CDF β* measurement

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Introduction – using calibration data

- We are using calibration data for beam width fit.
  - It is slightly modified offline method.
    - Main difference is the absence of beam line information in Calibration data.
    - With an assumption that beam line is consistent in localized z bin, it makes reasonable beam width fit.

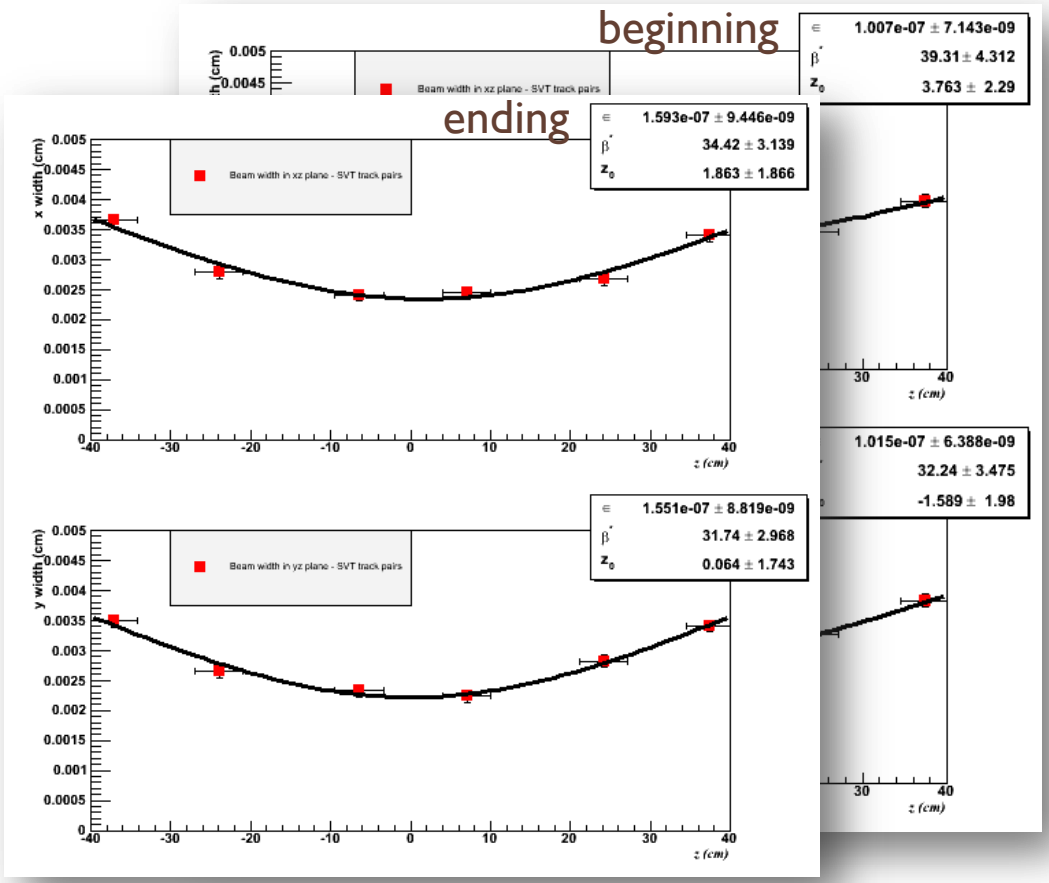
$$\sigma_beam = sqrt(\sigma^2_observed - \kappa^2 * <\sigma^2_pvtx>)$$
$$= sqrt(\varepsilon(\beta^* + (z-z0)^2/\beta^*))$$

, where κ is a scale factor to the measurement uncertainty.
σ^2_observed : width of (vertex – beam line) distribution.

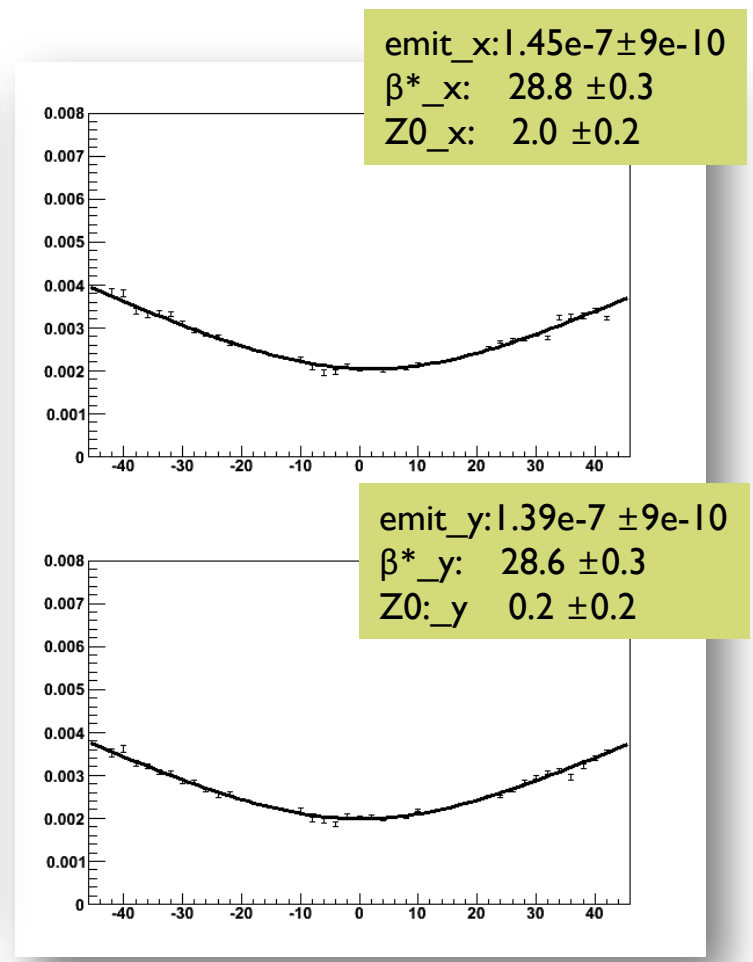
  - Calibration data can be handy in a week from data being taken.
  - We use all the jet data, so statistics is not worse than using production data.
  - Calibration is done run by run, which is CDF specific. Used one or two longest run in each store.

Emittance measurement, store 5837

Onlne beam width fit



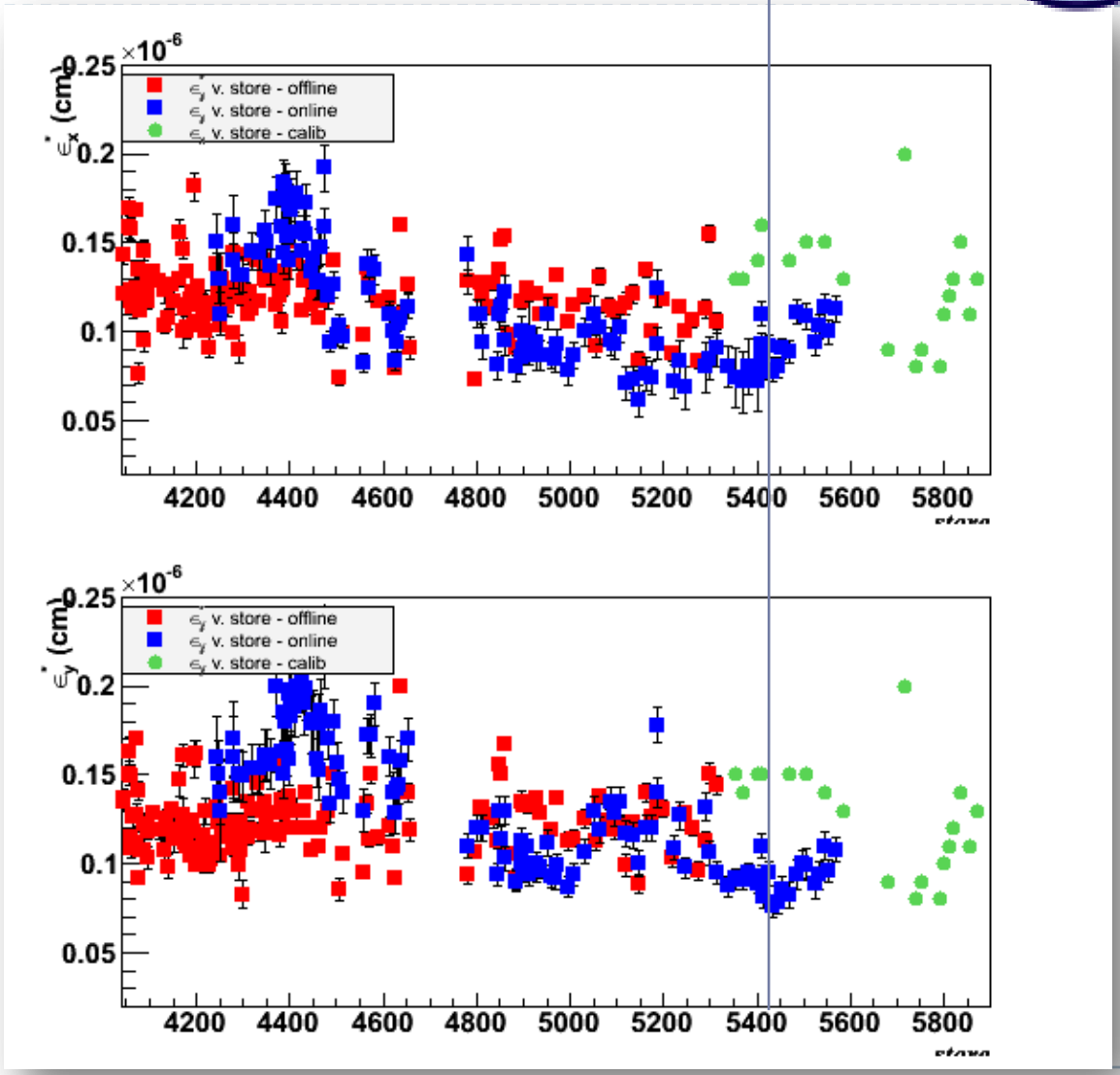
Fit from calibration data



History of emittance

New Sextupoles

Offline (~store 5314)
Online (~store 5567)
Calib (5353~5870)

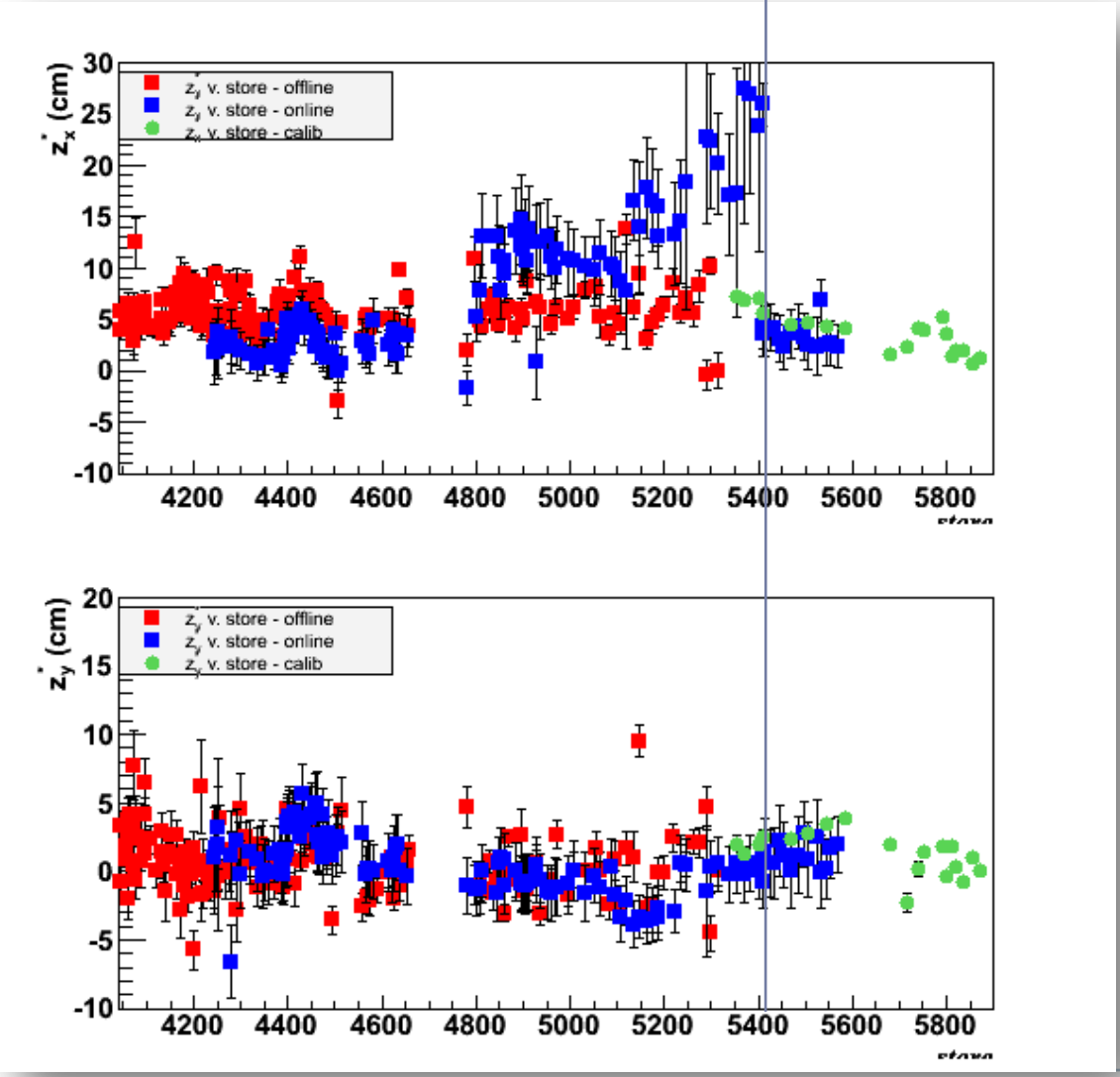


- Many up and downs around 2007 shutdown.
- Store 5716 is the outlier.

History of Z0

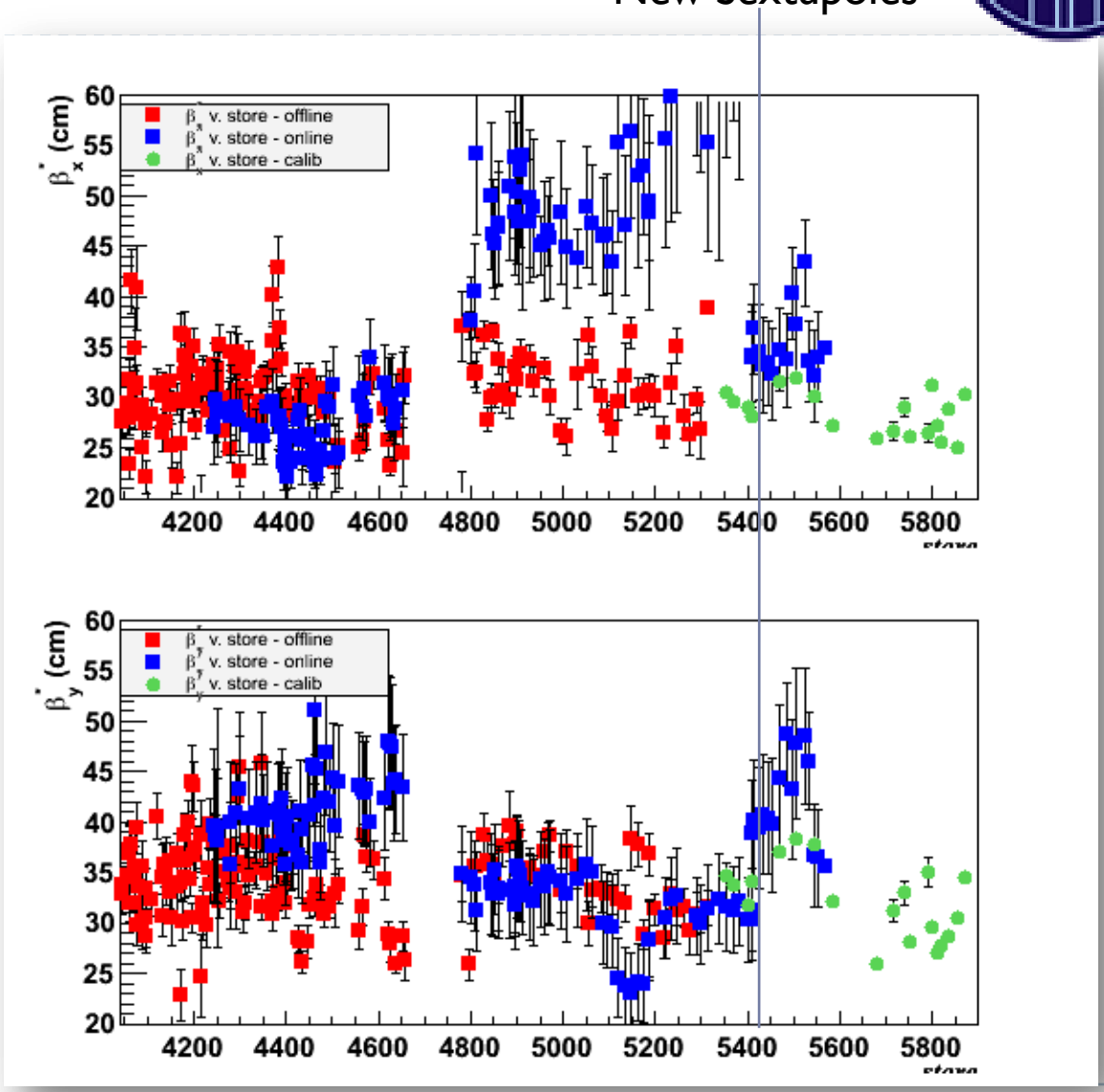
New Sextupoles

Offline (~store 5314)
Online (~store 5567)
Calib (5353~5870)



History of β*

Offline (~store 5314)
Online (~store 5567)
Calib (5353~5870)



Summary

- Using calibration data works well so far.
- History plot included calibration result and it is consistent with offline beam parameter.
- In CDF side, there was a discussion about automated beam width fit along with beam line fit using calibration data.
  - New group (Carnegie Mellon Univ.) joined this business, and they will be a major contact later.