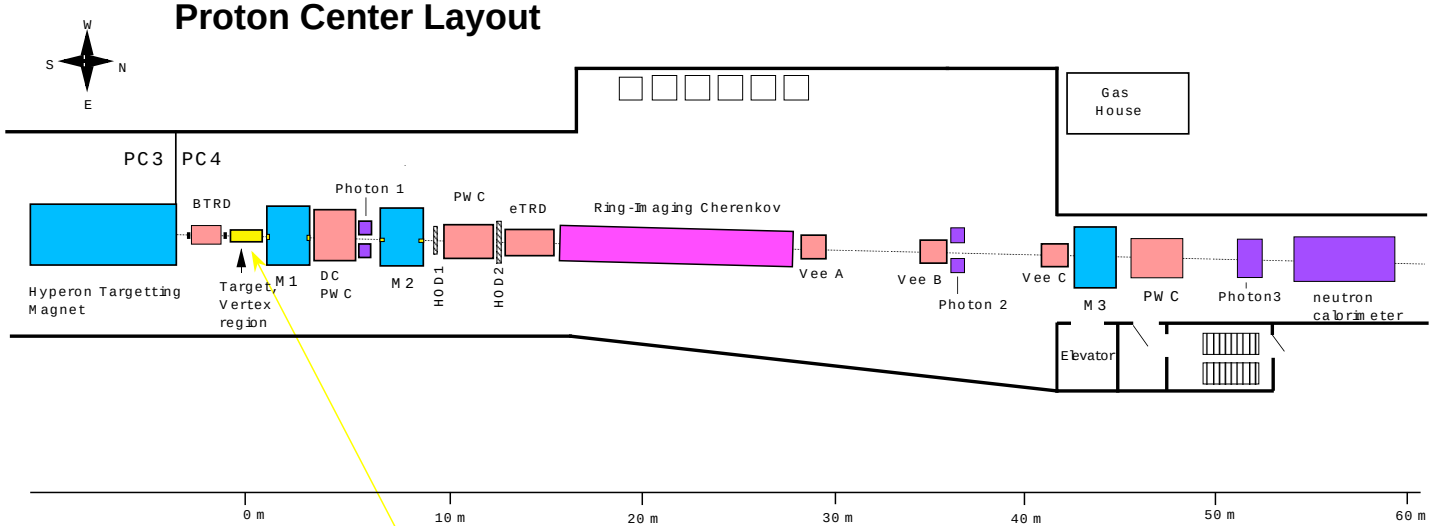
Introduction to the SELEX Ring Imaging C•renkov Counter (RICH)

Earl C. Swallow

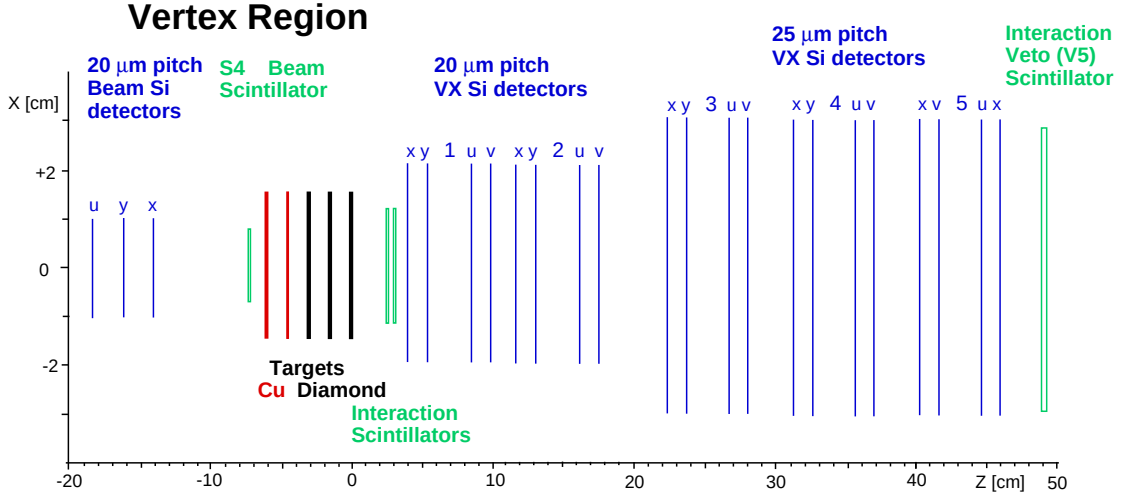
Elmhurst College &
The University of Chicago

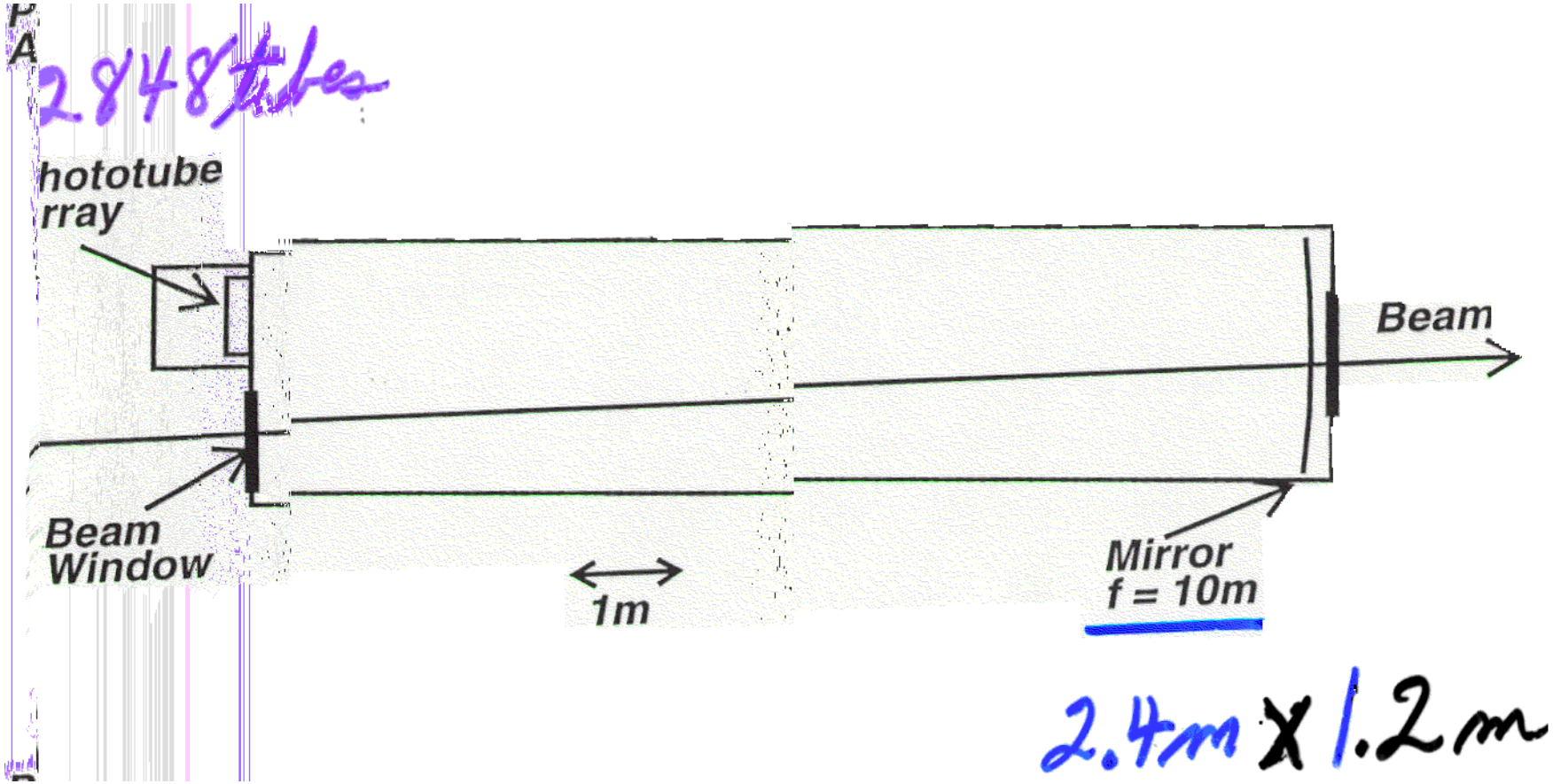
P907 Collaboration Meeting
September 29, 2000

Selex (E781)
Proton Center Layout

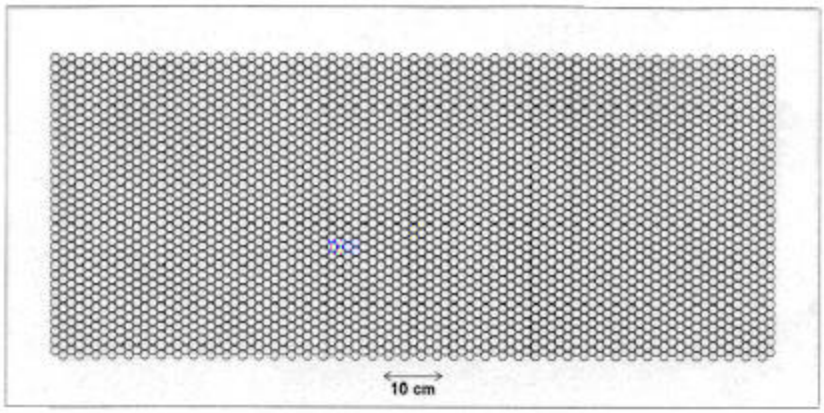


Vertex Region




2848 tubes
hototube
rray
Beam
Beam
Window
1m
Mirror
f = 10m
2.4m x 1.2m

150cm X 50cm active area

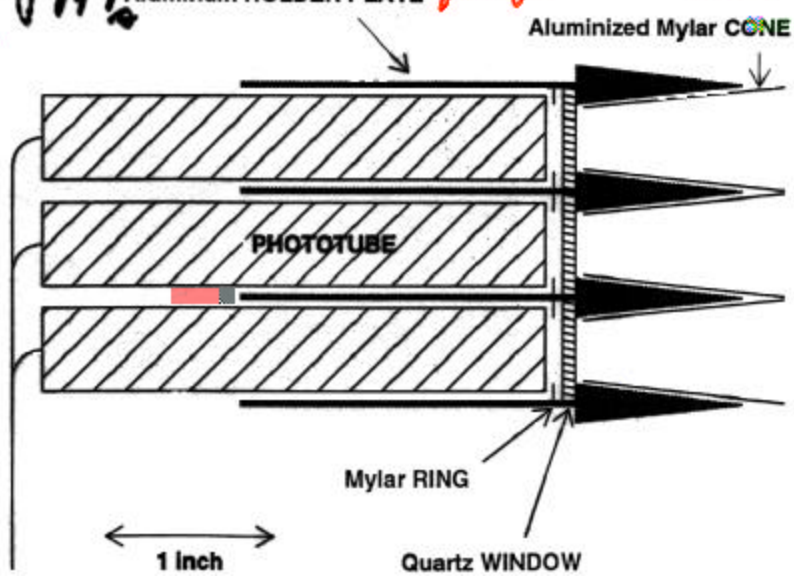


608 R760 + 2240 FEUL

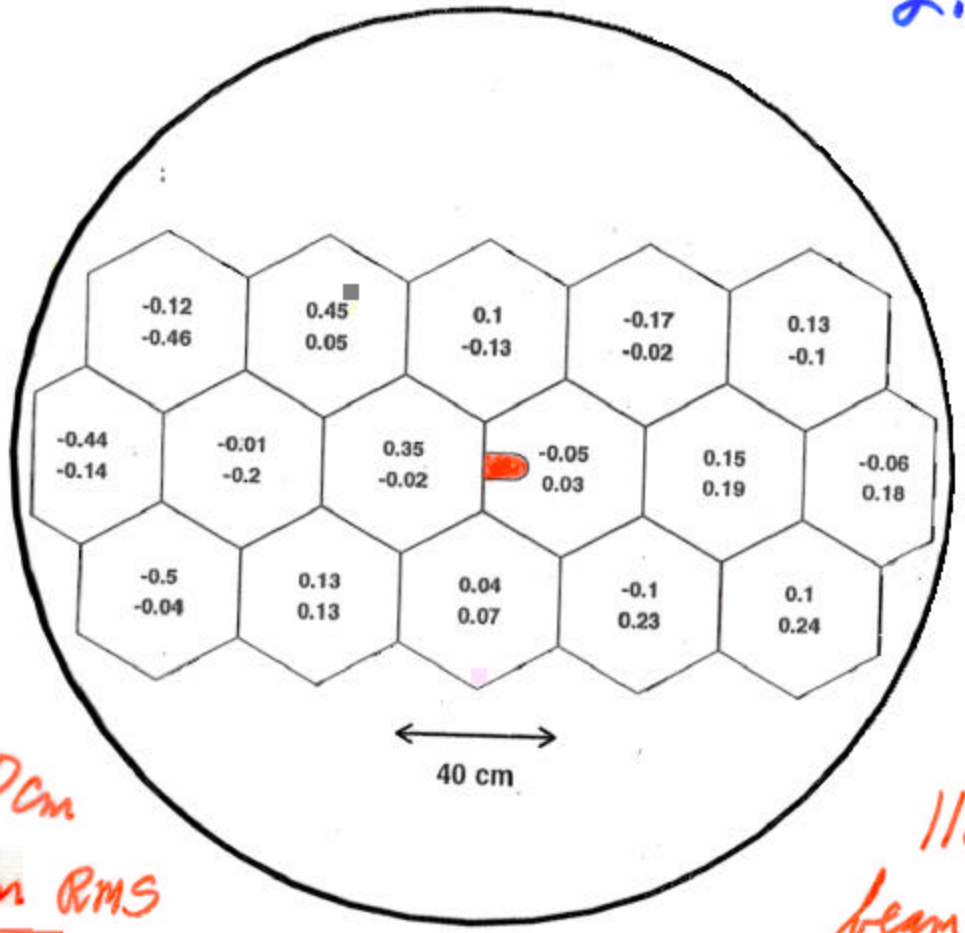
quartz

wavelength shifter

2847 PMT



2.4m x 1.2m



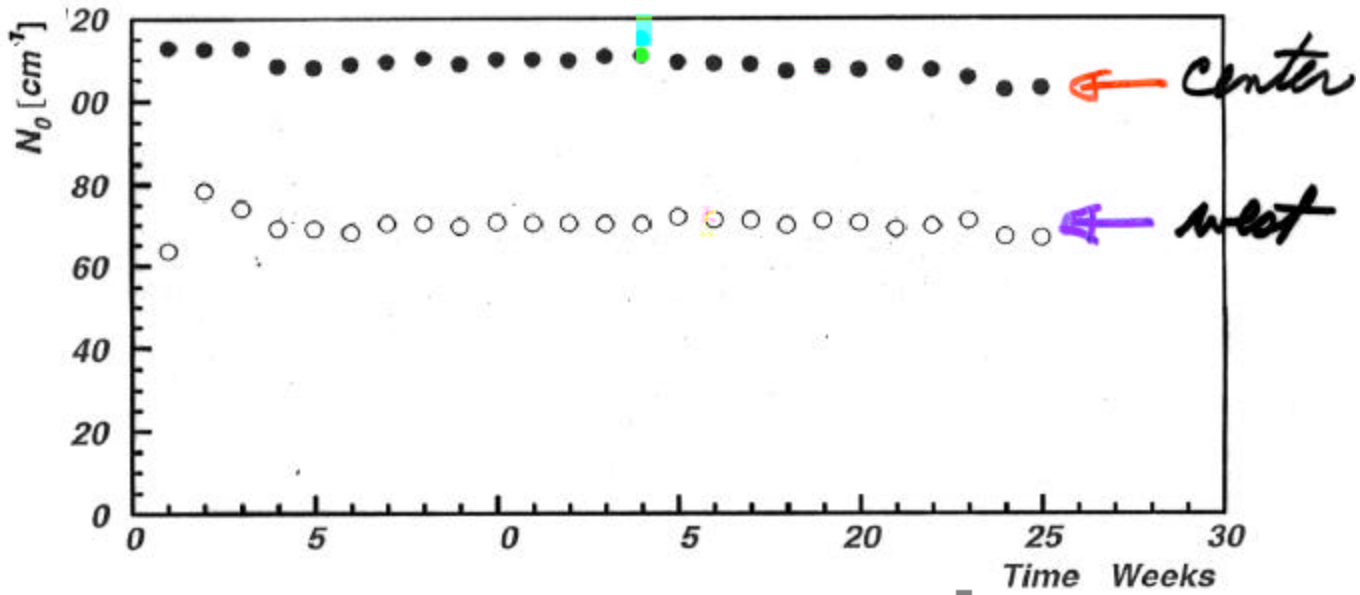
f = 990cm
± 2.5cm RMS

11cm x 6.8cm
beam hole

Neon @ 1.05 atm

$\delta \equiv n - 1 = 67 \times 10^{-6}$

$N_{pe} = \underline{N_0} L \sin^2(\theta_c)$



13.2 "hits"/ring typical e^-

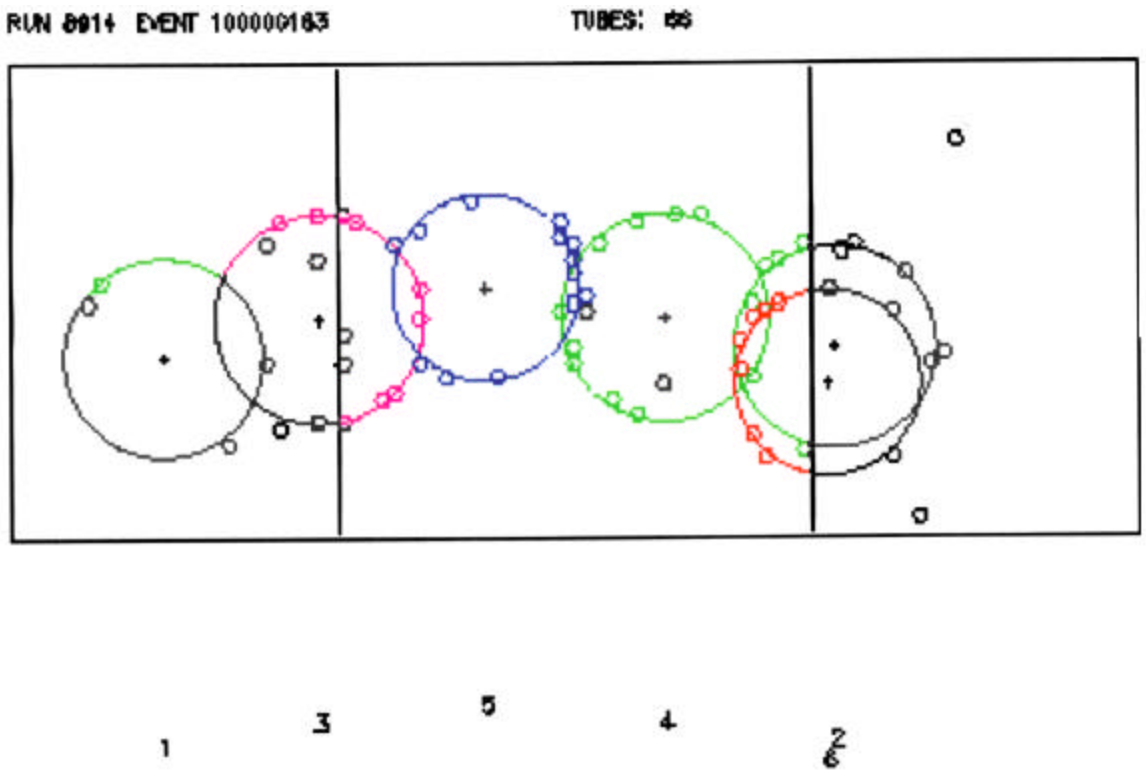
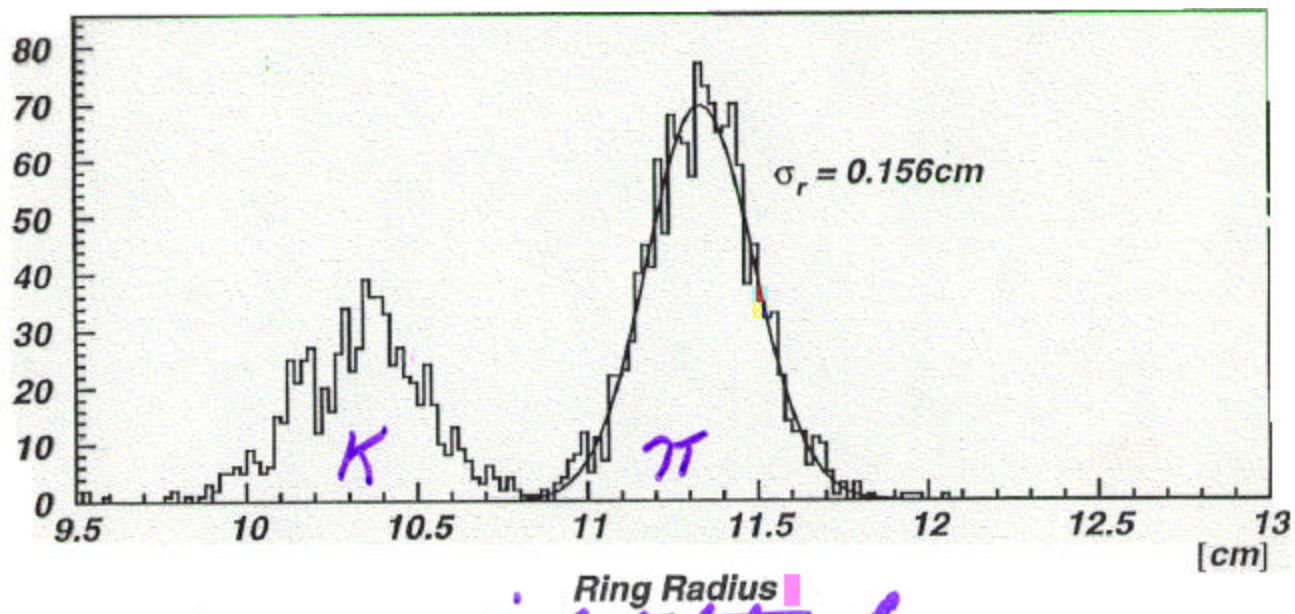


Fig. 2. Single event display.

each track in the event. The algorithm uses tracking information for the ring centers and then examines hypotheses for several different particle types for each track. For example, track 5, with momentum of 180 GeV/c, has been identified as a proton with likelihood more than 100 times that for being a pion, kaon or heavier mass particle.

Figure 3 demonstrates the power of good particle identification, showing the



$\sigma_r = 5.5\,mm$

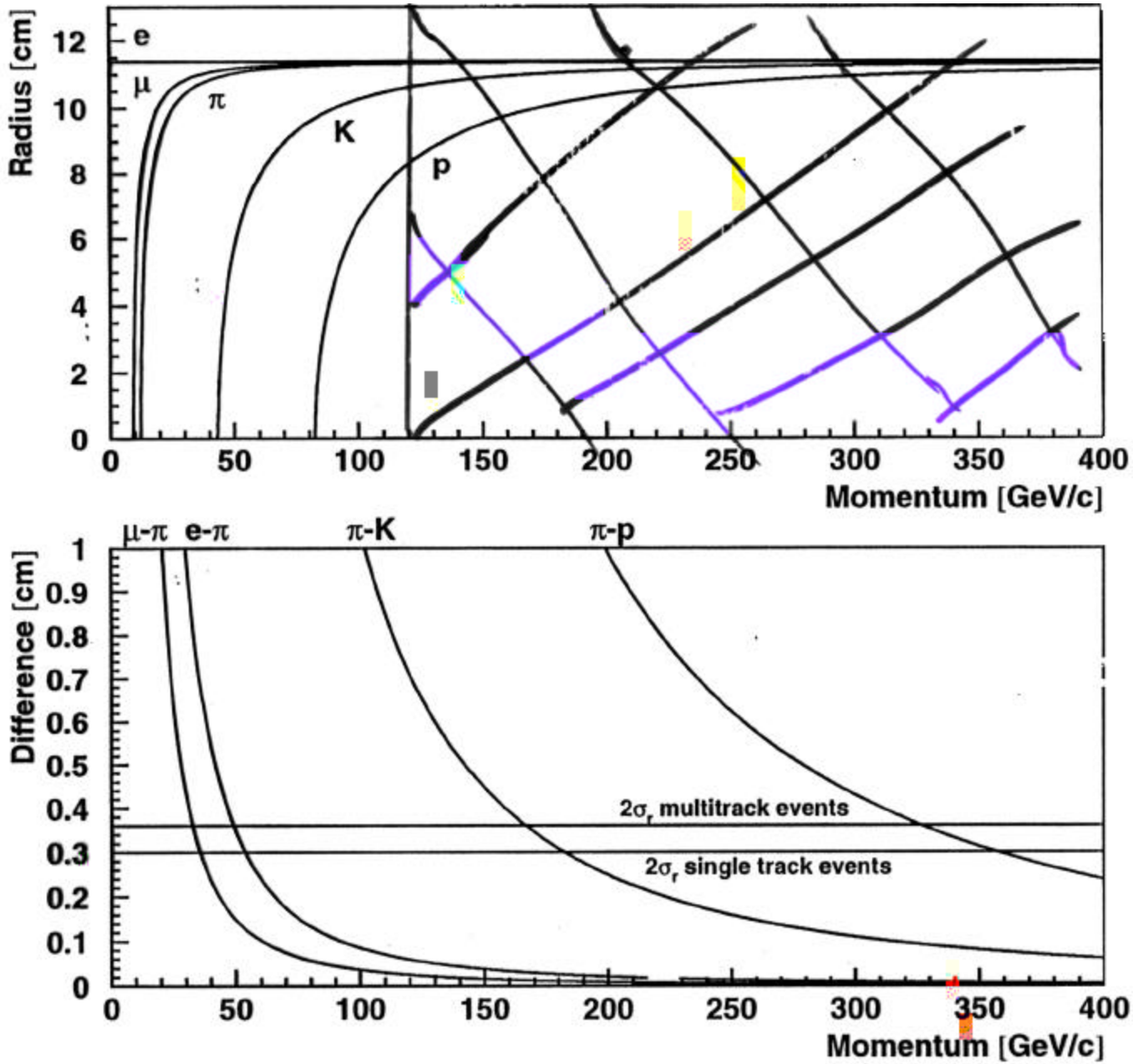
$\sigma_{r1} = 1.56\,mm$

$\sigma_{rm} = 1.8\,mm$

isolated tracks

95 – 105 GeV/c

$$\sigma_r \cong \frac{\sigma_1}{\sqrt{N_{hit}}}$$


Radius [cm]
e
μ
π
K
p
Momentum [GeV/c]
Difference [cm]
μ-π
e-π
π-K
π-p
2σ_r multitrack events
2σ_r single track events
Momentum [GeV/c]

Some Possible P907 RICH Gasses

GAS	, = n-1 (10^{-6})	dispersion F_h (mm)	UV cutoff (nm)	r_1 (cm)	scint. light	Threshold Momentum (GeV/c)		
						B	K	p
Ne	67	1.2	<170	11.6	low?	12	43	81
Ar	283	?	?	23.8	?	6	21	39
N_2	298	2.8	<170	24.4	HIGH	6	20	38
CO_2	410	3.1	~200	28.6	modest	5	17	33

$ = 1 - *

n = 1 + ,

$$N_{pe} = N_0 L \sin^2(2_C) - N_0 L 2 (, - *)$$

$$r_{\$} = f\, 2_C - f\, [2 (, - *)]^{1/2}$$

$$r_1 - f\, [2\ ,]^{1/2}$$

$$P_{th} - M/[2\ ,]^{1/2}$$

Subsystem Concerns and Issues

- FEU60 ownership ($$)
- FEU60 wavelength shifter condition
- Readout system status
- Partial ring reconstruction
- New gas choice
- HV system status
- LV system status
- Gas filling system status & new gas
- Gas monitoring systems
- Gas seal
- LED pulsing system
- Temperature control system
- Mirror alignment
- Spares
- Epicure monitoring readout
- Staging area?