficiency only in this presentation

$$n_1 = \varepsilon_1 N$$

$$n_2 = \varepsilon_2 N .$$

$$n_{12} = \varepsilon_1 \varepsilon_2 N ,$$

$$N = n_1 n_2 / n_{12}$$

* K. K. M. Wu and et al., Some remarks on scanning efficiency, Nuclear Instruments and Methods **25**, 343 (1964).

Run14 Au + Au 200GeV

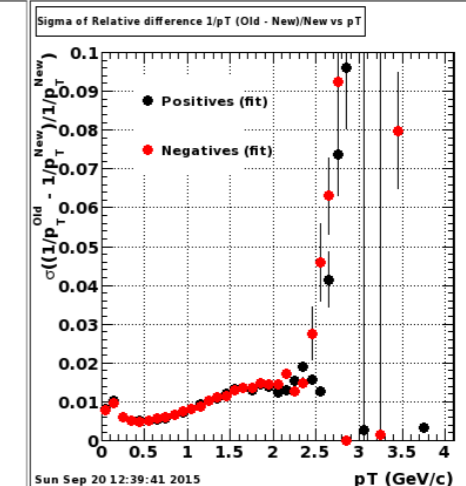
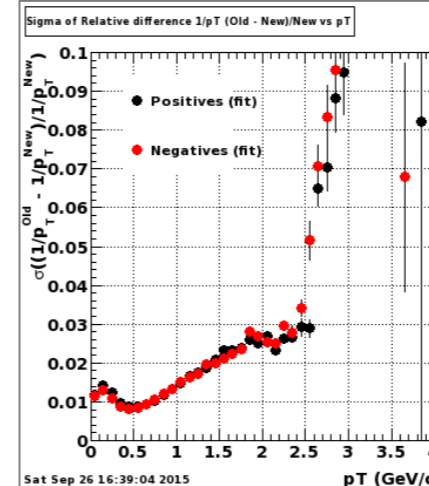
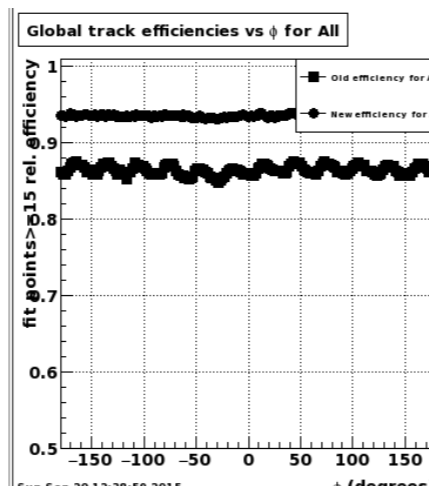
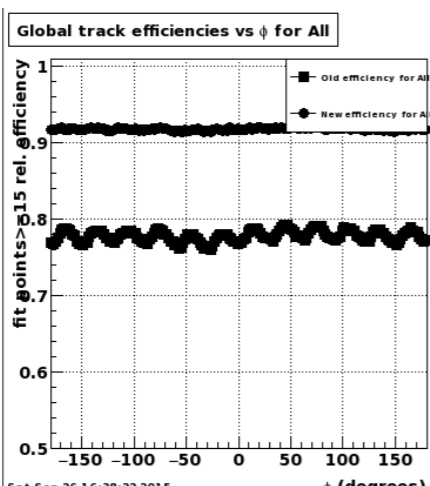
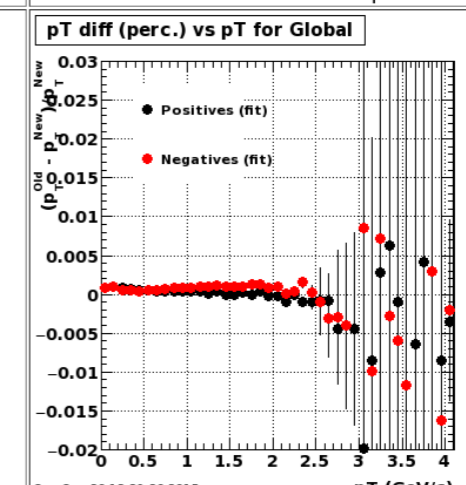
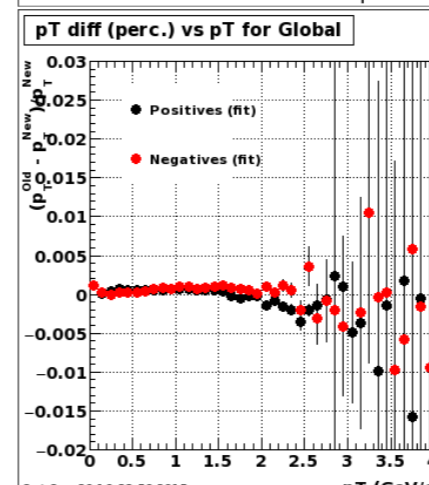
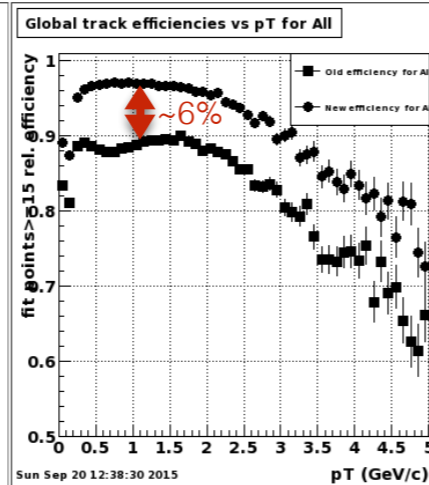
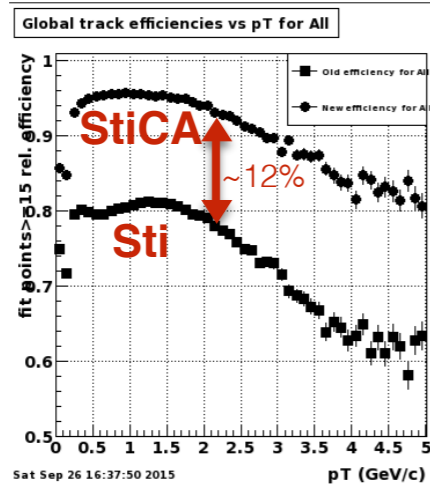
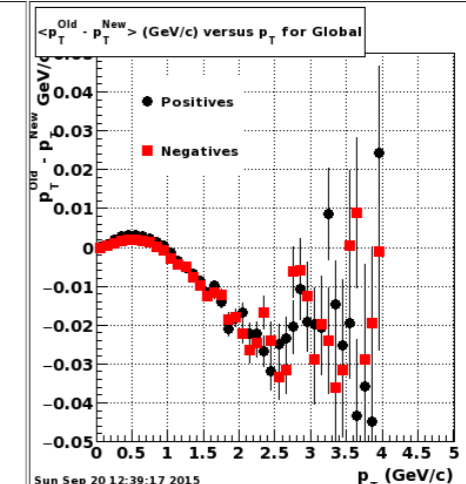
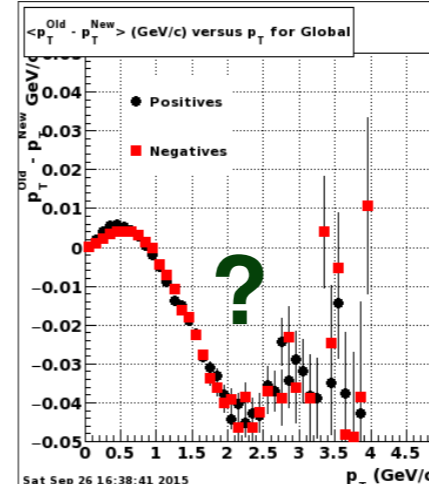
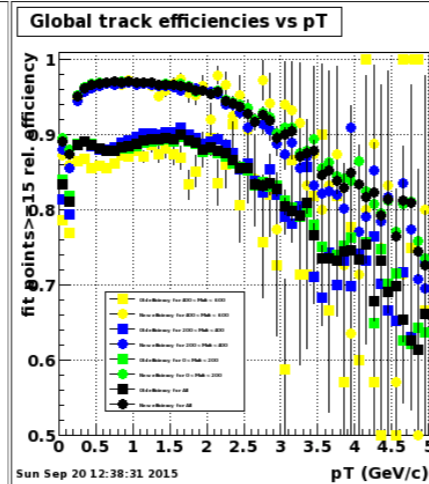
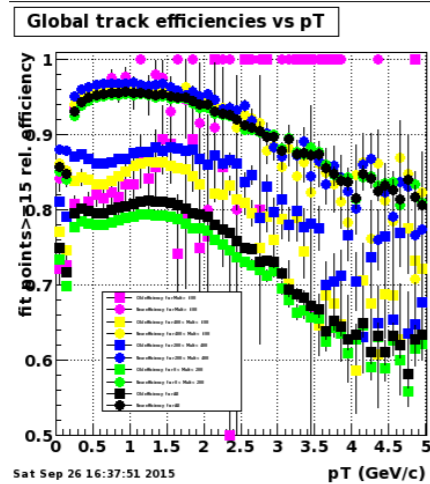
Global Tracks

Production High
(w/o HFT)

Production Mid
(w/ HFT)

Production High
(w/o HFT)

Production Mid
(w/ HFT)



StiCA

Sti

Run14 Au + Au 200GeV

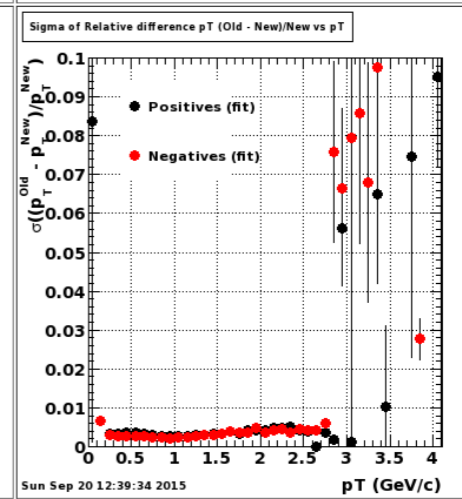
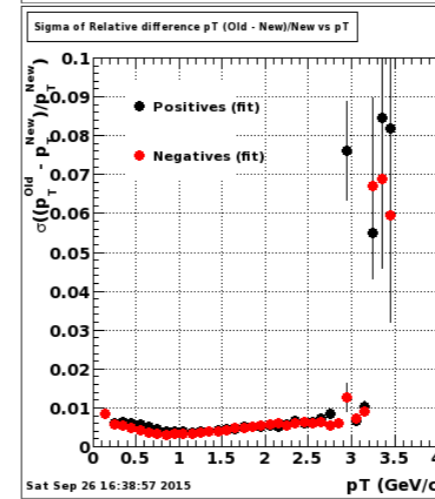
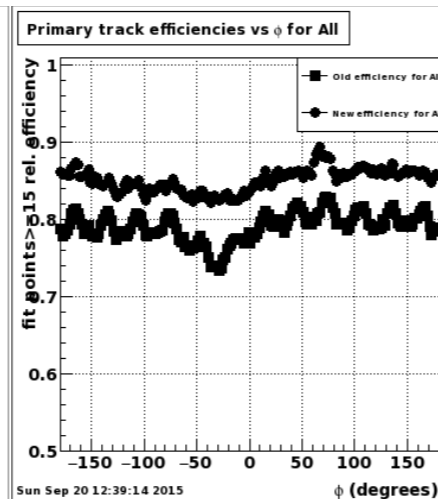
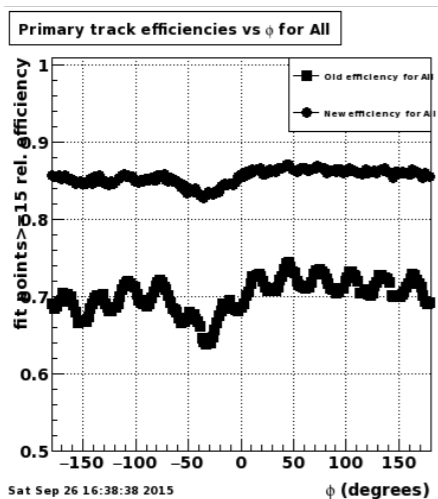
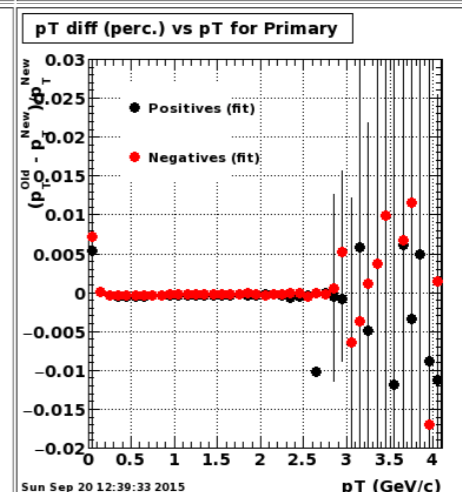
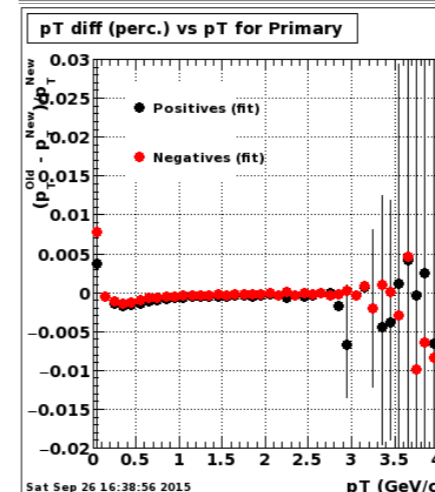
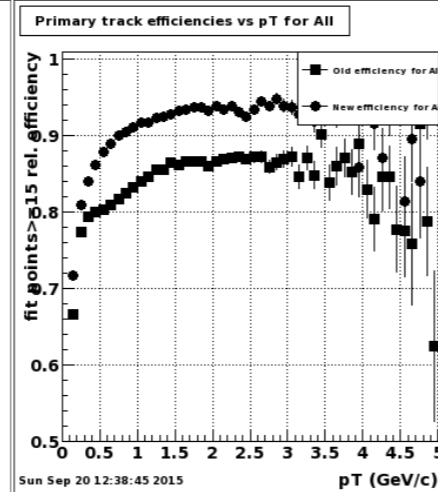
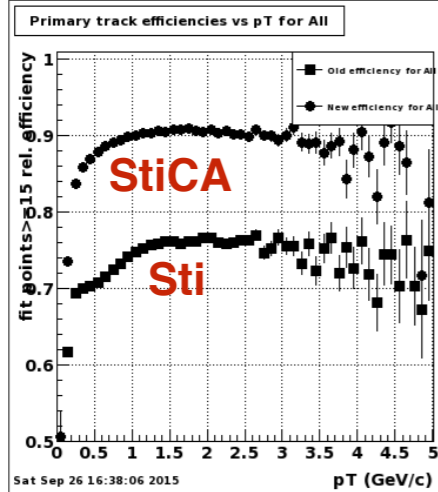
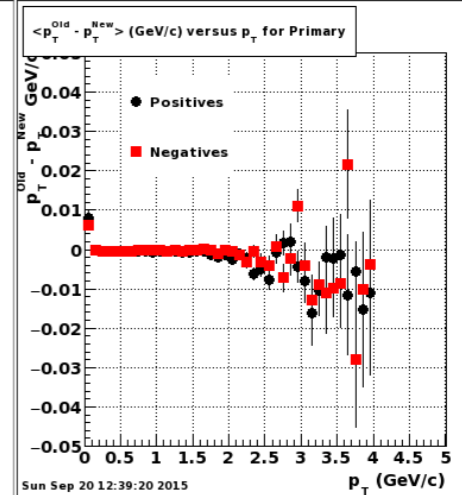
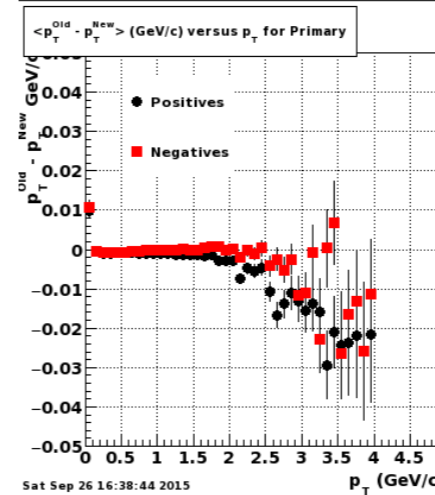
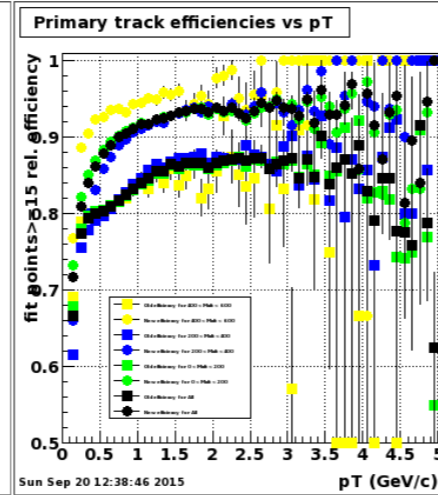
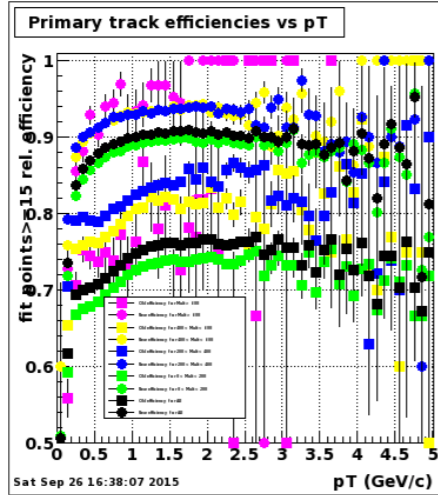
Primary Tracks

Production High
(w/o HFT)

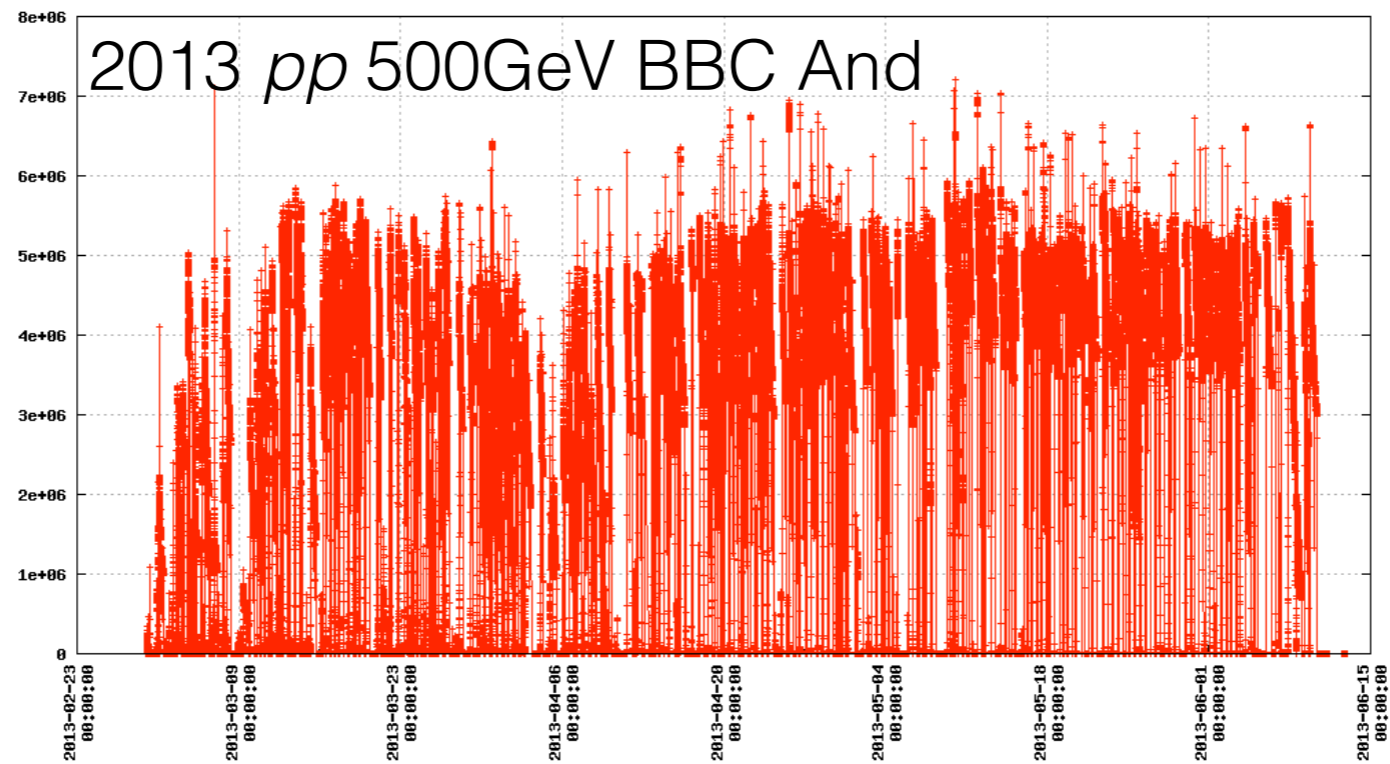
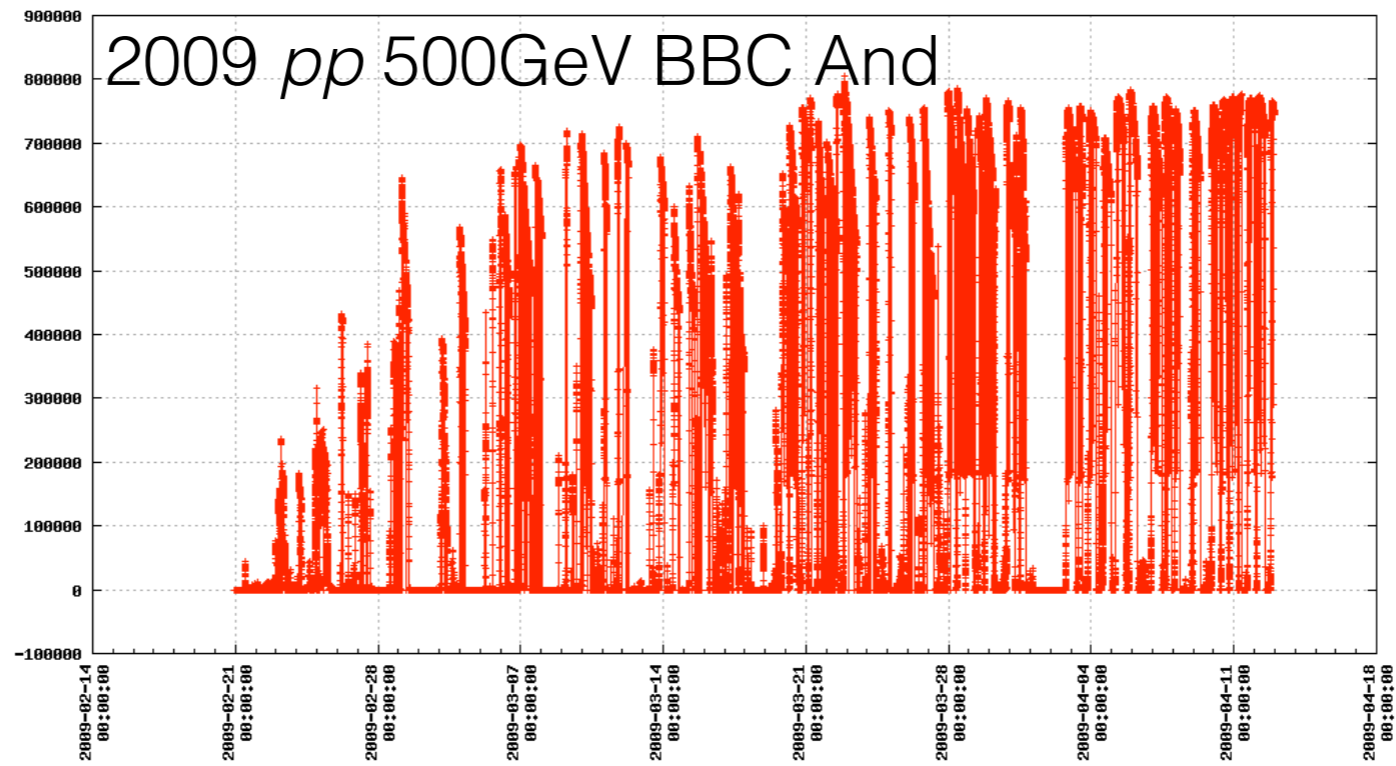
Production Mid
(w/ HFT)

Production High
(w/o HFT)

Production Mid
(w/ HFT)



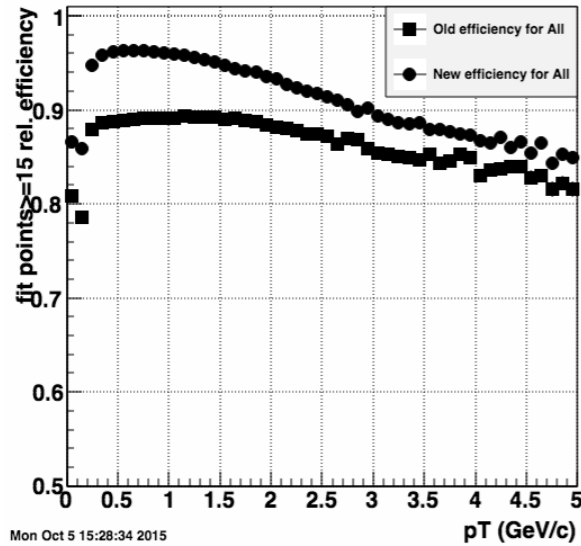
Run 9 and 13 pp 500GeV Luminosity



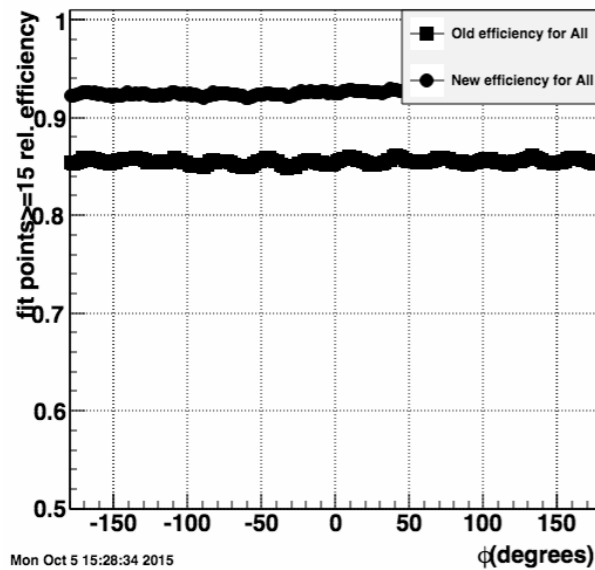
Run 9 and 13 pp 500GeV Global Tracks

Run 13

Global track efficiencies vs pT for All

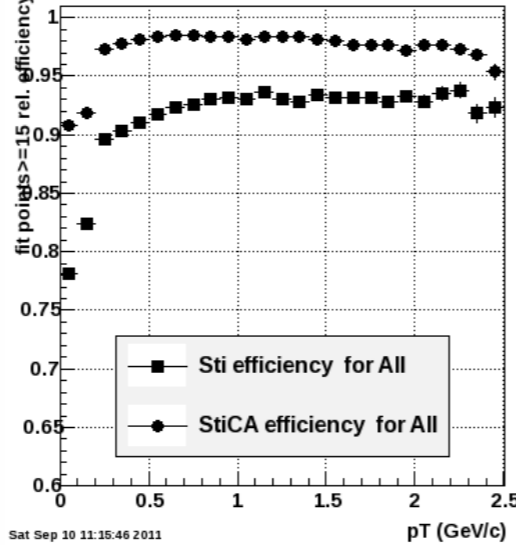


Global track efficiencies vs ϕ for All

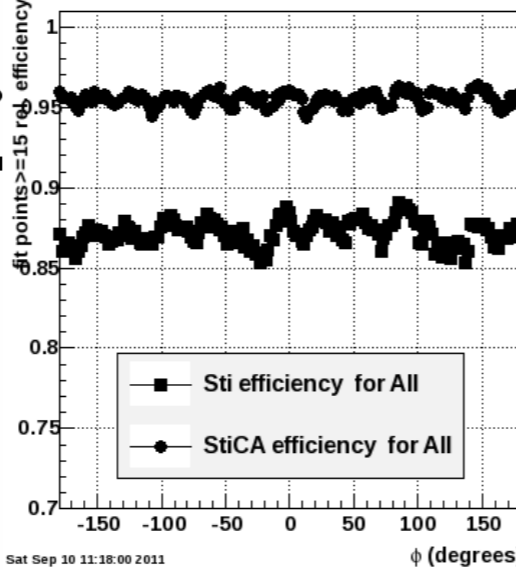


Run 9

Global track efficiencies vs pT for All

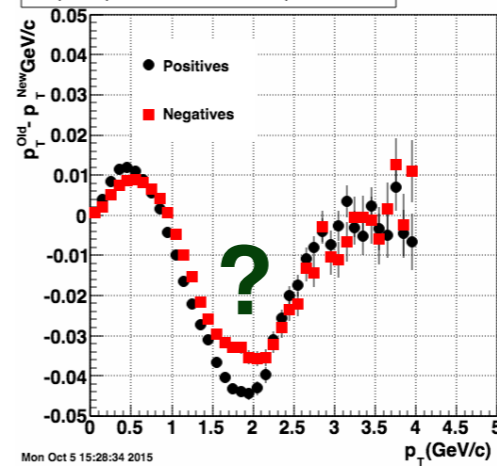


Global track efficiencies vs ϕ for All

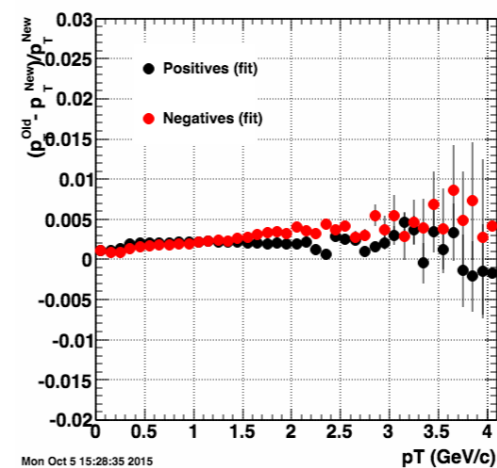


Run 13

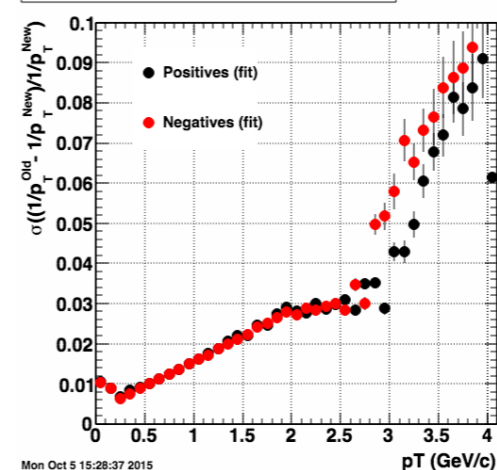
$\langle p_T^{Old} - p_T^{New} \rangle$ (GeV/c) versus p_T for Global



pT diff (perc.) vs pT for Global

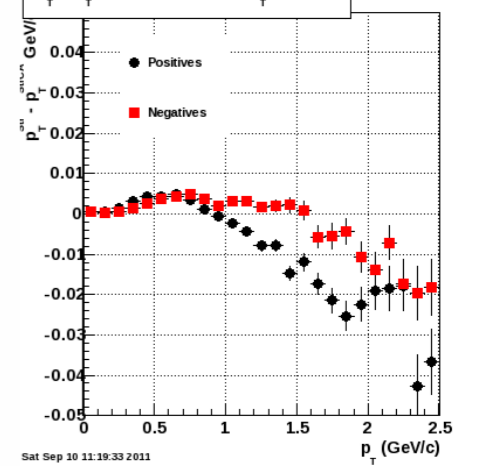


Sigma of Relative difference $1/p_T$ (Old - New)/New vs pT

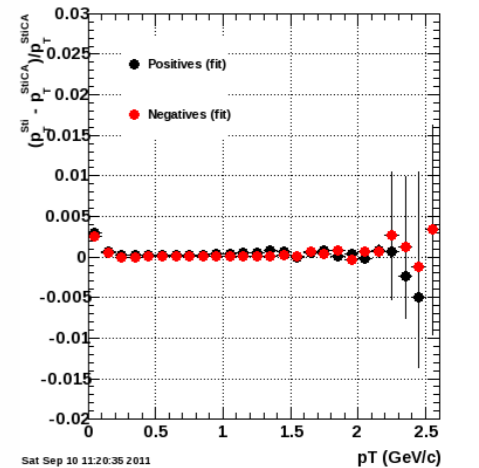


Run 9

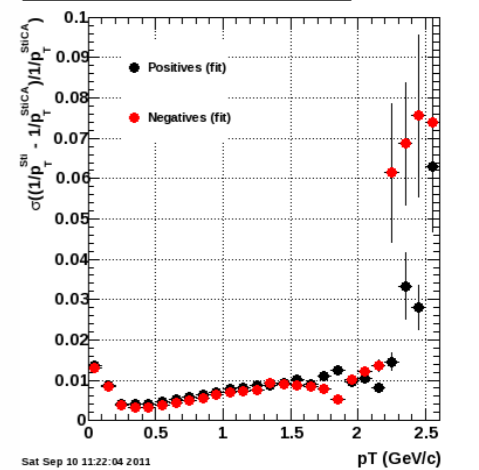
$\langle p_T^{Sti} - p_T^{StiCA} \rangle$ (GeV/c) versus p_T for Global



pT diff (perc.) vs pT for Global



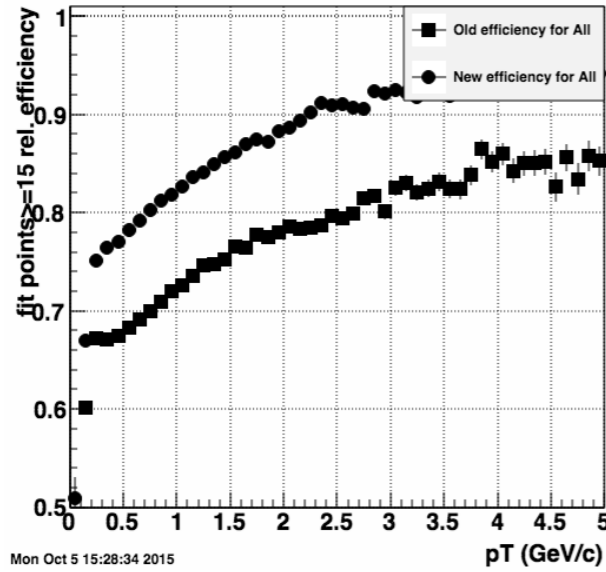
Sigma of Relative difference $1/p_T$ (Sti - StiCA)/StiCA vs pT



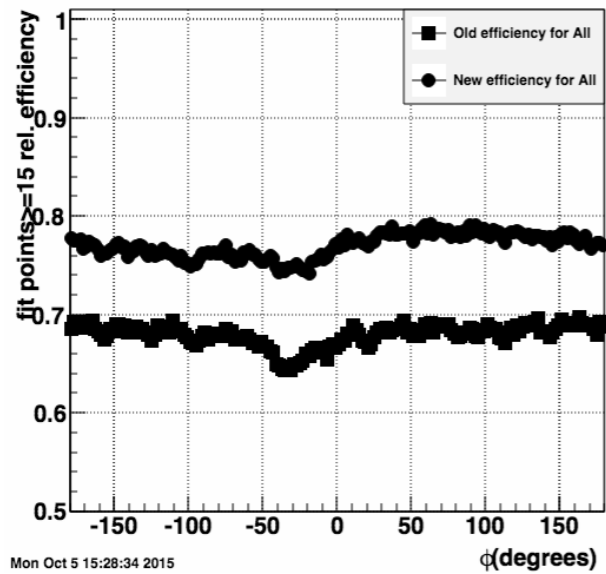
Run 9 and 13 pp 500GeV Primary Tracks

Run 13

Primary track efficiencies vs p_T for All

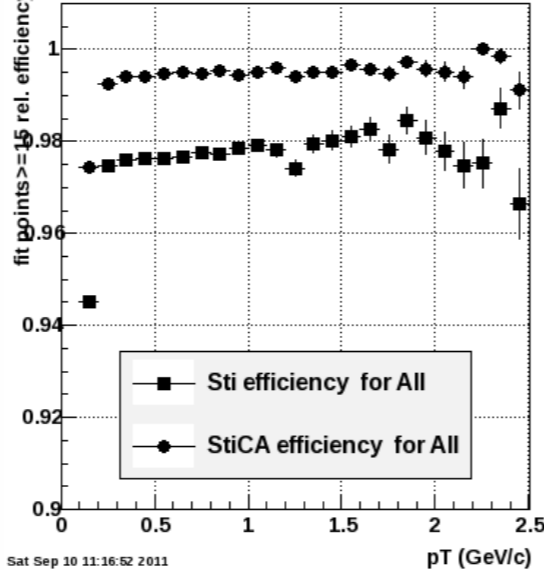


Primary track efficiencies vs ϕ for All

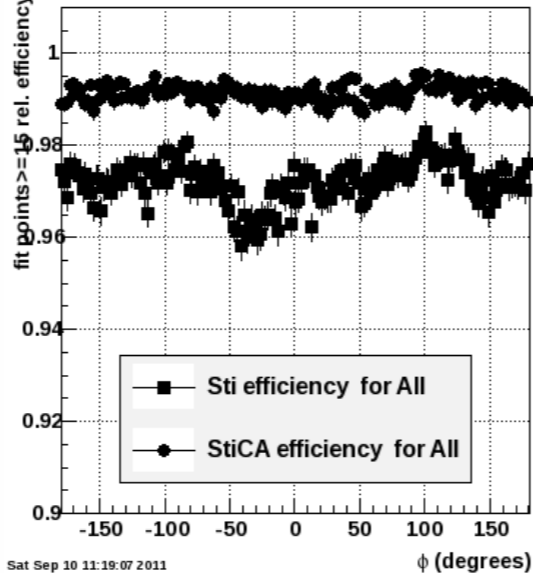


Run 9

Primary track efficiencies vs p_T for All

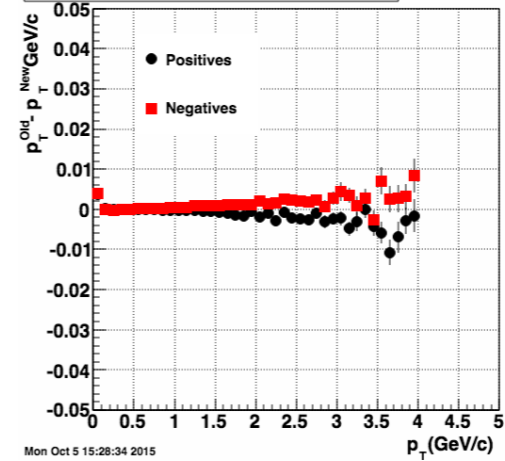


Primary track efficiencies vs ϕ for All

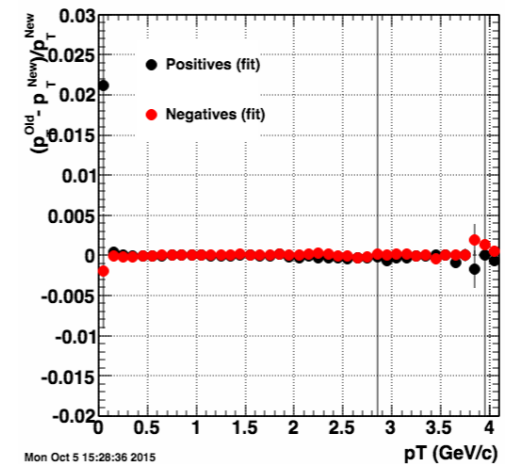


Run 13

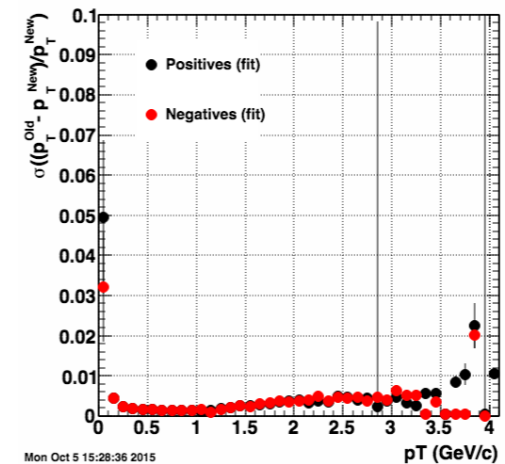
$\langle p_T^{Old} - p_T^{New} \rangle$ (GeV/c) versus p_T for Primary



p_T diff (perc.) vs p_T for Primary

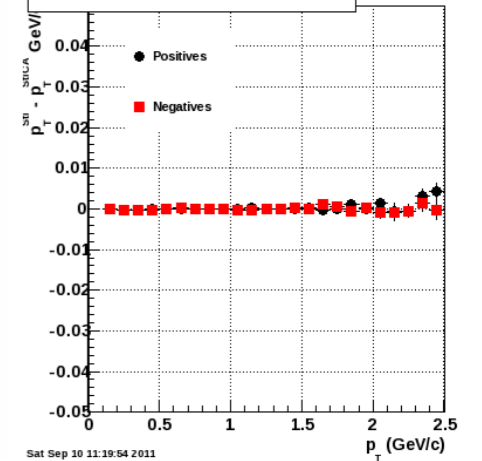


Sigma of Relative difference p_T (Old - New)/New vs p_T

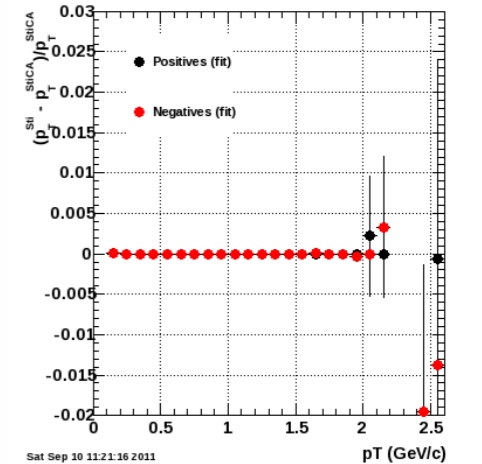


Run 9

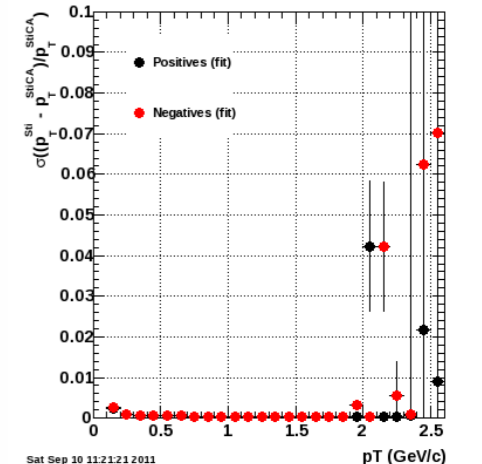
$\langle p_T^{Sti} - p_T^{StiCA} \rangle$ (GeV/c) versus p_T for Primary



p_T diff (perc.) vs p_T for Primary



Sigma of Relative difference p_T (Sti - StiCA)/StiCA vs p_T



Summary

- ❖ We compared the tracking efficiency and p_T resolution between Sti and StiCA with real data in AuAu 200GeV Collisions in year 2014 and pp 500GeV collisions in year 2013 and 2009.
- ❖ AuAu 200GeV
 - StiCA gives $\sim 12\%$ higher tracking efficiency when there is no HFT and $\sim 6\%$ higher tracking efficiency when HFT is available
 - The p_T difference between Sti and StiCA is less than 3% for global tracks and no obvious difference for primary tracks
- ❖ pp 500GeV
 - StiCA gives $\sim 8\%$ higher tracking efficiency at RHIC-II luminosity
 - The p_T difference is less than 3% for global tracks
- ❖ StiCA is less sensitive to bad TPC sectors

Issues and Todo

❖ Issues

- Δp_T shows a p_T dependence for global tracks in both AuAu and pp collisions

❖ Todo

- Comparing timing performance
- Use MC data to evaluate the real tracking efficiency and p_T resolution