1 - Forward Proton Detector Layout

- 9 momentum spectrometers composed of 18 Roman Pots
- Scintillating fiber detectors can be brought close (~6 mm) to the beam to track scattered protons and anti-protons
- Reconstructed track is used to calculate momentum fraction and scattering angle
- Much better resolution than available with gaps alone
- Cover a region (0 < t < 3 GeV^2) never before explored at Tevatron energies
- Allows combination of tracks with high-pT scattering in the central detector

2 - FPD Detector Setup

- 6 planes per detector in 3 frames and a trigger scintillator
- U and V at 45 degrees to X, 90 degrees to each other
- U and V planes have 20 fibers, X planes have 16 fibers
- Planes in a frame offset by ~2/3 fiber
- Each channel filled with four fibers
- 2 detectors in a spectrometer

3 - Tagged Elastic Trigger

- Approximately 3 million raw elastic events
- About 1% (30 thousand) pass multiplicity cuts
  - Multiplicity cuts used for ease of reconstruction and to try to handle high halo background from Tevatron
    - 1 or 0 hits in each of 12 planes of the PD spectrometer
    - Each frame of both PD detectors needs a valid segment (i.e. 6 segments total)
    - Segments turned into hits and then reconstructed into tracks

4 - Segments to Hits

- Combination of fibers in a frame determine a segment
- Need two out of three possible segments to get a hit
  - U/V, U/X, V/X
    - Can reconstruct an x and y
- Can also get an x directly from the x segment
- Require a hit in both detectors of spectrometer

5 - Initial Reconstruction

- Reconstructed ξ
- ξ = Δp/p should peak at 0 for elastic events!!

6 - Spectrometer Alignment

- Good correlation in hits between detectors of the same spectrometer but shifted from kinematic expectations
  - 3mm in x and 1 mm in y

7 - Distributions after Alignment Correction

- After correction, ξ now peaks at 0
  - MC ξ resolution is 0.013 (including z smearing and dead channels), data is 0.015, 1.15 times larger
- The f distribution has a minimum of 0.8 GeV^2. f_min is determined by how close the pots are from the beam (would expect 0.5 GeV^2 with clean beam).
  - Shape is in agreement with expected angular acceptance from MC.

8 - TDC Timing from Trigger Tubes

- Can see bunch structure of both proton and antiproton beam
- Can reject proton halo at dipoles using TDC timing

9 - TDC Resolution

- Tevatron Lattice:
  - L1 = 56.5 m; L2 = 58.8 m