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 $\sigma^{tot} \sim S^E$
- Elastic cross section $d\sigma/dt \sim \exp[2\alpha' \ln s] \rightarrow$ shrinking forward peak
- Single diffraction Breakdown of Regge factorization
Run-IC 1992-1996

CDF-I

Run-IA,B

Fiber Tracker Detail

Acceptance: 0 < |t| < 1, 0.03 < ξ < 0.1

Scintillator fiber xy-tracker
270 μ pitch, 2 m lever arm

x=1

x < 0.97

Recoll P Track
Bellows

To MCPMT

DIPOLE MAGNETS

ROMAN POTS at 57 m

x=0.97

µ

 xã

ξ

±

Acceptance: 0 < |t| < 1, 0.03 < ξ < 0.1

Forward Detectors
BBC 3.2<η<5.9
FCAL 2.4<η<4.2

CED

Central Muon Extension

θ = 0

θ = 0.9

θ = 2.4

θ = 4.2

CDF Detector

Central Muon Upgrade

Steel Absorber

Central Muon

Central hadron

End plug hadron

End plug em

End plug em

Central Tracking Chamber

Interacting Point

Silicon Vertex Detector

CentralMuonUpgrade

SteelAbsorber

CentralMuon

Central hadron

End plug hadron

End plug em

End plug em

Central Tracking Chamber

Interacting Point

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SteelAbsorber

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End plug hadron

End plug em

End plug em

Central Tracking Chamber

Interacting Point

Silicon Vertex Detector
CDF-I Roman Pot Spectrometer

FIBER TRACKER

Reconstructed track
A bunch of fibers
True Track

0.266 mm, (=1b/in)

Fiber width: 800 µ

Expected position resolution 80 µm
Expected angle resolution 60 µrad

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

Hosai Nakada - thesis

CERN 17-19 Jan 2005
Alignment of CDF Run II Roman Pots
K. Goulianos
Diffraction@CDF in Run I

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

SOFT diffraction

<table>
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<tr>
<th>Type</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Non-Diffractive (ND)</td>
<td>50 (1994) 5535</td>
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<td>Single-Diffractive (SD)</td>
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<td>Double Diffractive (DD)</td>
<td>87 (2001) 141802</td>
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<td>Double Pomeron Exchange (DPE)</td>
<td>93(2004)141601</td>
</tr>
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<td>Single + Double Diffractive (SDD)</td>
<td>91(2003)011802</td>
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HARD diffraction

PRL references

with roman pots

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<tr>
<th>Type</th>
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<tr>
<td>W</td>
<td>78 (1997) 2698</td>
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<td>JJ</td>
<td>74 (1995) 855</td>
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<td>JJ</td>
<td>79 (1997) 2636</td>
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<td>80 (1998) 1156</td>
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<td>b-quark</td>
<td>84 (2000) 232</td>
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<td>JJ</td>
<td>81 (1998) 5278</td>
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<td>J/ψ</td>
<td>87 (2001) 241802</td>
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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

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

\[ \xi^X - \text{distribution} \]

\[ \xi \approx 1 \]

Flat region \[ \left\{ \frac{d\sigma}{d\xi} \propto \frac{1}{\xi} \Rightarrow \frac{d\sigma}{d \log \xi} = \text{constant} \right\} \]

CDF Run II Preliminary

- J5 (\(E_T^{\text{lower}} > 5 \text{ GeV}\))
- RP + J5

SD & SD+MB overlap events

\[ \xi = \frac{\sum_i E_T^i e^{-\eta_i}}{\sqrt{s}} \]
Run II Roman Pot Tracking
Calibration of RP position

\[ \frac{d\sigma}{dt} \sim e^{bt} \Rightarrow \text{Method} \]

Adjust $\Delta x$ to get the steepest $t$ distribution

$\xi_{\text{fixed}}$

$\leftarrow t=-0.5$

$\leftarrow t=0$

$\leftarrow t=-0.5$

$\Delta x$

pbar

Z

X
Roman Pot Distributions

edge effect
Determining $\Delta x$ from data

Method: maximize the t=0 value of $d\sigma/dt$
HERA & Tevatron -> LHC