Real data samples: track by track evaluation

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Outlook

- Data samples
- Track by track
- Efficiencies
- Momentum reconstruction
- Conclusions

Data samples

1. 2004 AuAu200 : Sti (4.8 k), StiCA(4.8 k), Stv (2.9 k), StvCA(4.8 k)
2. 2009 pp500: Sti(82.9 k), StiCA(10k), Stv(74 k), StvCA (73.3 k)
3. 2010 AuAu200: 10k for all Sti, StiCA, Stv and StvCA

These samples were processed on the same type of CPU which allows to compare CPU usage.

Track by Track analysis

- This analysis is based on matching tracks from different reconstructions by the list of hits which were used to built these tracks.
- The algorithm has been developed ~10 years ago by Manuel.
- Thus this analysis requires full StEvent with hits because track matching is based on the hits.
- The complete list of plots obtained in this analysis can be found at

http://www4.rcf.bnl.gov/~fisyak/star/RECO/Eval/TbyT/

- In this talk I will flush the most interesting ones.

Efficiencies

To calculate efficiencies I use “scanning girls” example from book ┌**“Statistical methods in experimental physics**” by W. T. Eadie, Frederick James.

This example considers a task to calculate efficiencies for finding some type of events by two girls scanning Bubble Chamber films.

There are two assumptions:

1. The two girls are independent i.e. one girl does not know anything about results of an other one.
2. The efficiencies for both girls have a sense ($\varepsilon_1 > 0$ and $\varepsilon_2 > 0$) i.e. efficiencies are defined in phase space satisfied the above condition.

If **N** is total events then

- $\mathbf{N_1 = N \times \varepsilon_1}$ is no. of events found by the 1-st girl,
- $\mathbf{N_2 = N \times \varepsilon_2}$ is no. of events found by the 2-nd girl, and
- $\mathbf{N_{12} = N \times \varepsilon_1 \times \varepsilon_2}$ is no. of events found by both girls.

We have 3 equations and 3 unknowns which we can resolve

- $\boldsymbol{\varepsilon_1 = N_{12} / N_2}$
- $\boldsymbol{\varepsilon_2 = N_{12} / N_1}$
- $\mathbf{N = N_1 \times N_2 / N_{12}}$

Just remember that one girls has name Sti and another has name Stv.

2010 AuAu 200, StiCA (•) versus Sti(■)

Legend:

- Color: black for all, others for different sets of ref. multiplicities.

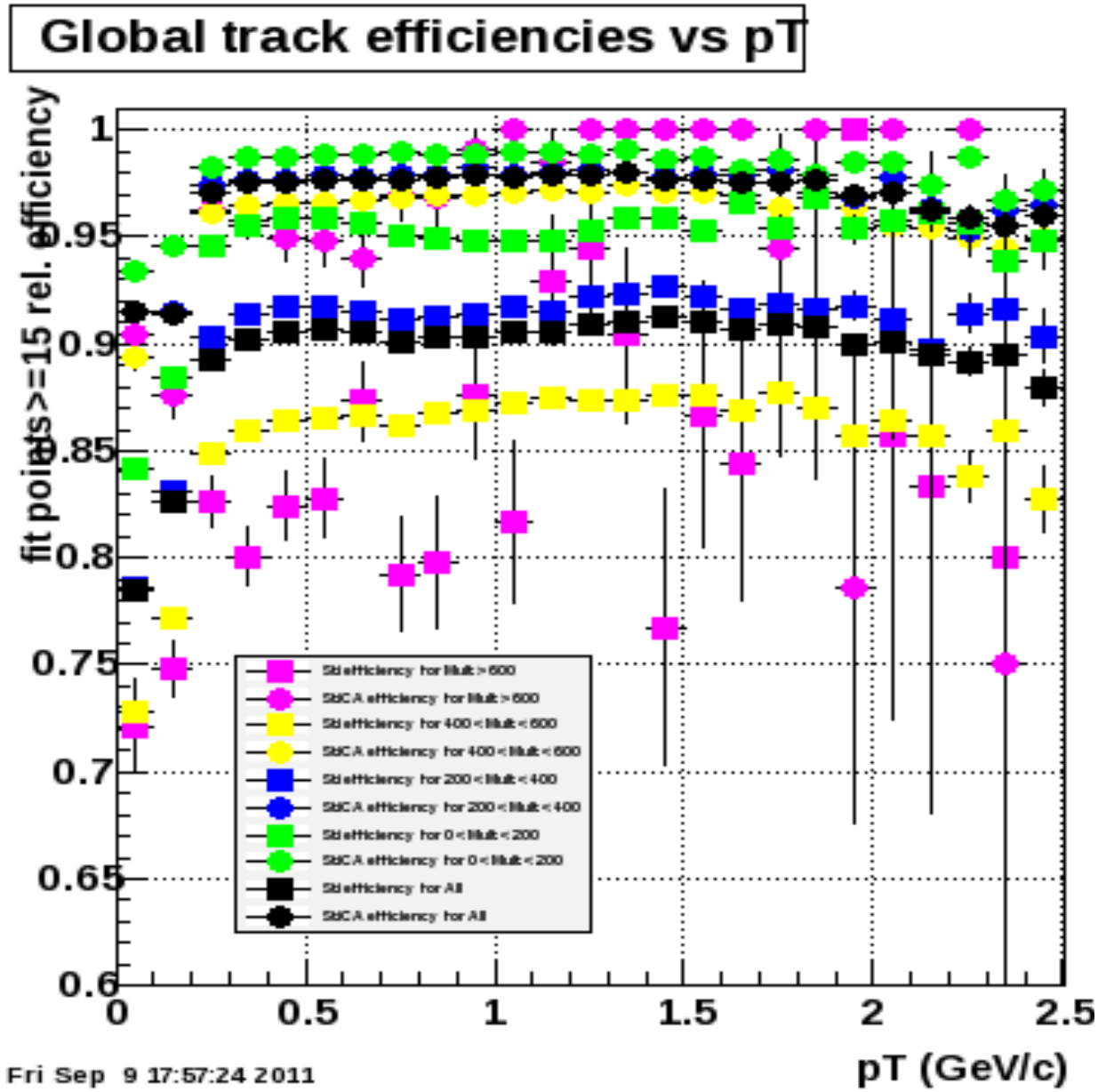
Selection:

- |η| < 0.5,
- No. fit points > 15

Overall efficiency is ~7% higher for StiCA than Sti.

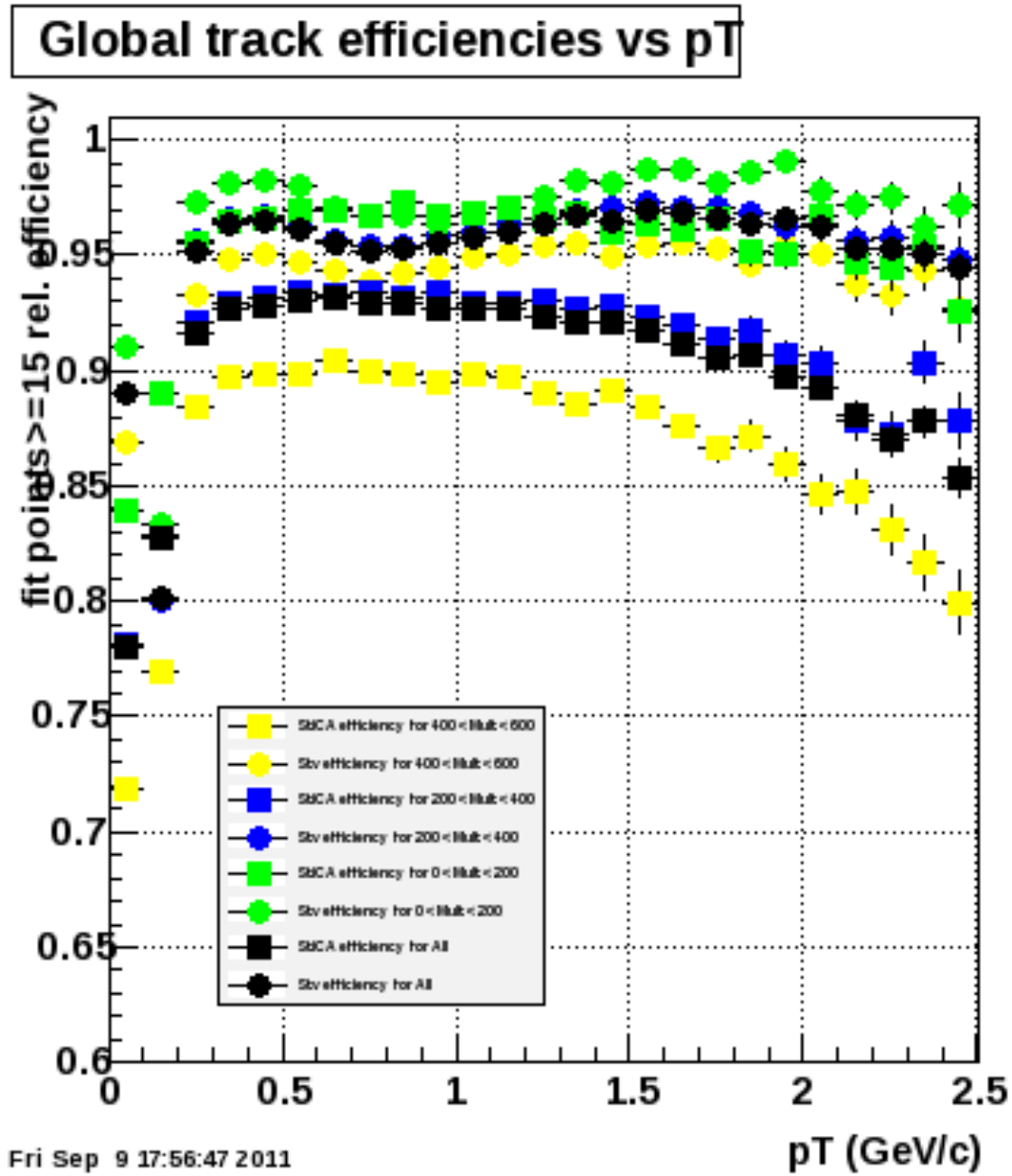
Sti efficiency does depend on ref. mult.

StiCA has much less such dependence.



2010 AuAu 200, Stv (•) versus StiCA(■)

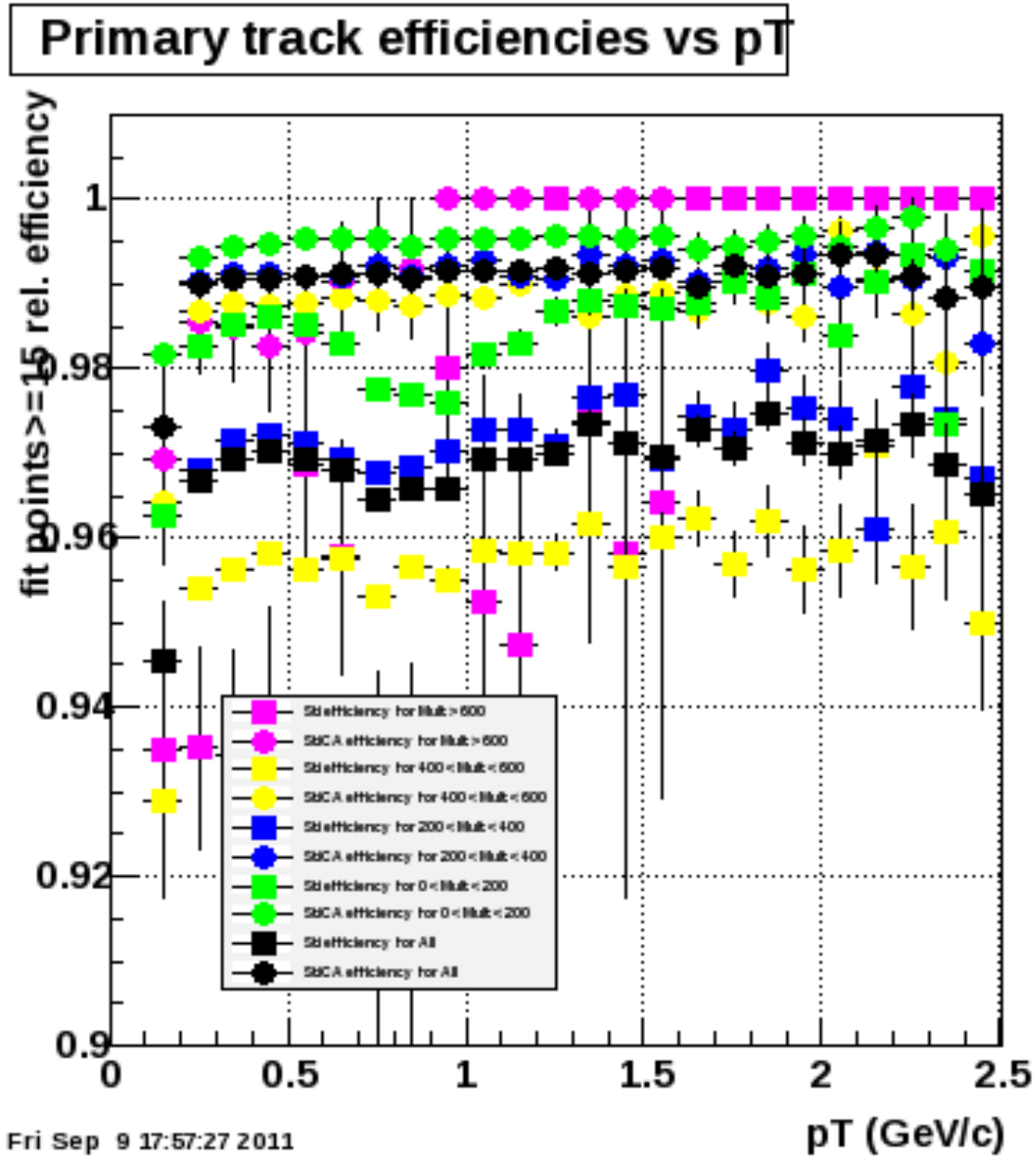
Stv efficiency is higher than StiCA (~2%) and this difference increased with p_T.



2010 AuAu 200, StiCA (•) versus Sti(■)

The same statement as before:

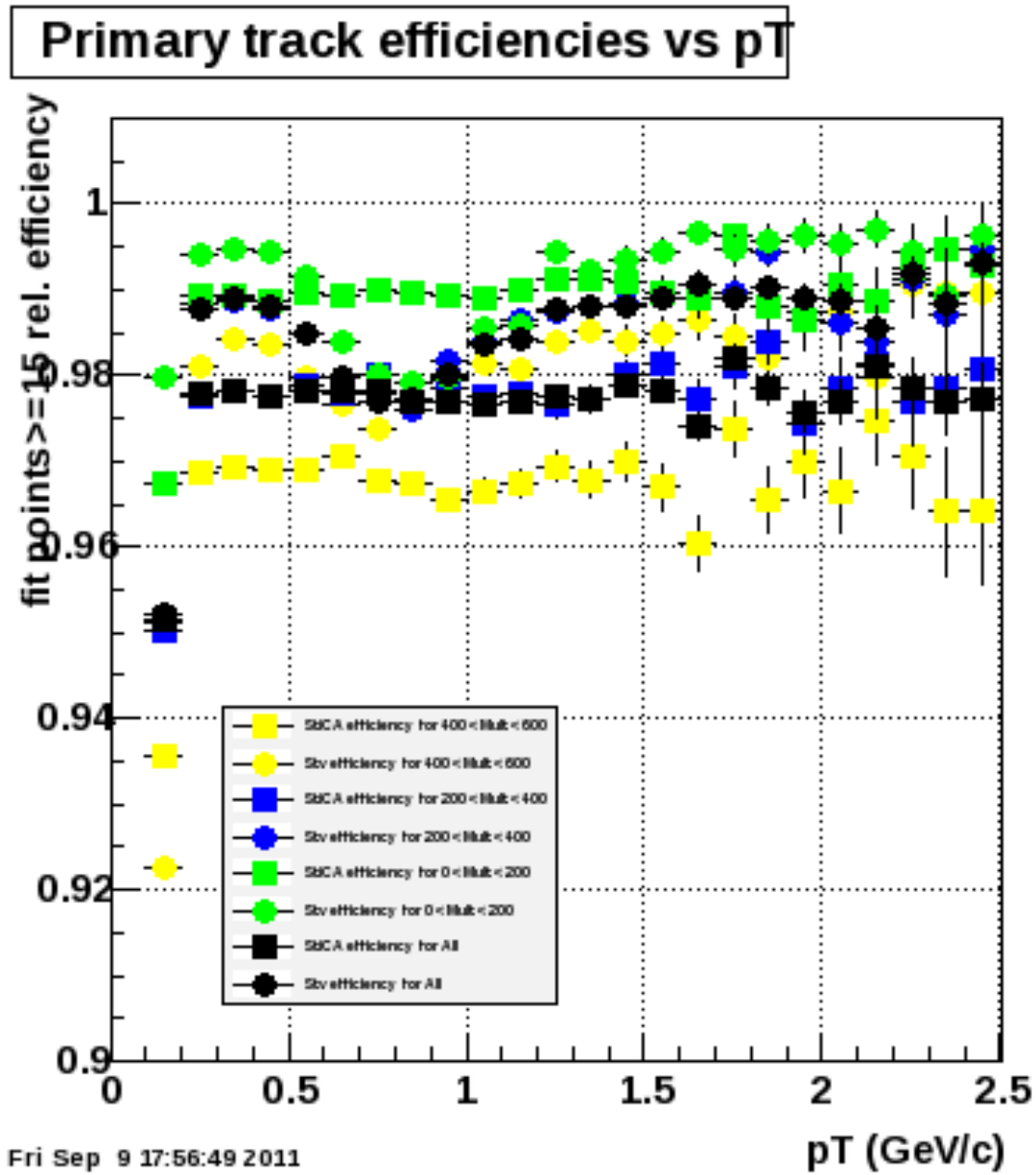
- StiCA efficiency is higher than Sti by ~2%.
- StiCA efficiency has less multiplicity dependence.



2010 AuAu 200, Stv (•) versus StiCA(■)

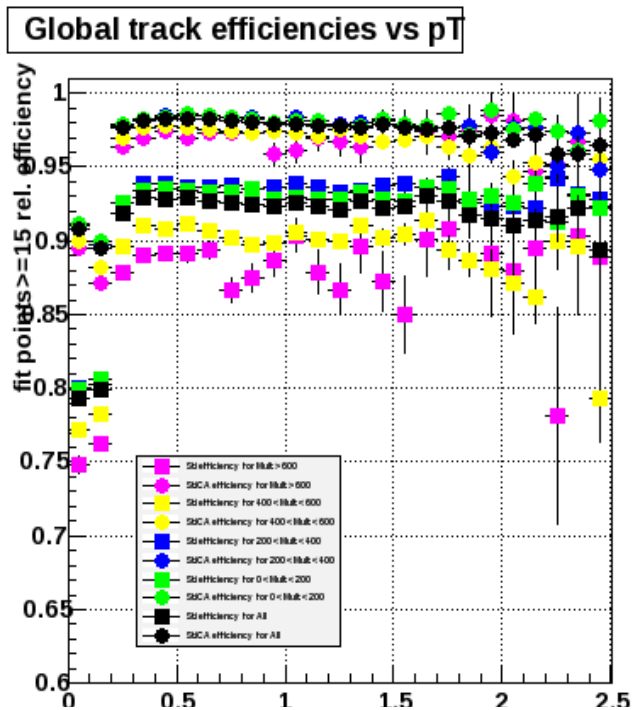
Efficiency Stv is higher by ~1%. There is strange wiggle for StiCA at p_T ~ 0.7 GeV/c.

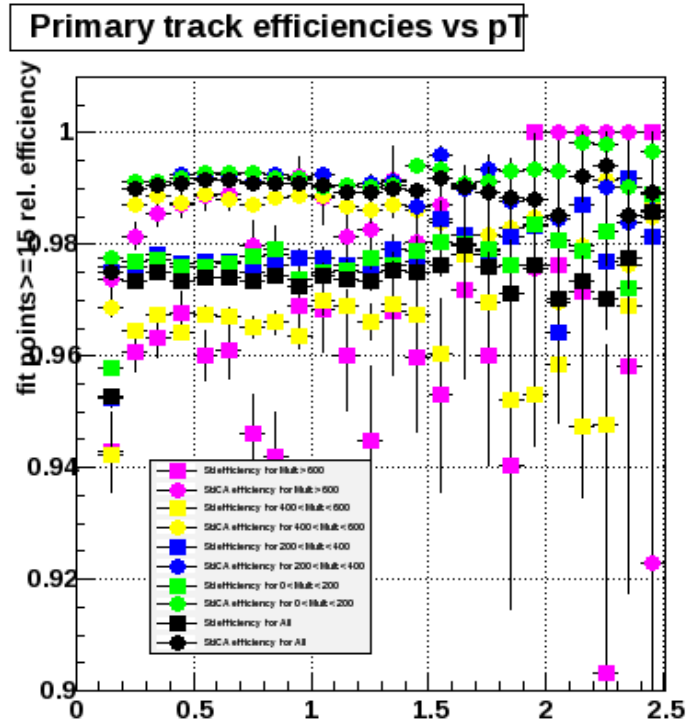
This behavior is common for all other data sets.



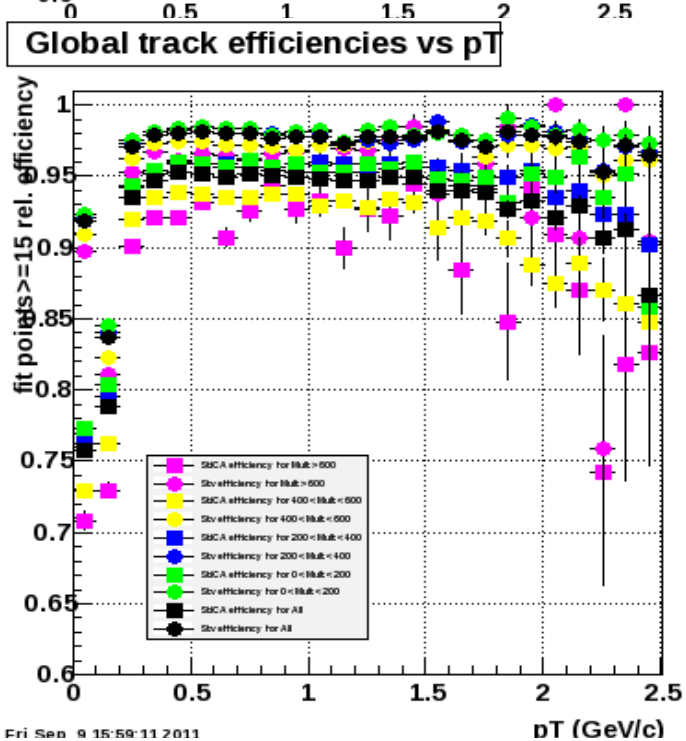
2004 AuAu200

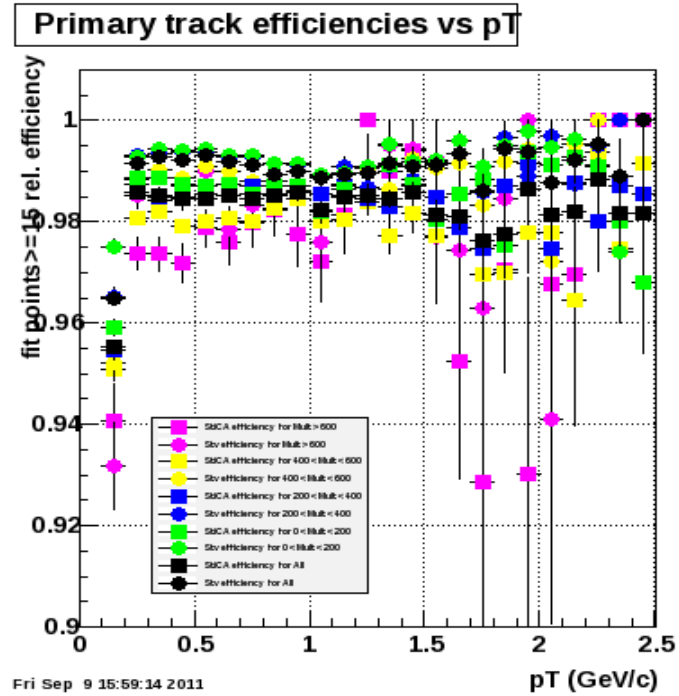
StiCA (•) versus Sti (■)





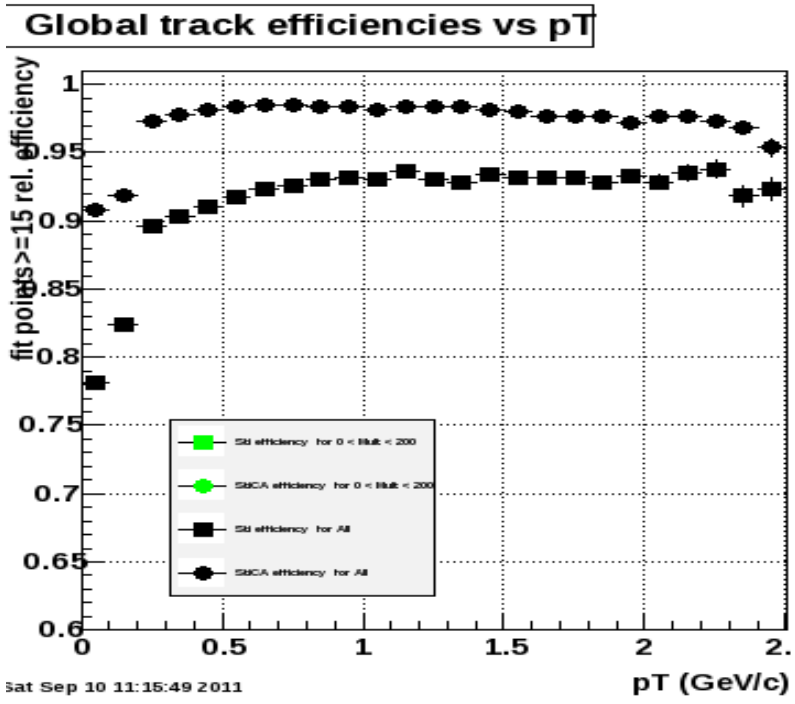
Stv(•) versus StiCA (■)

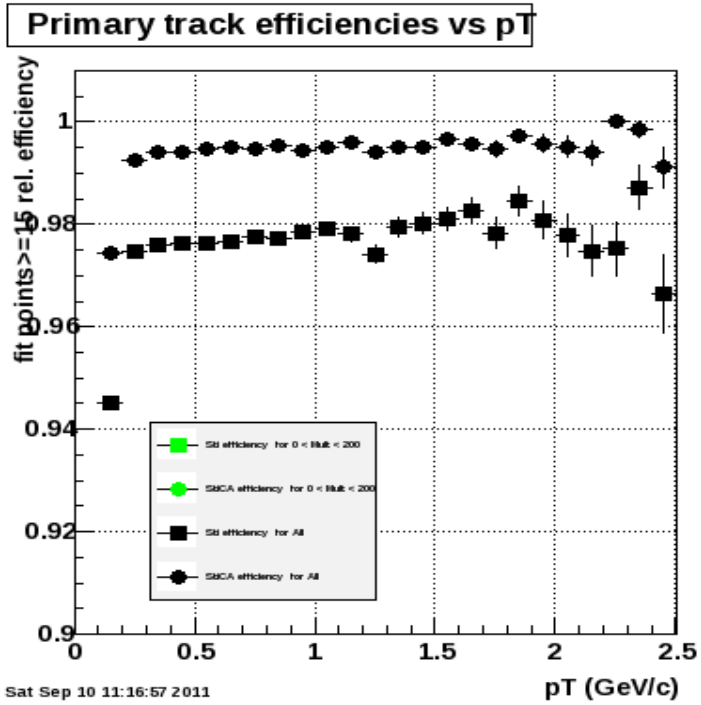




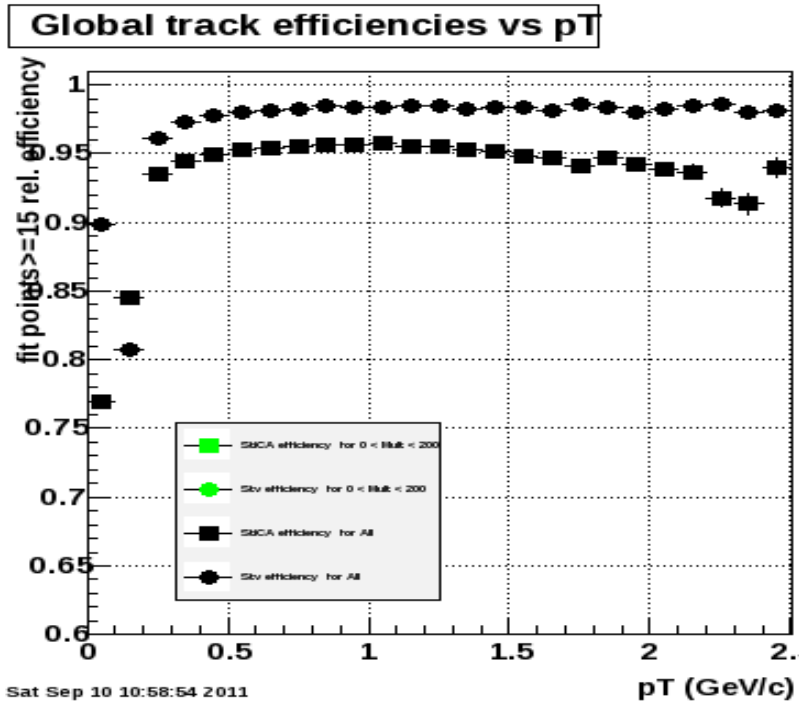
2009, pp500

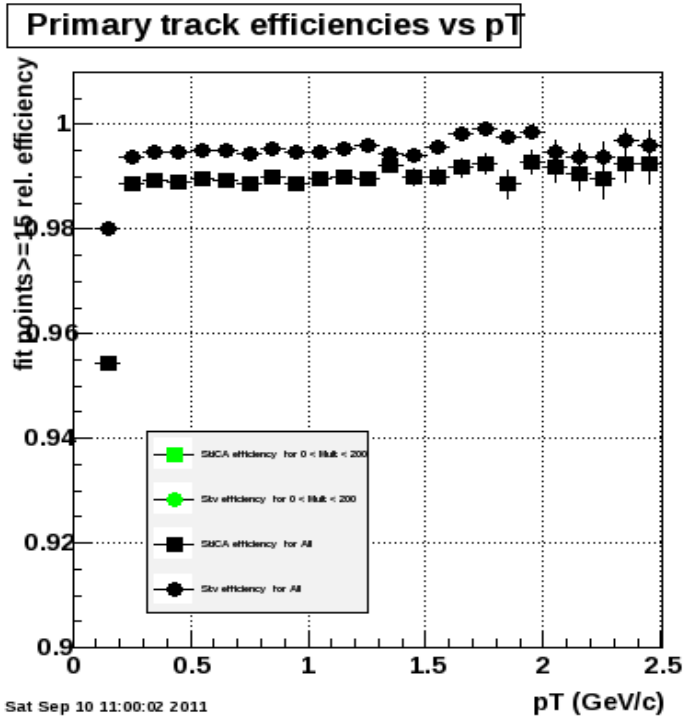
StiCA(•) versus Sti (■)





Stv(•) versus StiCA(■)

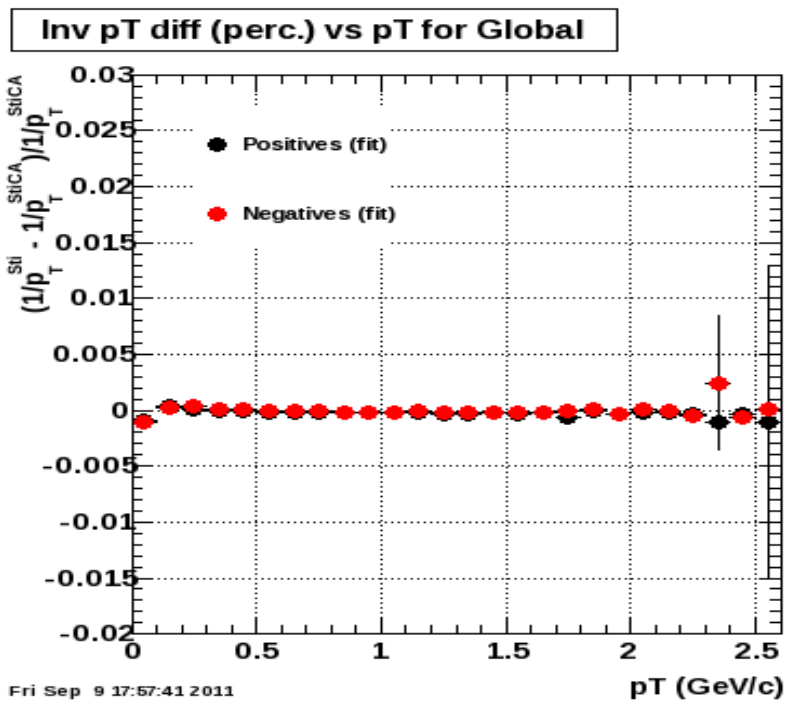


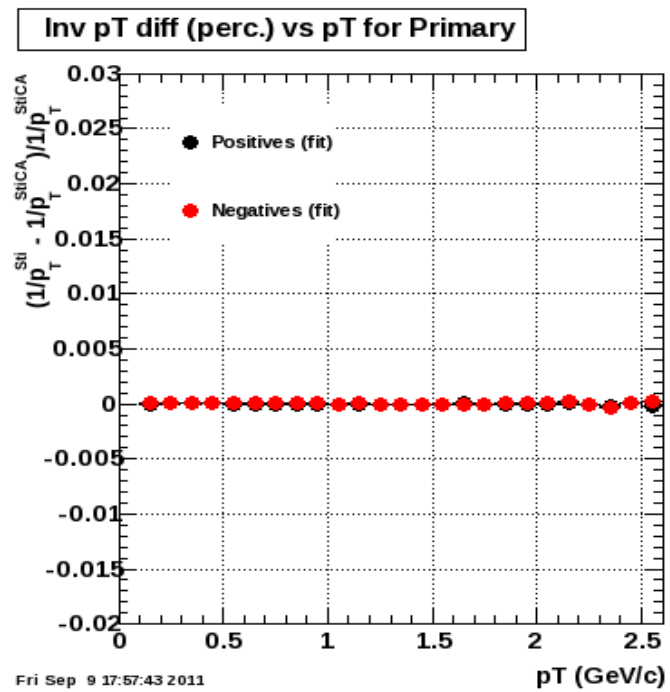


Momentum difference, 2010 AuAu200

Sti versus StiCA:

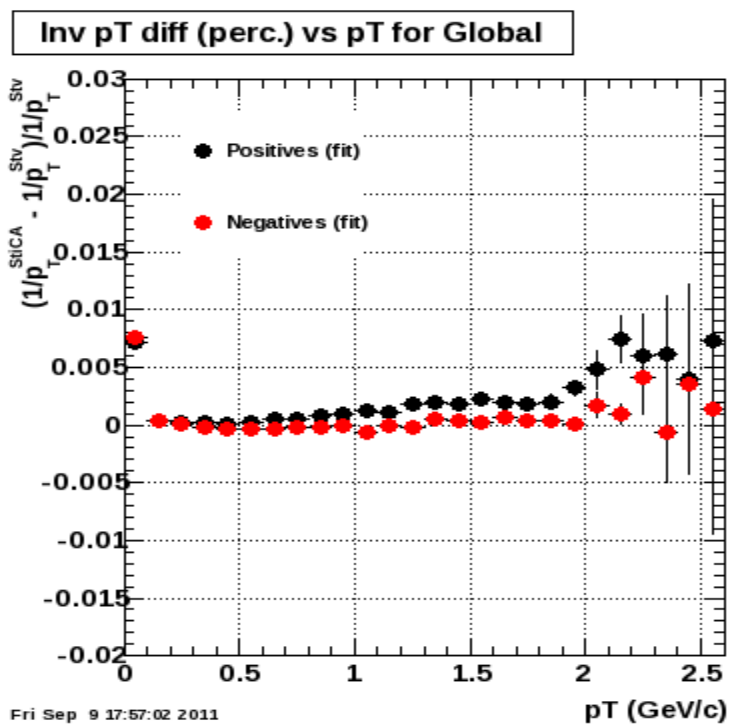
No difference

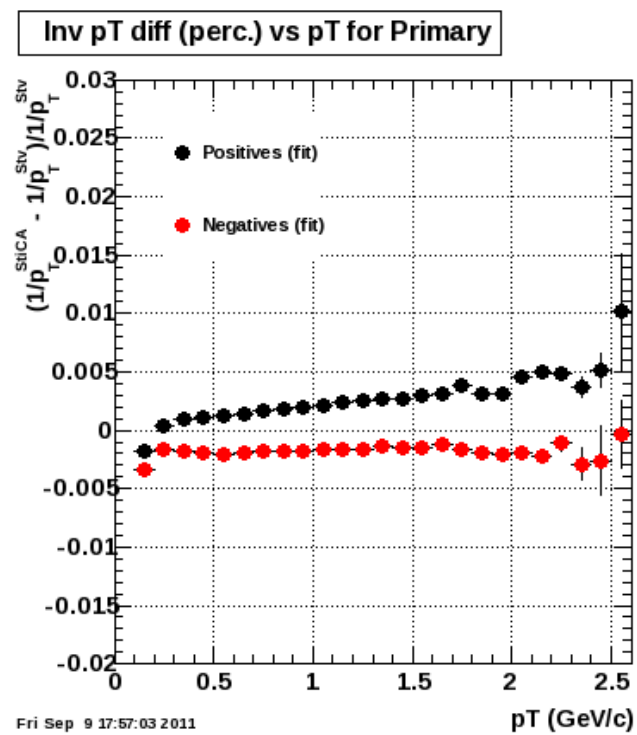




Stv versus StiCA:

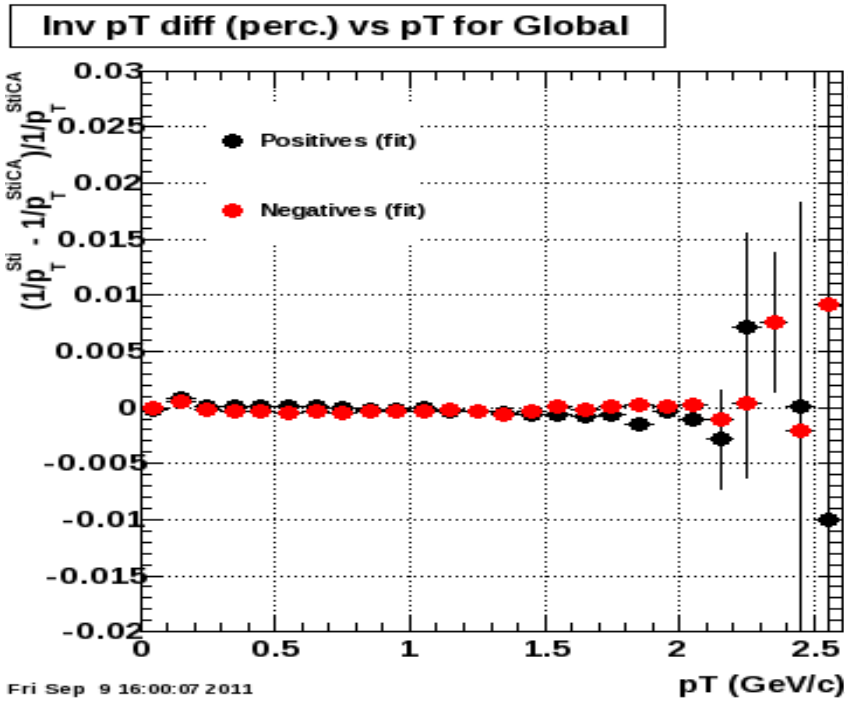
- Small difference for global tracks
- For primary tracks sign splitting on the level a few per mills.

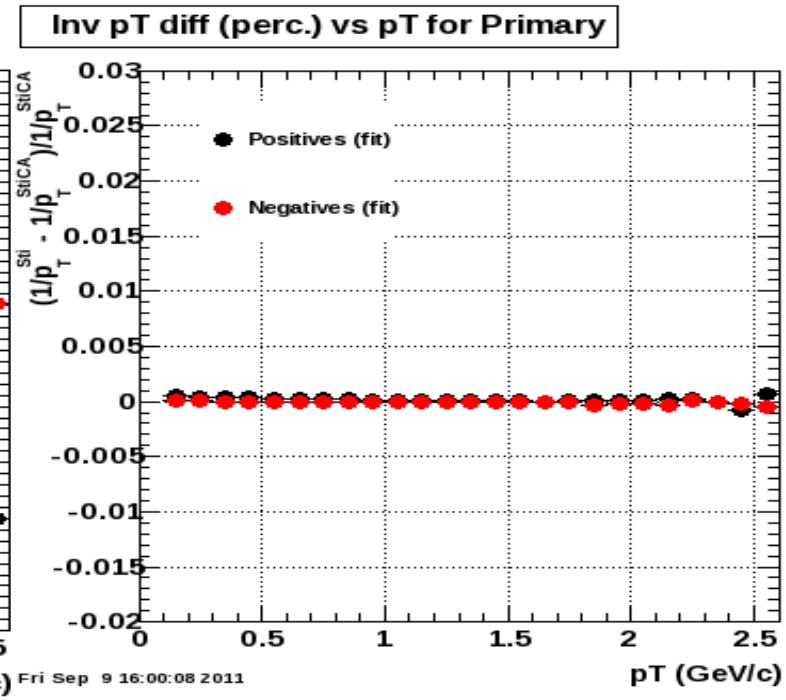




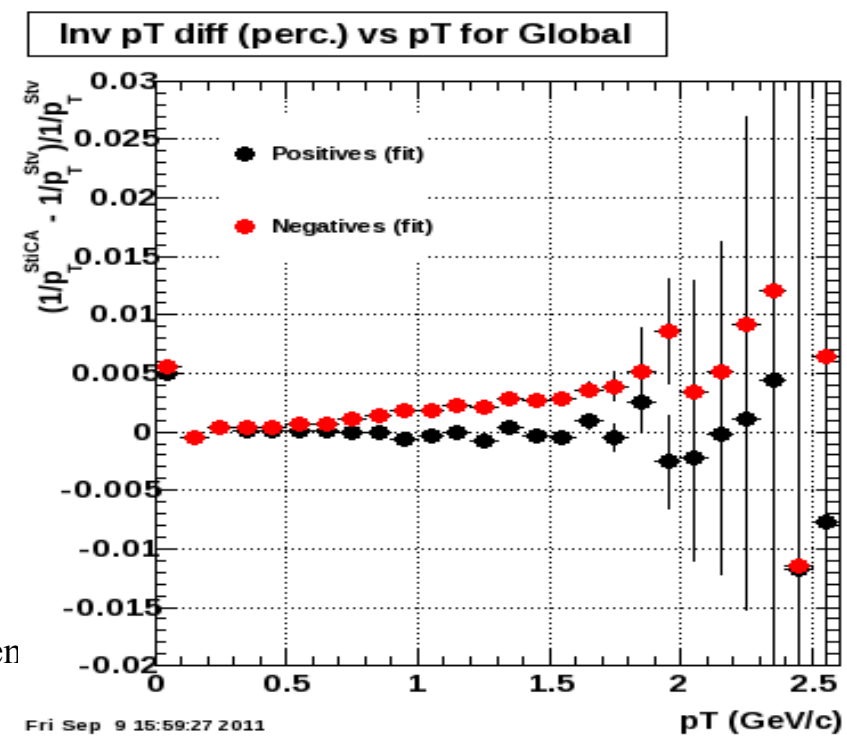
2004, AuAu200

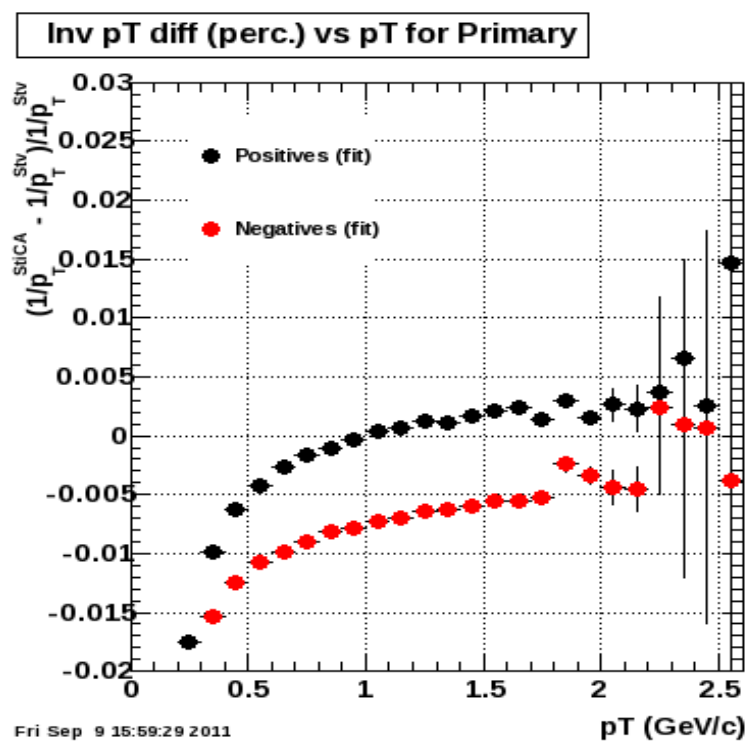
StiCA versus Sti





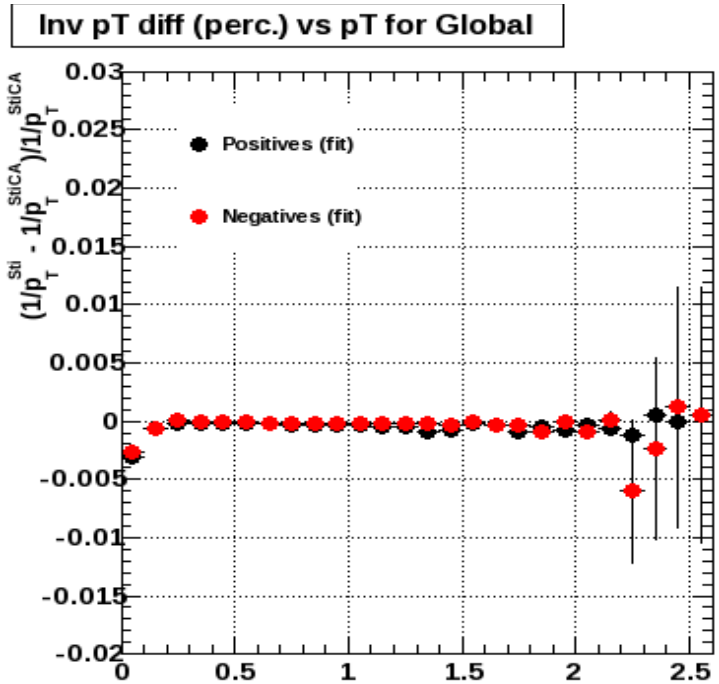
Stv versus StiCA: Sign splitting and shift for primaries on the level ~1%

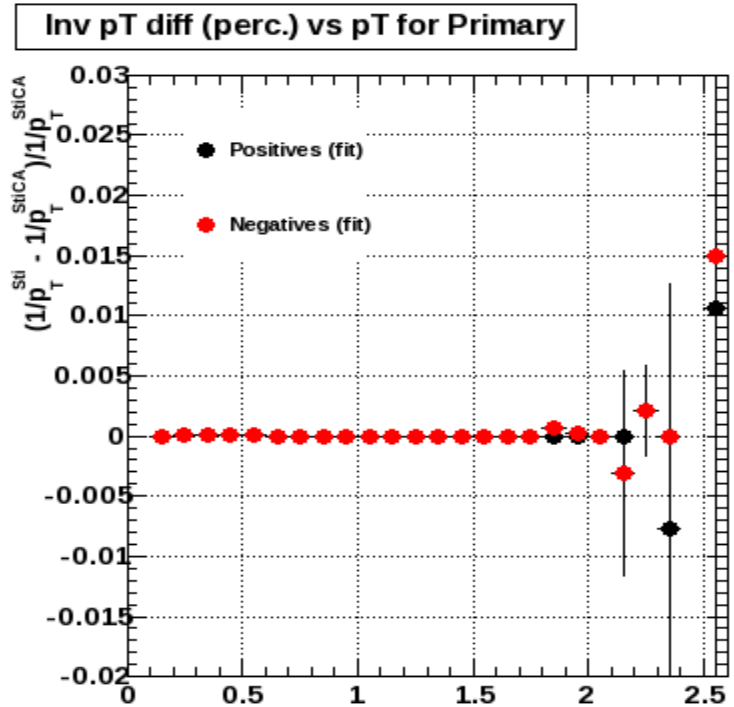




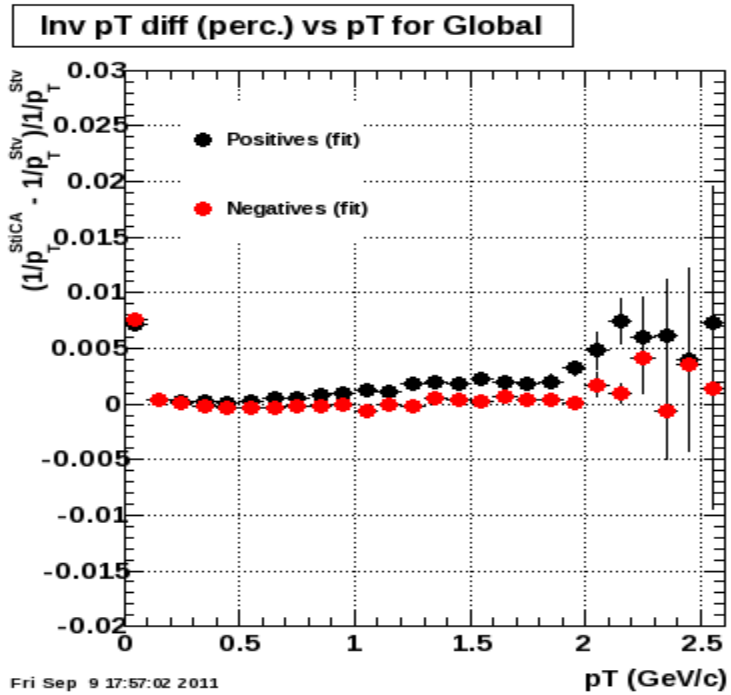
2010, pp500

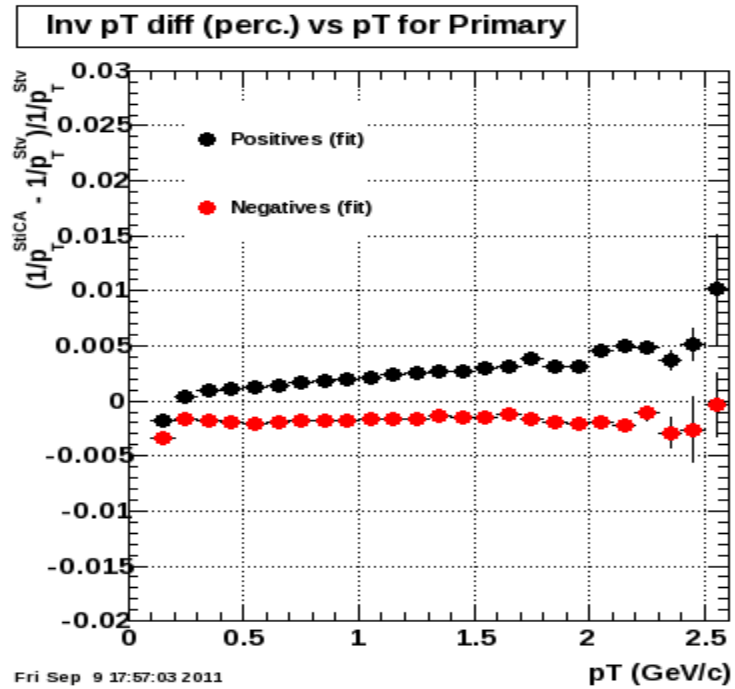
StiCA versus Sti:
No differences





Stv versus StiCA:
The same as for
2010 AuAu200





Conclusions

	StiCA/Sti	Stv/StiCA
Efficiency for global tracks	(+) 7%	(+) 2%
Efficiency for primary tracks	(+) 2%	(+) 1%
$1/p_T$ difference for globals	(+) No	(+) < 0.1 %
$1/p_T$ difference for primaries	(+) No	(?) ~0.5 %

Sti to StiCA conclusions are the same as ones presented at S&C meeting in August 2010 and CHEP 2010 in October 2010.