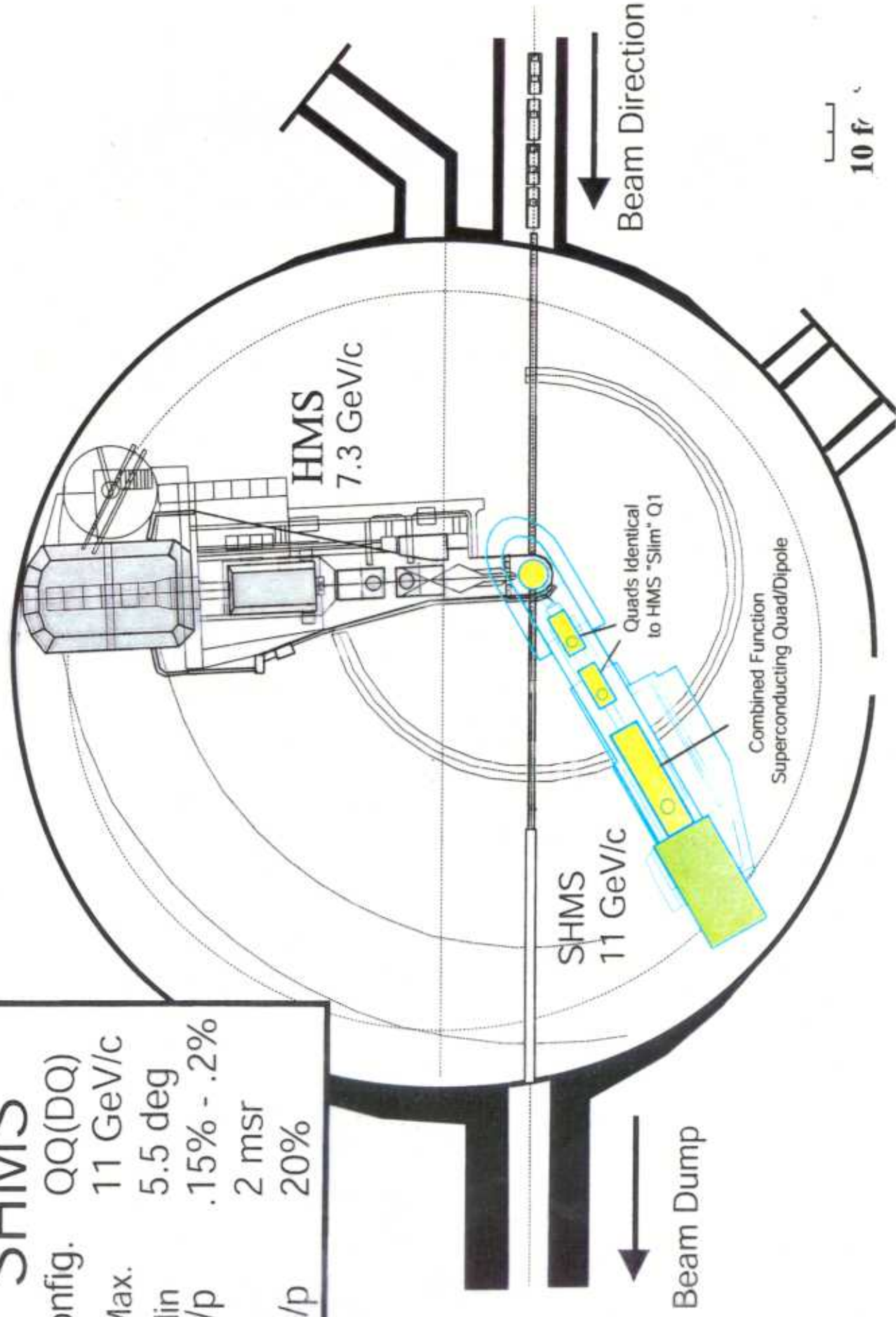


New Hall C "Core" Spectrometers

SHMS
Config. QQ(DQ)
P_{Max} . 11 GeV/c
θ_{Min} 5.5 deg
$\delta p/p$.15% - .2%
Ω 2 msr
$\Delta p/p$ 20%



Constraints imposed by the physics objectives:

- Maximum momentum of 11 GeV/c (CT)
- Minimum central angle of 5.5° (F_π)
- Maximum angle of 30° ($N \rightarrow N^*$)
- Moderately good resolution in momentum and angle ($N \rightarrow N^*$)
- Larger vertical than horizontal angular acceptance. ($F_\pi, N \rightarrow N^*$)

Characteristics needed to match the SHMS to the HMS:

- Moderate solid angle (2-3 msr in small angle mode).
- Full acceptance of a 15 cm cryotarget cell at $\Theta_{shms} = 30^\circ$
- Minimum opening angle of the SHMS-HMS pair to be $5.5^\circ + 10.5^\circ = 16^\circ$.

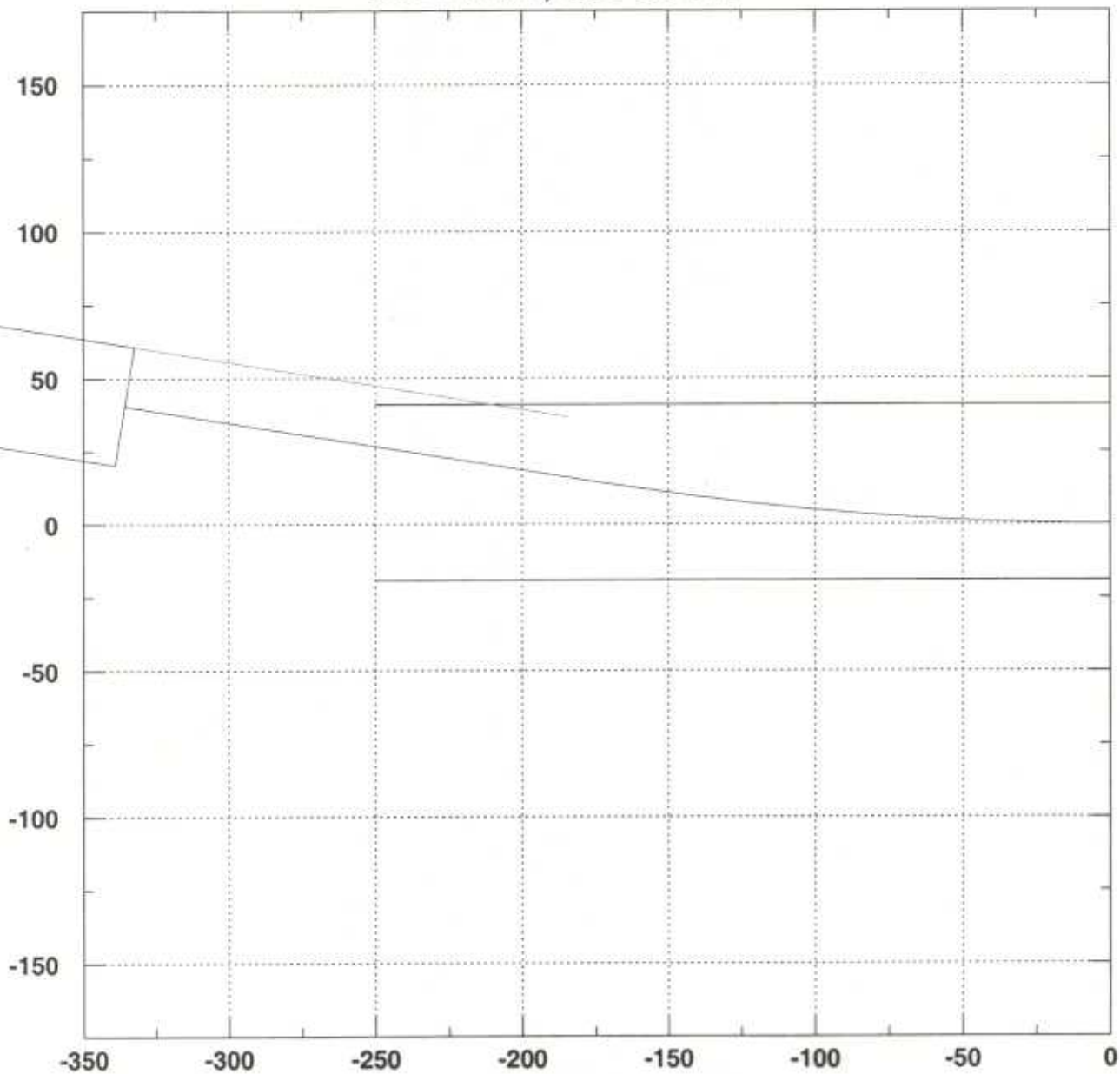
Miscellaneous considerations:

- Distance to the focal plane less than 19 meters.
- Bend angle of the dipole larger than 15° .
- Point to Point tune.
- Assume two first quads are HMS Q1-type.

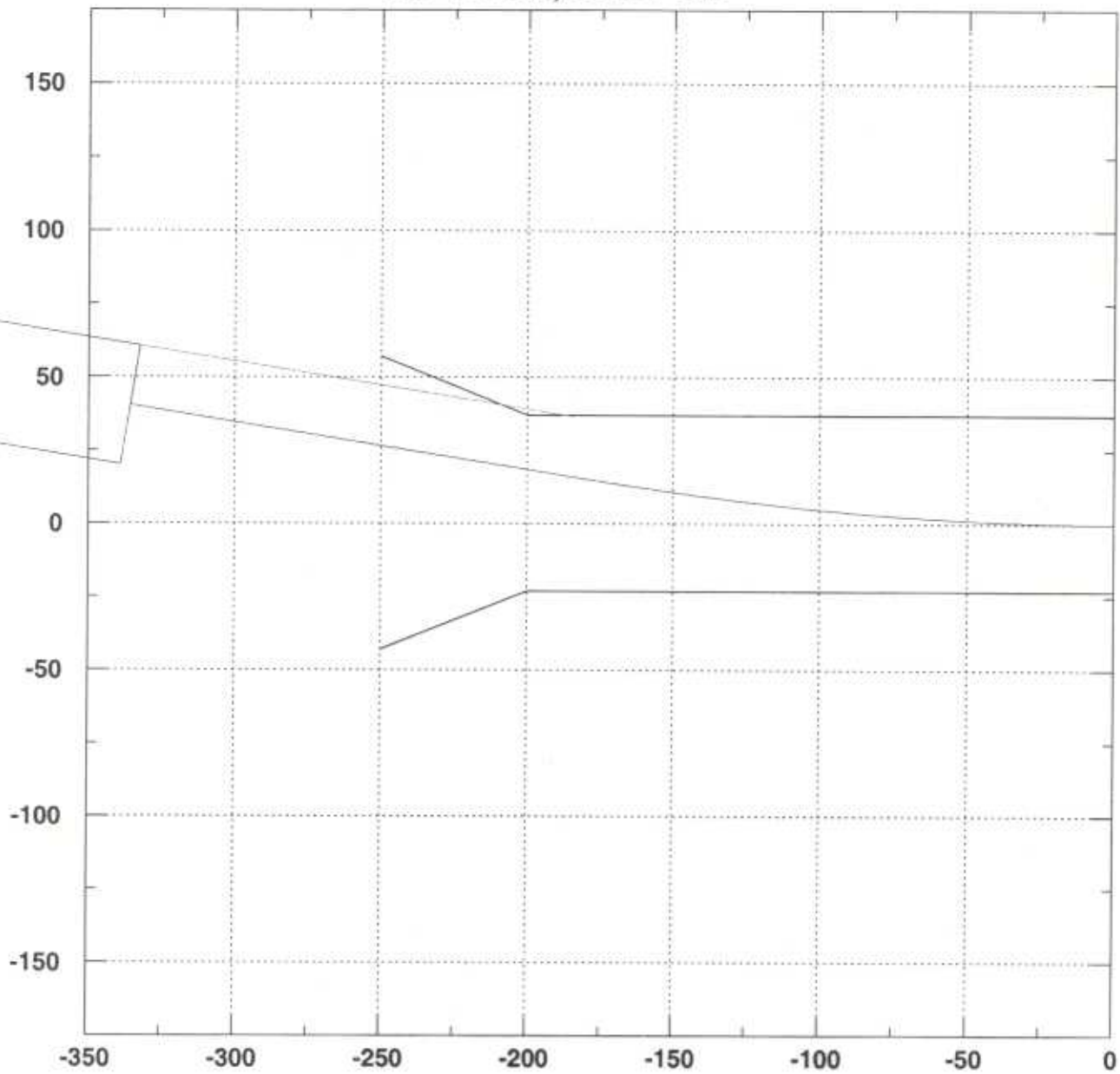
Basic parameters of the SHMS

Max. Central Momentum	11 GeV/c
Min. scattering angle	5.5°
Momentum resolution	.15%-.2%
xptar,yptar resolution	1-2 mrad, 1-2 mrad
Ytar resolution	.2-.6 cm
Vertical acceptance	±42 mrad
Horizontal acceptance	±14 mrad
Solid angle	2 msr (small angle mode)
Momentum acceptance	20%
Opening angle with HMS	16°
Configuration	QQ(DQ)
Bend Angle	18.4°
Focusing mode	Double
Max. rigidity	400 kG-m
Dispersion	1.764 cm/%
D/M	1.20 cm/%
Mx	1.47
My	1.02
Focal plane angle	4.88°
Focal plane dimension	40 cm (X) x 20 cm (Y)
Optical length	18.5 m

AP=30 cm, CR=11 cm



AP=30 cm, CR=7 cm



Basic parameters of the DQ combined function magnet.

overall length	5 m
warm bore radius	30 cm
stored energy	11 MJ

DIPOLE:

configuration	4-sector $\cos(\theta)$ superconducting
Int(B.dl)	11.9 Tesla-m
Effective Length	3.45 m
B(0,0,0)	3.446 Tesla
Field Uniformity dB/B	1e-3 inside 30 cm
Current Density	11,000 amp/cm ²
Peak Force on Coil	40,000 lbs/in
Peak Pressure	3390 psi

8.7 GeV/c
> 10°?

± 65 mrad
± 24 mrad
4.4 mrad

QUADRUPOLE:

configuration	2-sector $\cos(2\theta)$ superconducting
Gradient (0,25,0)	3.337 Tesla/m
Int(Gradient)	10.99 (Tesla/m)m
Effective Length	3.29 m
Gradient Uniformity dG/G	1e-3 at 30 cm
Current Density	4000 amp/cm ²
Peak Force on coil	11,000 lbs/in
Peak Pressure	1290 psi

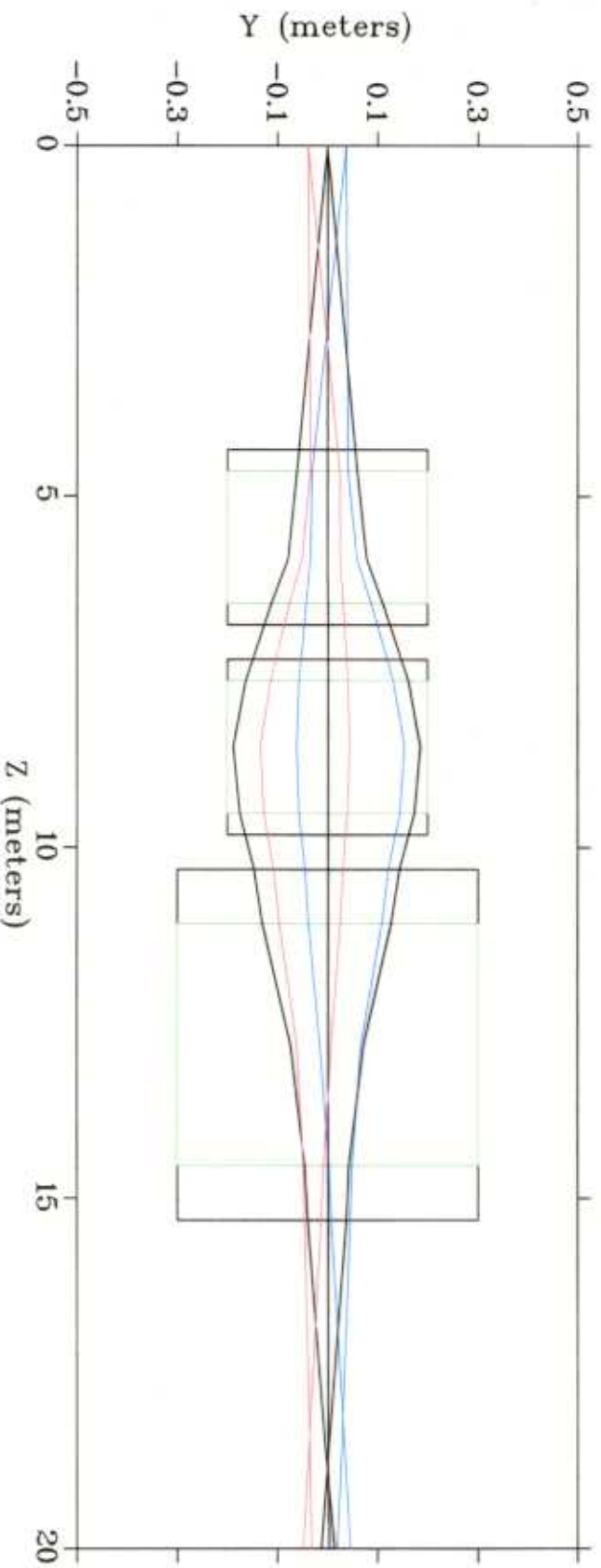
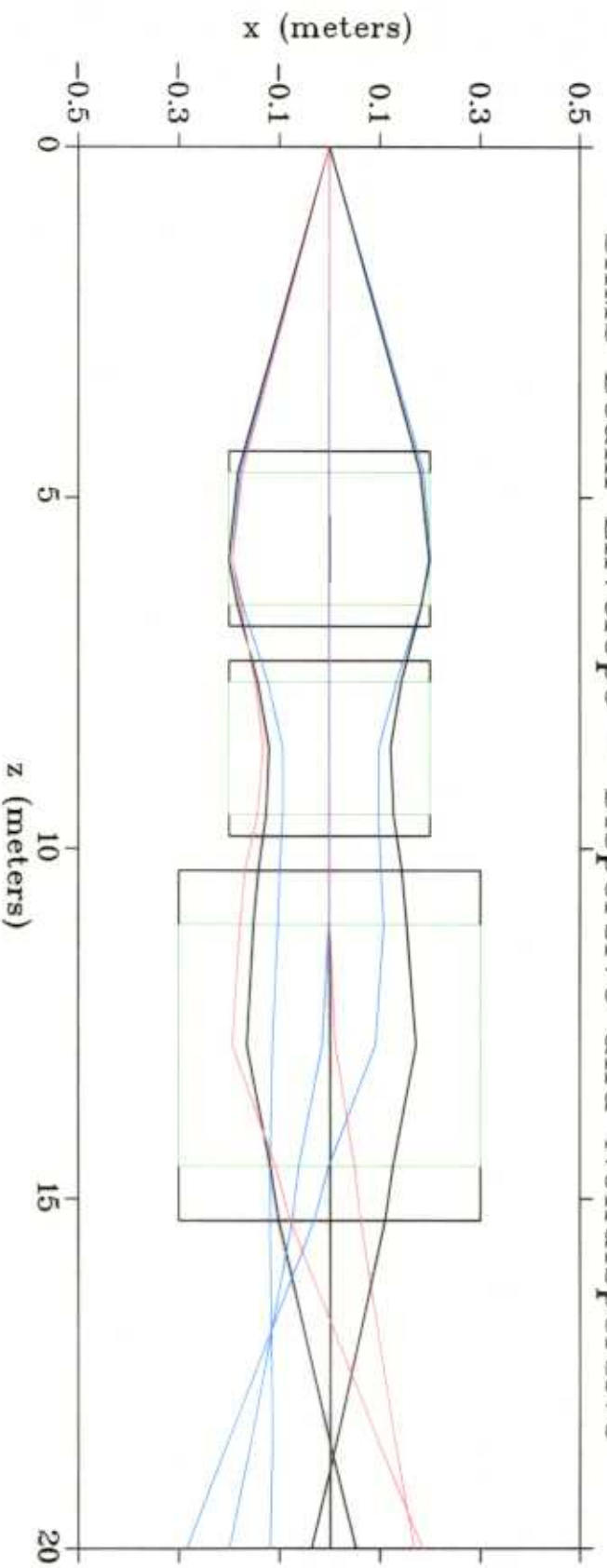
> 25°?

Main characteristics of the SHMS superconducting quadrupoles.

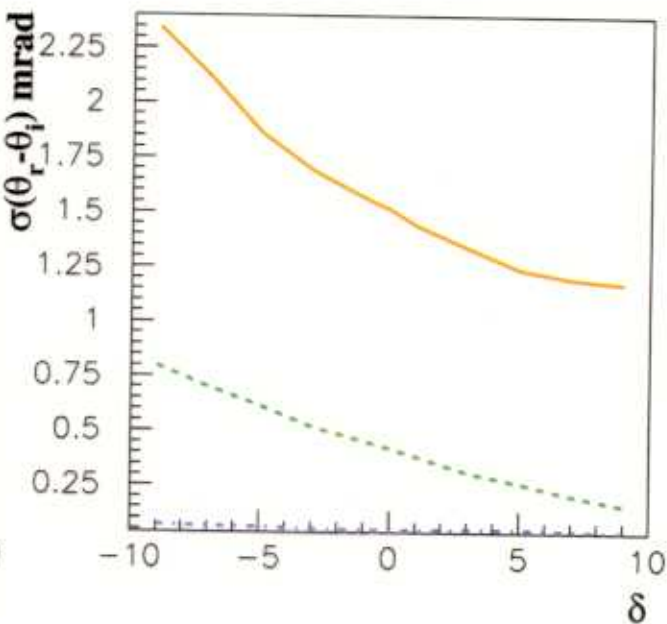
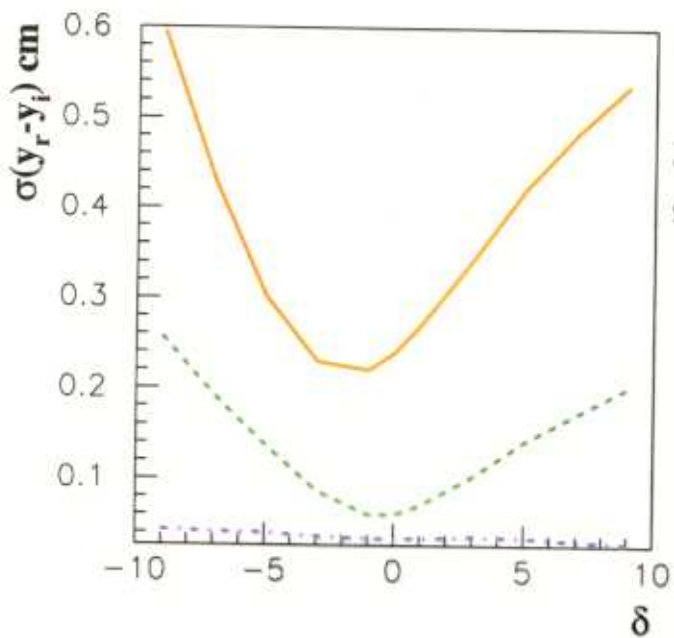
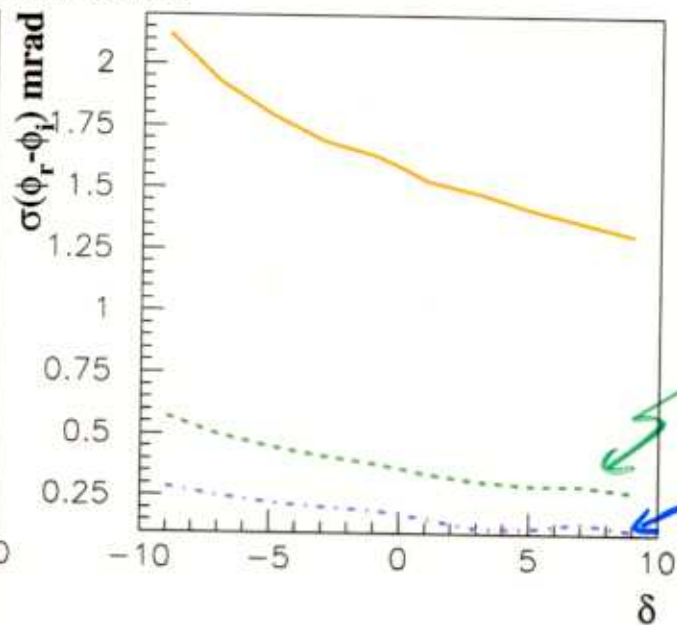
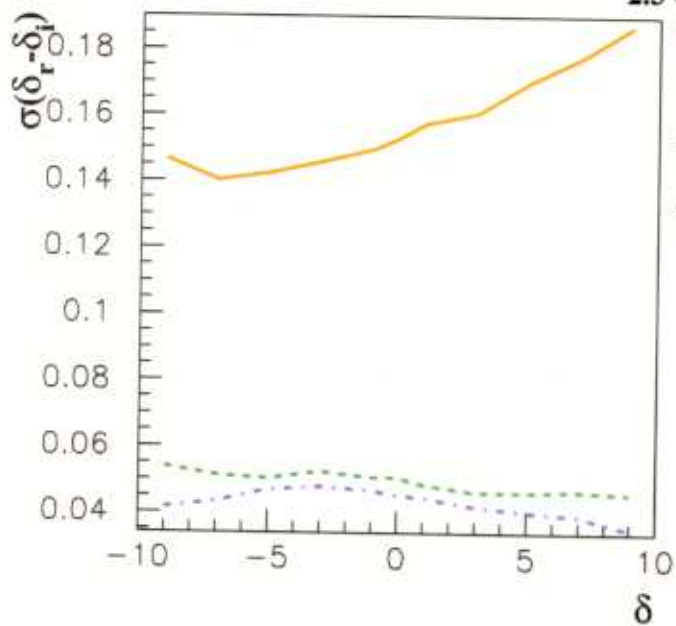
Effective Length	1.89 m
Maximum Gradient	8.4 T/m
Warm Bore Diameter	40 cm
Current at Max. Grad.	1200 A
Higher Order Multipoles	< 1% at 1000 A
Overall Length	2.5 m

50 cm x 35 cm

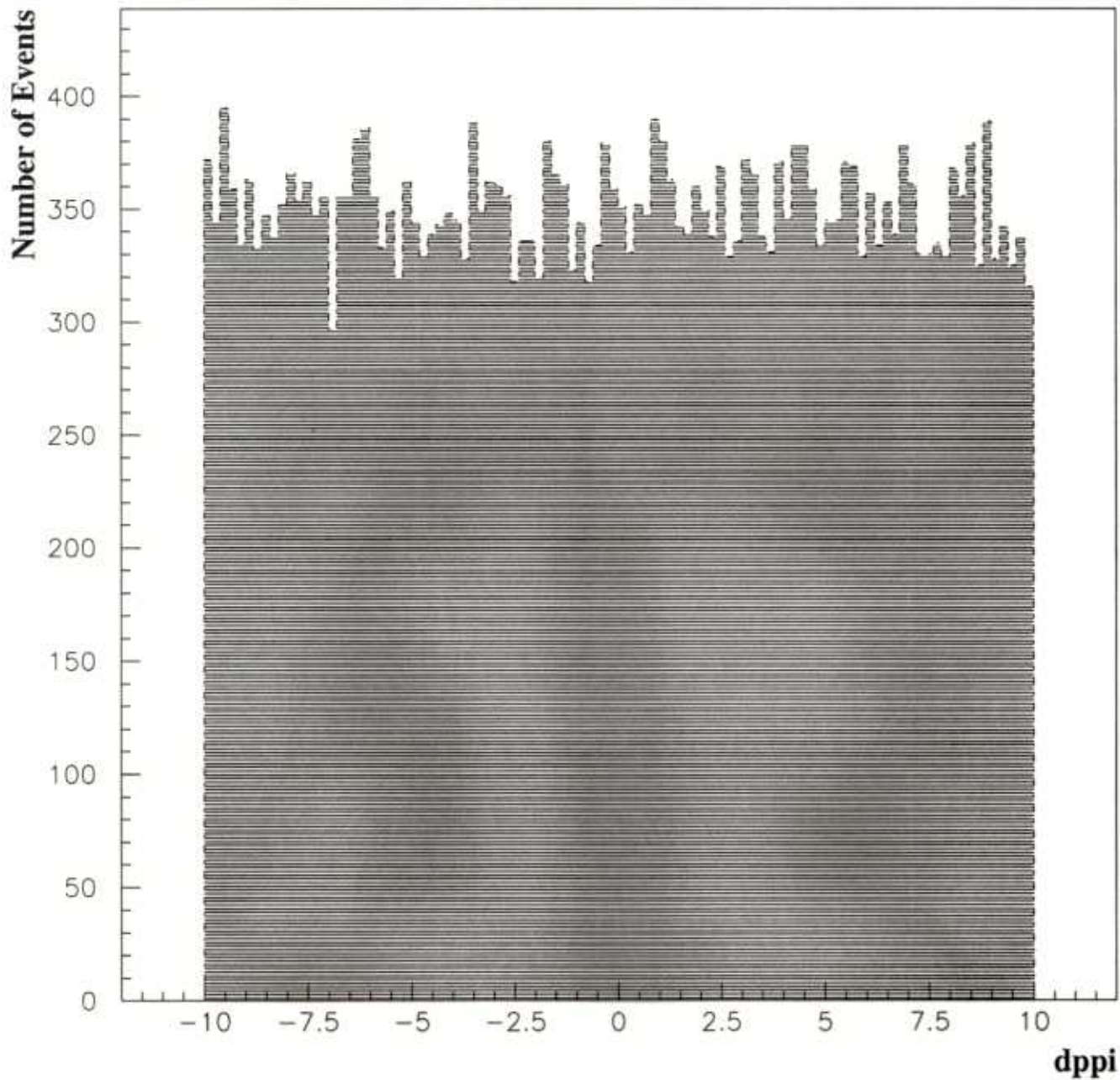
SHMS Beam Envelope – Dispersive and Nondispersive



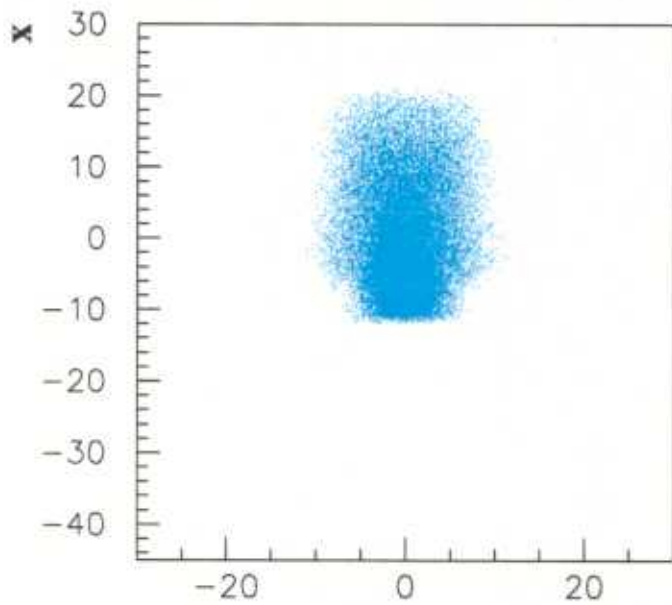
2.5 GeV electron



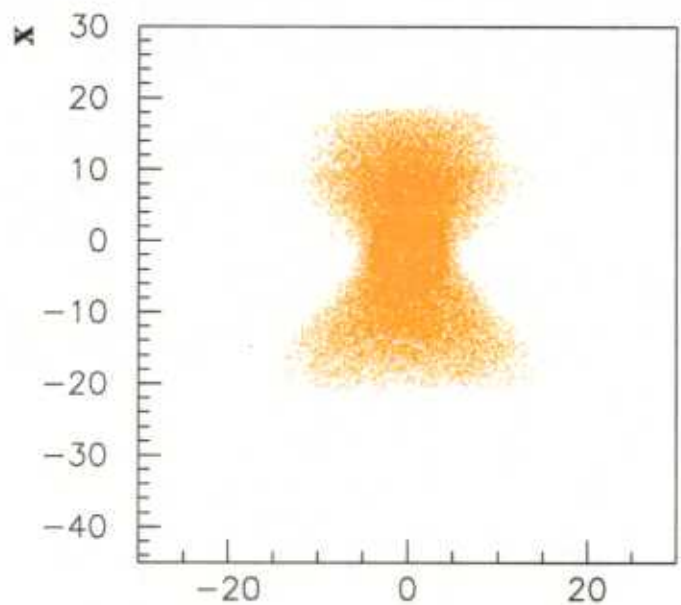
2.5 GeV electron



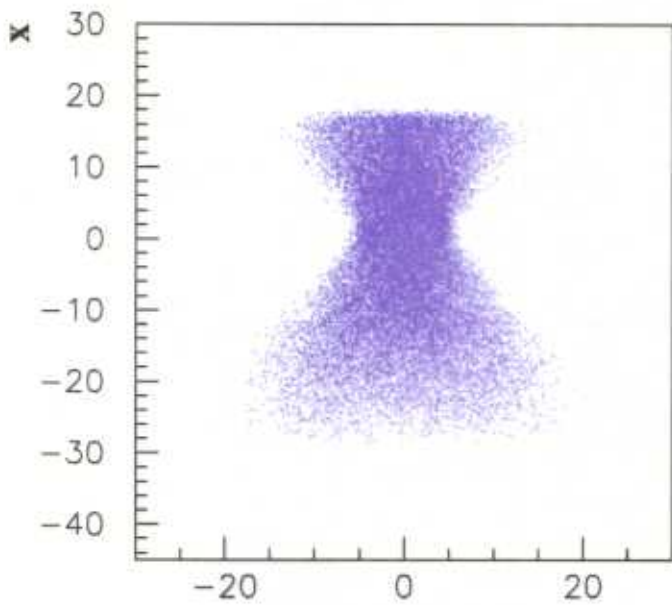
SHMS nominal tune



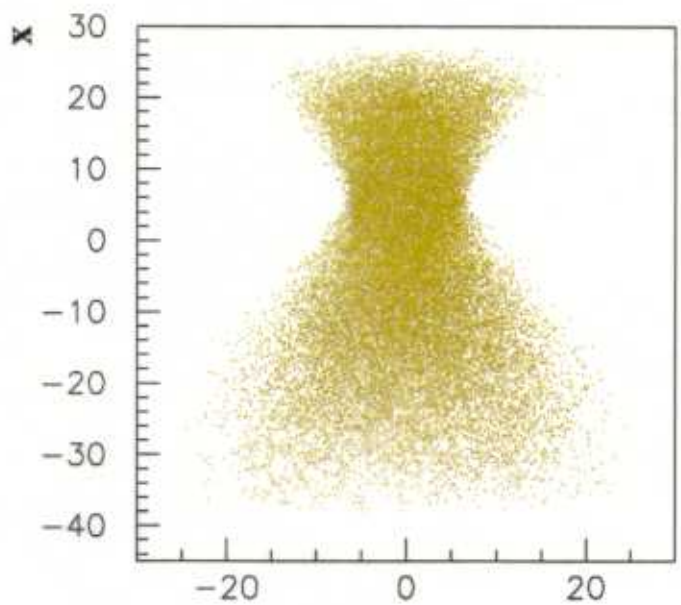
Low Pressure Cerenkov



Focal Plane

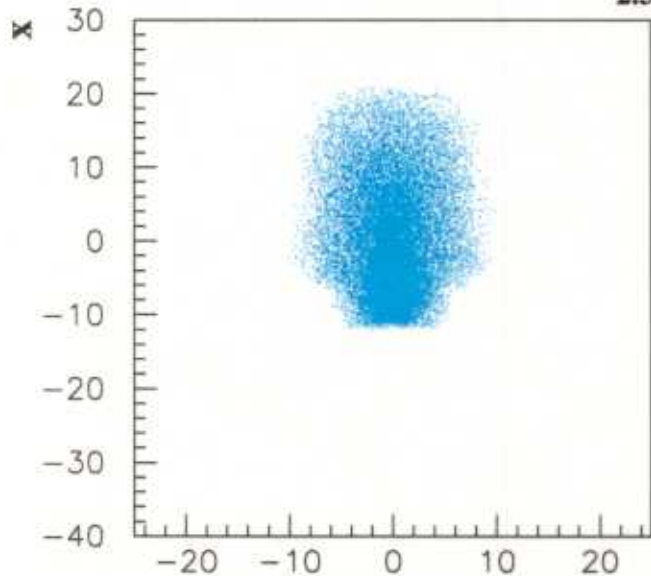


High Pressure Cerenkov

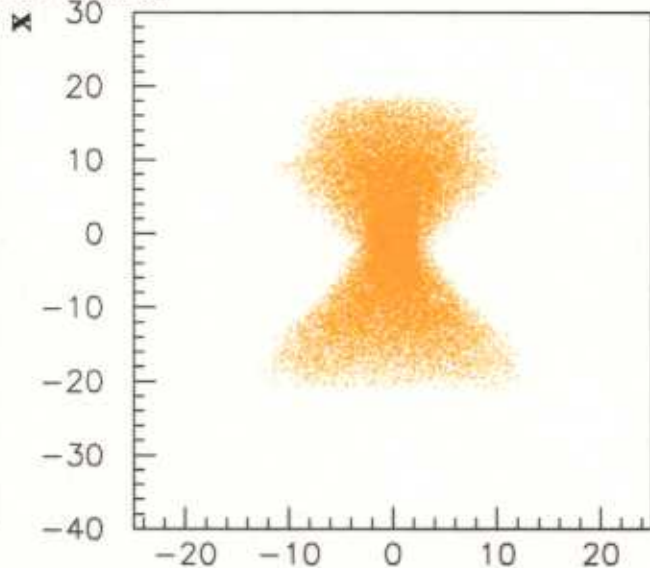


Shower Counter

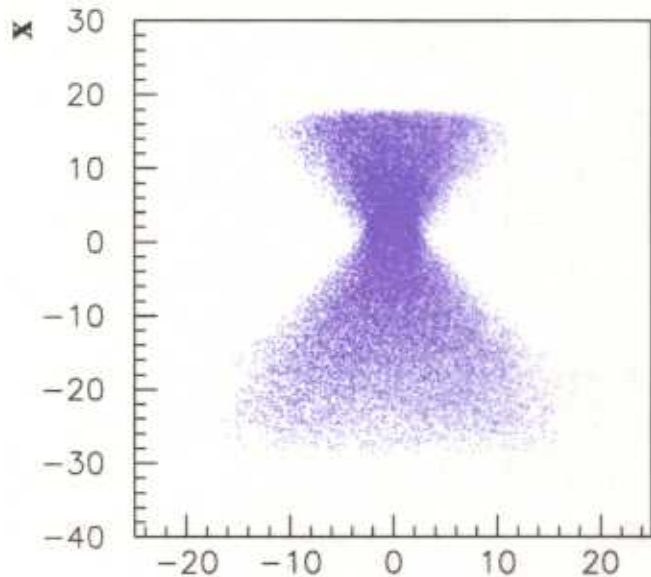
2.5 GeV electron



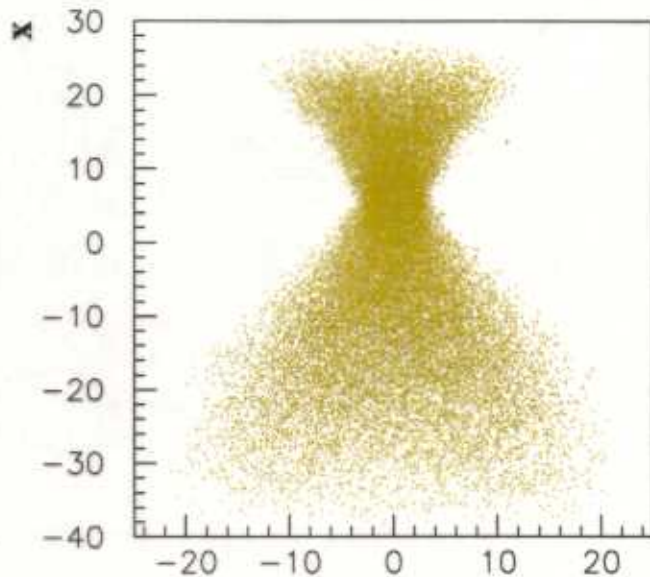
Low Pressure Cerenkov



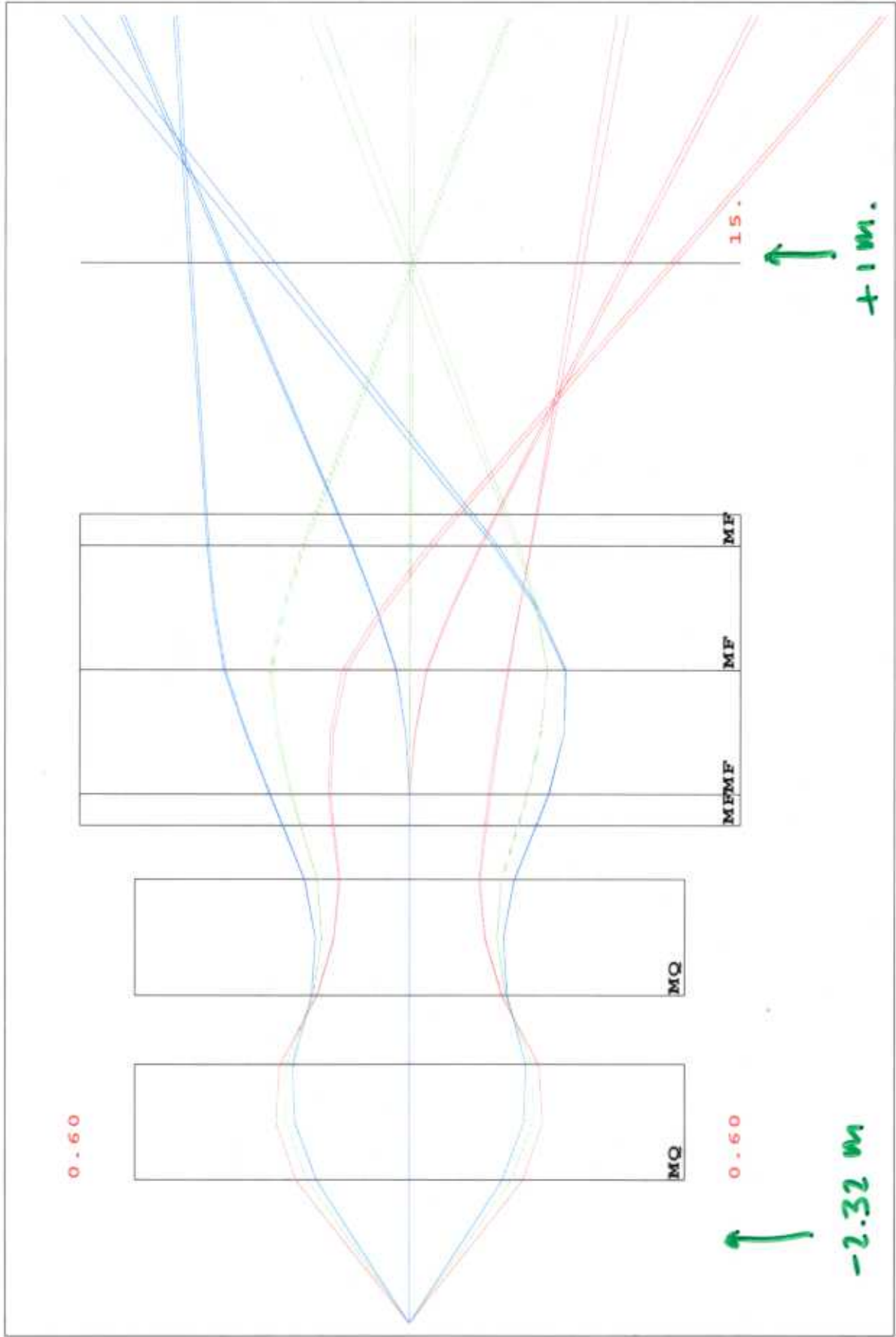
Focal Plane



High Pressure Cerenkov



Shower Counter



$\Theta > 8.5^\circ$
 $P \leq 8.7 \text{ GeV/c}$

Uniform illumination Monte-Carlo results

Spectrometer setting:

3.000000 = P spect (GeV)
~~90.000000~~ = TH spect (deg)

Monte-Carlo limits:

10.000000 = GEN_LIM(1) - DP/P (half width, %)
40.000000 = GEN_LIM(2) - Theta (half width, mr)
80.000000 = GEN_LIM(3) - Phi (half width, mr)
.1000000E-01 = GEN_LIM(4) - HORIZ (full width of 3 sigma cutoff, cm)
.1000000E-01 = GEN_LIM(5) - VERT (full width of 3 sigma cutoff, cm)
7.500000 = GEN_LIM(6) - Z (Full width, cm)

Summary:

500000 Monte-Carlo trials:

0 stopped in the FIXED SLIT HOR
0 stopped in the FIXED SLIT VERT
0 stopped in the FIXED SLIT OCTAGON
3283 stopped in Q1 ENTRANCE
102589 stopped in Q1 MIDPLANE
85307 stopped in Q1 EXIT
94547 stopped in Q2 ENTRANCE
29493 stopped in Q2 MIDPLANE
374 stopped in Q2 EXIT
0 stopped in BP ENTRANCE
6351 stopped in D1 ENTRANCE
5033 stopped in D1 MIDPLANE
0 stopped in D1 EXIT
0 stopped in BP EXIT

173023 Trials made it to the hut

0 Trials were cut in dc1
0 Trials were cut in dc2
0 Trials were cut in s1
0 Trials were cut in s2
0 Trials were cut in s3
0 Trials were cut in cal

173023 Trials passed all cuts and were histogrammed.

DPP resolution = .1661233 %
DTH resolution = 1.791283 mr
DPH resolution = 2.476526 mr
YTG resolution = .3206622 cm

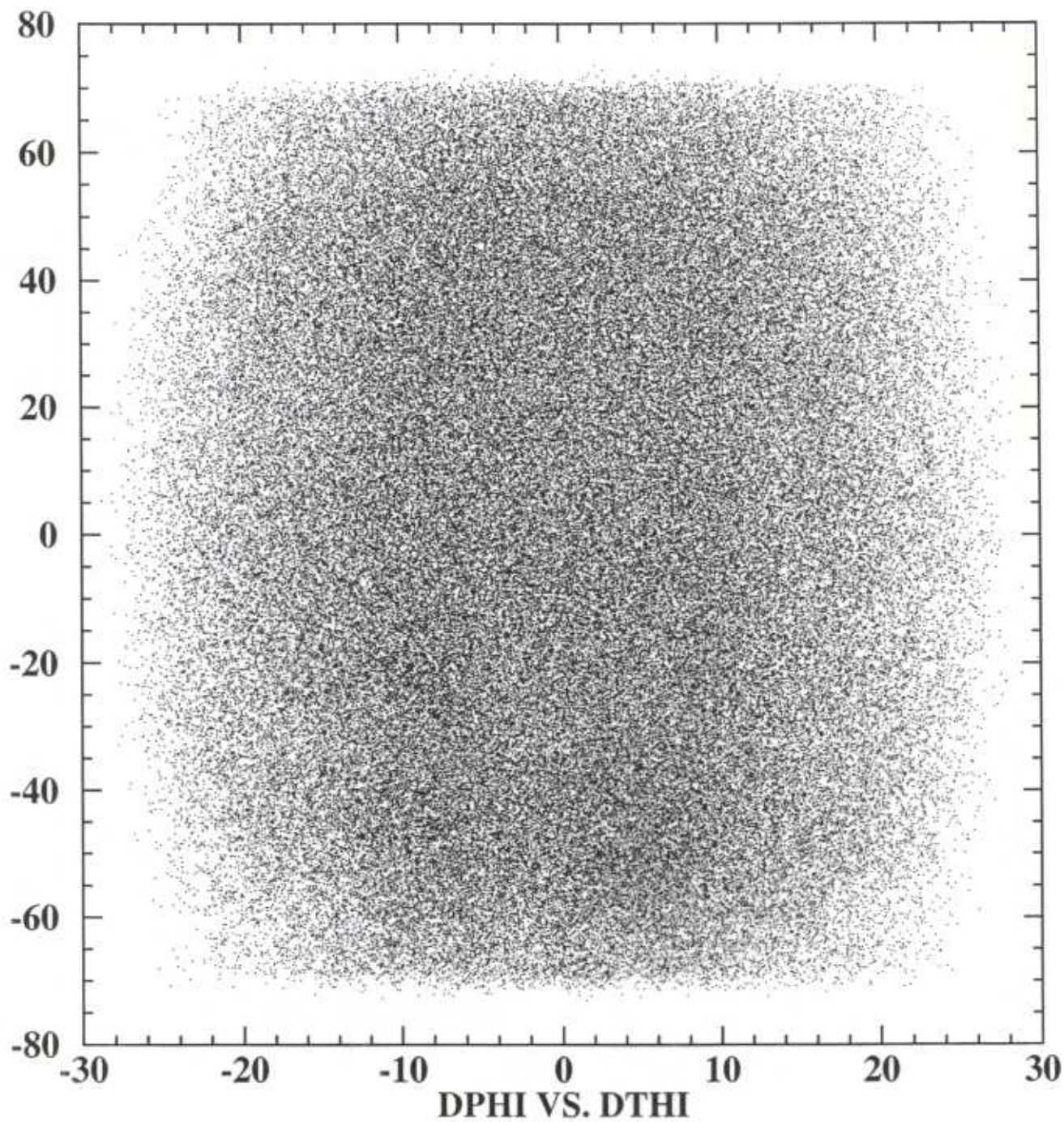
4.4 ms2

.133
1.34
1.35
.32



2.1 ms2 tune

"Everything" 2.32 m forward



Status

* Standalone MC exists

(MC-SHMS)

for both forward angle and
"large solid angle" tube

* Modifications to

transp. f

project. f

needed to make compatible w. SIMC