Alignment of CDF Roman Pots

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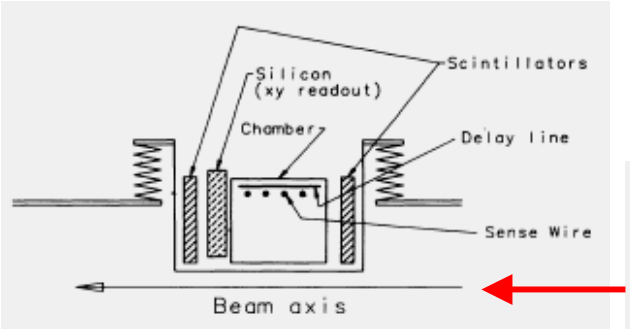
(talk delivered by video)

Thanks!

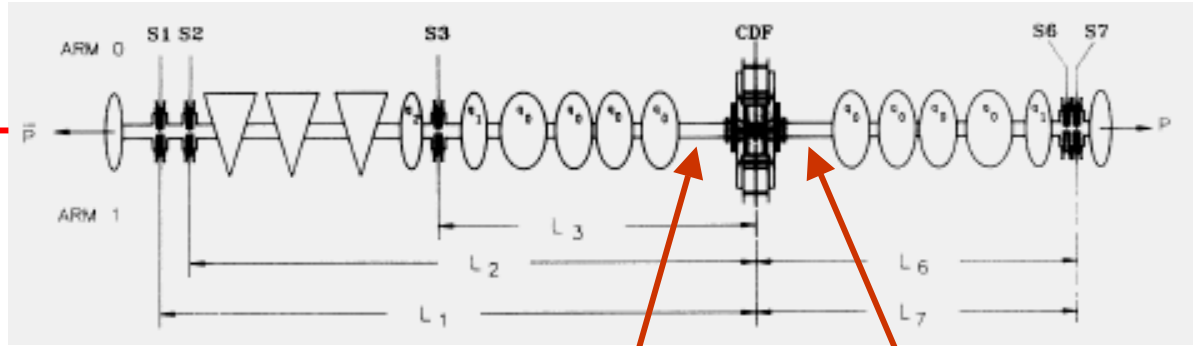
Many thanks to
Michele Gallinaro

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

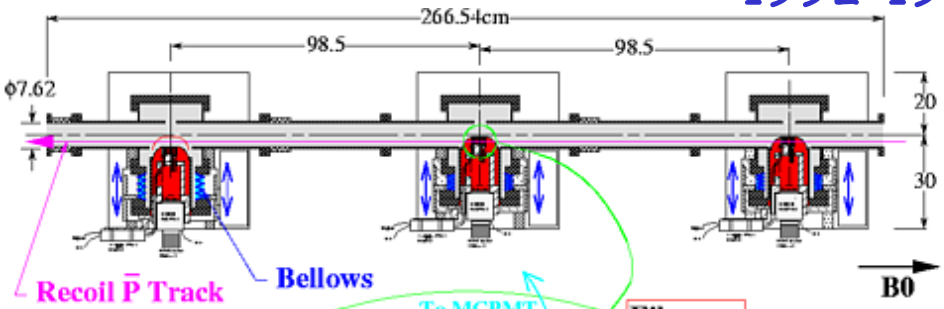
PRD 50 (2004) 5518; 5535; 5550

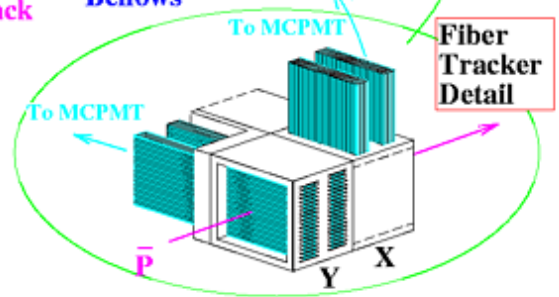
- Total cross section $\sigma^{tot} \sim s^{\varepsilon}$
- Elastic cross section $d\sigma/dt \sim \exp[2\alpha' \ln s]$ → shrinking forward peak
- Single diffraction Breakdown of Regge factorization

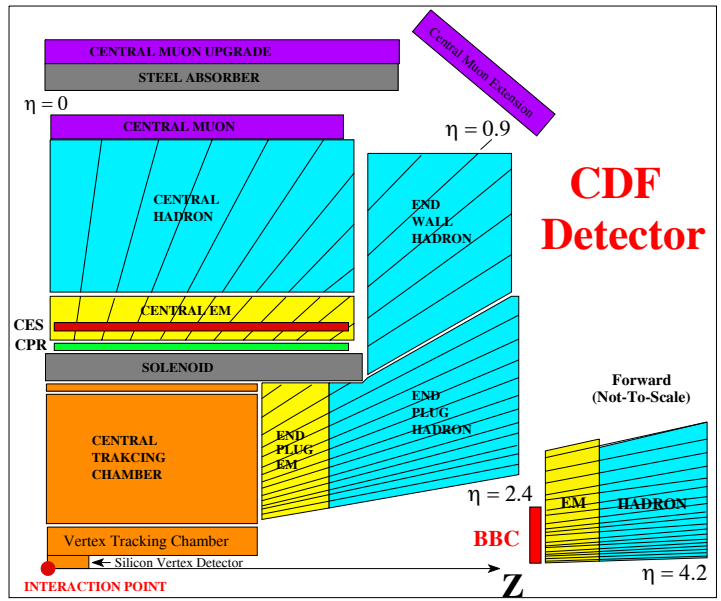
Run-IC

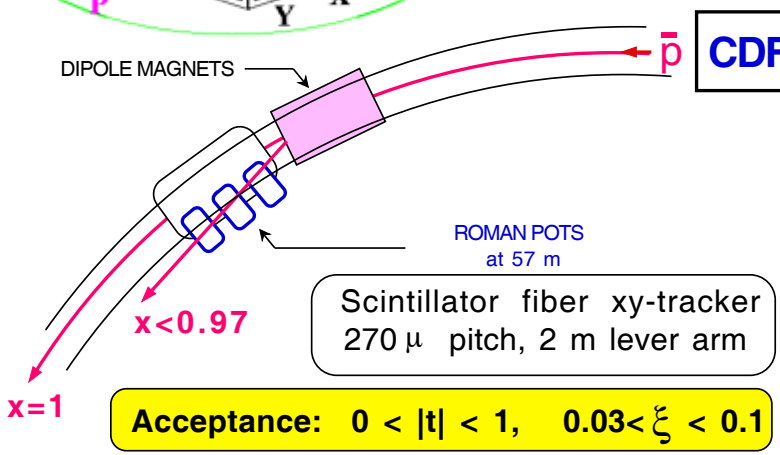
CDF-I
1992-1996

Run-IA,B









Forward Detectors

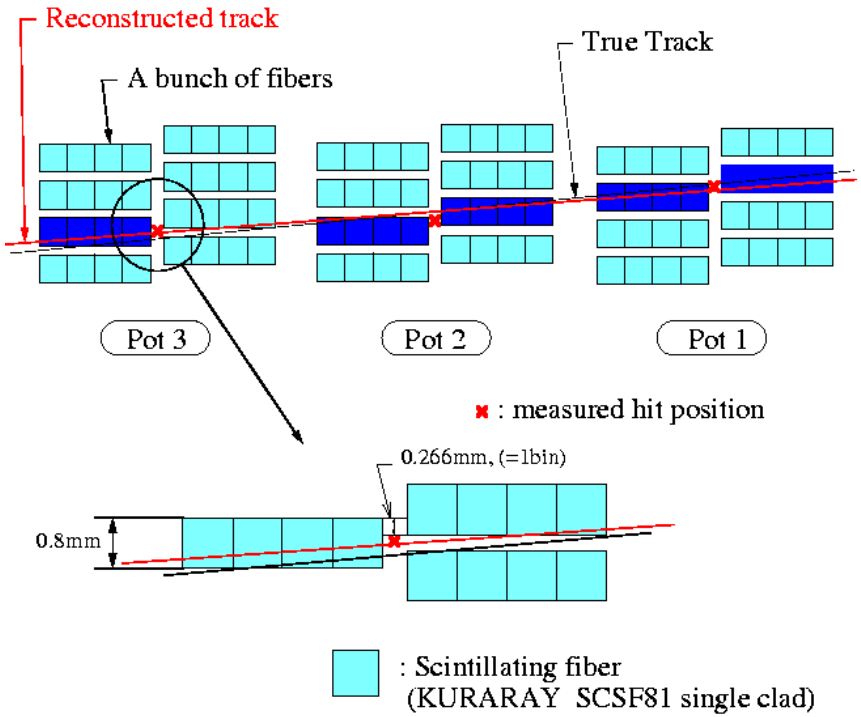
BBC 3.2<η<5.9

FCAL 2.4<η<4.2

CDF-I Roman Pot Spectrometer

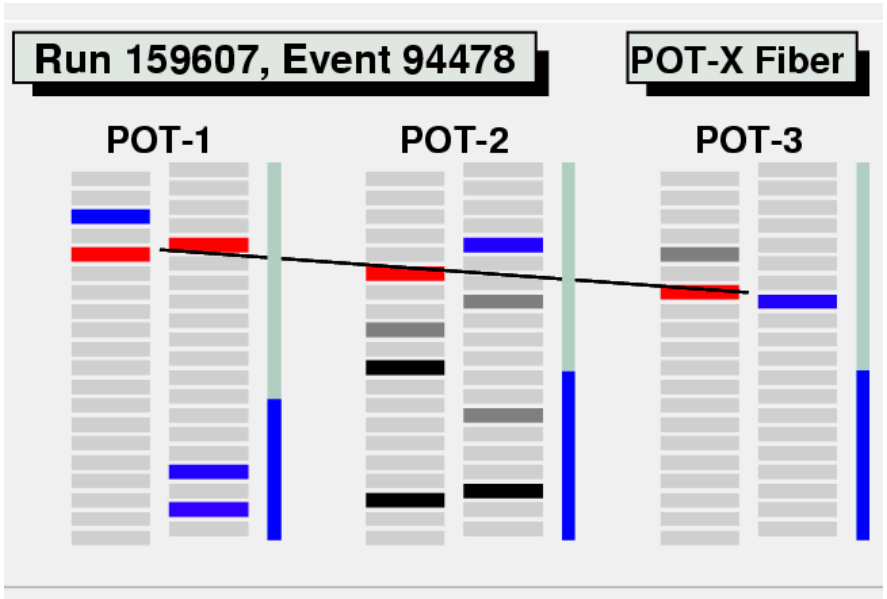
FIBER TRACKER

Hosai Nakada – thesis
http://hep-www.px.tsukuba.ac.jp/research/thesis_d.html



Fiber width: 800 μ

Expected position resolution	**80 μm**
Expected angle resolution	**60 μrad**



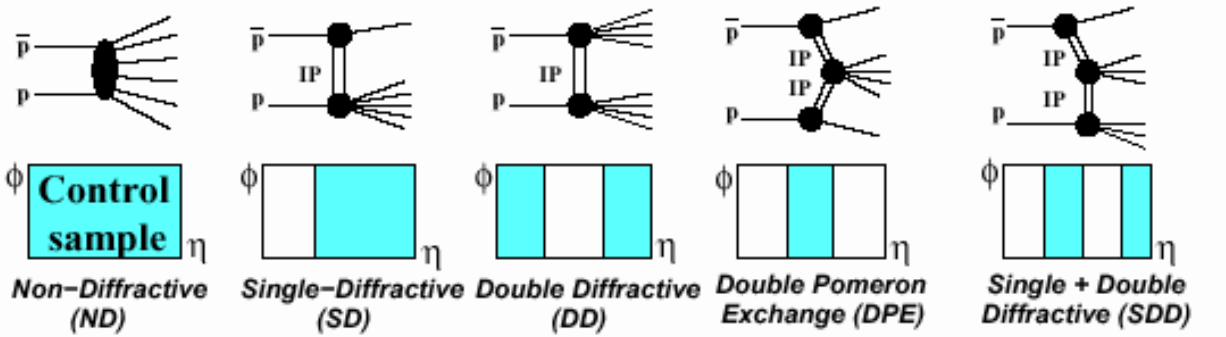
- 3 trigger counters
- 3x[2X(20+20)]=240 channels

Diffraction@CDF in Run I

16 papers

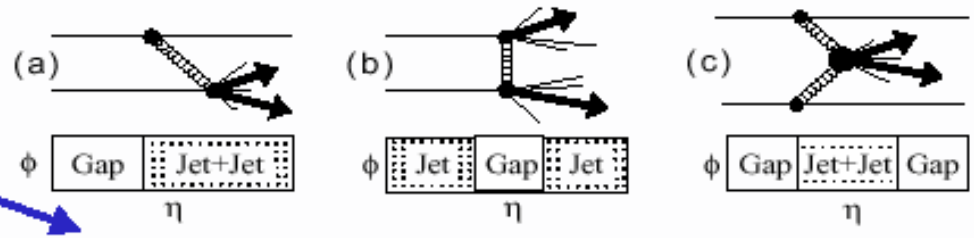
- Elastic scattering PRD 50 (1994) 5518
- Total cross section PRD 50 (1994) 5550
- Diffraction

SOFT diffraction



PRD 50 (1994) 5535 | PRL 87 (2001)141802 | PRL 93(2004)141601 | PRL 91(2003)011802

HARD diffraction



PRL references

with roman pots

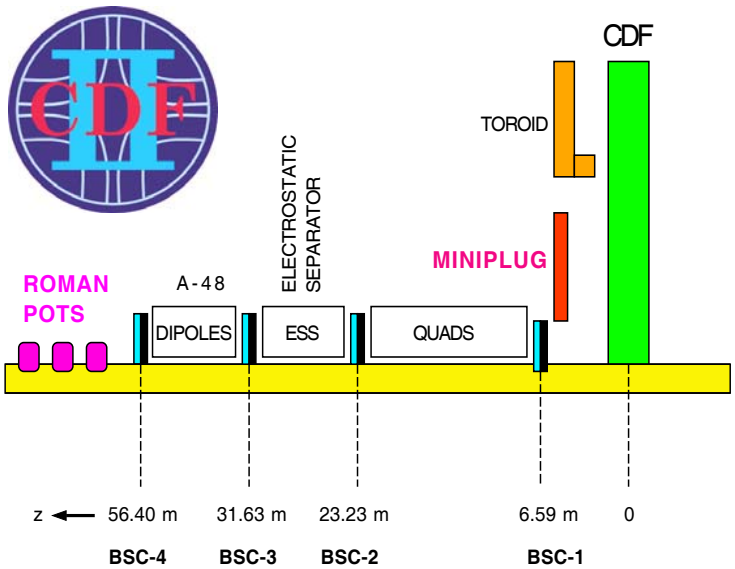
JJ 84 (2000) 5043		
JJ 88 (2002) 151802		

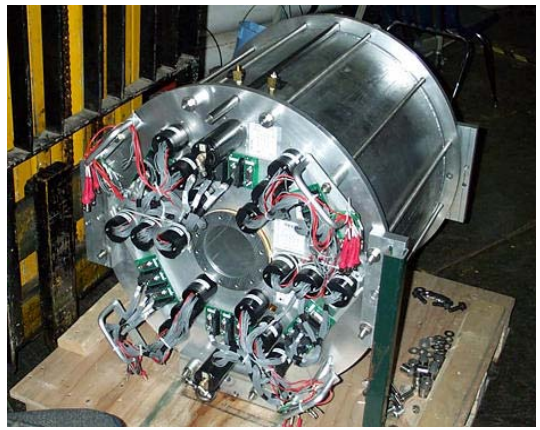
W 78 (1997) 2698	JJ 74 (1995) 855	JJ 85 (2000) 4217
JJ 79 (1997) 2636	JJ 80 (1998) 1156	
b-quark 84 (2000) 232	JJ 81 (1998) 5278	
J/ψ 87 (2001) 241802		

Run-II Diffraction @ CDF

2001-

CDF Forward Detectors

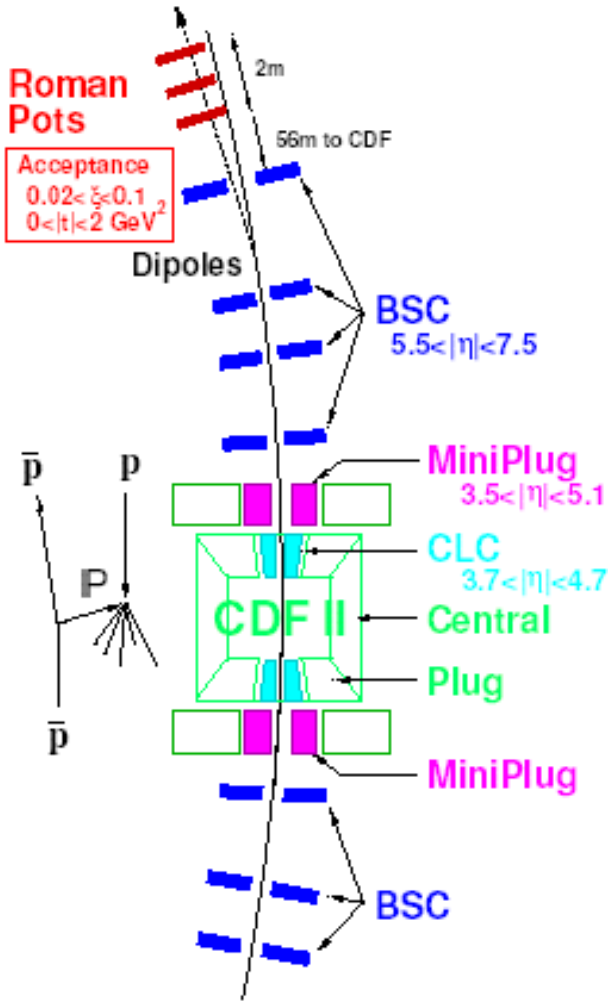


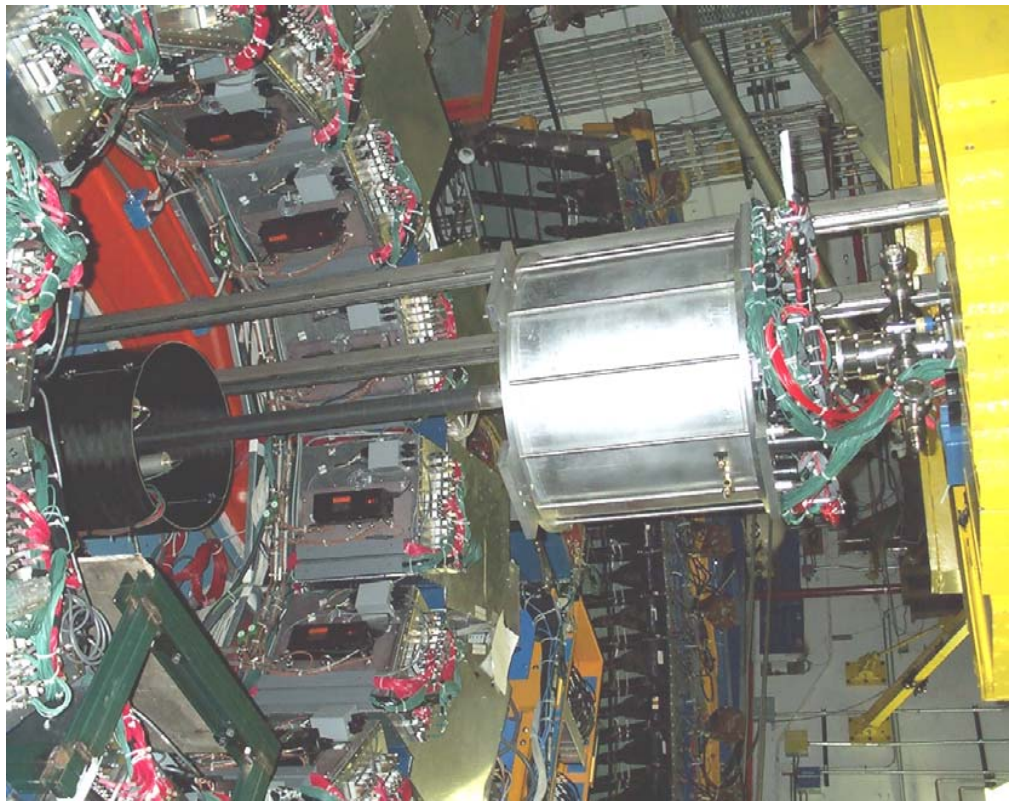


- ✓ **MiniPlug calorimeters (3.5<η<5.5)**
- ✓ **Beam Shower Counters (5.5<η<7.5)**
- ✓ **Antiproton Roman Pot Spectrometer**

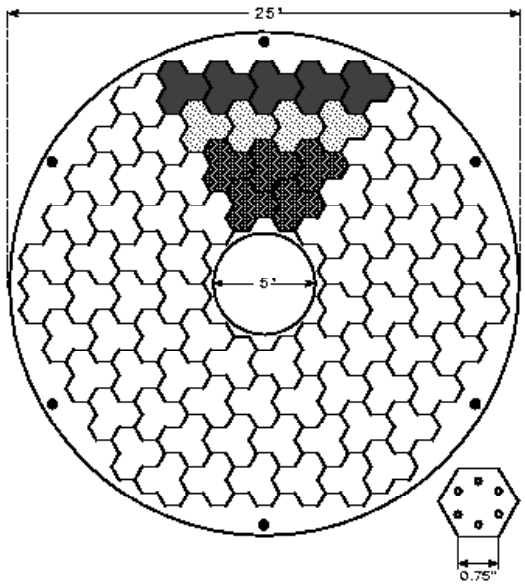
Run-II Forward Detectors

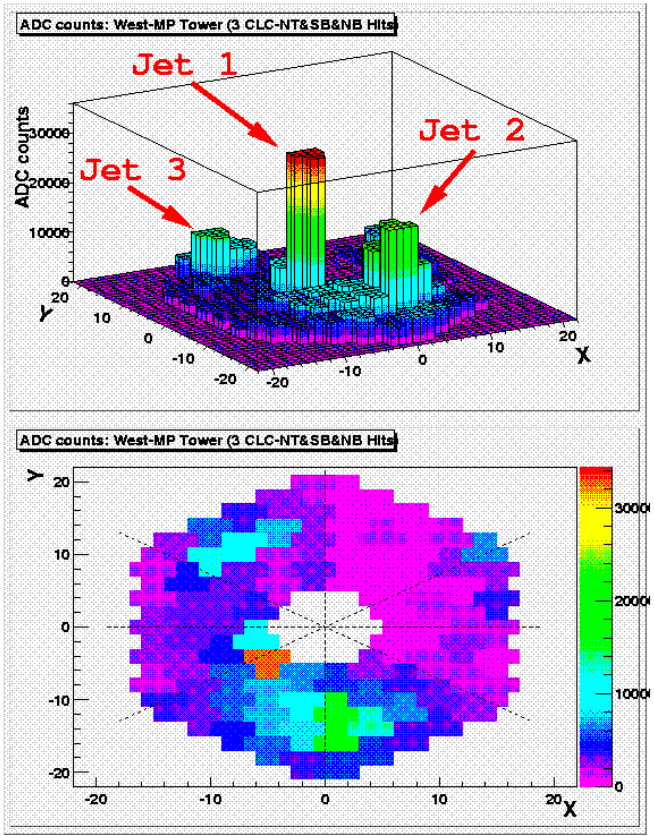
M. Gallinaro @ http://arxiv.org/abs/hep-ph/0407255

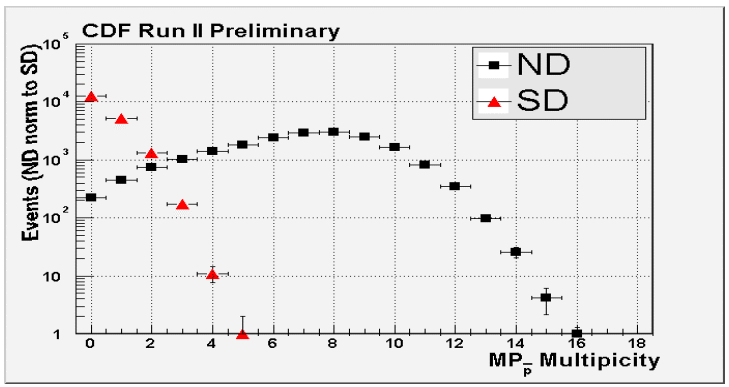




MiniPlug Run -II Data







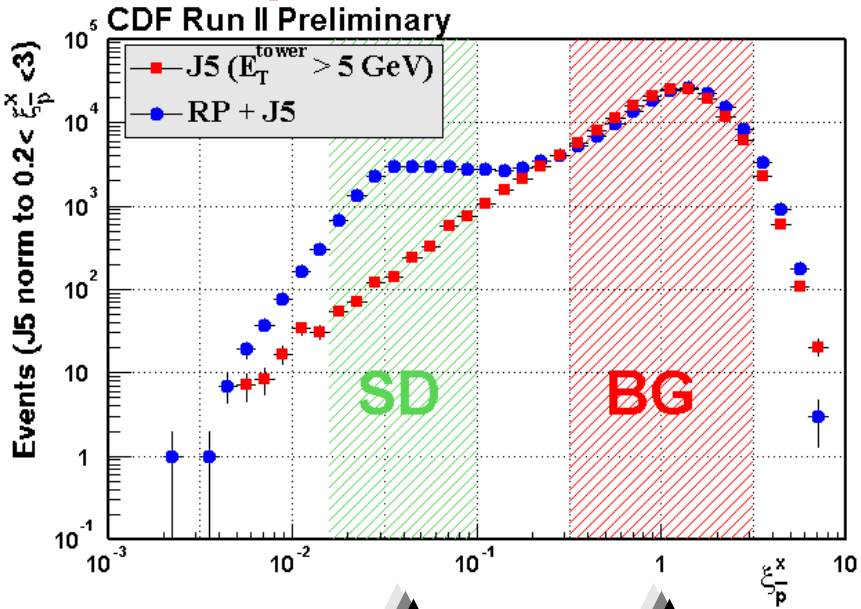
Multiplicity distribution in SD and ND events

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*



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

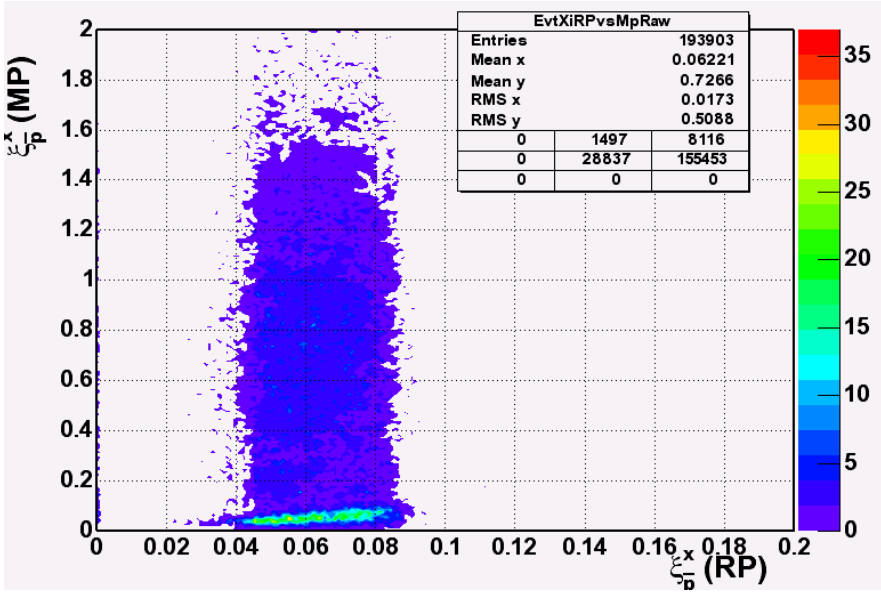
SD events

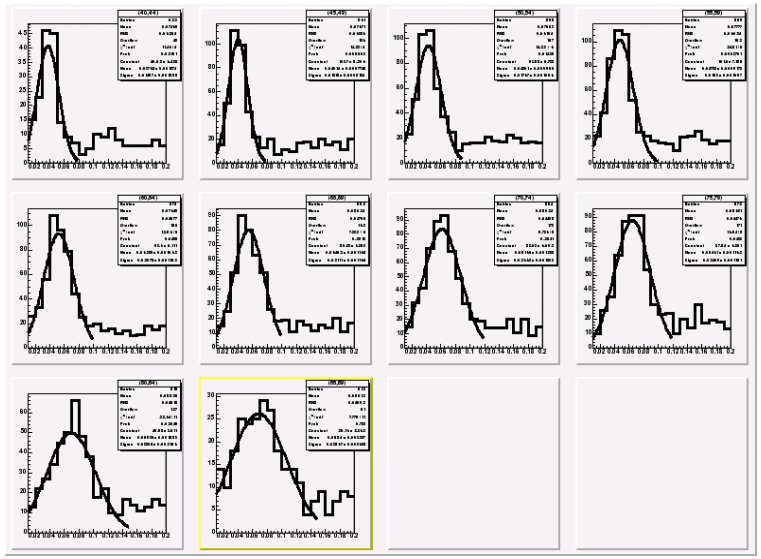
ND+SD & SD+MB overlap events

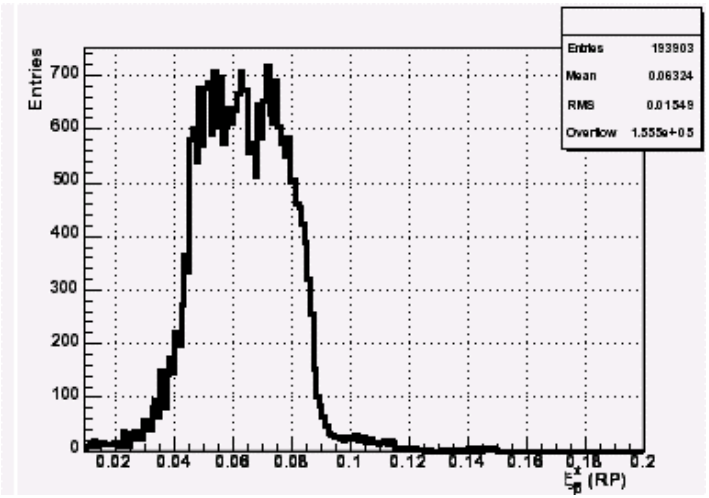
$\xi \sim 1$

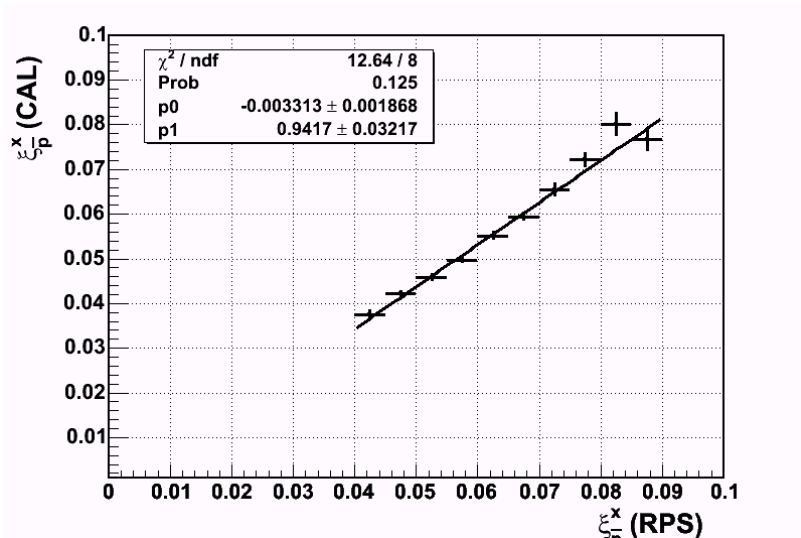
Flat region $\left\{ \quad \frac{d\sigma}{d\xi} \propto \frac{1}{\xi} \Rightarrow \frac{d\sigma}{d\log\xi} = \text{constant} \right.$

Run II Roman Pot Tracking







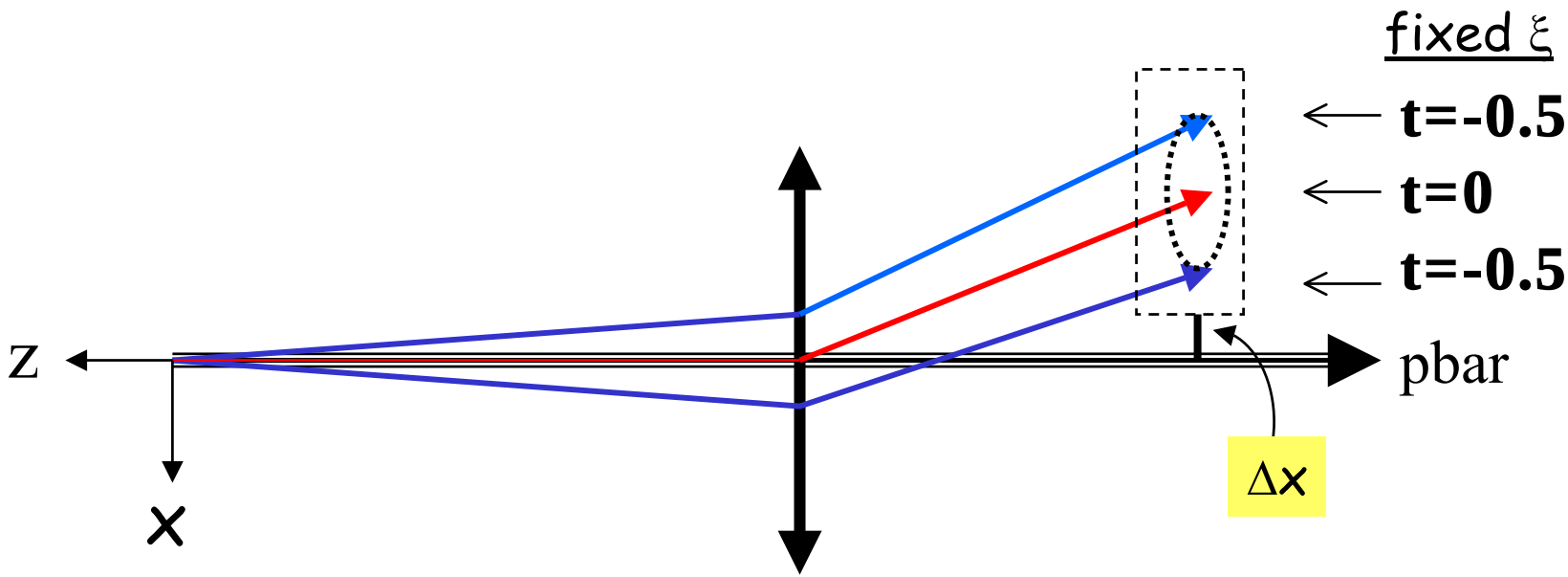


Calibration of RP position

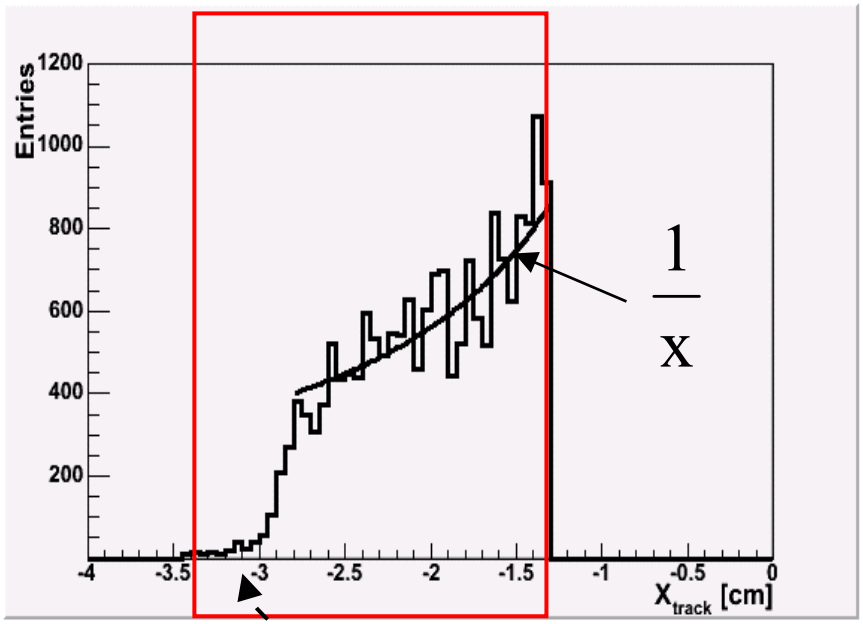
$$\frac{d\sigma}{dt} \sim e^{bt} \Rightarrow$$

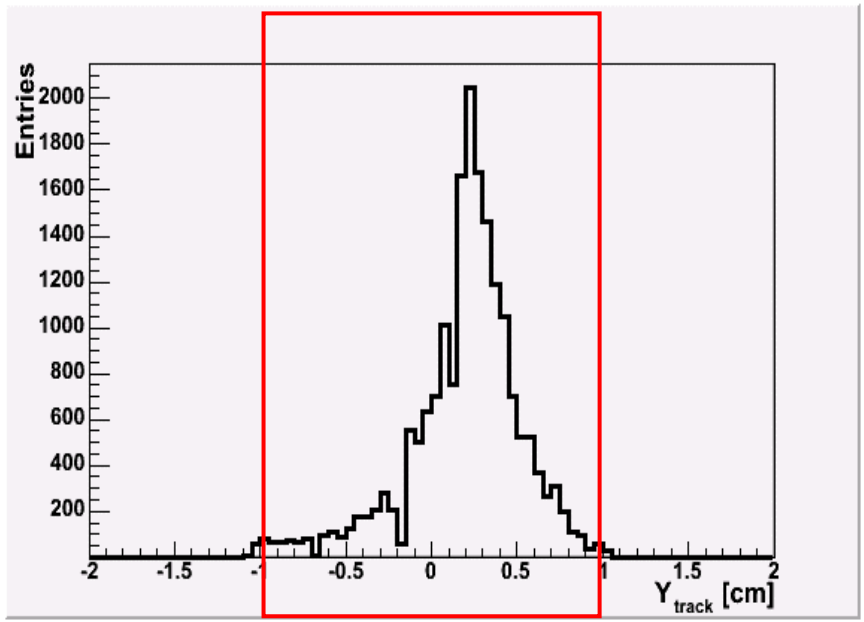
Method

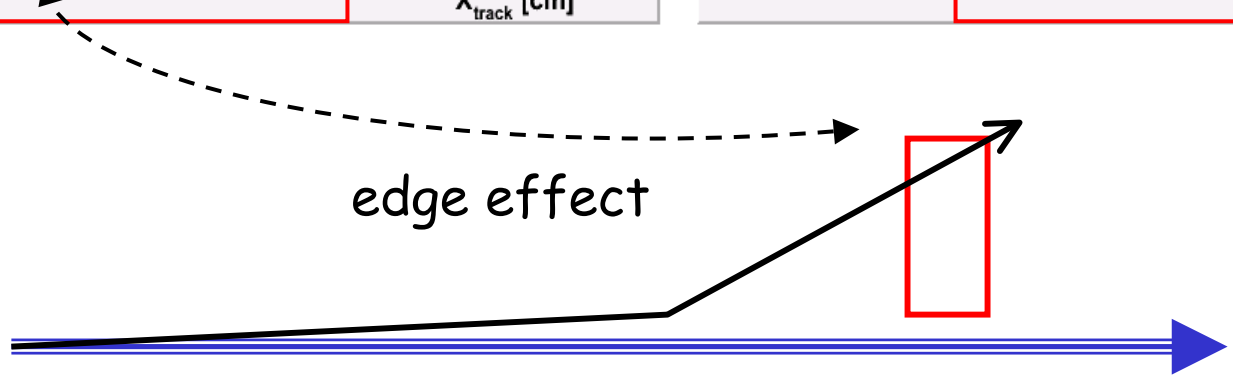
Adjust Δx to get the steepest t distribution



Roman Pot Distributions

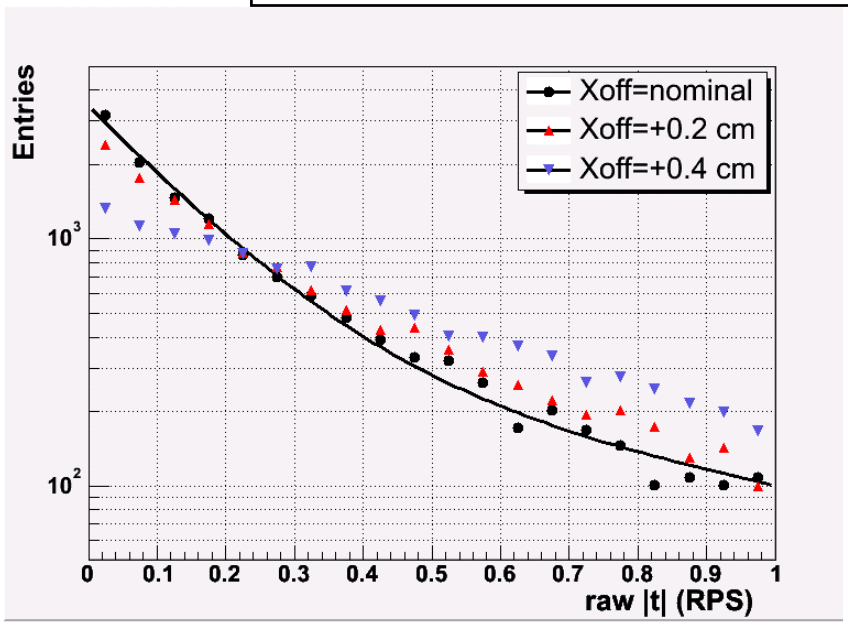


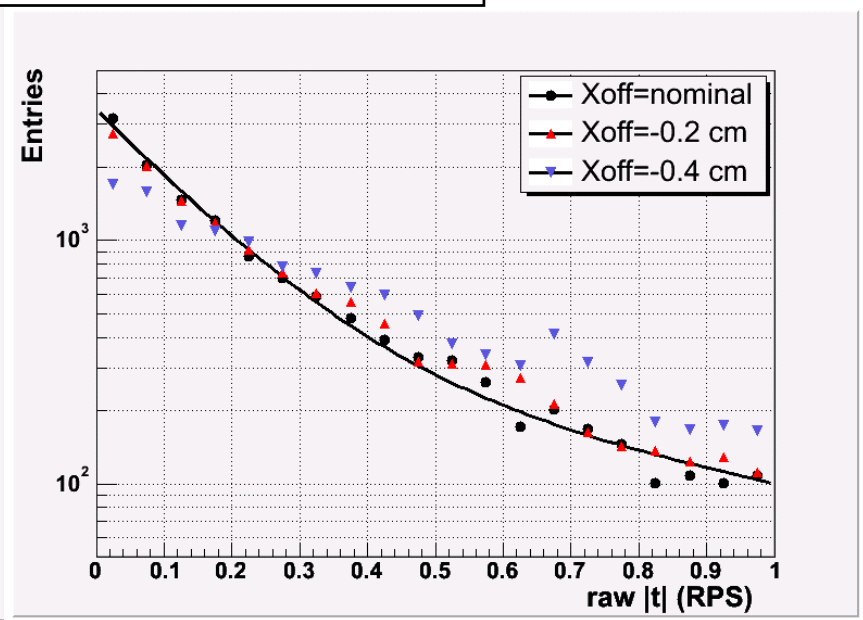




Determining Δx from data

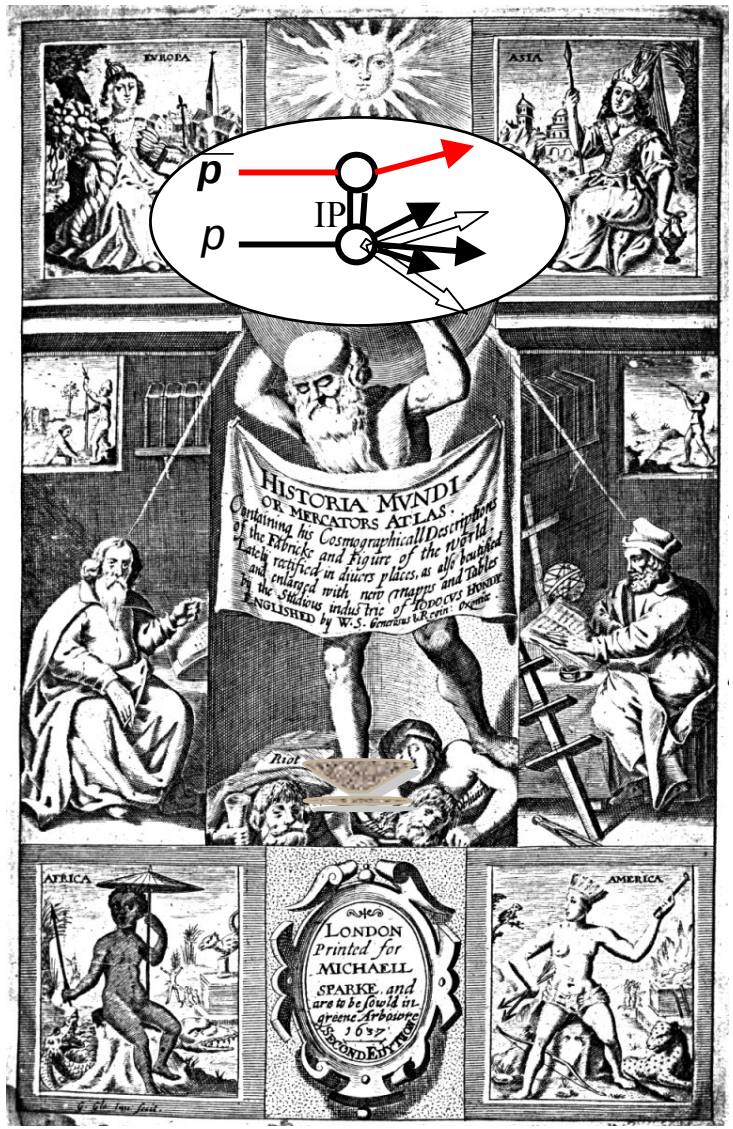
Method: maximize the t=0 value of dσ/dt





HERA &Tevatron->LHC

Diffraction



Soft & Hard