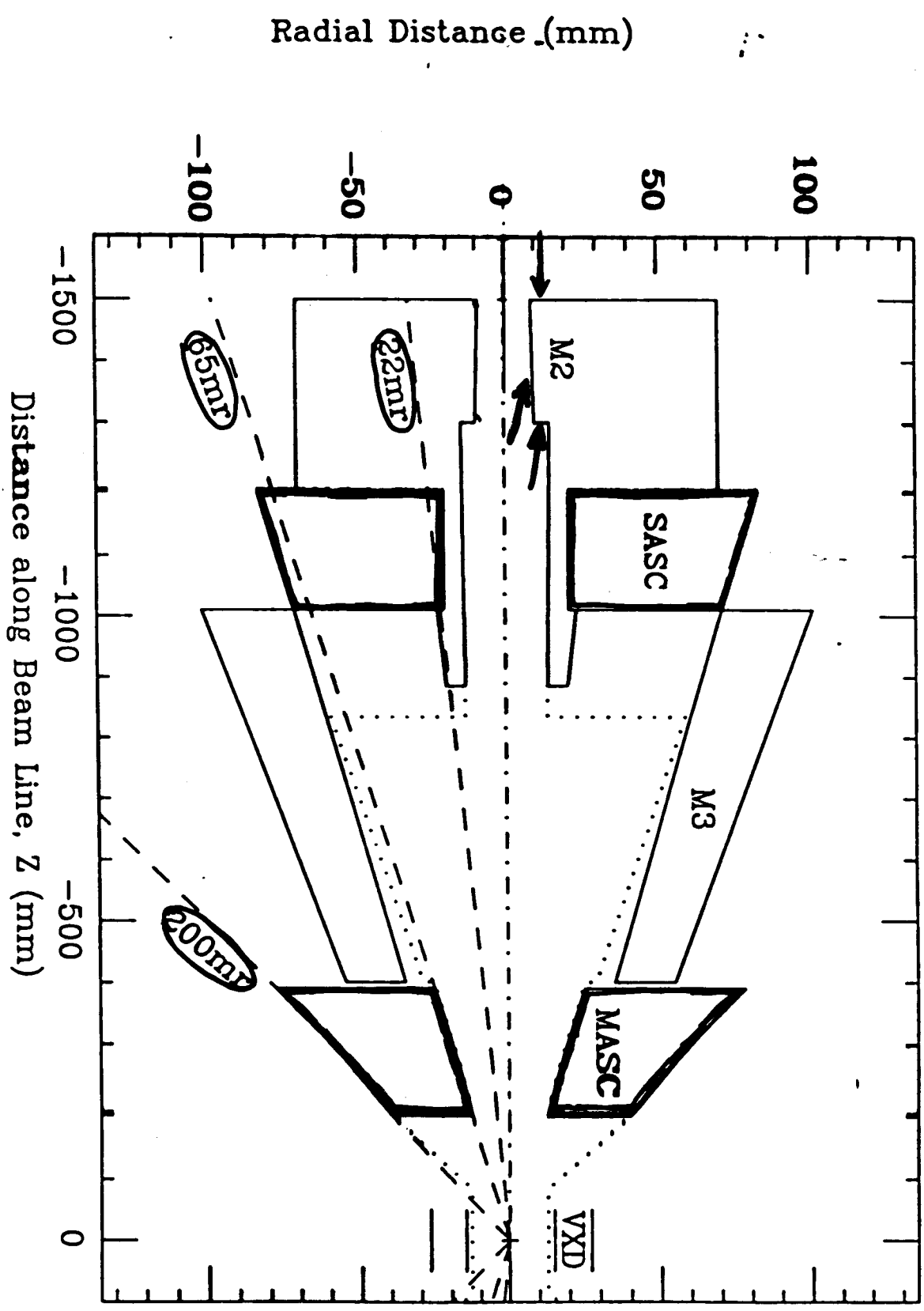


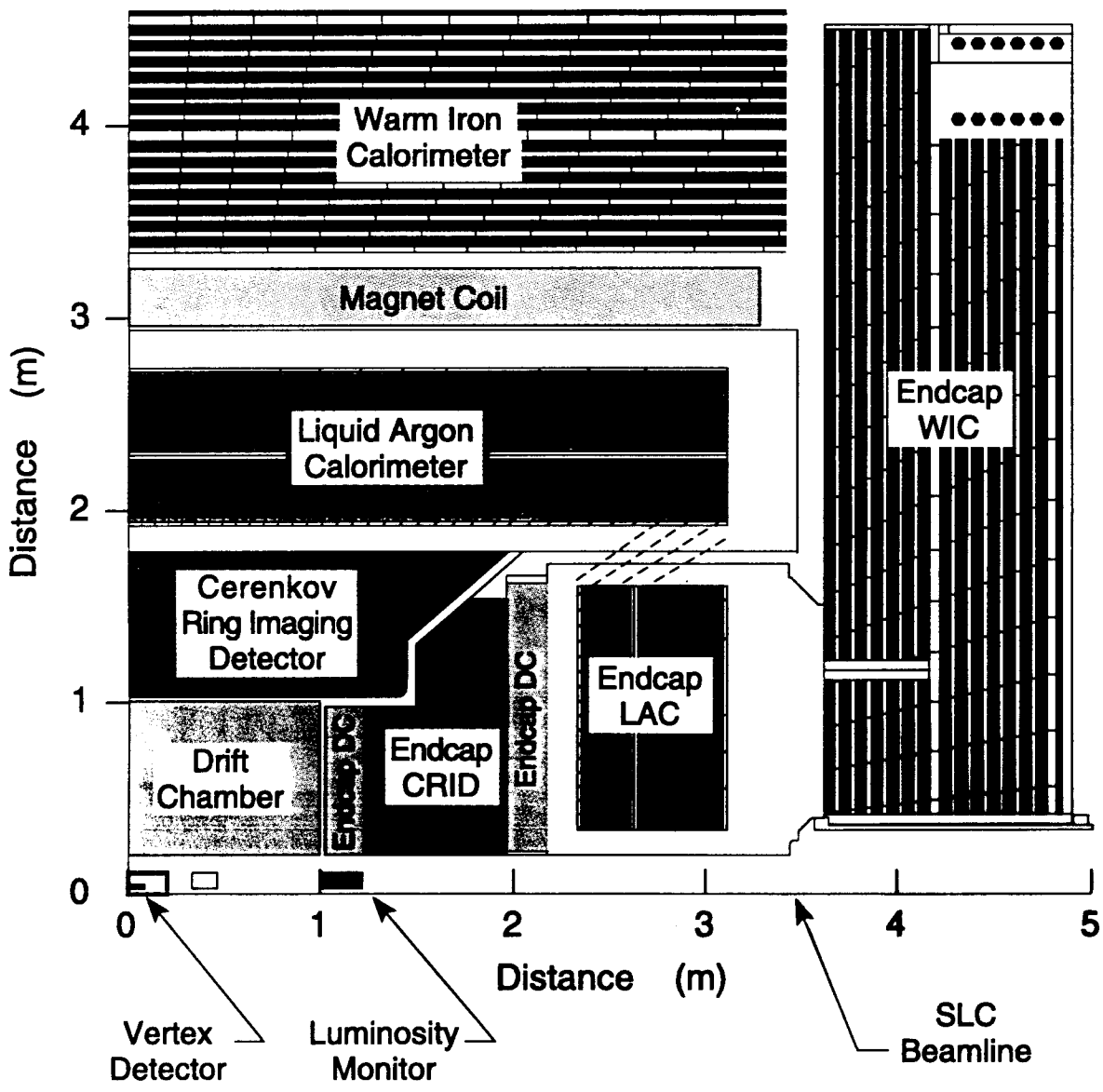
IR Masking Requirements and Impact on Calorimetry

T. Maruyama (SLAC)

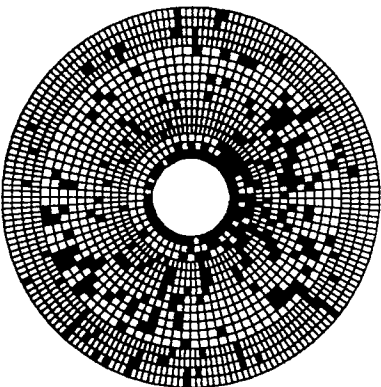
- SLC/SLD Experience
- IR Masking

SLD MASKING

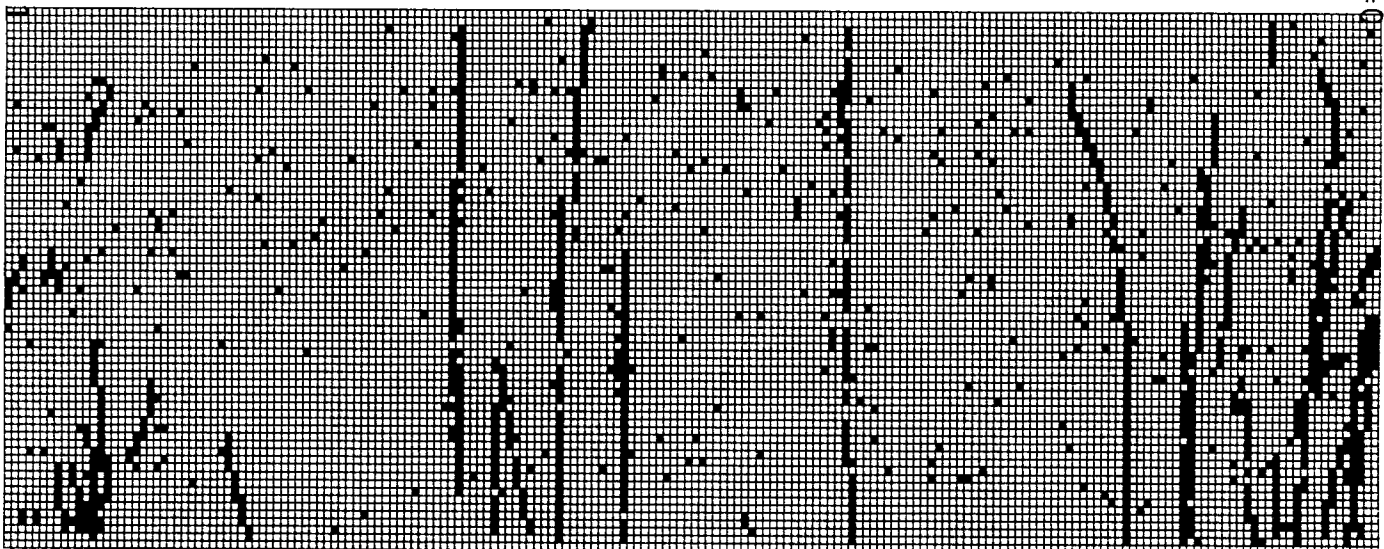




Run 13884, EVENT THETA=8135,
29-AUG-1992 04:43
Source: Run Data Pol: L
Trigger:
Beam Crossing -1793798240

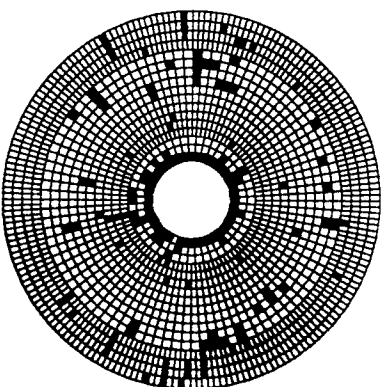


SOUTH



THETA=-35, PHI=191

THETA=35, PHI=191

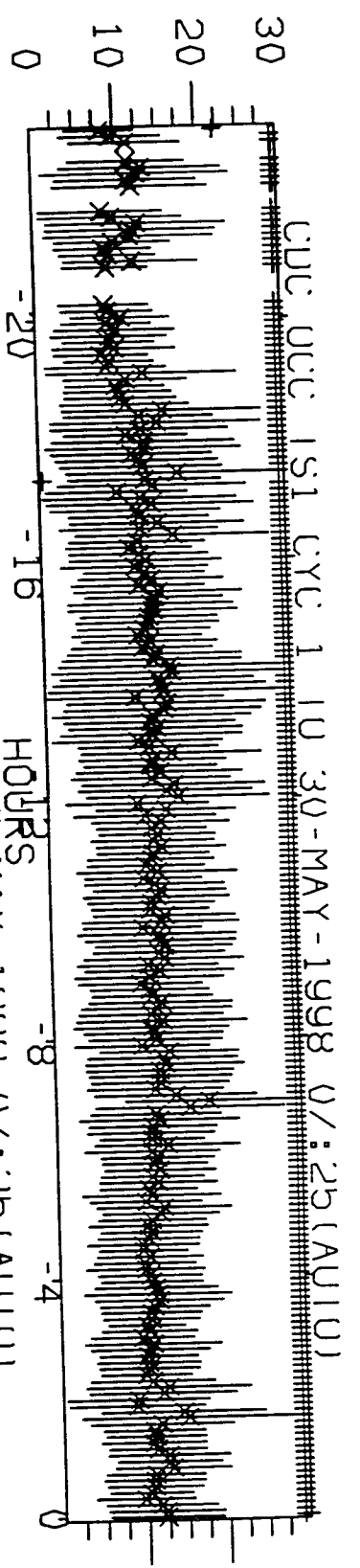


NORTH

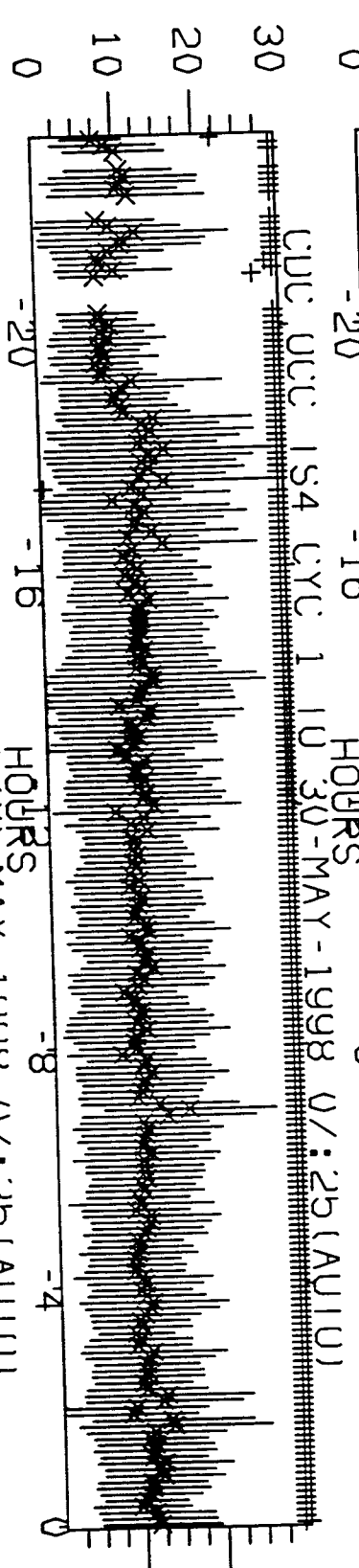
THETA=35, PHI=0



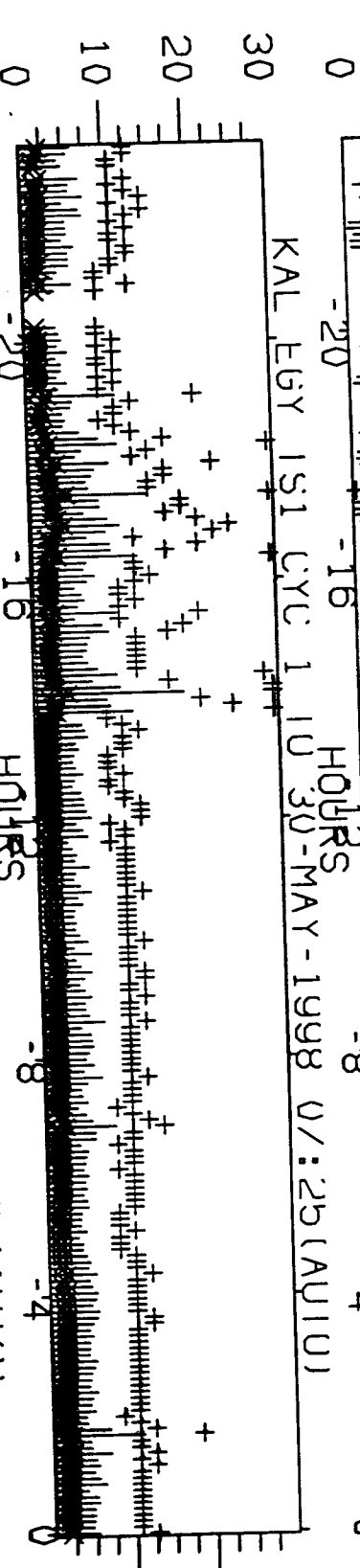
% OCCUP



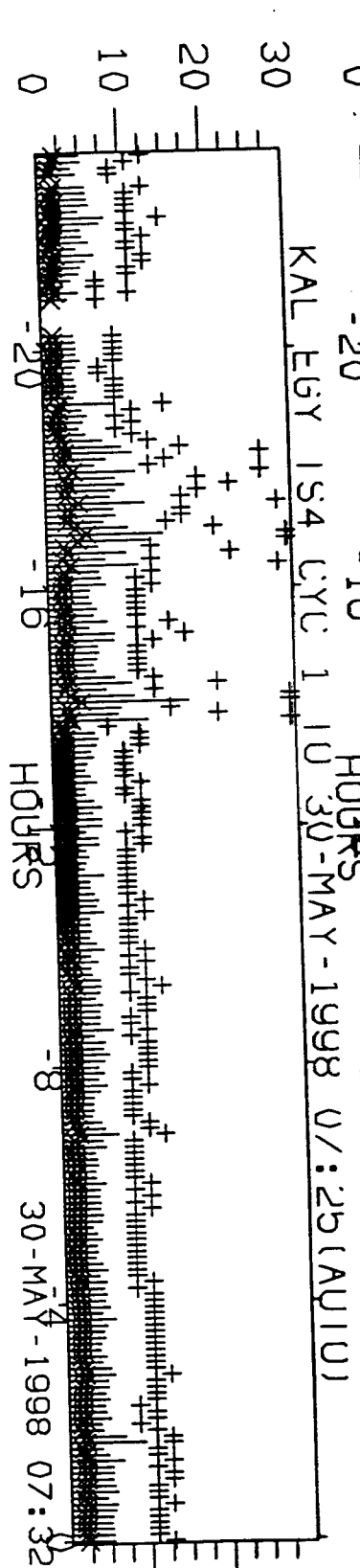
% OCCUP



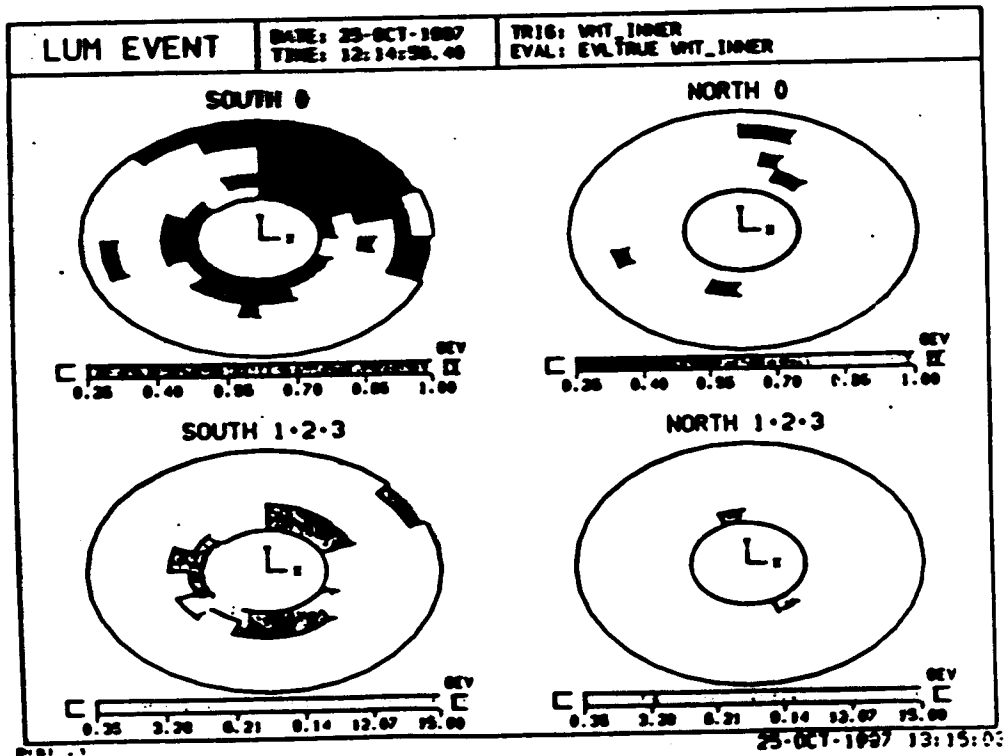
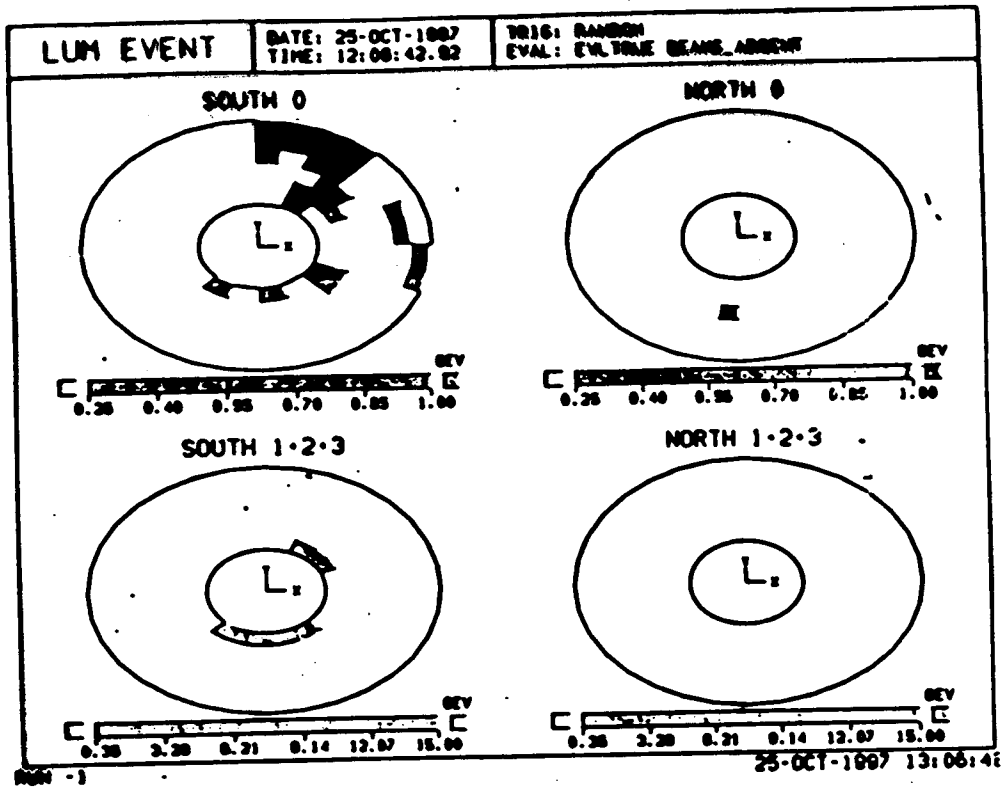
GEV



GEV



30-MAY-1998 07:32:24



Backgrounds in SLD Calorimeter

- Muons

- Syn. Radiation

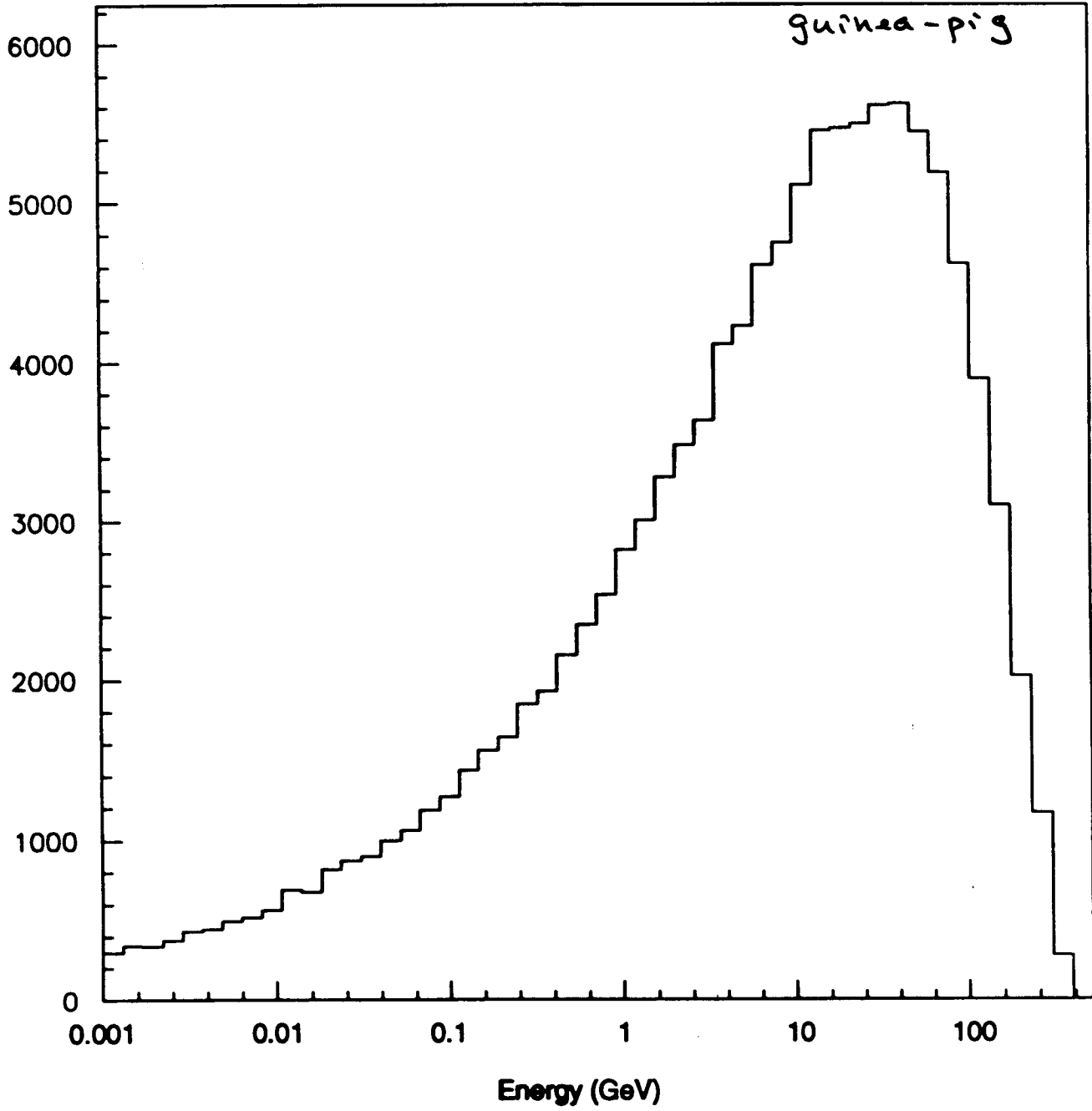
$$\sim 10^4 \gamma/\text{bunch} \times 300 \text{ KeV} = \underline{\underline{3 \text{ GeV}}}$$

- Over focused electrons
in luminosity monitor

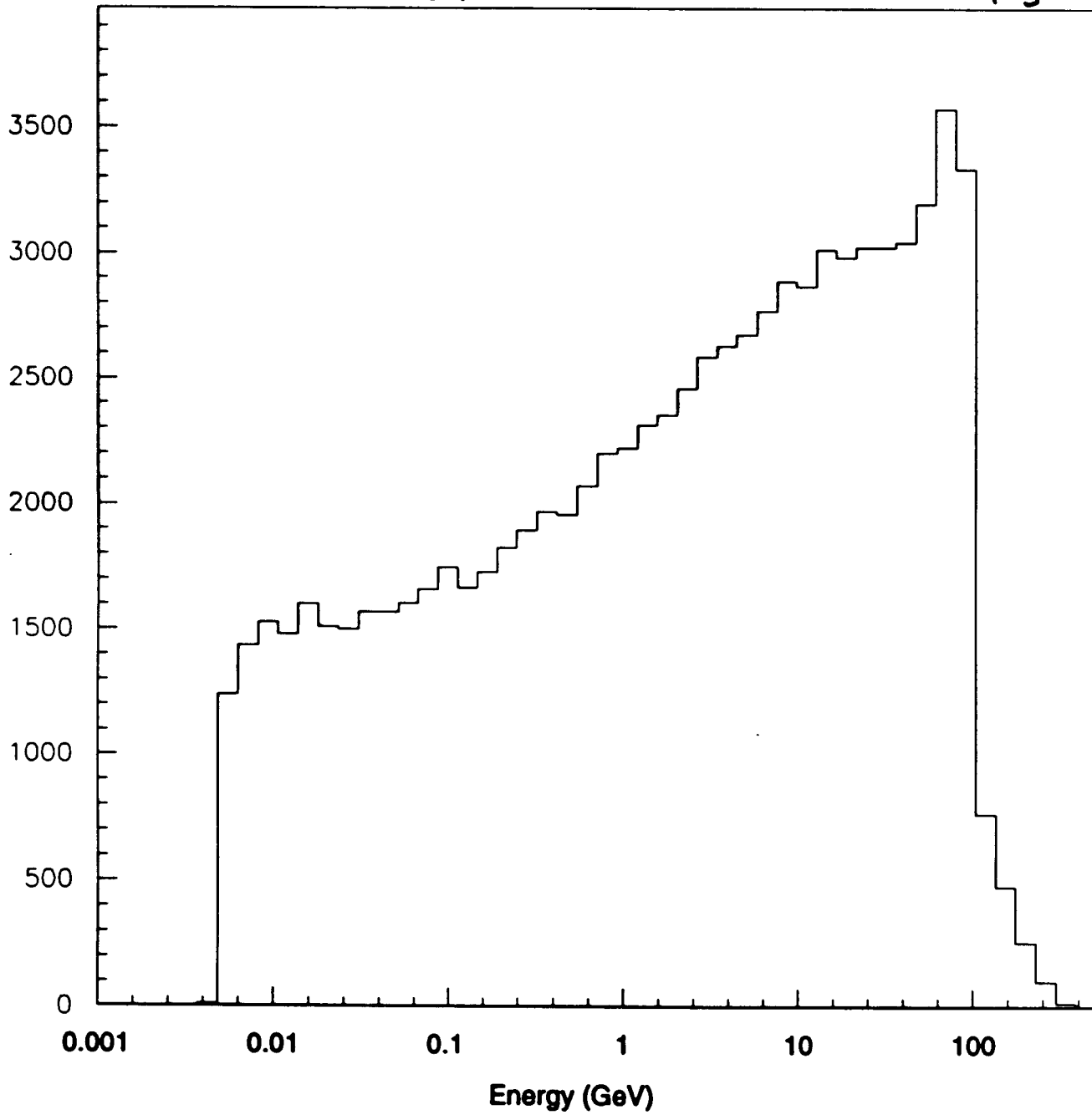
Detector background simulation

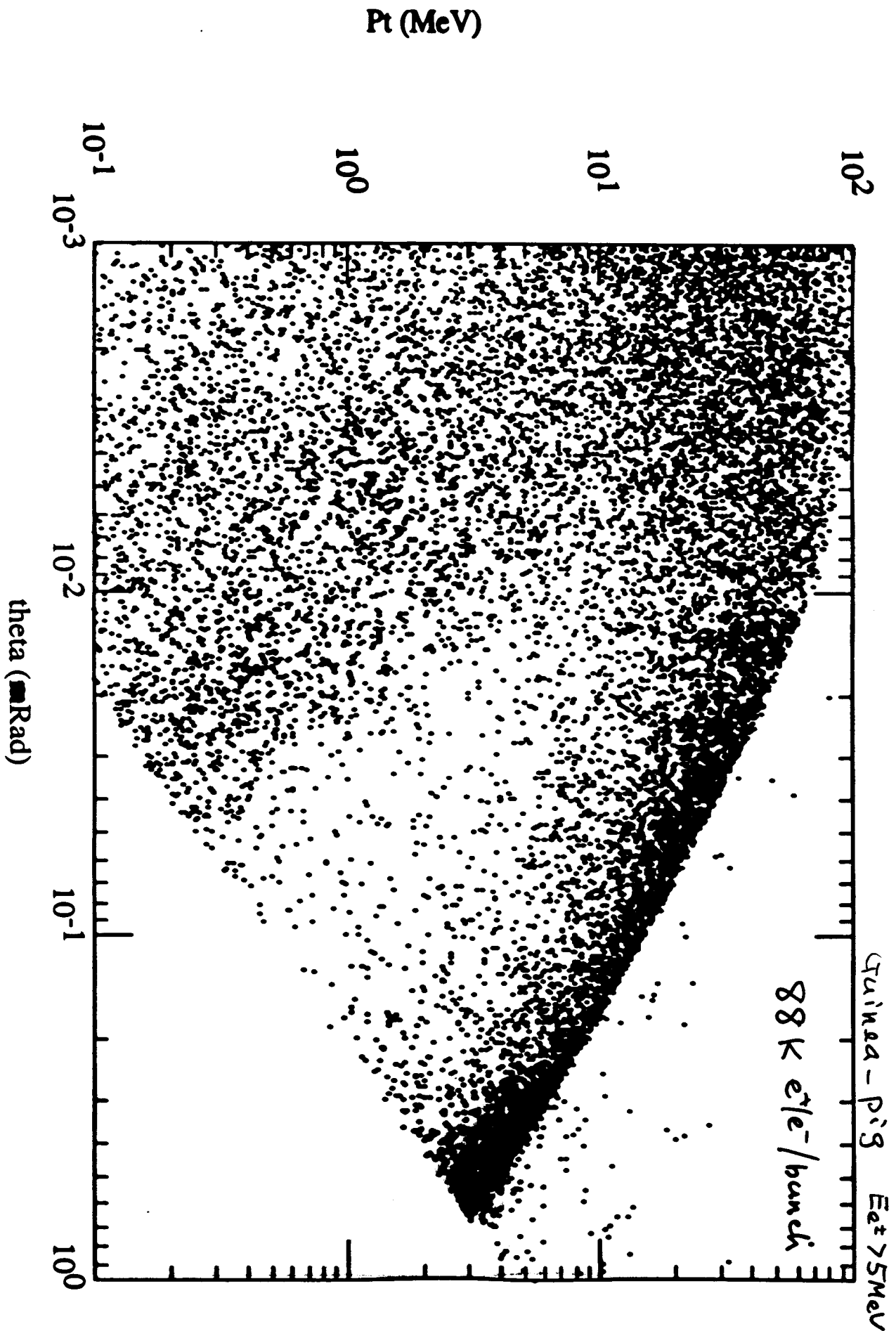
- Beams: 1 TeV 0.95×10^{10} e^- /bunch \times 90 bunches
- Sources
 - e^\pm pairs from beam-beam interaction
 $\sim 10^5$ e^\pm /bunch
 - Sync. Radiation
 - Soft bend – collimated
 - Quads
 - Gaussian core – no hits
 - Tail 1% flat in $7 \sigma_x \times 35 \sigma_y$ --
 4.1×10^5 hitting QFTA
- Criteria
 - CCD vertex detector
 e^\pm hit density $< 1/\text{mm}^2/\text{train}$
 - Drift chamber tracker
Total photons $< 10^4/\text{train}$

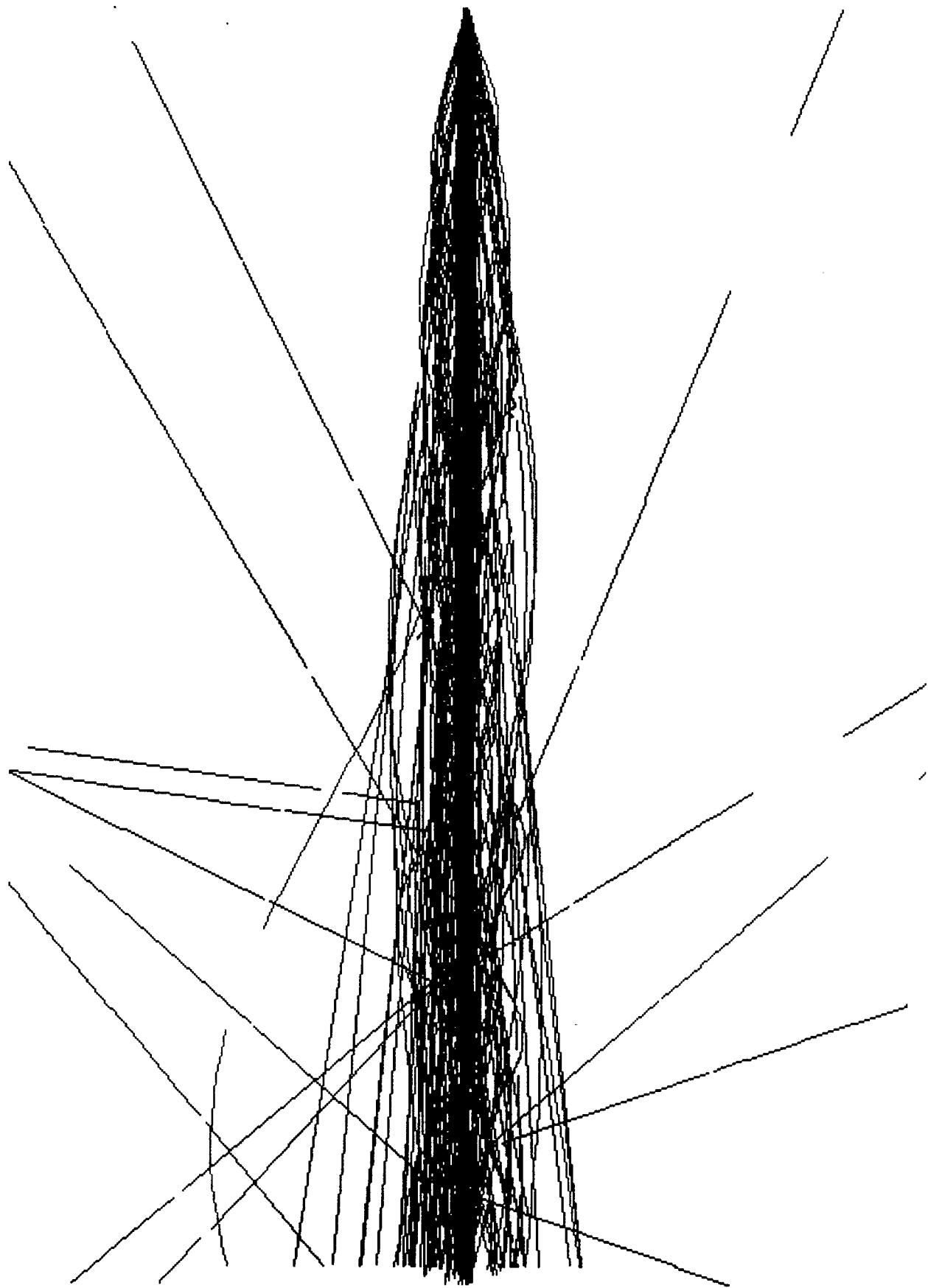
Beamstrahlung photon energy distribution

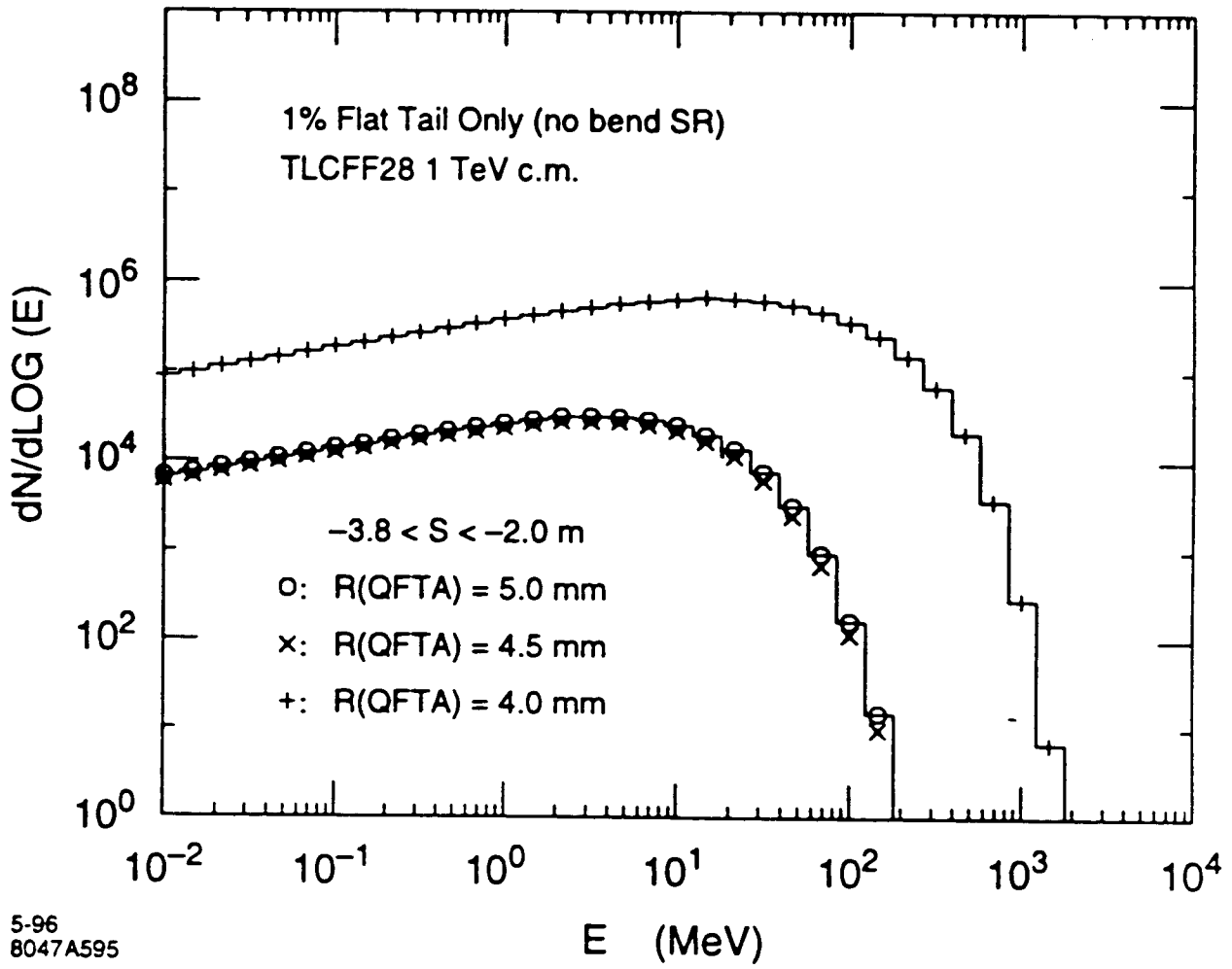


e^+e^- Energy Distribution Guinea-pig



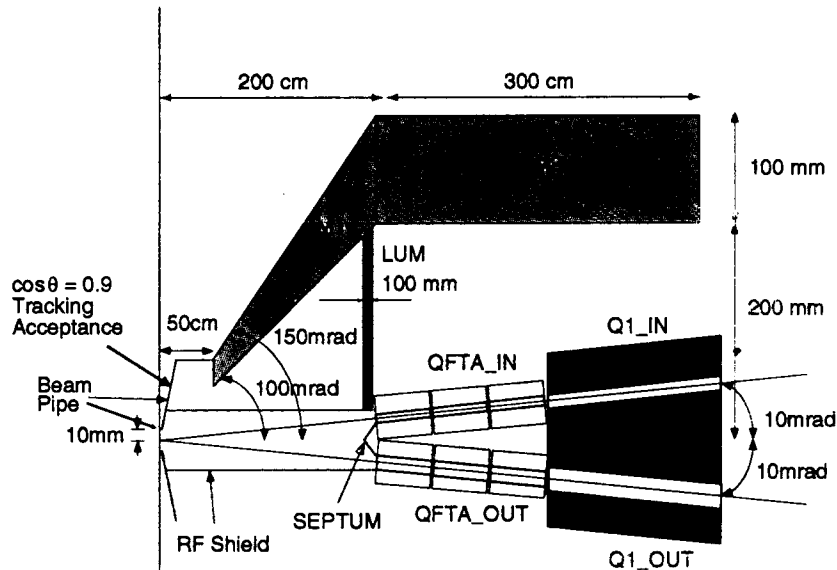






5-96
8047A595

NLC IR REGION



5-96
8047A589

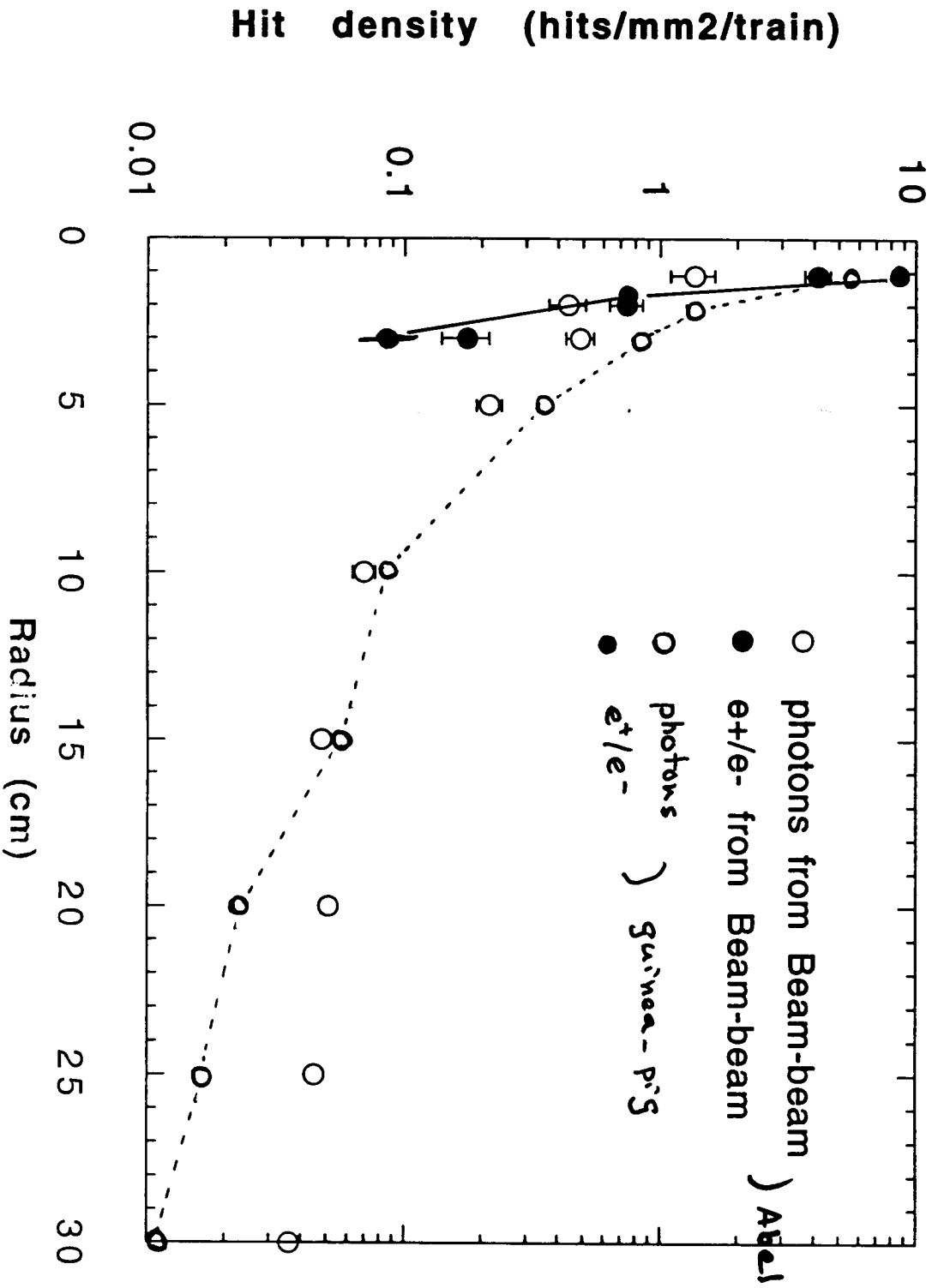
M1 Mask	Tapered Tungsten Cone beginning at $z=0.5$ m and ending at $z=2.0$ m, with inner and outer angles of 100 and 150 mr, respectively.
M2 Mask	Tungsten annulus with 10-cm wall and inner radius 20 cm, $2.0 < z < 5.0$ m.
QFTA_IN/OUT	Incoming/Outgoing Sm ₂ Co ₁₇ FF quads rotated 10 mr in $x-z$ plane. QFTA_IN - Inner/Outer radii = 4.5/20.0 mm QFTA_OUT - Inner/Outer radii = 7.5/20.0 mm Longitudinally divided into three 5.0-cm-long segments with 2.0-cm gaps. L^* = line at 10 mr to IP is 2.0-m long.
Q1_IN/OUT	Superconducting magnet with Q1_IN aperture = 5 mm; Q1_OUT aperture = 8 mm. Extends from 3.5 to 5.0 m.
Beam Pipe	750-μm Be beam pipe with 100-μm Titanium liner at 1.0 cm, at $z \pm 2.1$ cm, which is joined onto a 500-μm Stainless sectioned flared at 451 mr until $r = 7.56$ cm, after which it proceeds to the M1 mask and follows its inner contour.
RF Shield	200-μm Cu extension at $r = 2.75$ cm, $z = 2.1$ cm, extending at constant radius to $z = 165$ cm, then proceeding via two "legs" to join electroplated inner radius of in-/out-going quads.
SEPTUM	200-μm Cu cone beginning at $z = 189$ cm and proceeding to $z = 2.0$ m at an angle θ , where $\theta = \arctan((20 \text{ mm} - 7.5 \text{ mm})/11 \text{ cm})$.
LUM	10-cm Tungsten with back end at 195 cm, outer radius tapered at 150 mr at M1, inner radius tapered at 10 mr at radius of outgoing quad.

All calculations are for trains of 90 bunches at 1 TeV

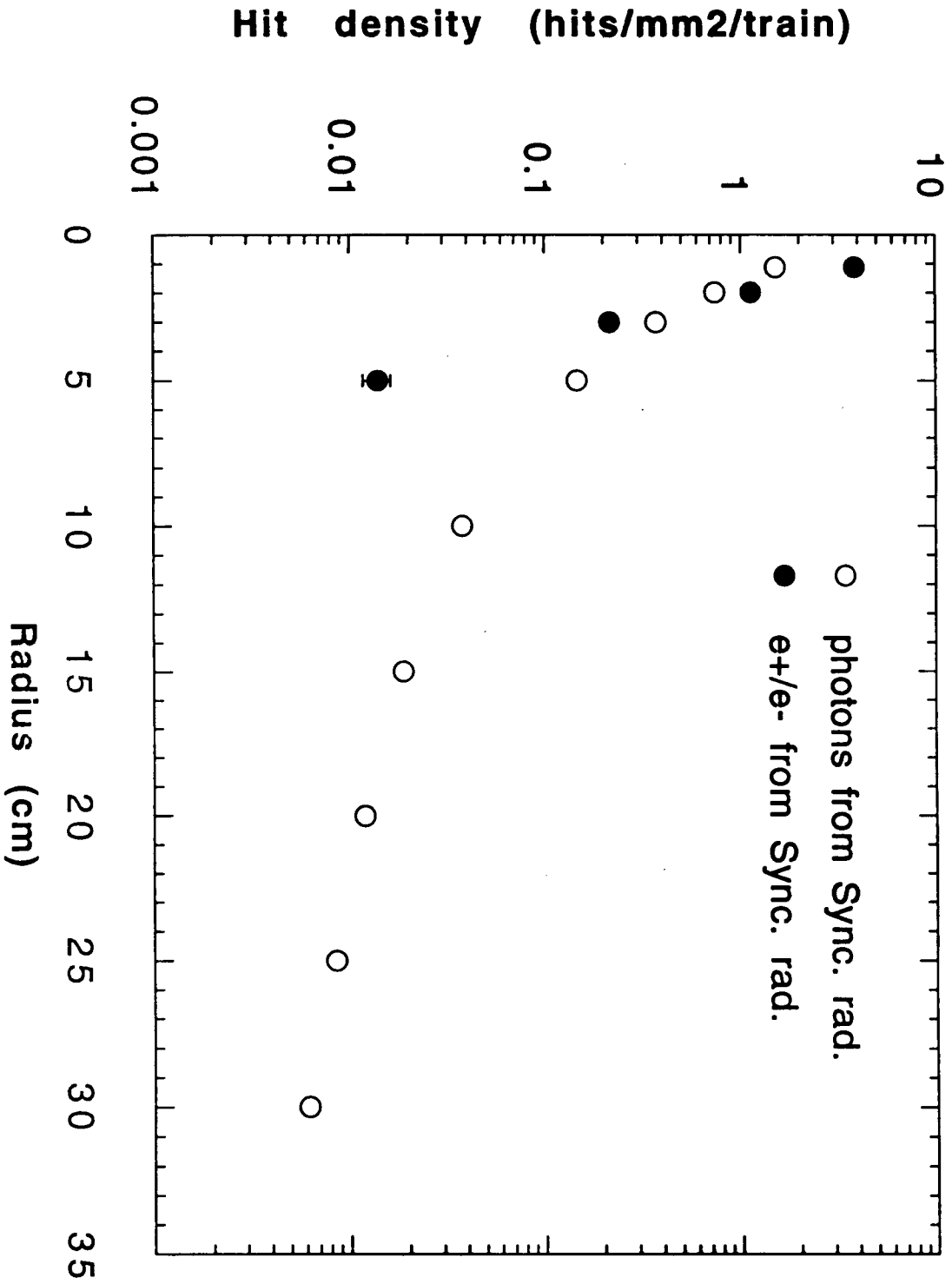
Conclusions from ZDR calculations

- High detector magnetic field is necessary -- $B \geq 4$ Tesla
- Photons into tracking chamber -- 100 K/train
Drift chamber is questionable \rightarrow Si tracker
TPC
- e^\pm hits in vertex detector
 $R \geq 2$ cm and $B \geq 4$ Tesla -- OK
 $10/\text{mm}^2/\text{train}$ at $r = 1\text{cm}$ -- worrisome

Beam-beam backgrounds



Sync. radiation backgrounds



Neutron productions

- e^\pm pairs from beam-beam interaction
 $\langle n \rangle = 494$ neutrons / bunch
- Sync. Radiation
 $\langle n \rangle = 90$ neutrons / bunch

Neutron hit density

$$\begin{aligned} &\sim 3 \times 10^{-3} \text{ hits/cm}^2/\text{train} \\ &\quad \times 120 \text{ pps} \times 3 \times 10^7 \text{ sec/year} \\ &= 1.1 \times 10^7 \text{ hits/cm}^2/\text{year} \end{aligned}$$

CCD limit: 3×10^9 hits/cm² (Damerell)

To do list on simulations

Backgrounds from the dump line

- Disrupted beams
- Beamstrahlung photons
- Beam-beam pairs going into the dump line.
- (• Radiative Bhabhas)

Summary

- e^+/e^- from beam-beam interaction are serious backgrounds in the small angle calorimeter.
- photons $\sim 100 \text{ K Ys} \times 500 \text{ KeV} = 50 \text{ GeV}$ in Cal.
- neutrons $\sim 10^7 \text{ hits/cm}^2/\text{year}$ from beam-beam and syn. radiations.

Neutrons from the dump line need to be studied