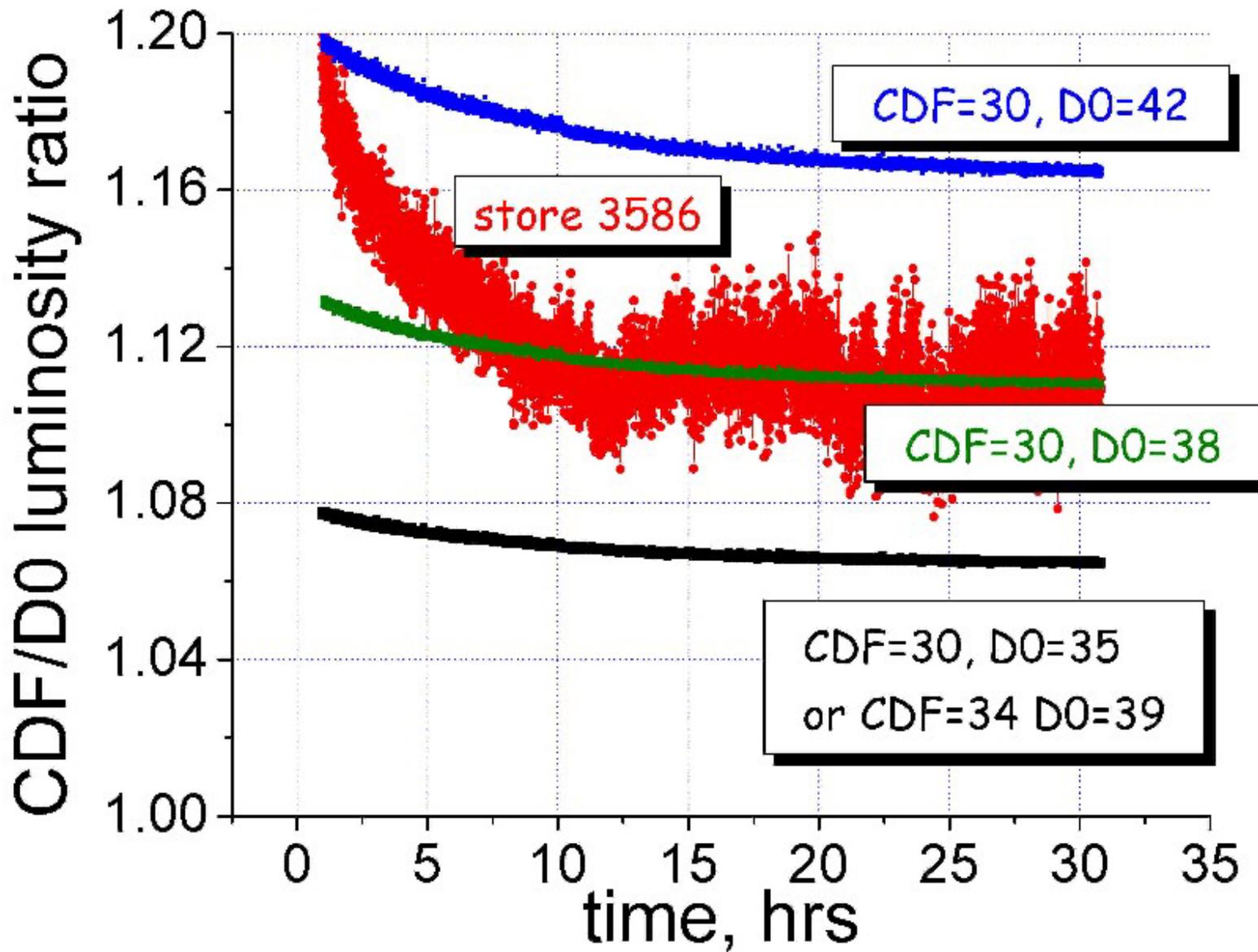


f

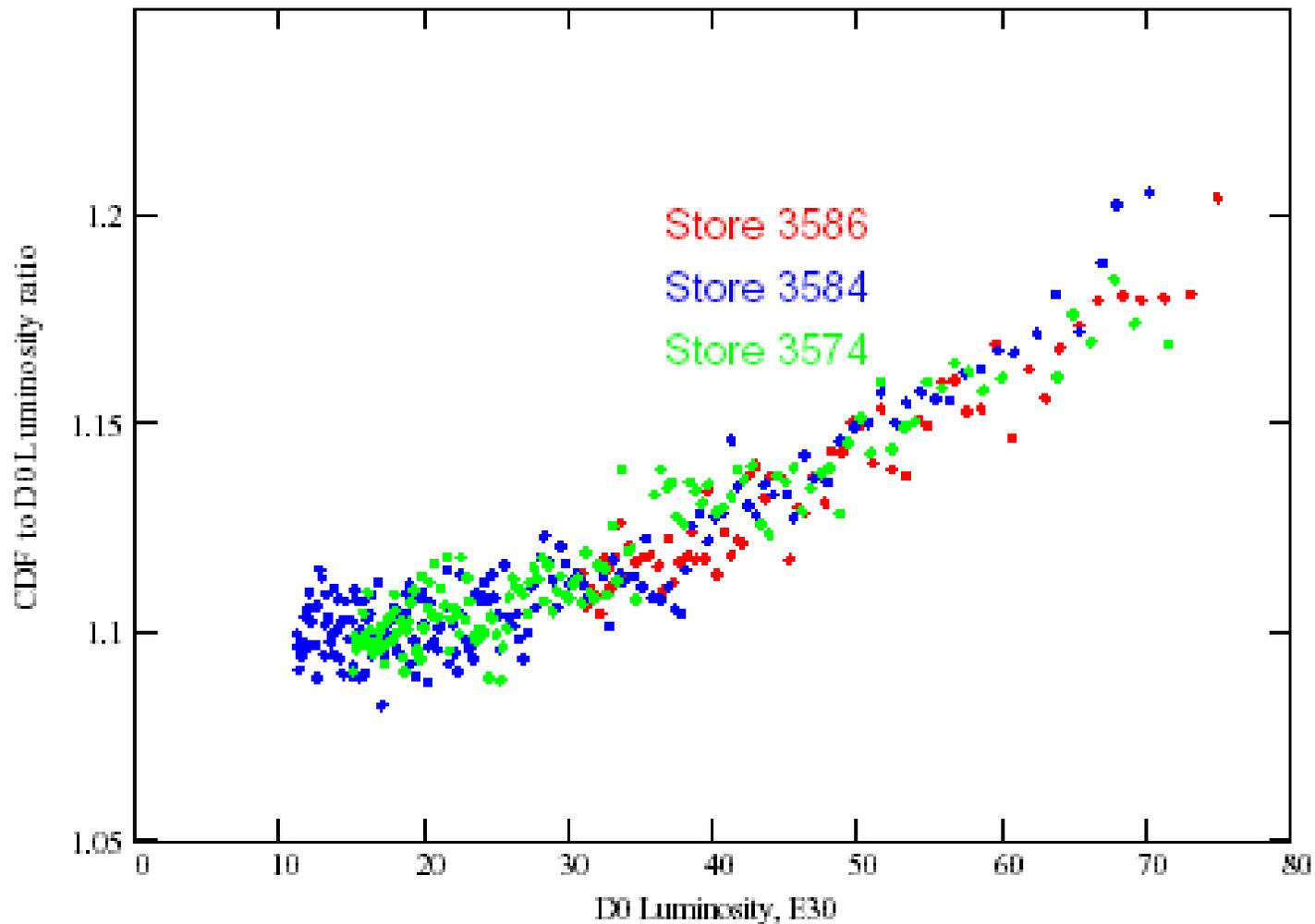
CDF/D0 Luminosity Ratio from Accelerator Point of View

Vladimir Shiltsev



W is proportional to β^{*} \rightarrow β^{*} at D_0 is $75.5/78 = 3\%$ SMALLER than at CDF

CDF to D0 Luminosity Ratio



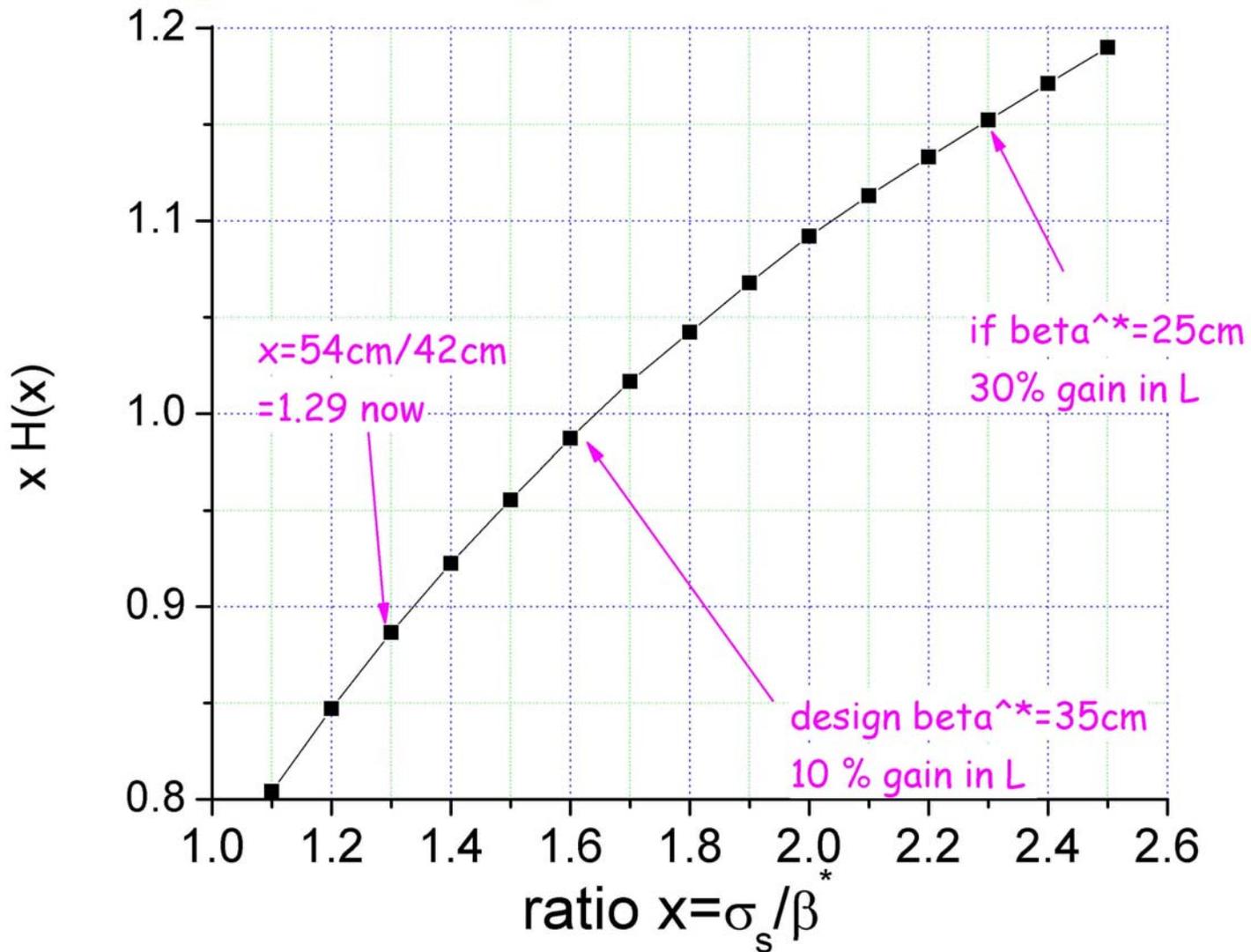
Is R a function of luminosity? *Obvious above, but not clear from bunch-by bunch data...*
Also, seems that LOSTP is not a factor now, *though once we saw the effect at EoS studies...*

General Remarks

$$L = \frac{3\gamma f_0 B N_{\bar{p}} N_p}{\pi\beta^* (\epsilon_p + \epsilon_{\bar{p}})} H(\sigma_l / \beta^*)$$

- Factors affecting R=CDF/D0
 - Product $N_{pbar} (N_p/\epsilon_p)$ - affects DC and AC components , but small <1% (Zhang)
 - Beta*:
 - As $1/\beta^{*}$ - affects DC component
 - As $H(\sigma/\beta)$ – affects both DC and AC component
 - besides that , there might be longitudinal offsets, transverse separation and crossing angles – affects both DC and AC component

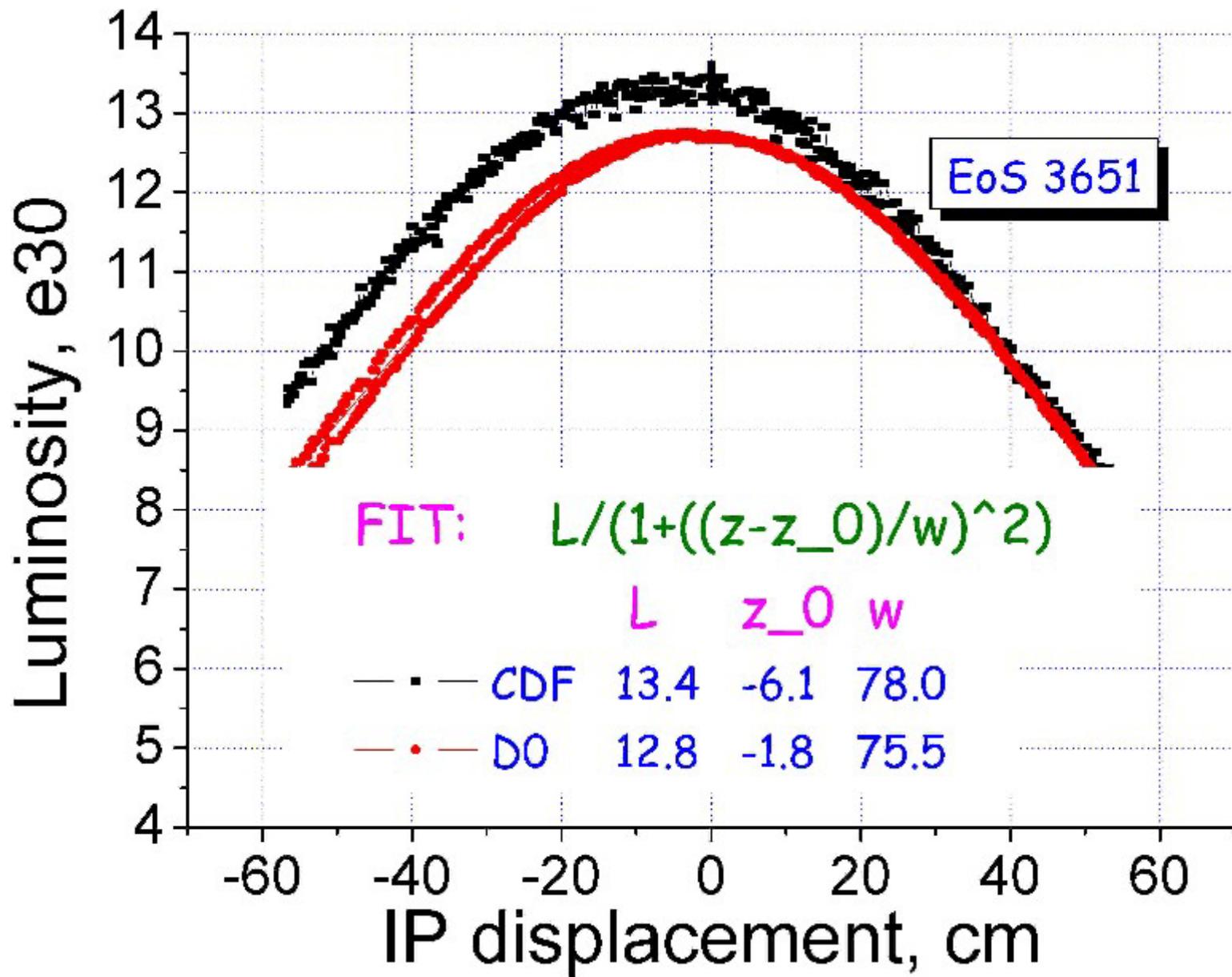
Lumi gain: Hour-glass factor times x vs x



$$H(x) = 1 / (1 + 1.32x^2)^{0.33}, \text{ at our parameters } H(x)/\beta \text{ scales approx as } \sqrt{\beta^* \sigma_s}$$

On beta-functions at IP

- Off-line analysis from both detectors \rightarrow beta* values
- Optics measurements \rightarrow very close values at both detectors, D0 < CDF
- Longitudinal scans \rightarrow very close values at both detectors, D0 < CDF



W is proportional to β^{*2} \rightarrow β^{*2} at D0 is $75.5/78 = 3\%$ SMALLER than at CDF

On separation/angle at IPs

- Need significant separation in one of IPs (D0), equivalent to 20 microns, lumi drop by 20-25% - to explain the difference dL (Xiao)
- Optics measurements (Valishev) → no separation at IPs, $dL < 1\%$
- Special method to close IP separator bumps (Alexahin) → no separation, $dL < 1\%$
- Regular separator scans → $dL < 1\%$

Summary:

- We can not explain observed $R=CDF/D0$ difference on base of known machine parameters:
 - Looking for 10% DC + 8% AC effect
 - Bunch by bunch effects <1%
 - Beta-functions are the same , but even 34/39 would give only 7% in R, and only 2-3% in AC part
 - Longitudinal and transverse position/angle scans show no indication of needed mis-optimization of about 20%, instead, we can explain some 1% or less only
- Open questions:
 - Does $R=CDF/D0$ depend on luminosity? bunch-by-bunch?
 - Does beam position at IP affect R?
 - Why slopes and intersects in (meas'd/calc'd) luminosity are different in both detectors? (see KB talk, Vaia has data, too)
 - Does anybody have any other clues?