Montauk 10/1/99

Detector W. G.

Shielding Configuration

Directionality in tracking and calorimetry.

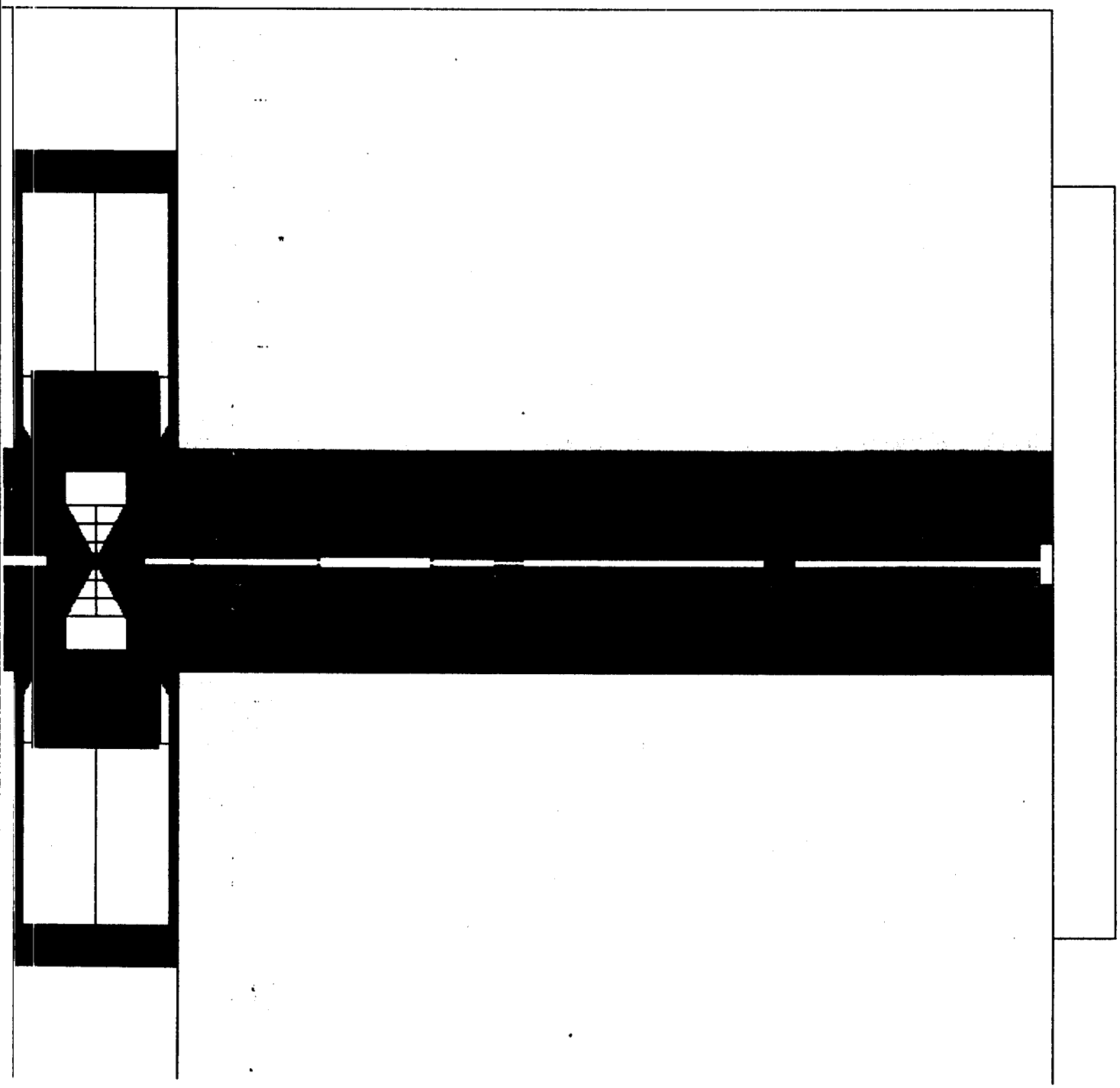
Instrumentation of the 20° shielding cone.

Conclusions.

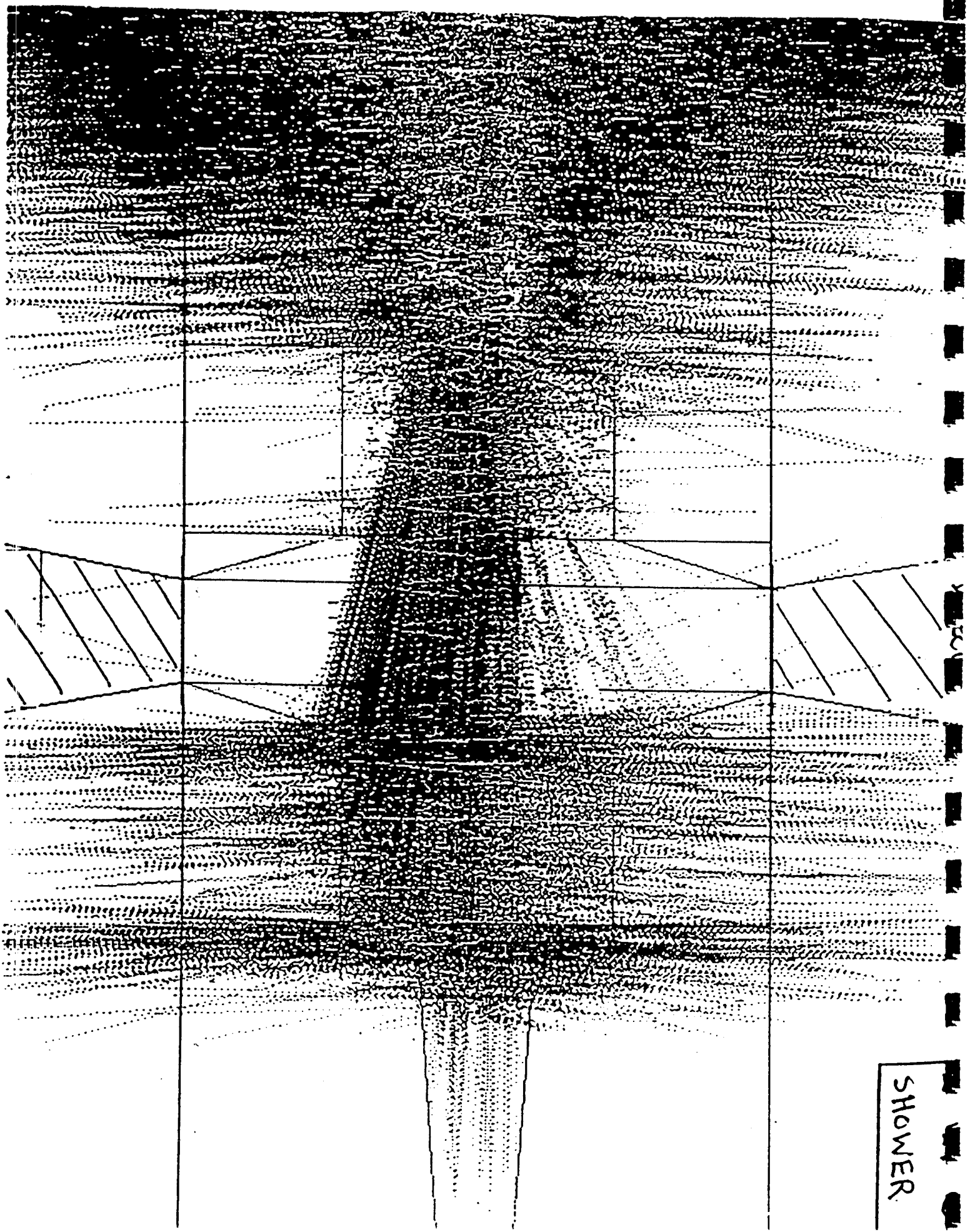
More work is needed!

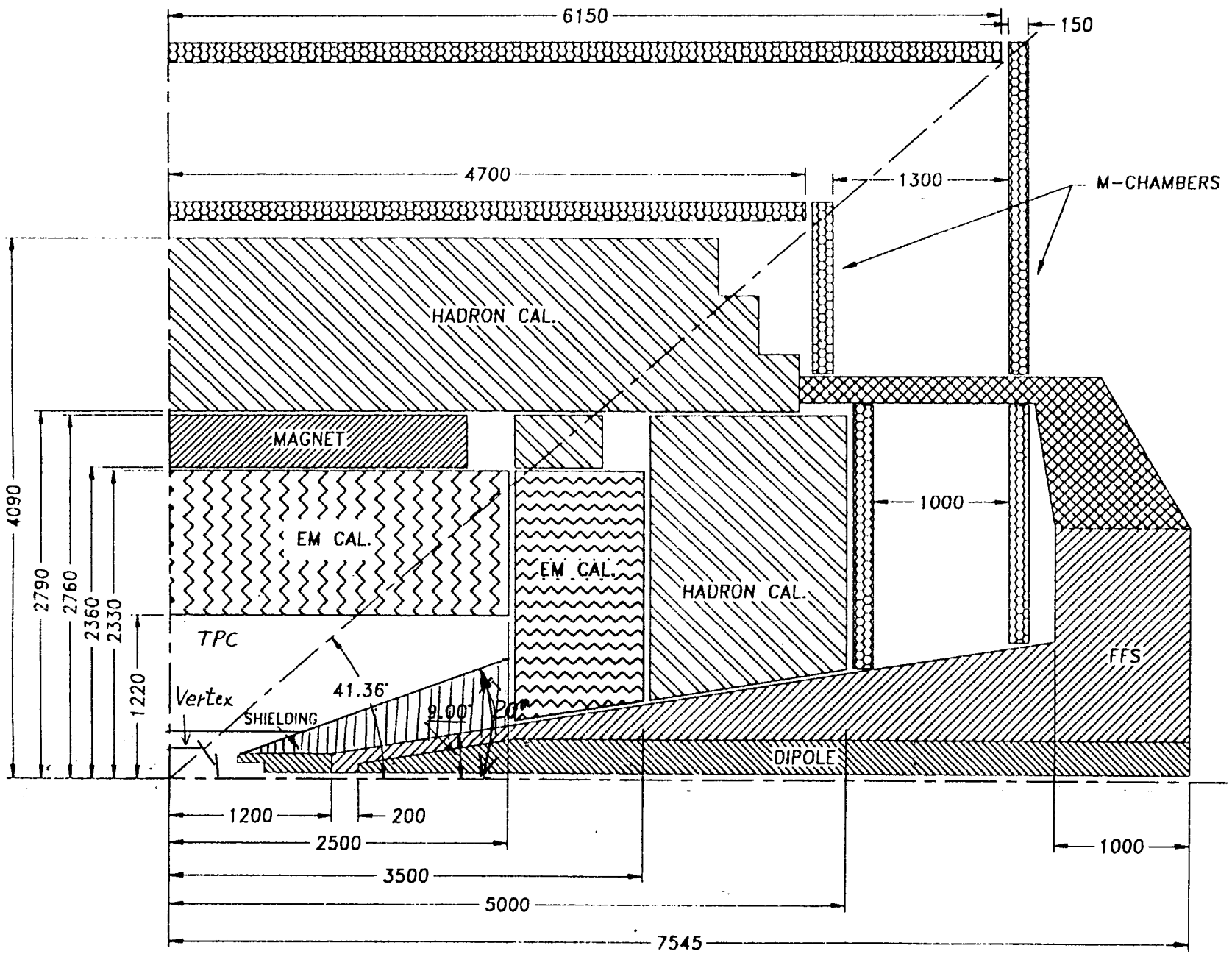
Shielding Configuration to Reduce Backgrounds

- 20 degree conical tungsten shield in forward/backward direction.
- Expanding inner cone from minimum aperture point is set at 4 σ beam size.
- Inverse cone between IP and min aperture point is set to 4 σ beam divergence.
  - Designed so detector does not see surfaces struck by incident electrons.
- Inner surface of each shield shaped into collimating steps and slopes to maximize absorption of electron showers.
  - Reduces low energy electrons in beam pipe.
- High field sweeping dipole magnets placed upstream of 1st quadrupole. These dipoles have collimators inside to sweep decay electrons in advance of final collimation.

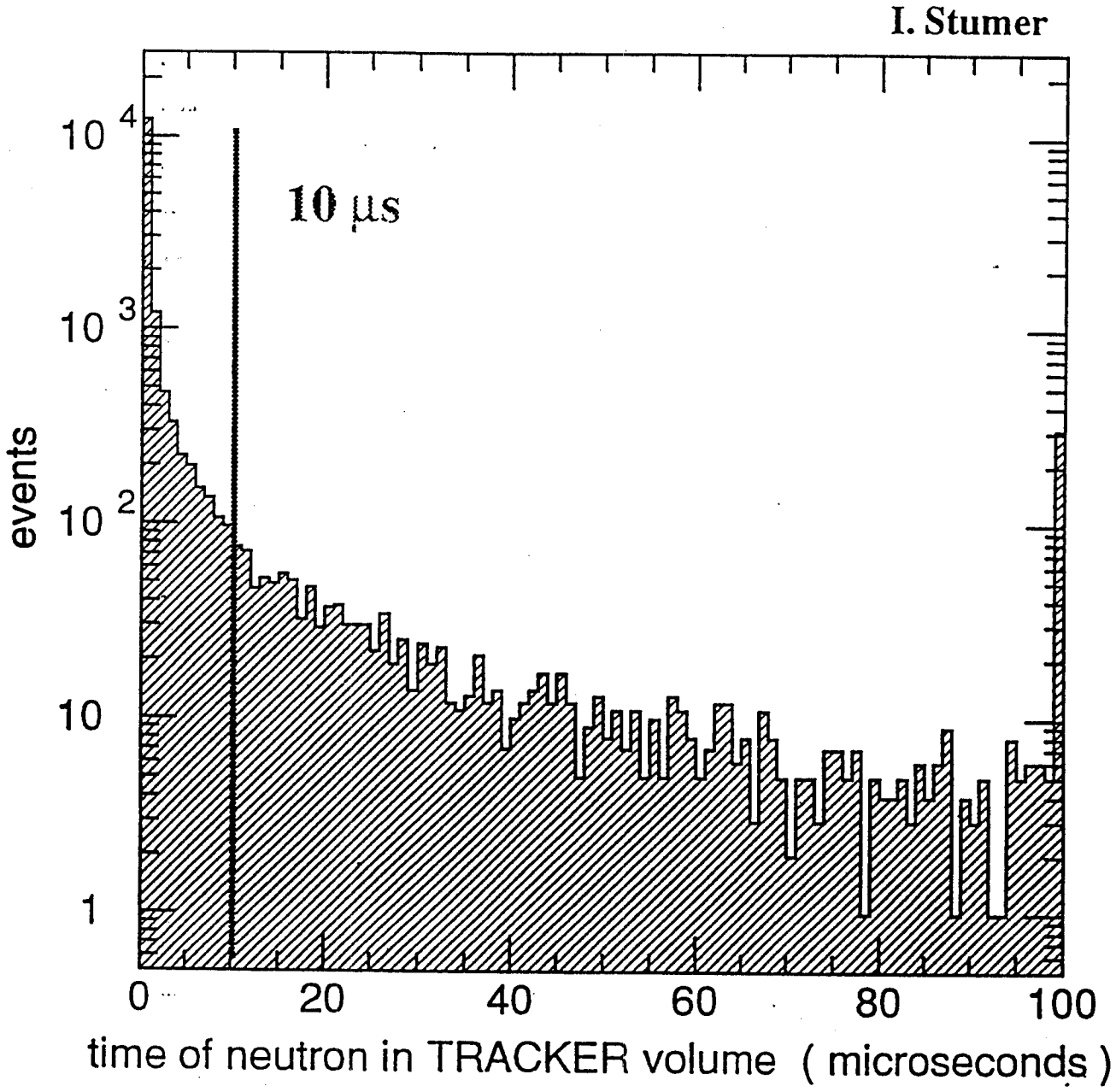


I.22




6150
150
4700
1300
M-CHAMBERS
HADRON CAL.
MAGNET
EM CAL.
EM CAL.
HADRON CAL.
1000
FFS
TPC
Vertex
41.36°
SHIELDING
9.00°
20°
DIPOLE
4090
2790
2760
2360
2330
1220
1200
200
2500
3500
5000
7545
1000

GEANT Result: Neutrino flux time distribution for neutrons in the tracking volume.



- **The neutron flux has fallen by 2 orders of magnitude before the next bunch–bunch crossing at t = 10μs**

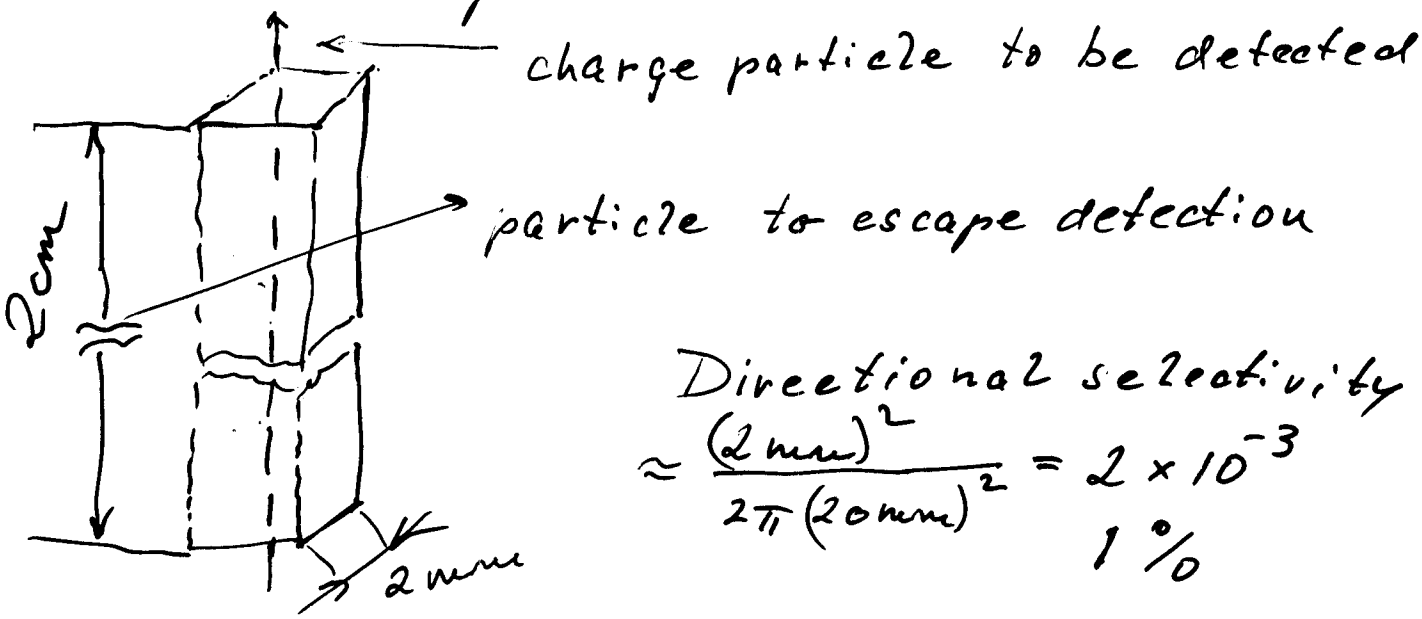
Radiation Hard, Background Blind Detector.

Full advantage of

1) Small size of interaction point

2) Time structure of signal and background.

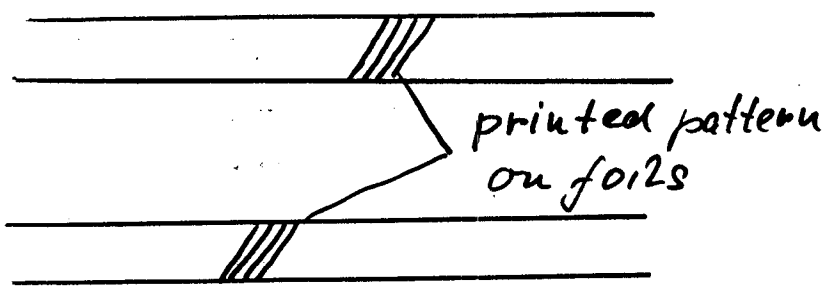
Vertexing & tracking based on Deep Detection Cell.

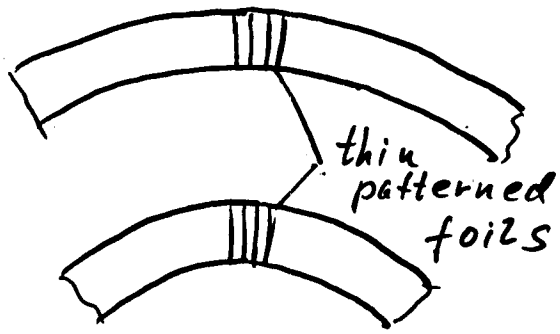


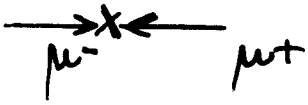
Directional selectivity

$$\approx \frac{(2\,mm)^2}{2\pi(20\,mm)^2} = 2\times10^{-3}$$

1 %

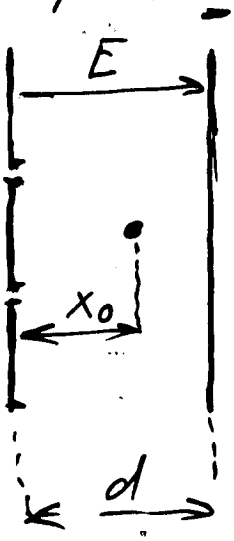


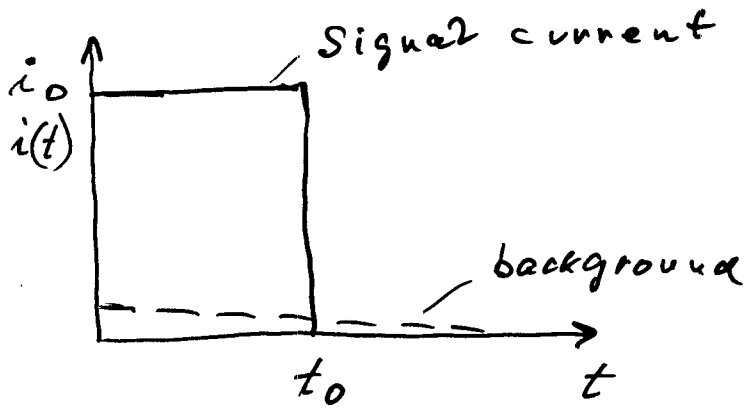




+ intersection point

Top view.





$$i_0 = \frac{Q}{d} \cdot V$$

Q - total charge created along the trajectory of particle (≈ 160 000 el in 2 cm of L Ar)

V - electron drift velocity

Very fine segmented, directional calorimetry.

1) Pure heavy liquid

Elm. Xe; $\lambda = 2.4$ cm $t \approx 60$ cm

$V \approx 40\ m^3$. $\bar{r} = 1.5$ m; $l = 7$ m

$\Delta E/E \approx 3\%/\sqrt{E} + a$

2) "Copy" ATLAS forward

Elm Cu-LAr calorimeter.

$\lambda_{Cu} = 1.43$ cm $t = 40$ cm

$\Delta E/E \approx 30\%/\sqrt{E}$.

Combination of Cu + L Xe ?

$n_{ch} \approx (2-5) \times 10^5$

of the interaction point

$$\delta\vartheta_{vert} \approx \frac{15\,\mu m}{10\,cm} = 0.15\ mrad$$

If we keep tracker at the same quality

$$\delta\vartheta \approx 0.2\ mrad$$

$$\frac{\delta P}{P^2} = \frac{\delta\vartheta}{0.3BL} = \frac{2\times10^{-4}}{1.2\ GeV/c}$$

$$\frac{\delta P}{P} \text{ for } P = 100\ GeV/c \approx 2\%$$

$$P = 1\ TeV \approx 20\%$$

3σ sign determination

$$P_{max} = \frac{0.3BL}{3\cdot\delta\vartheta} = \frac{1.2\ GeV}{0.6\times10^{-3}} = 2\ TeV$$

Not good enough for 100 TeV option.

Larger B, R – better measurements of points.