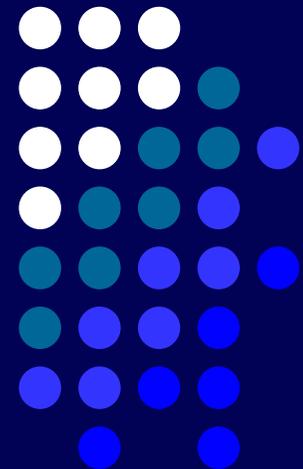


# CDF beam width measurement

Christopher Neu, Willis Sakumoto,  
Geumbong Yu

## Outline

- Introduction
- Online  $\beta^*$  changes with time.
- History plot (online vs. offline)
- Combined  $\beta^*$
- Plan

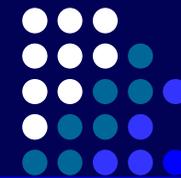


# Introduction

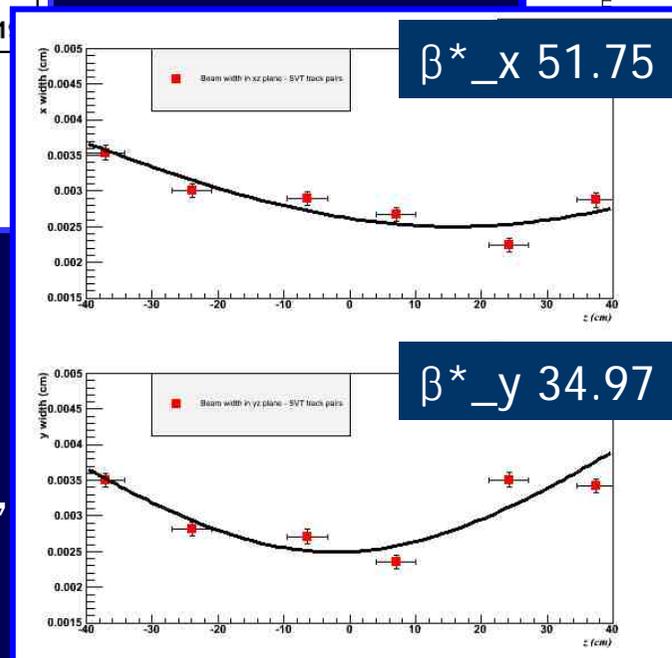
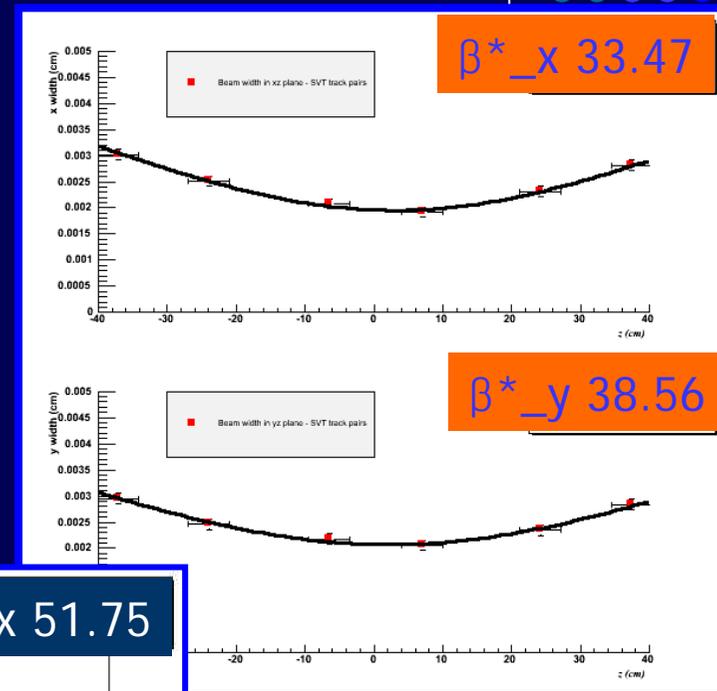
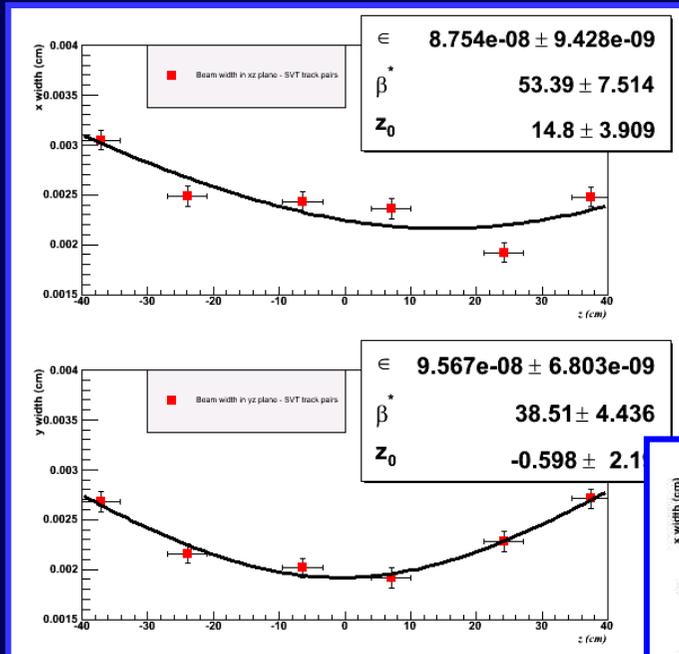


- CDF has three  $\beta^*$  measurement methods (2 separate, 1 combined).
- Online/Offline method to measure  $\beta^*$  in x-z, y-z plane.
  - Online
    - Pros. : Quick (as of data taking).
    - Cons. : Not precise due to 6 fit points.
  - Offline
    - Pros : precise fit from primary vertices.
    - Cons : Not available until data is fully reconstructed.
- Combined  $\beta^*$  measurement from z-vertex distributions.
  - pros : Quick(~1 month) and precise enough.
  - Cons : Only combined fit available.
- Online & combined measurements are available up to Jul. 2007 and offline  $\beta^*$  is available up to Mar 2007.

# Unstable online fit points.



Aug. 2006  
Post-shutdown

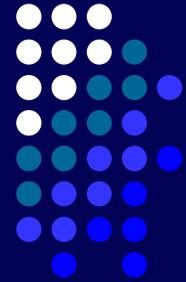


2007-08-01

Store 5188,  
Jan. 2007

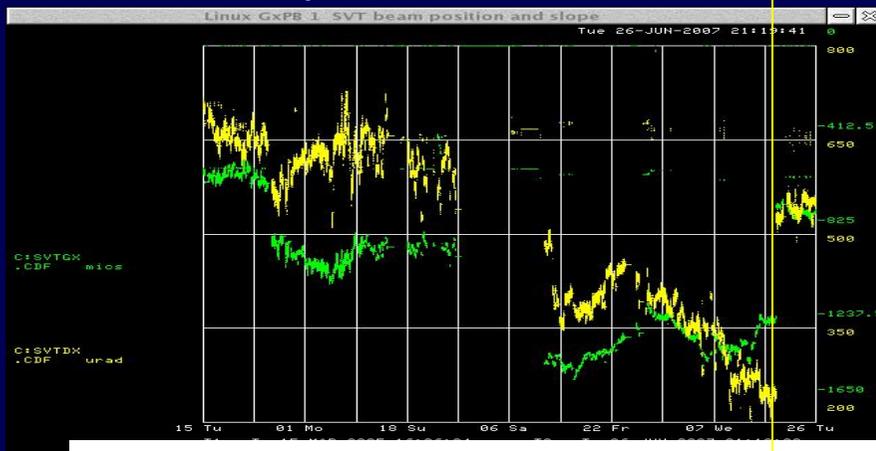
Store 5544,  
Jul. 2007

# Hint for debugging online method

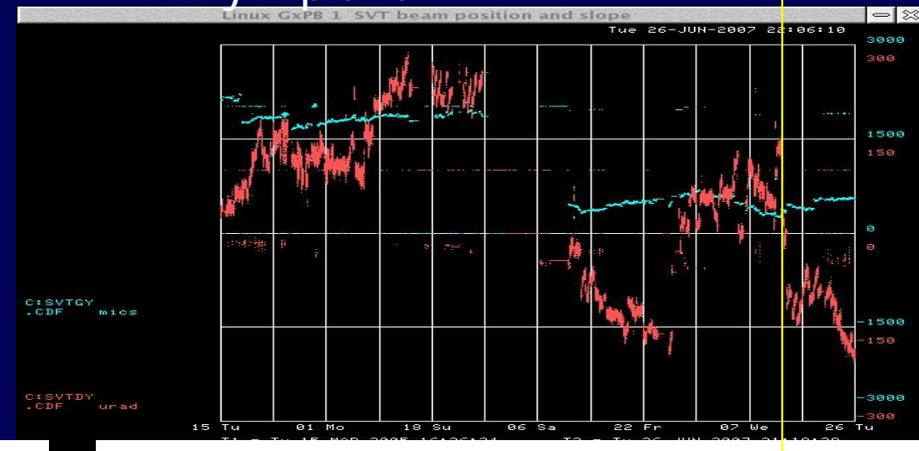


- The beam slope change (yellow and red) seem to correlated with online  $\beta^*$  value, which is not understood logically.
- We are checking out corrections in the online method.

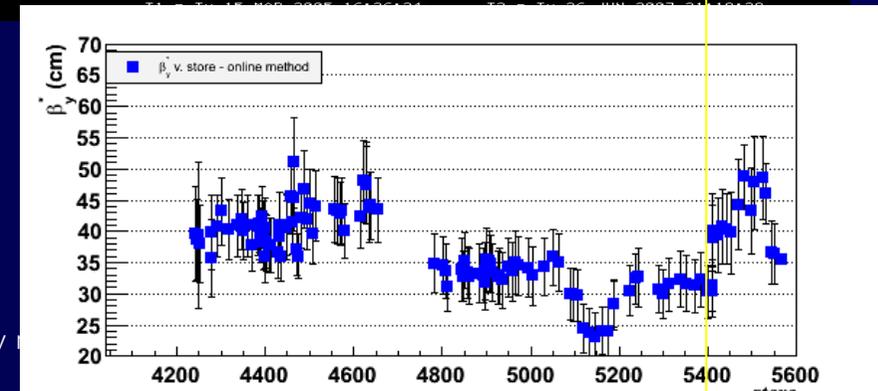
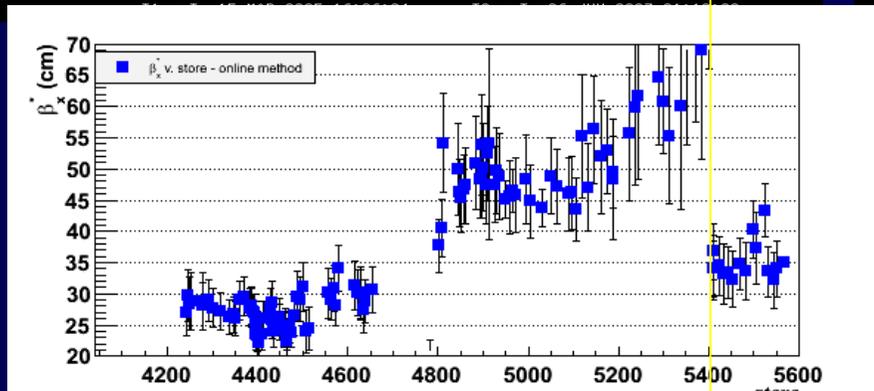
In x-z plane



In y-z plane

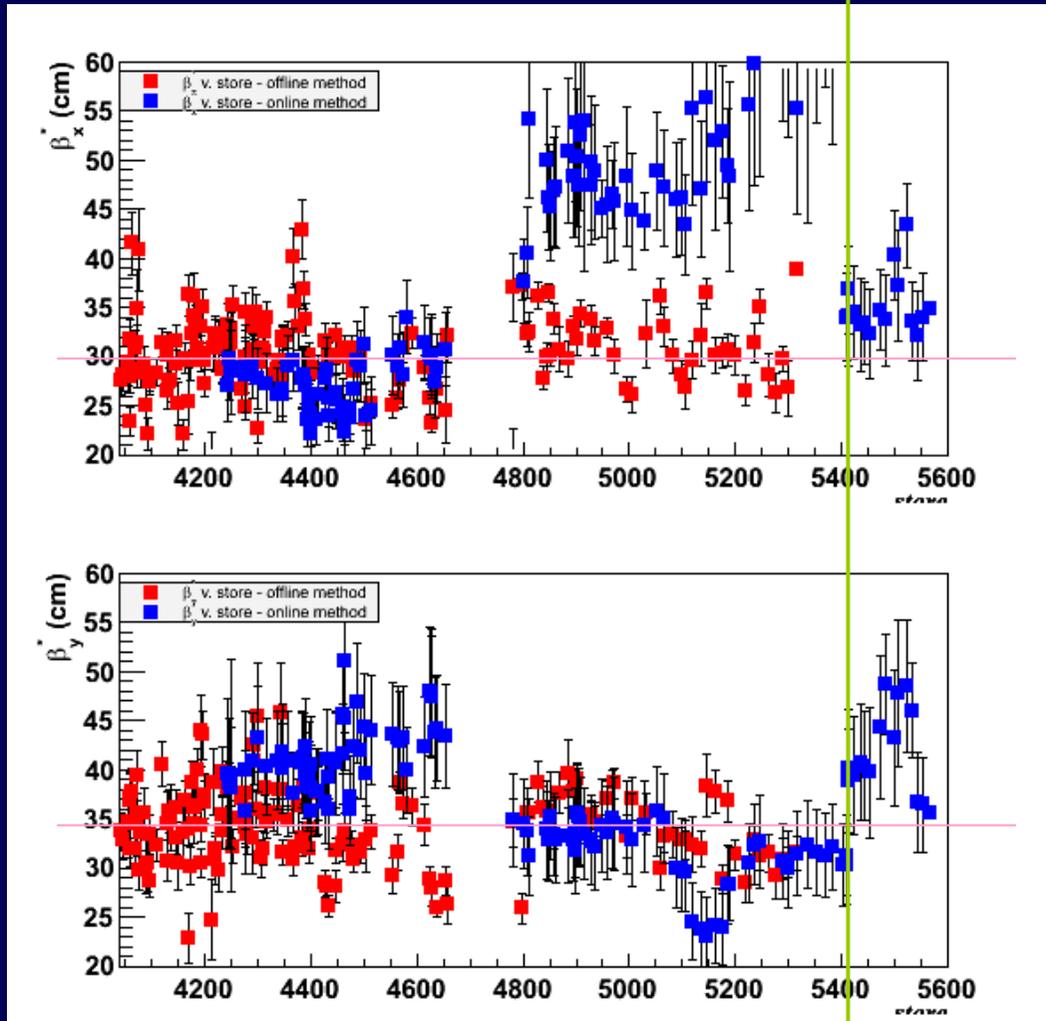


IP moving at dzero



# History plot for $\beta^*$

IP moving at Dzero

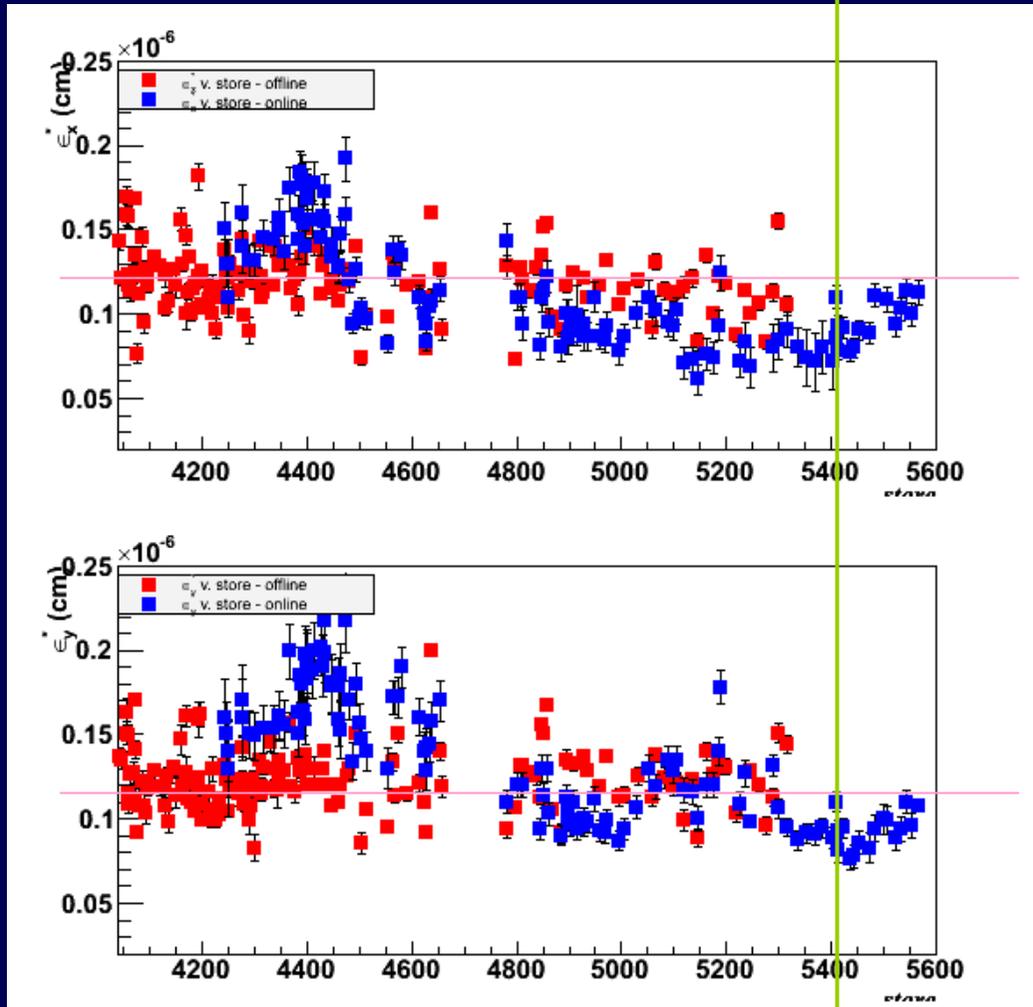


Offline (~store 5314)  
Online (~store 5567)

- Online measurement has been unstable compared to the offline measurement.

# History plot for $\varepsilon$

IP moving at Dzero

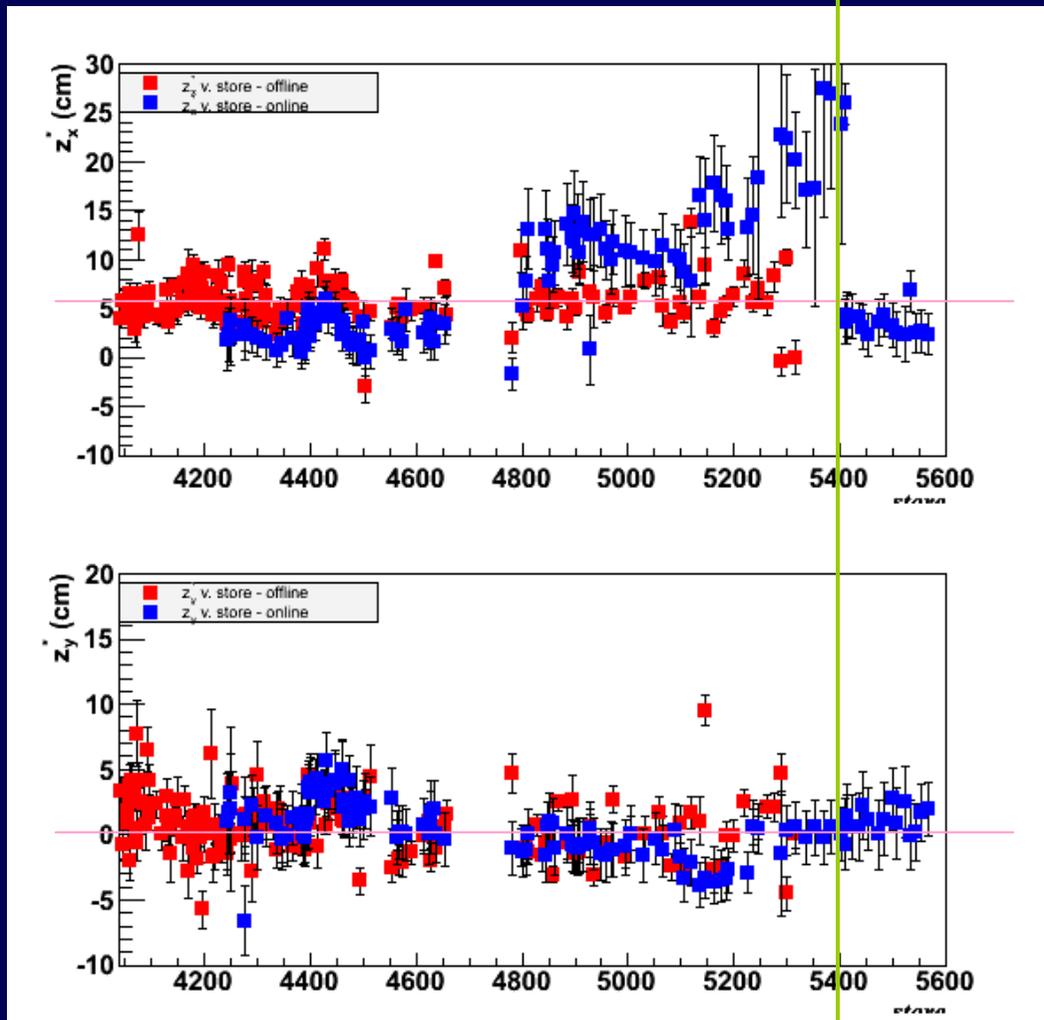


Offline (~store 5314)  
Online (~store 5567)

- CDF online measurement has been pretty unstable compared to the offline measurement.

# History plot for z0

IP moving at Dzero



Offline (~store 5314)  
Online (~store 5567)

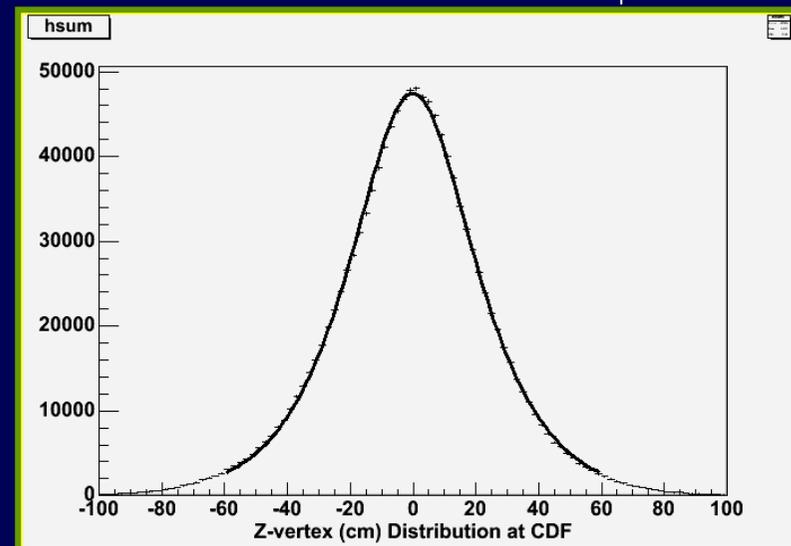
•CDF online measurement has been pretty unstable compared to the offline measurement.



# Combined $\beta^*$ from z-vertices

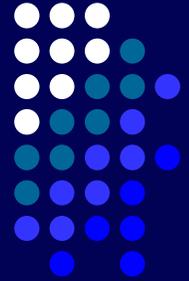
- Use  $p\bar{p}$  luminosity function and fit data over  $|z| < 60\text{cm}$ .

$$\frac{dL(z)}{dz} \propto \frac{\exp(-z^2 / 2\sigma_z^2)}{\sqrt{\left[1 + \left(\frac{z - z_1}{\beta^*}\right)^2\right] \left[1 + \left(\frac{z - z_2}{\beta^*}\right)^2\right]}}$$



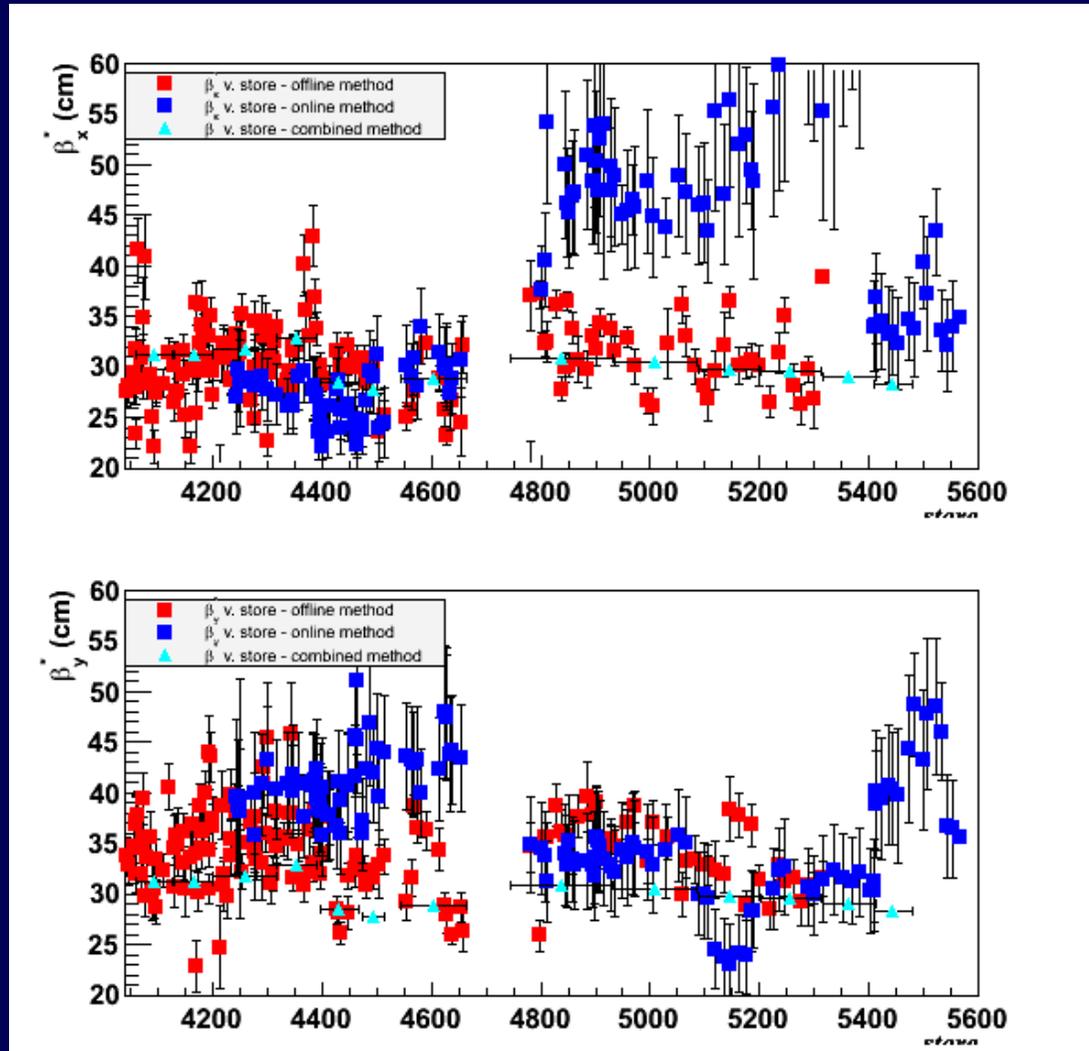
CDF Run #	Period	$\sigma_z$	$\beta^*$	$z1=z2$
233133-237795	1/30/07-3/31/07	$38.9 \pm 0.2$	$29.6 \pm 0.1$	$1.6 \pm 0.1$
237845-240873	4/01/07-5/7/07	$38.8 \pm 0.2$	$29.1 \pm 0.1$	$1.2 \pm 0.1$
240788-243029	5/3/07-6/7/07	$38.7 \pm 0.2$	$28.3 \pm 0.1$	$-1.7 \pm 1.2$

# Summary



- The measured  $\beta^*$  value at CDF has been slightly reduced but pretty stable since new sextuples are commissioned.
- An effort will be put on to get correct corrections. It may not be simple because online track corrections rely on tracking pattern sets which is not varied event by event basis.
- An an alternative way of getting offline measurement using calibration data (as like z-vertices method) other than fully reconstructed data is underway.

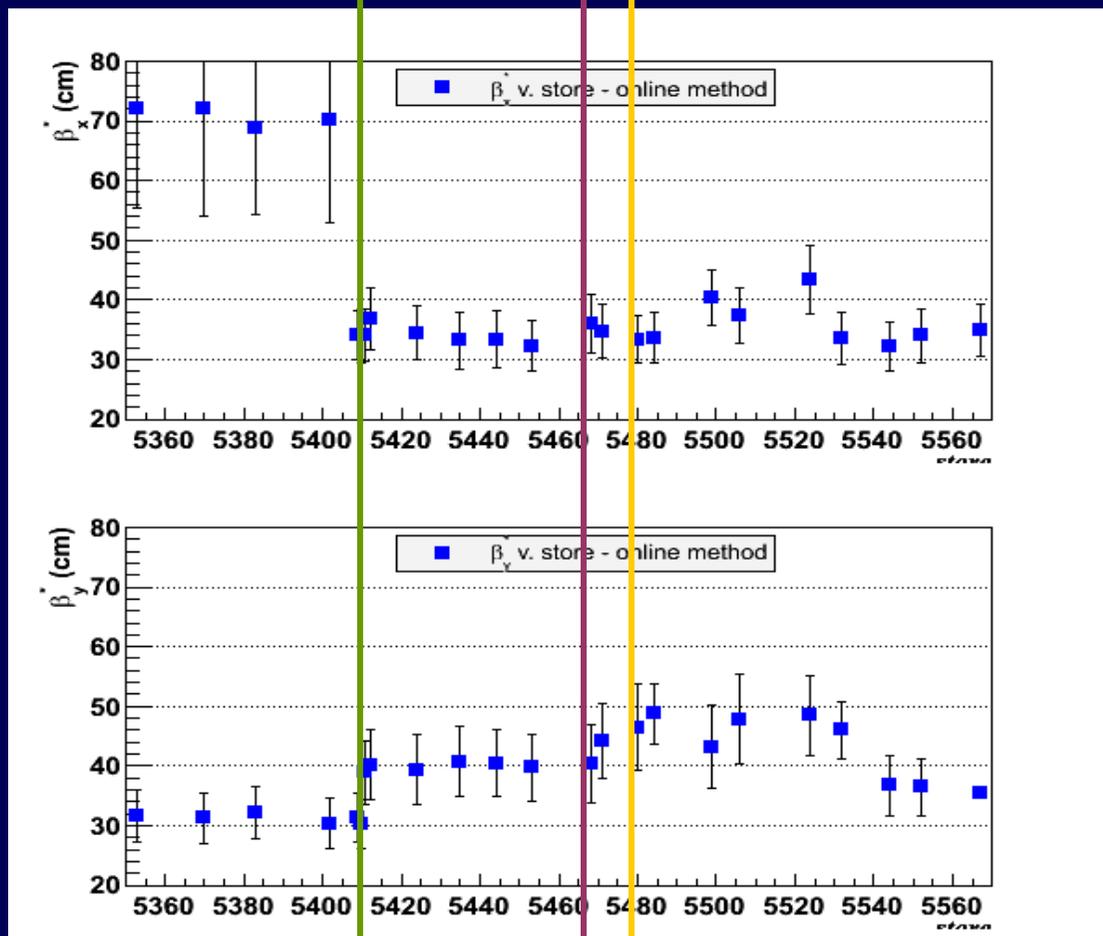
# Combined $\beta^*$ history (backup)



Offline ~store 5314  
Online ~store 5567  
Combined ~store 5479



# Online $\beta^*$ changes (backup)



- IP moving at Dzero
- IP moving at both of CDF and Dzero
- Sextupoles final configuration