IV. Backgrounds, Triggers, Rates

1. Typical Trigger Conditions

Apparatus Immediately Below Main Ring
$\bar{p}$'s Accelerated 1 sec/2.5 sec

- Blinding Flashes of Background

- Triggers Gated Off

- MWPC High Voltage
  Ramped Down 15%

Typical Trigger Conditions (Continued)

(a) Scintillator within Telescope in Loose Coincidence Dominated by Upstream-p Beam-Gas Interactions Generic Rate $\approx 4 - 10\,kHz$

(b) $p - \bar{p}$ Interaction Trigger Demands at Least One Upstream Counter in $\bar{p}$ Array Reporting (With $p - \bar{p}$ Collision Timing) Together With Telescope Trigger:

- Generic Background Rate $\approx 5{-}20\,Hz$
- Mostly p-induced Beam-Gas Interactions

2. Trigger Performance

(a) Genuine $p - \bar{p}$ Collisions are seen;
Trigger Cross Section of 35-40 mb

- $\sigma_{p\bar{p}} = 50\,mb$

- Generic Rate $\approx 300 Hz$,
($\sim$ D0 Luminosity $= 1\times10^{30} cm^{-2} sec^{-1}$)

(b) Trigger Efficiency Much Higher
Than Estimated from
Detector Acceptance:
Most Triggers Initiated by
Showers from Beampipe, Floor, Etc.

Trigger Performance(Continued)

(c) Multiplicity Distributions in Upstream $\bar{p}$ Scintillator Array Very Different for Beam-Gas & Beam-Beam Collisions:

- Very Low for p-Induced Beam-Gas Collisions

- Higher & Broader for $p - \bar{p}$ Collisions

- Background Level: Monitored & Updated Every Min. During Runs

3. Luminosity Determination

(a) Rely on D0 Luminosity Monitor for Determination. $F(\beta^*)$ is the D0 Bunch-Length Correction:

$$
\begin{aligned}
Lum(C0) &= \frac{\beta^*(D0)}{\beta^*(C0)} F(\beta^*) \\
&= \frac{0.35m}{70} \times 1.4 \\
&= \frac{1}{140}
\end{aligned}
$$

(b) Correction for Bunch-to-Bunch Intensity Fluctuations: Required and Made

(c) Run-to-Run Consistency within 10%

4. <u>Upstream Tags</u>

Purpose:

Study Leading $\bar{p}$ or $\bar{n}$ Dependence

Calorimetry at 25 m:

- Lambertson Magnets Bend Secondary ($x_F = 0.5 \pm 0.1$) $\bar{p}$'s into Calorimeter

- Leading $\bar{n}$'s ($\theta = 0^o$) into Other Calorimeter

- Fraction of Events with Tags $\approx$ 15 – 20%

- Purity of Sample $\longrightarrow$ 95%

- Very Little Change in Tracking Data

Upstream Tags (Continued)

Scintillator at 60 m :

- Superconducting Dipoles Bend: $\sim 800\,GeV$ $\bar{p}$'s ($x_F = 0.87 \pm 0.05$) into Beam Pipe

- Shower Products Seen in Scintillator

- Fraction of Events with Tags $\sim 1\% - 2\%$

- Purity of Sample $> 95\%$ in Late Runs

- Strong Change in $\bar{p}$-Scintillator Multiplicity Distribution

- Some Change in Tracking Data