

Allignment of CDF Roman Pots

K. Goulios

The Rockefeller University
CERN 17-19 January 2005
(talk delivered by video)

HERA AND THE LHC

A workshop on the implications of HERA for LHC physics

March 2004 - January 2005

Thanks!

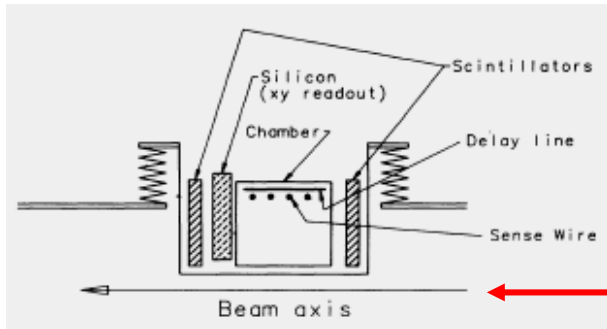


Many thanks to
Michele Gallinaro

Run-I,0 (1988-89)

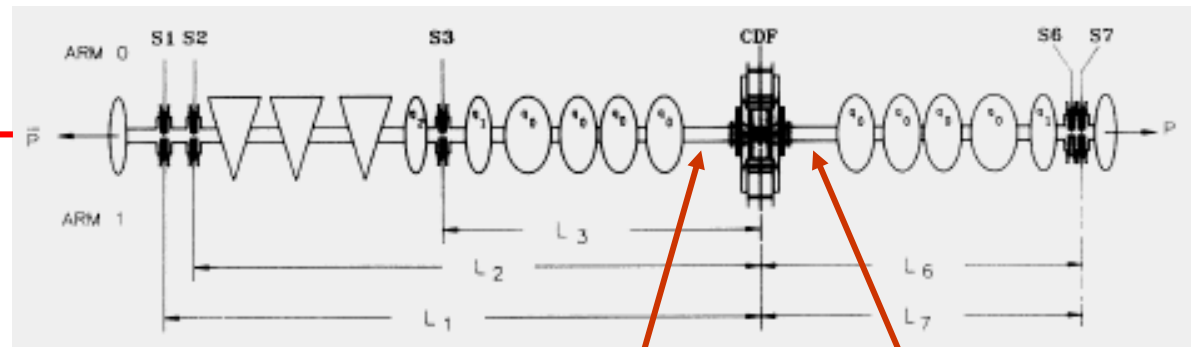
Elastic, single diffractive, and total cross sections
@ 546 and 1800 GeV

Roman Pot Spectrometers



Roman Pot Detectors

- Scintillation trigger counters
- Wire chamber
- Double-sided silicon strip detector



Additional Detectors
Trackers up to $|\eta| = 7$

Results

PRD 50 (2004) 5518; 5535; 5550

- Total cross section
- Elastic cross section
- Single diffraction

$$\sigma^{\text{tot}} \sim s^{\epsilon}$$

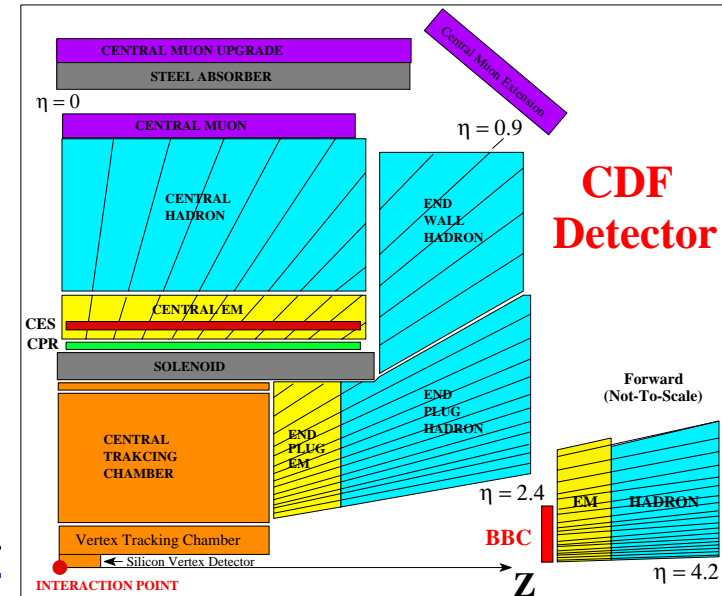
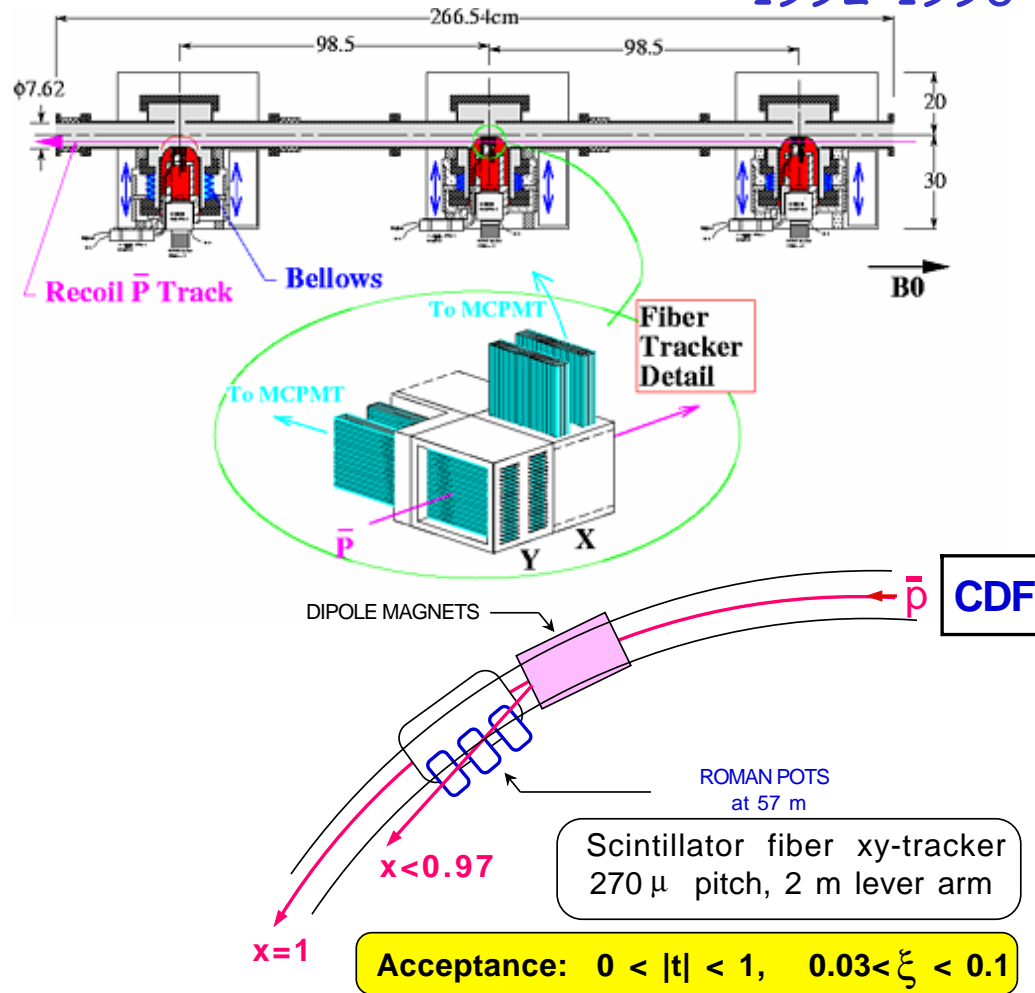
$$d\sigma/dt \sim \exp[2\alpha' \ln s] \rightarrow \text{shrinking forward peak}$$

Breakdown of Regge factorization

Run-IC

CDF-I 1992-1996

Run-IA,B



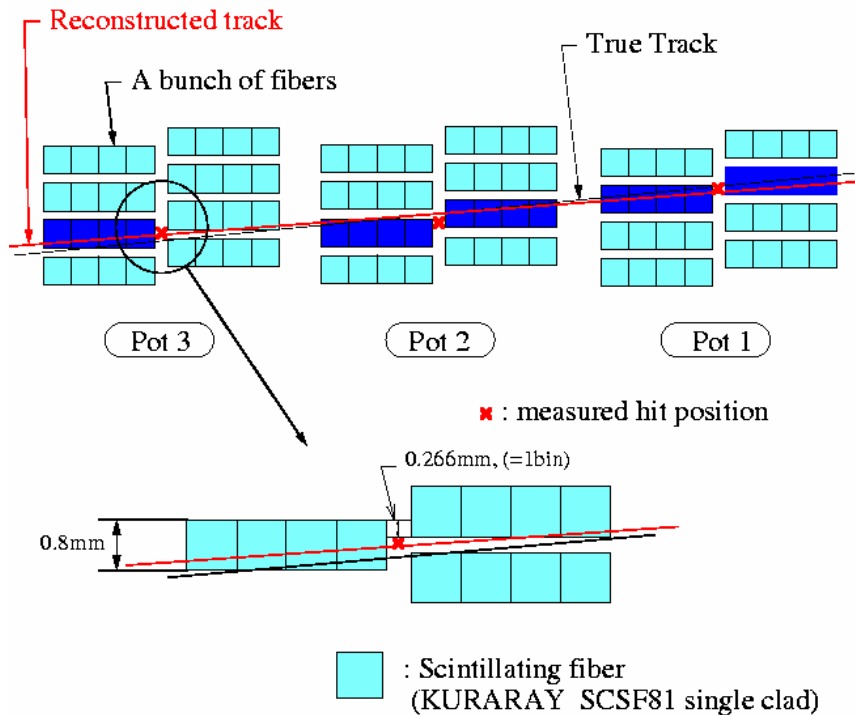
Forward Detectors
BBC $3.2 < \eta < 5.9$
FCAL $2.4 < \eta < 4.2$

CDF-I Roman Pot Spectrometer

FIBER TRACKER

Hosai Nakada - thesis

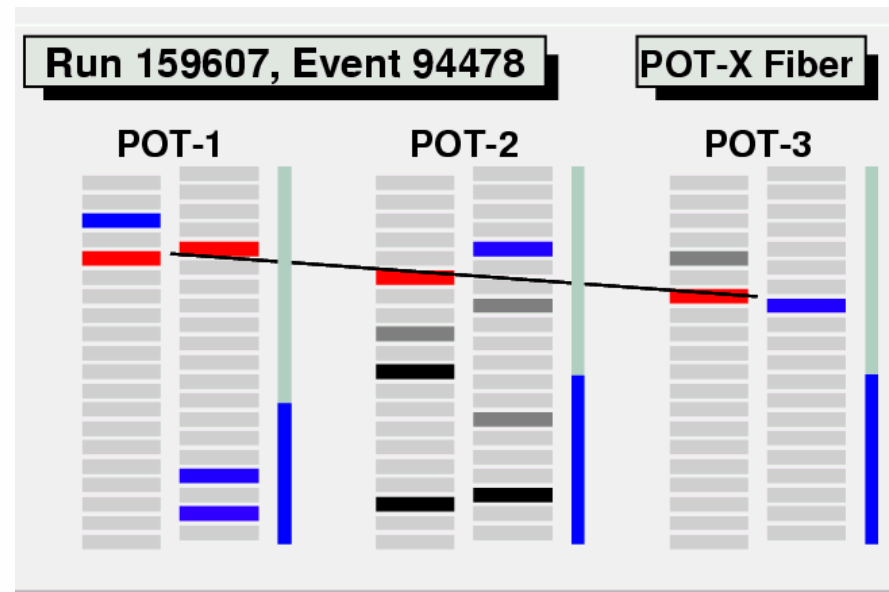
http://hep-www.px.tsukuba.ac.jp/research/thesis_d.html



Fiber width: 800 μ

Expected position resolution 80 μ m

Expected angle resolution 60 μ rad



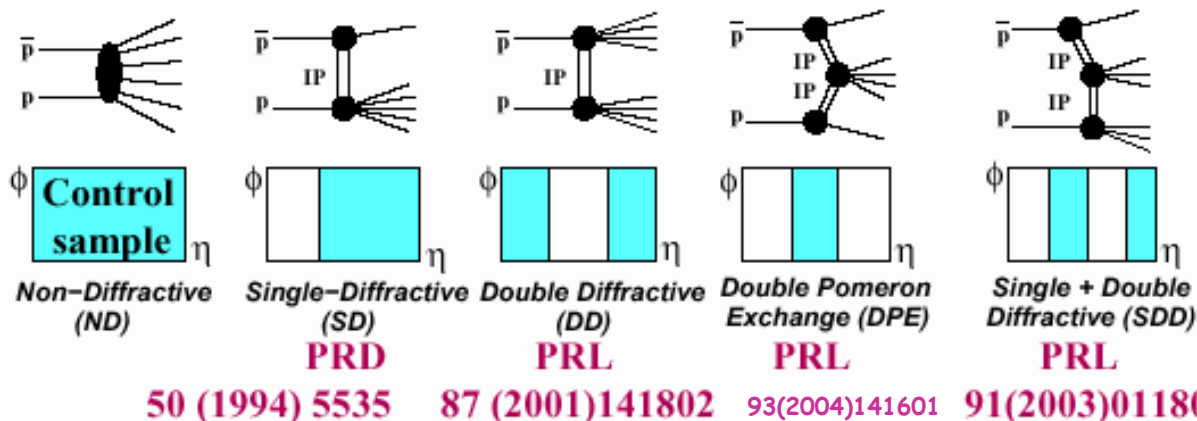
- 3 trigger counters
- $3 \times [2 \times (20 + 20)] = 240$ channels

Diffraction@CDF in Run I

16 papers

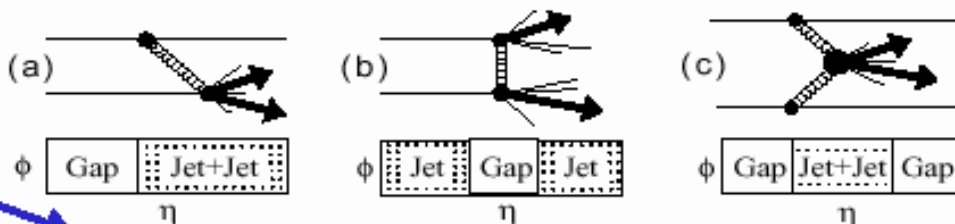
- ❑ Elastic scattering PRD 50 (1994) 5518
- ❑ Total cross section PRD 50 (1994) 5550
- ❑ Diffraction

SOFT diffraction



HARD diffraction

PRL references



with roman pots

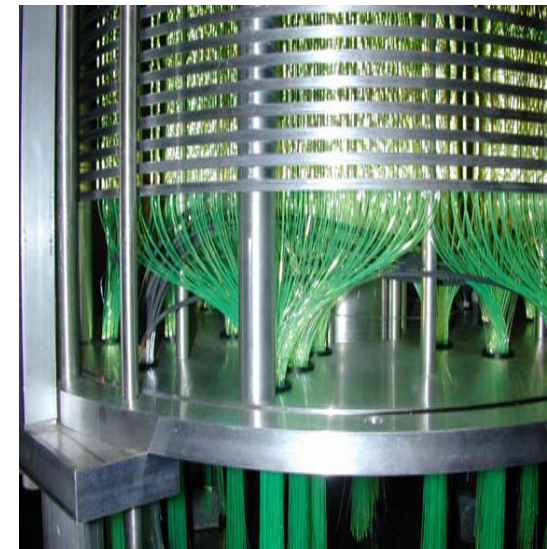
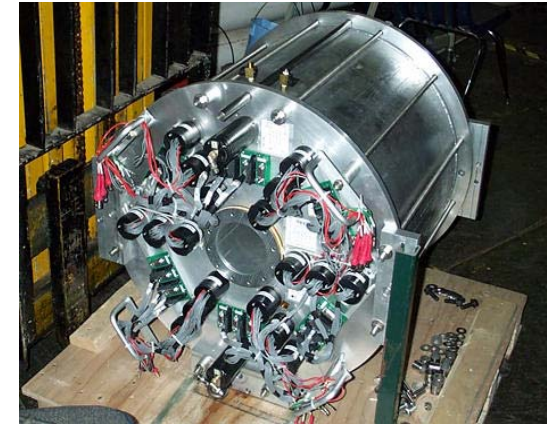
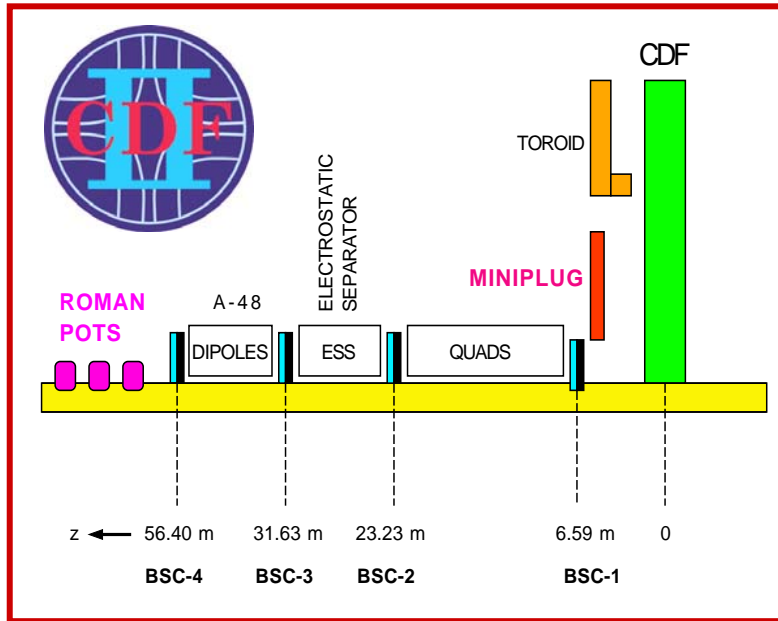
JJ	84 (2000) 5043
JJ	88 (2002) 151802

W	78 (1997) 2698	JJ	74 (1995) 855	JJ	85 (2000) 4217
JJ	79 (1997) 2636	JJ	80 (1998) 1156		
b-quark	84 (2000) 232	JJ	81 (1998) 5278		
J/ψ	87 (2001) 241802				

Run-II Diffraction @ CDF

2001 -

CDF Forward Detectors



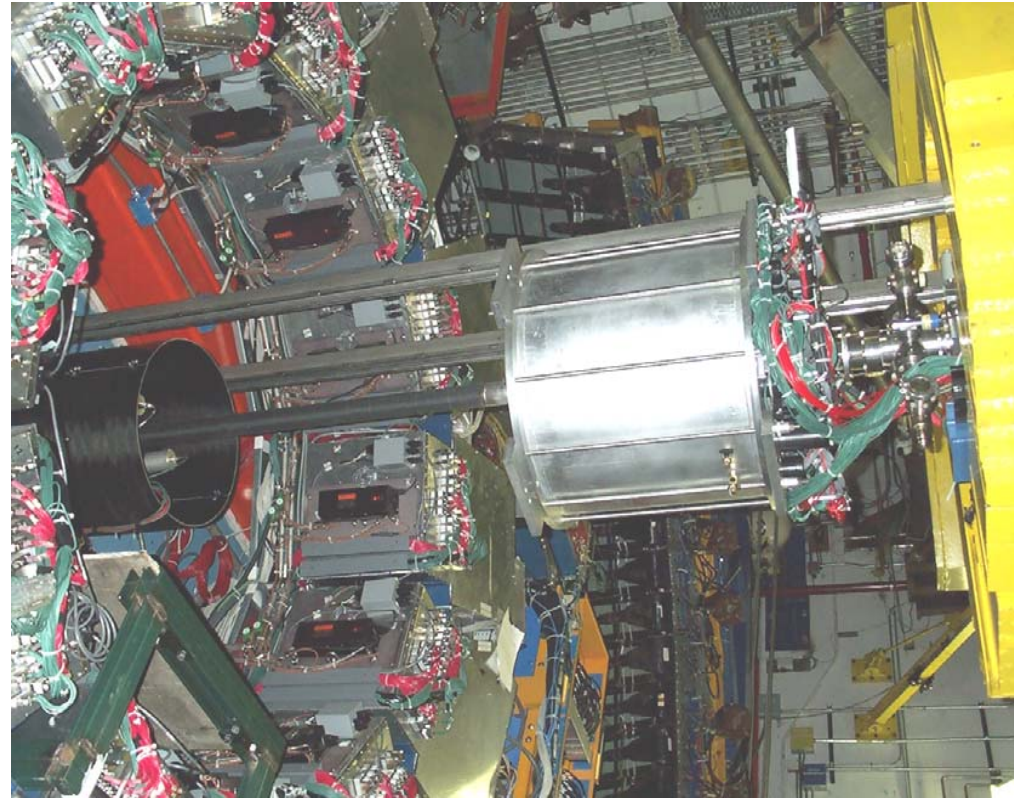
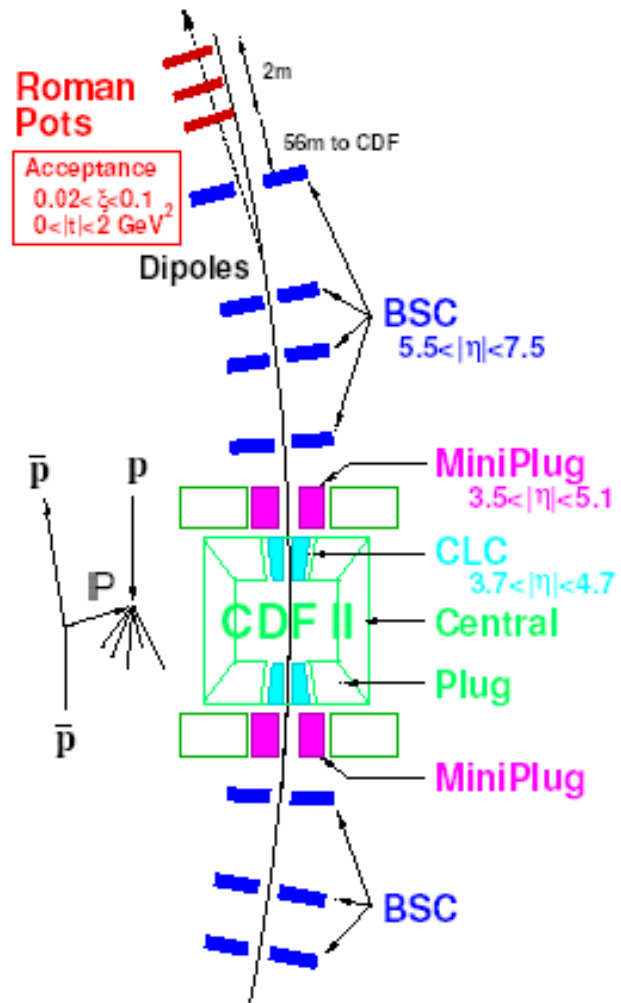
- ✓ MiniPlug calorimeters ($3.5 < \eta < 5.5$)
- ✓ Beam Shower Counters ($5.5 < \eta < 7.5$)
- ✓ Antiproton Roman Pot Spectrometer

February 23, 2004

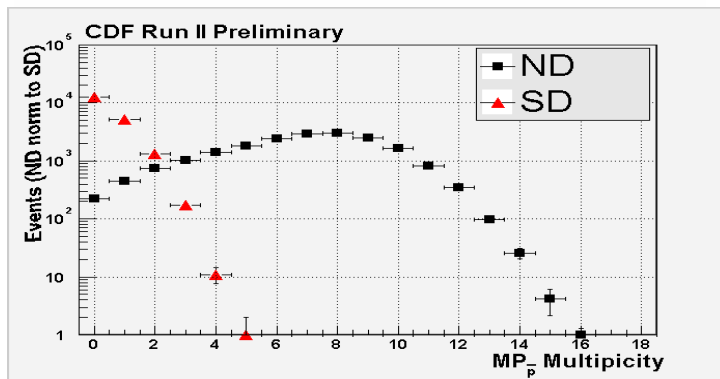
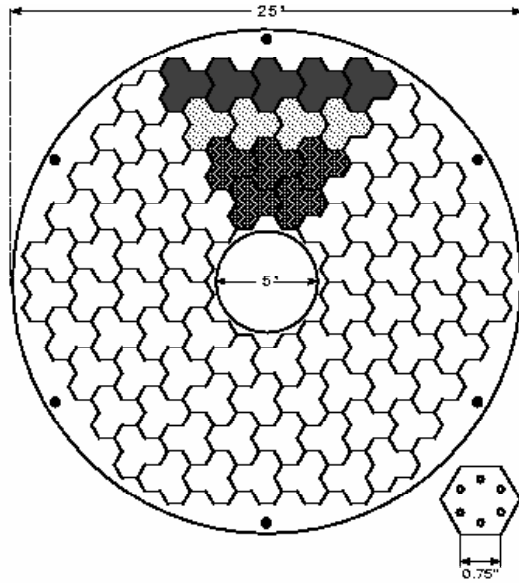
CDF Internal Review

Run-II Forward Detectors

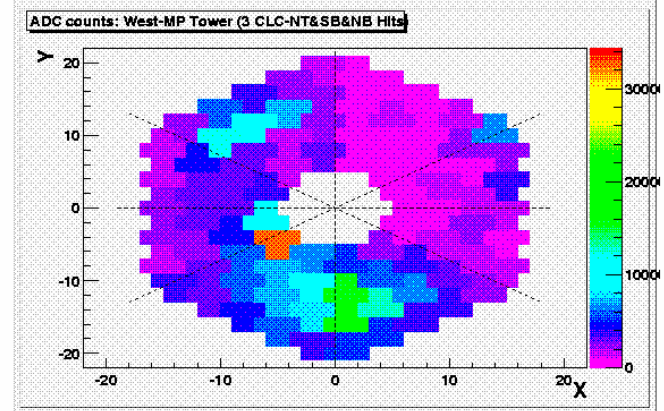
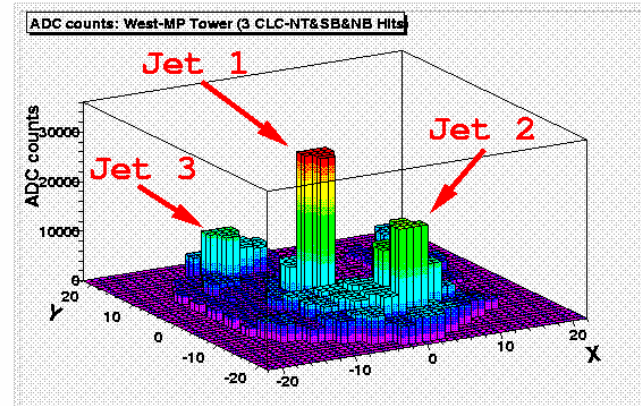
M. Gallinaro @ <http://arxiv.org/abs/hep-ph/0407255>



MiniPlug Run -II Data



Multiplicity distribution in SD and ND events

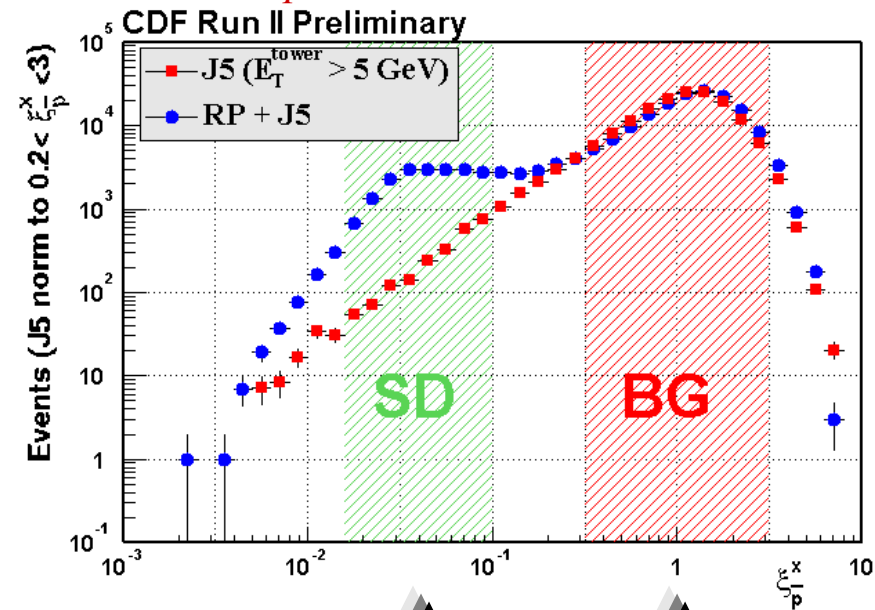


ADC counts in MiniPlug towers in a pbar-p event at 1960 GeV.

- “jet” indicates an energy cluster and may be just a hadron.
- Approximately 1000 counts = 1 GeV

Diffractive Dijets

$\xi_{\bar{p}}^X$ – distribution



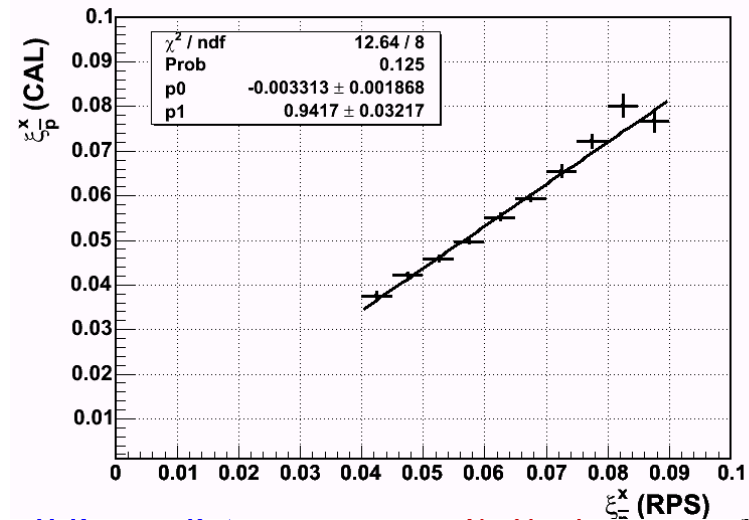
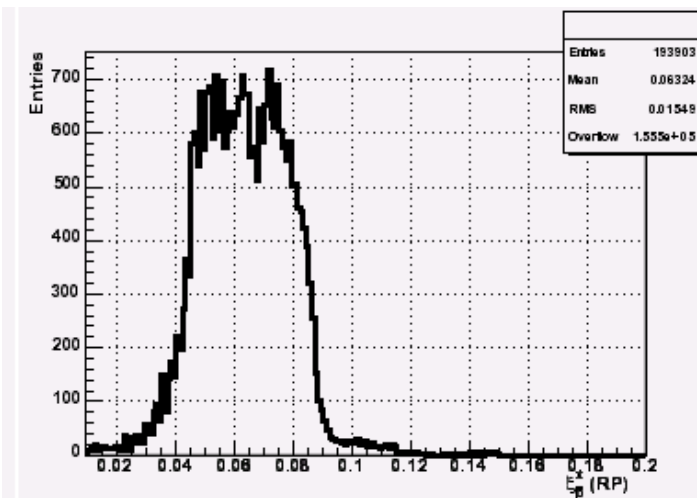
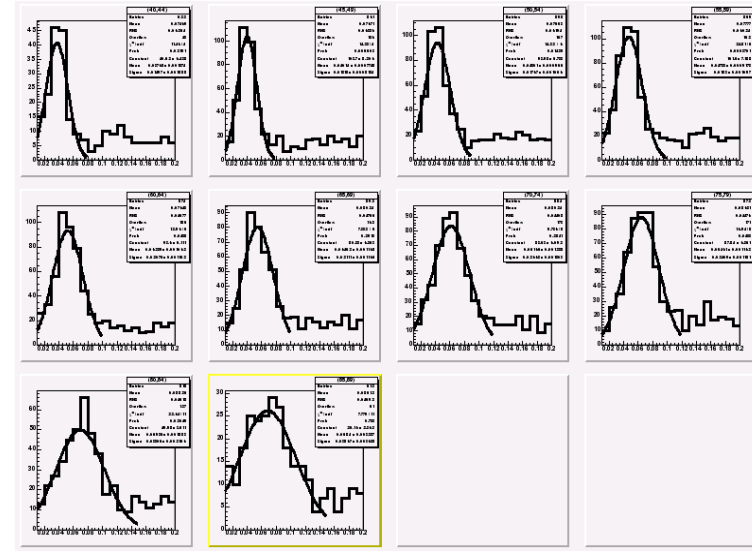
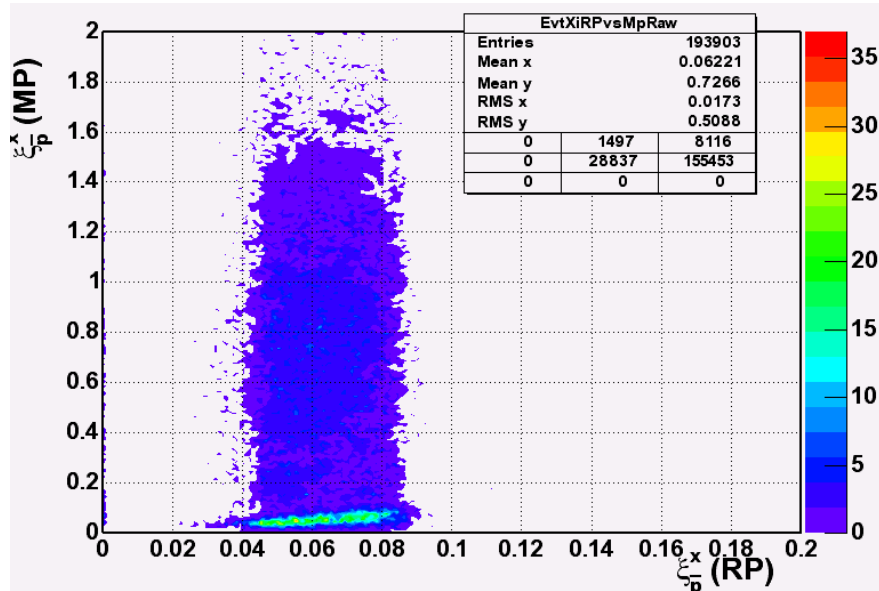
$$\xi = \frac{\sum_i E_T^i e^{-\eta_i}}{\sqrt{s}}$$

SD
events

ND+SD & SD+MB
overlap events
 $\xi \sim 1$

Flat region $\left\{ \begin{array}{l} \frac{d\sigma}{d\xi} \propto \frac{1}{\xi} \Rightarrow \frac{d\sigma}{d \log \xi} = \text{constant} \end{array} \right.$

Run II Roman Pot Tracking

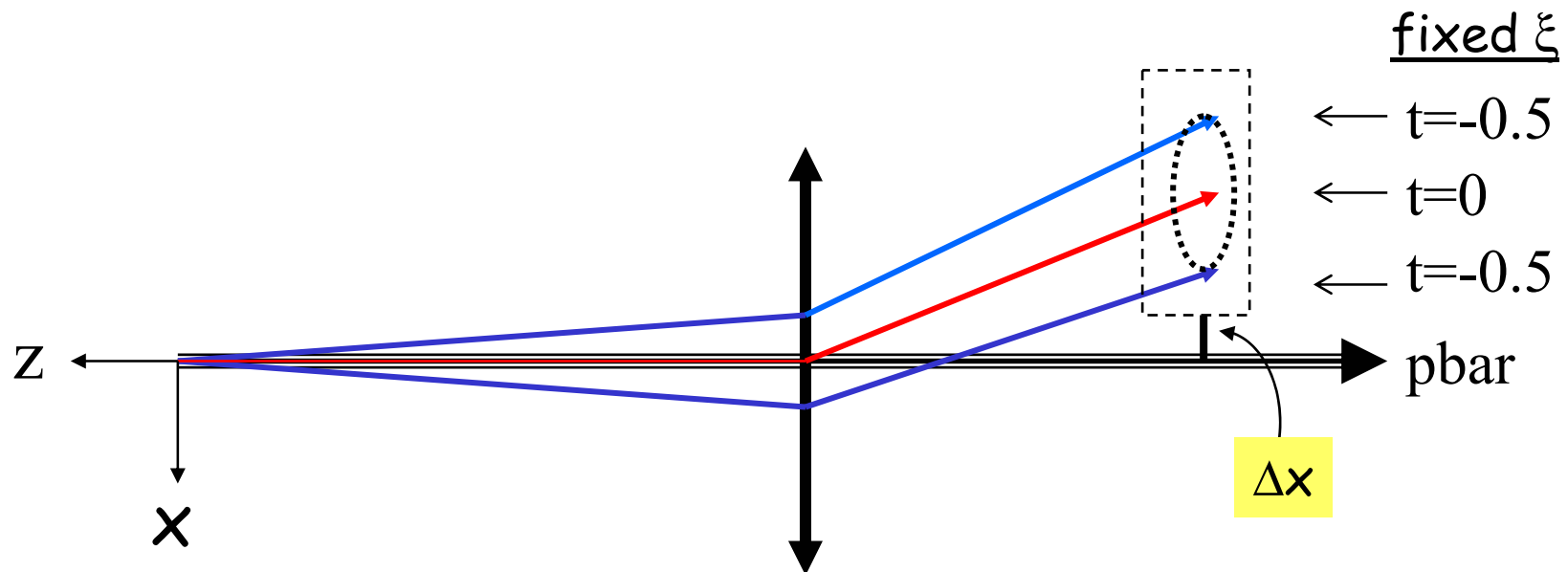


Calibration of RP position

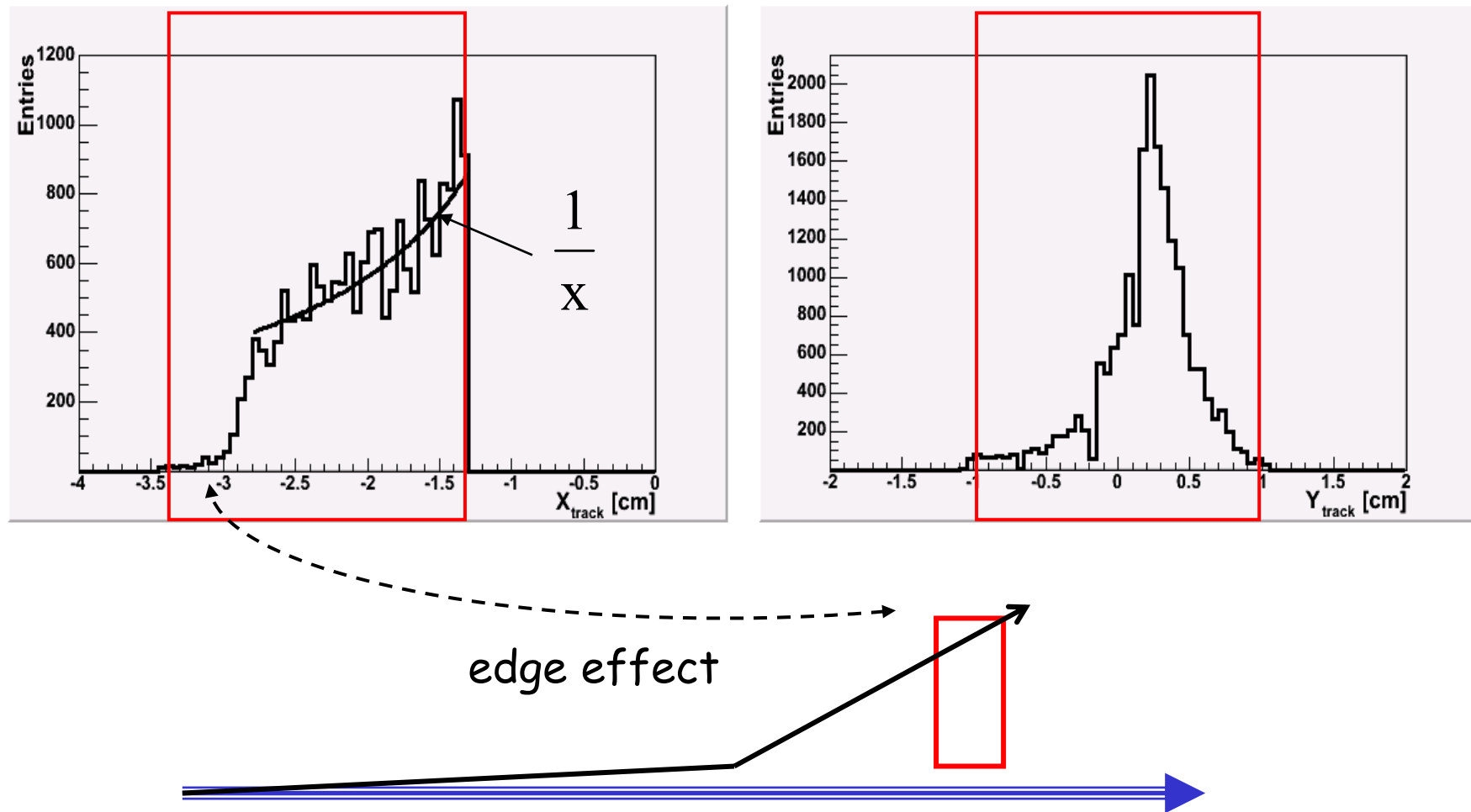
$$\frac{d\sigma}{dt} \sim e^{bt} \Rightarrow$$

Method

Adjust Δx to get the steepest t distribution

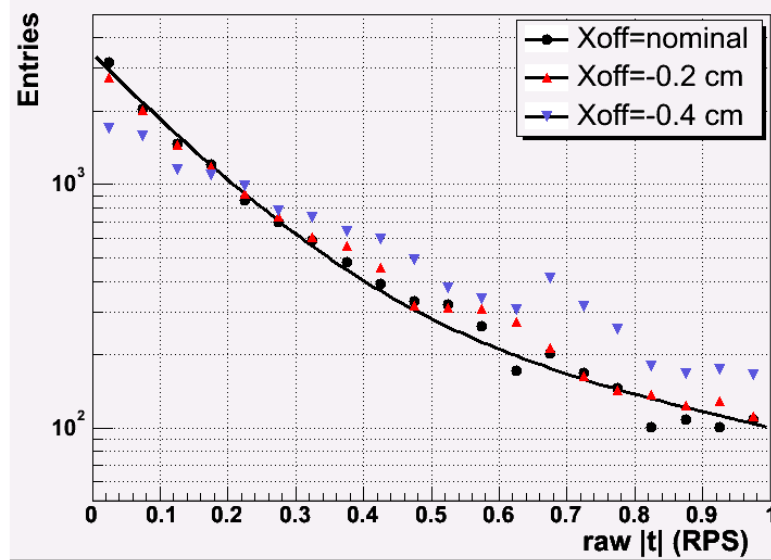
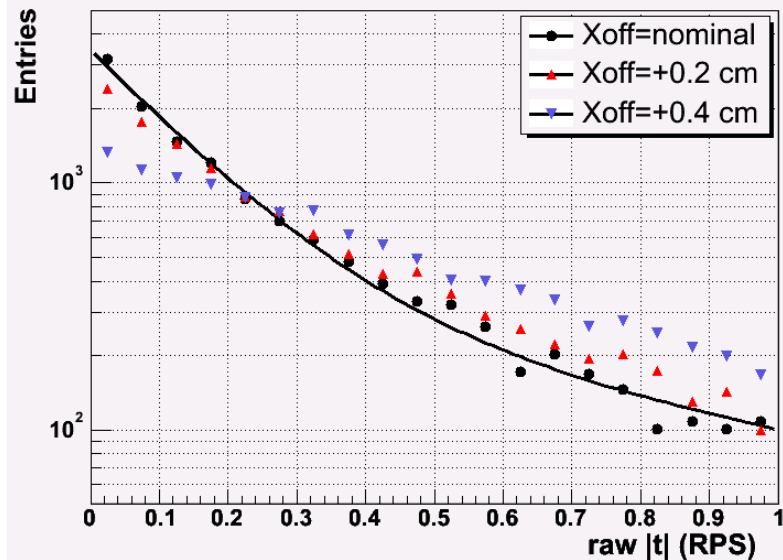


Roman Pot Distributions



Determining Δx from data

Method: maximize the $t=0$ value of $d\sigma/dt$



HERA & Tevatron → LHC

D
i
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