SHMS Single Arm Monte Carlo
&
Sieve and Collimator Design

Dipangkar Dutta

Mississippi State University

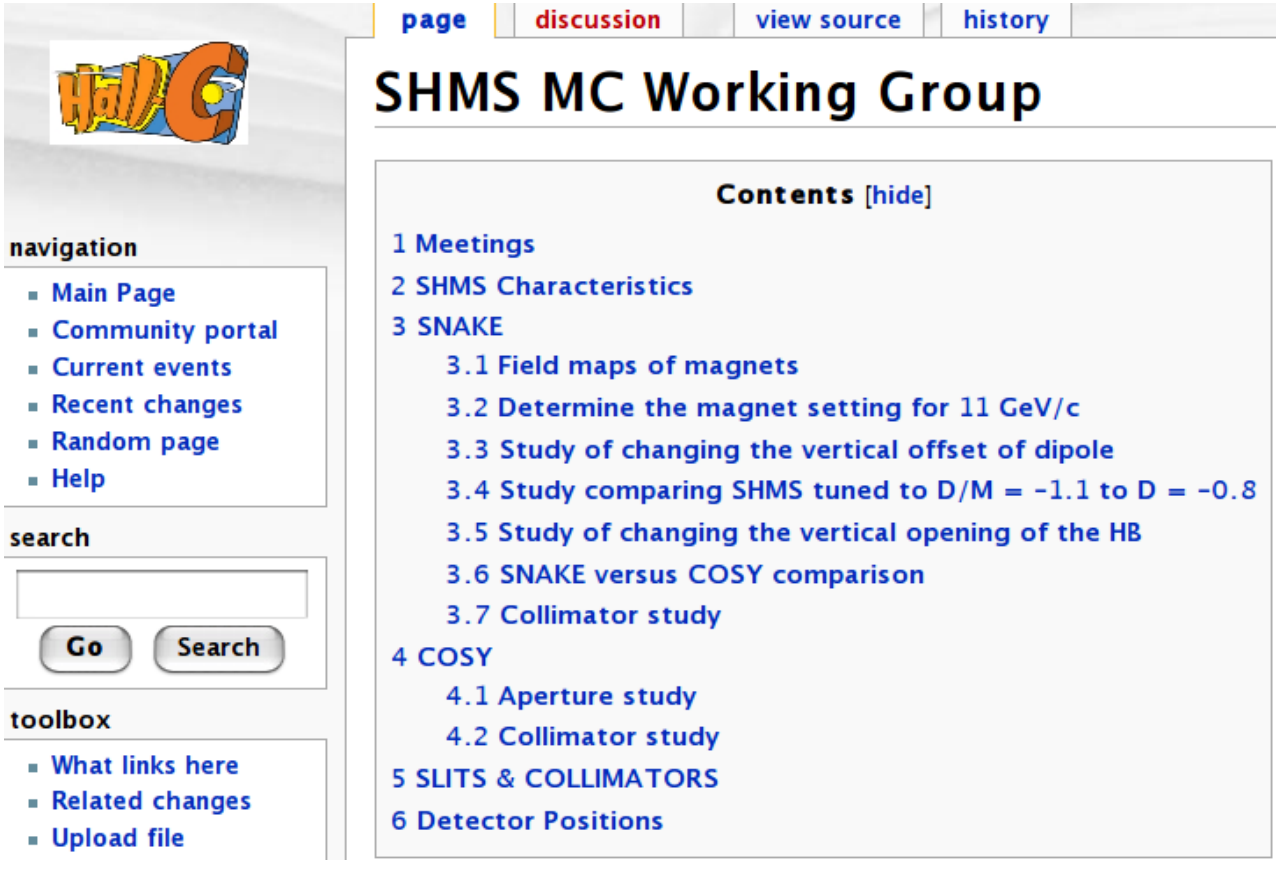
Hall-C Users Meeting
Jan 14-15, 2012

MC SHMS Working Group

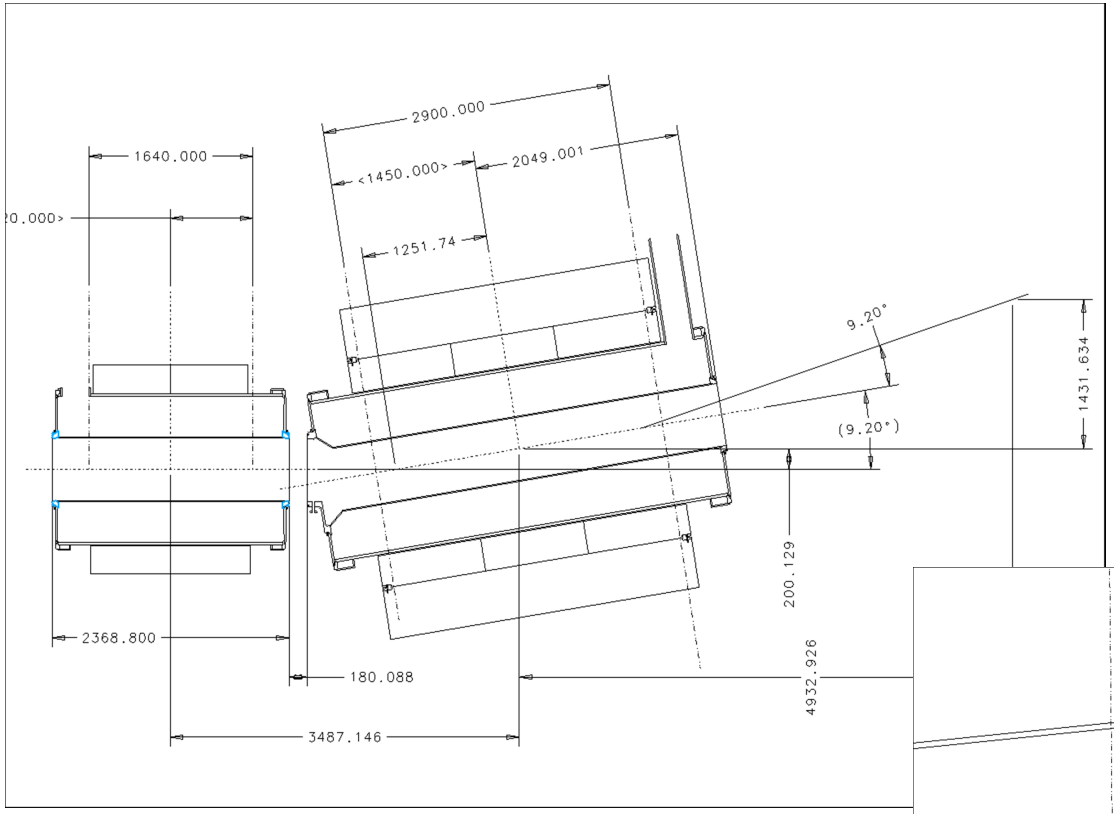
J. Arrington, D. Dutta, R. Ent, H. Fenker, D. Gaskell, T. Horn, M. Jones, and P. Monaghan

Minutes of the meetings and all the work that was completed over the last 6-8 months is posted on a wiki at :

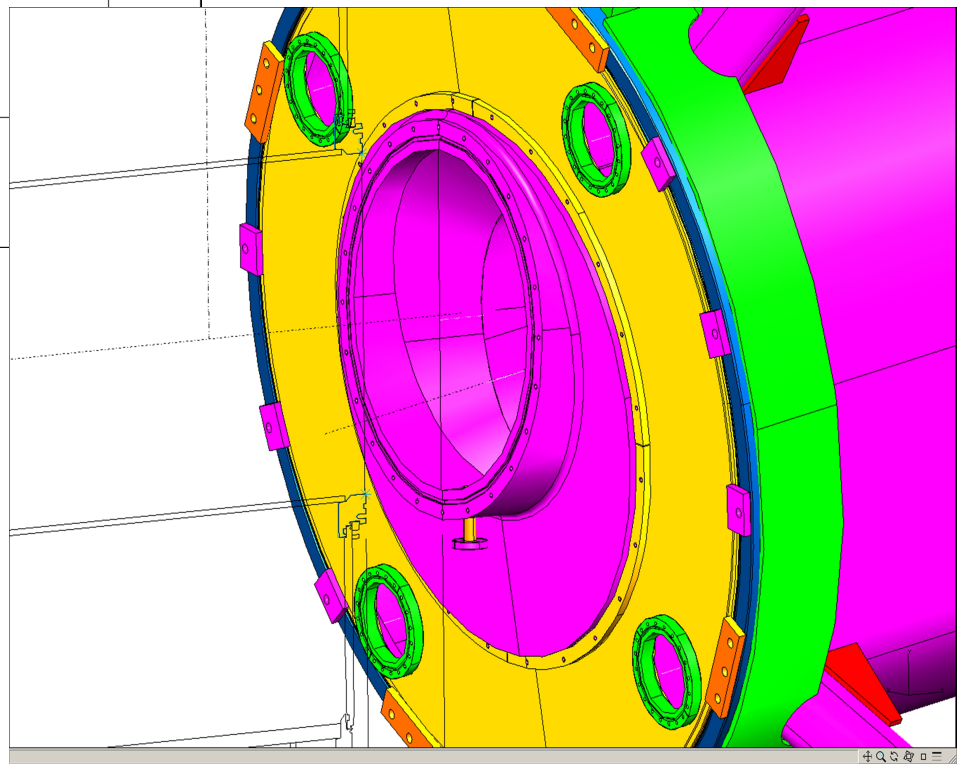
https://hallcweb.jlab.org/wiki/index.php/SHMS_MC_Working_Group



Validating the SHMS COSY Model



HB, Q1, Q2 and Q3 apertures, dimensions and placement verfied with latest drawings

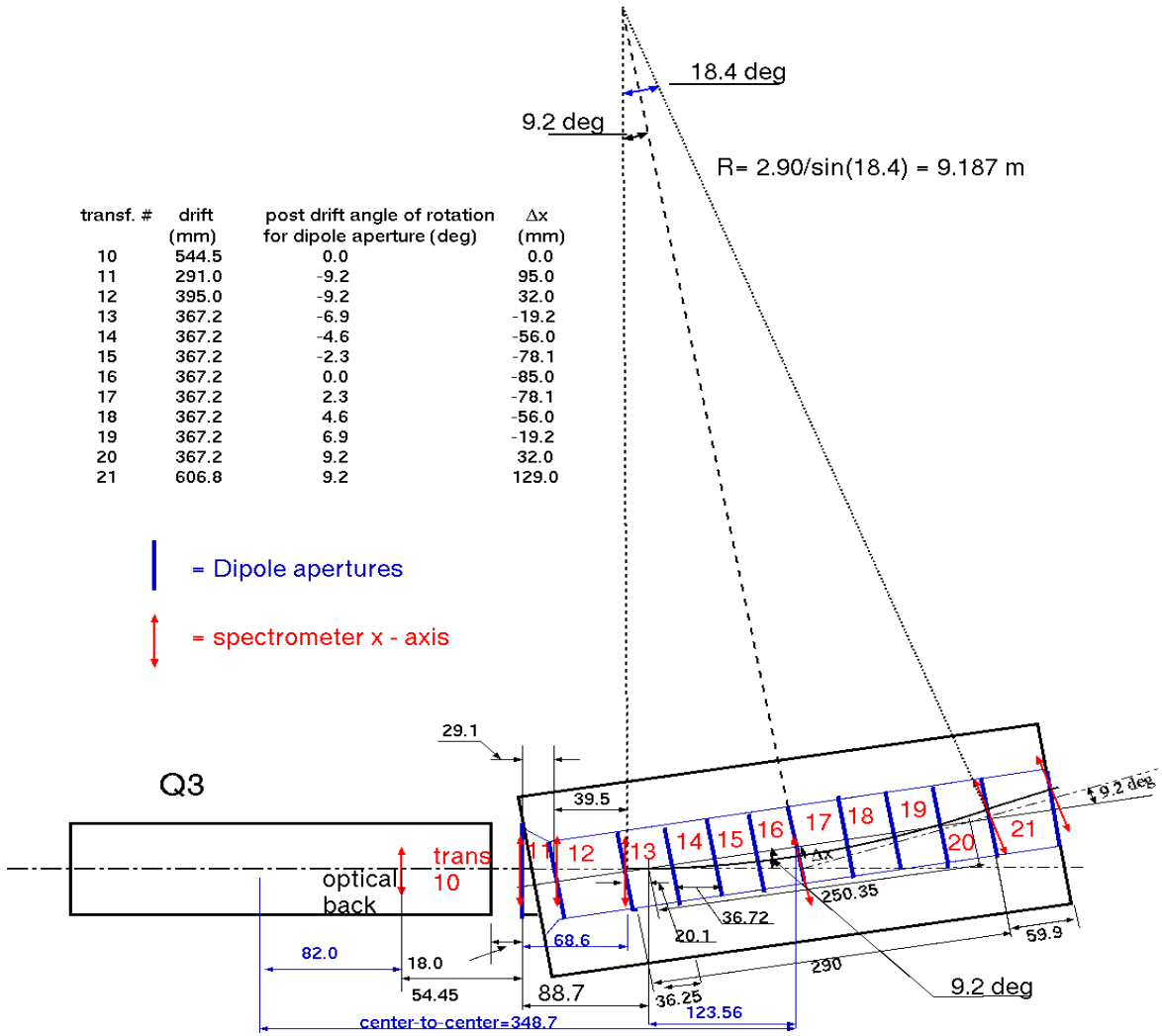


Redo dipole apertures using latest drawing and dimensions

Validating the SHMS COSY Model

In the COSY model dipole effective magnetic length divided into 8 equally spaced aperture

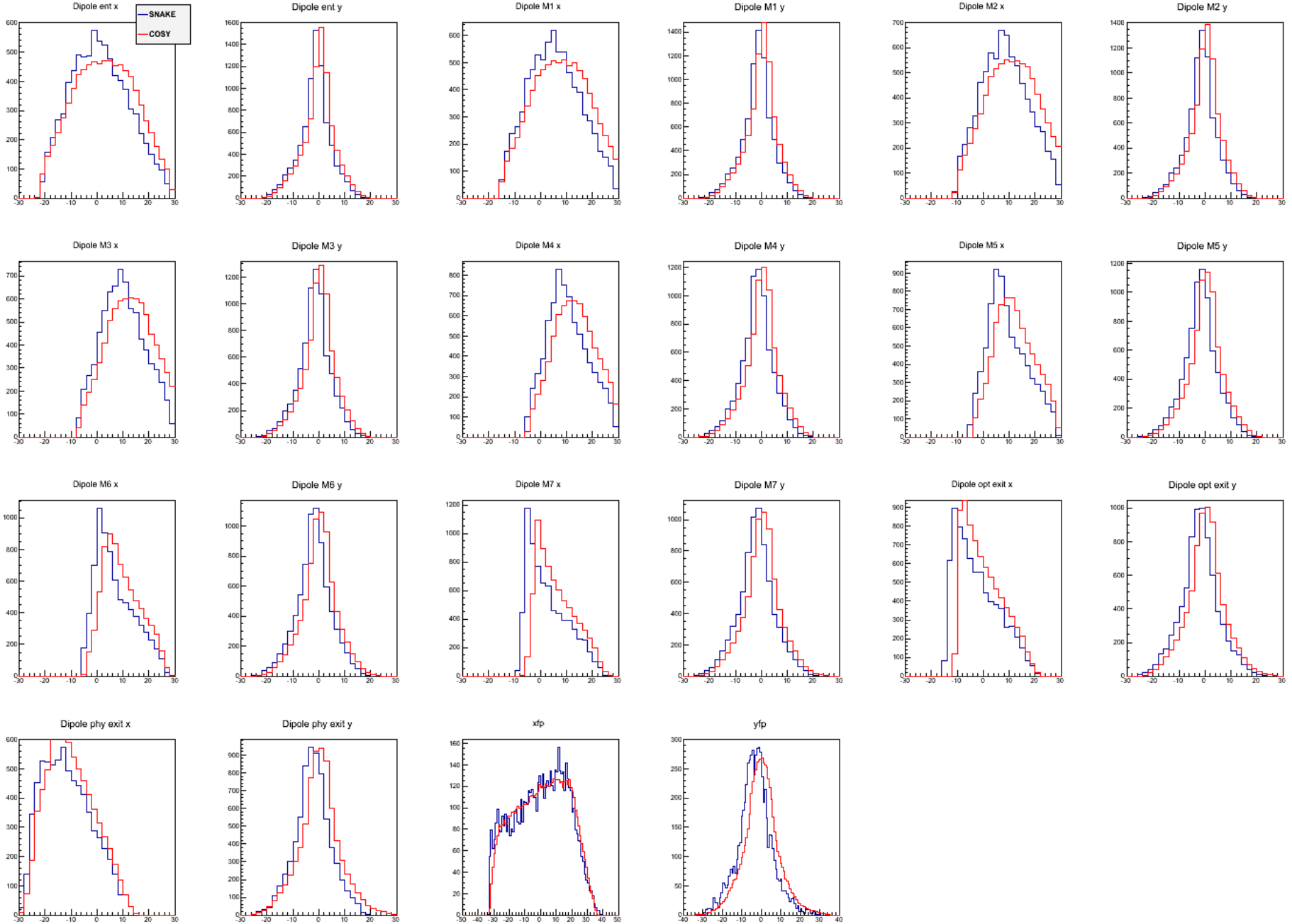
SHMS Dipole optics



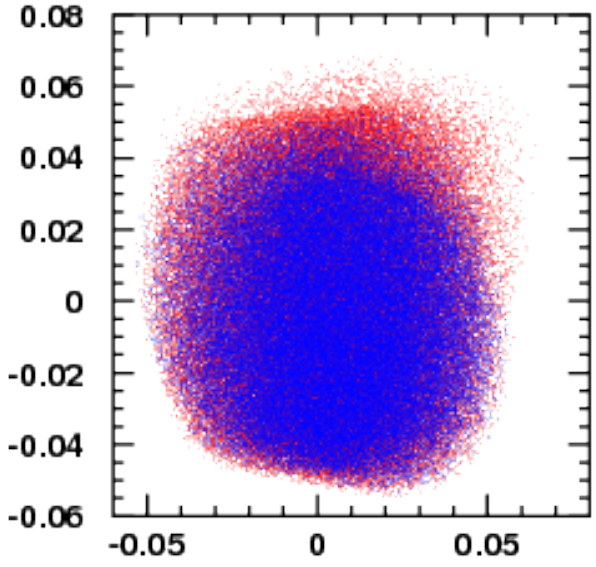
transf. #	drift (mm)	post drift angle of rotation for dipole aperture (deg)	Δx (mm)
10	544.5	0.0	0.0
11	291.0	-9.2	95.0
12	395.0	-9.2	32.0
13	367.2	-6.9	-19.2
14	367.2	-4.6	-56.0
15	367.2	-2.3	-78.1
16	367.2	0.0	-85.0
17	367.2	2.3	-78.1
18	367.2	4.6	-56.0
19	367.2	6.9	-19.2
20	367.2	9.2	32.0
21	606.8	9.2	129.0

drift 11 = 29.1 and Δx = (88.7-29.1)*sin9.2 =9.5 =(dipole-drop)*59.6/125.2
drift 12 = 88.7 - {(145-125.2)/cos9.2) = 68.6; Δx = (145-125.2)*sin9.2= 3.2 cm parametrized in terms of dipole drop
Δx = (dipole-drop)*(145-125.2)/125.2
drift 13-20 = (290/8)/cos9.2 = 36.72;
for transf. 13-15 and 17-20
Δx = (n*36.7 -20.1)*tan9.2 - R*(sec(n*2.3)-1)*cos(9.2-n*2.3) - R*(sec(n*2.3)-1)*sin(9.2-n*2.3)*tan9.2, for n=1--3, 5--8 R=918.7
for transf. 16 Δx = (4*36.7 -20.1)*tan9.2 - R*(sec(9.2)-1), for R=918.7
To parametrize in terms of dipole drop use 20.1 = 145/cos9.2 - 2*dipole_drop/sin18.4
drift 21 = 0.599/cos9.2=60.68; Δx = Δx(20) + 59.9*tan9.2

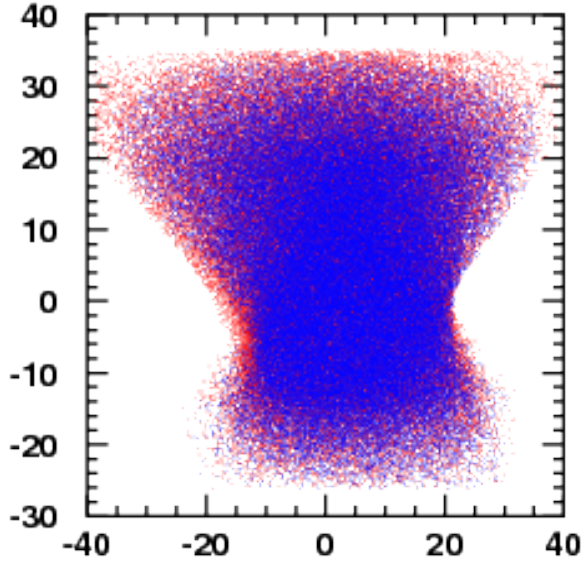
SHMS COSY vs SNAKE Models



Reproducing pre-2009 distributions



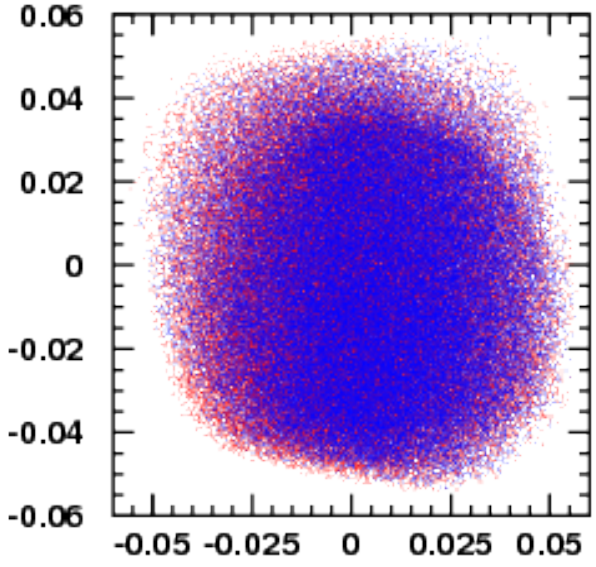
hsxptar VS. hsyptar



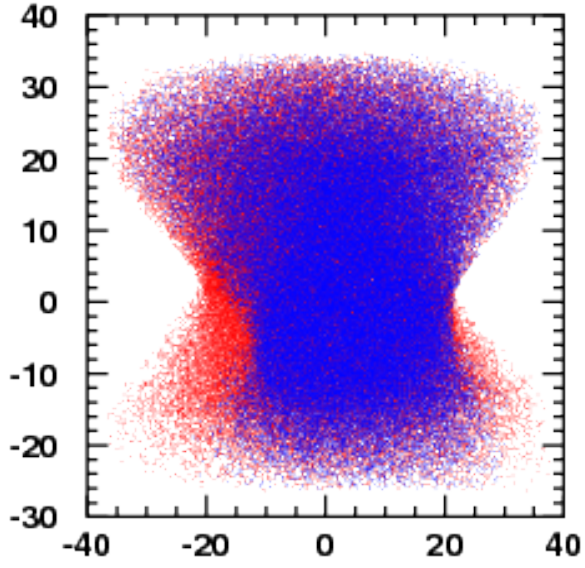
hsxfp VS. hsyfp

Blue: all apertures (final acceptance) ~ 4 msr

Red: No dipole aperture



hsxptar VS. hsyptar



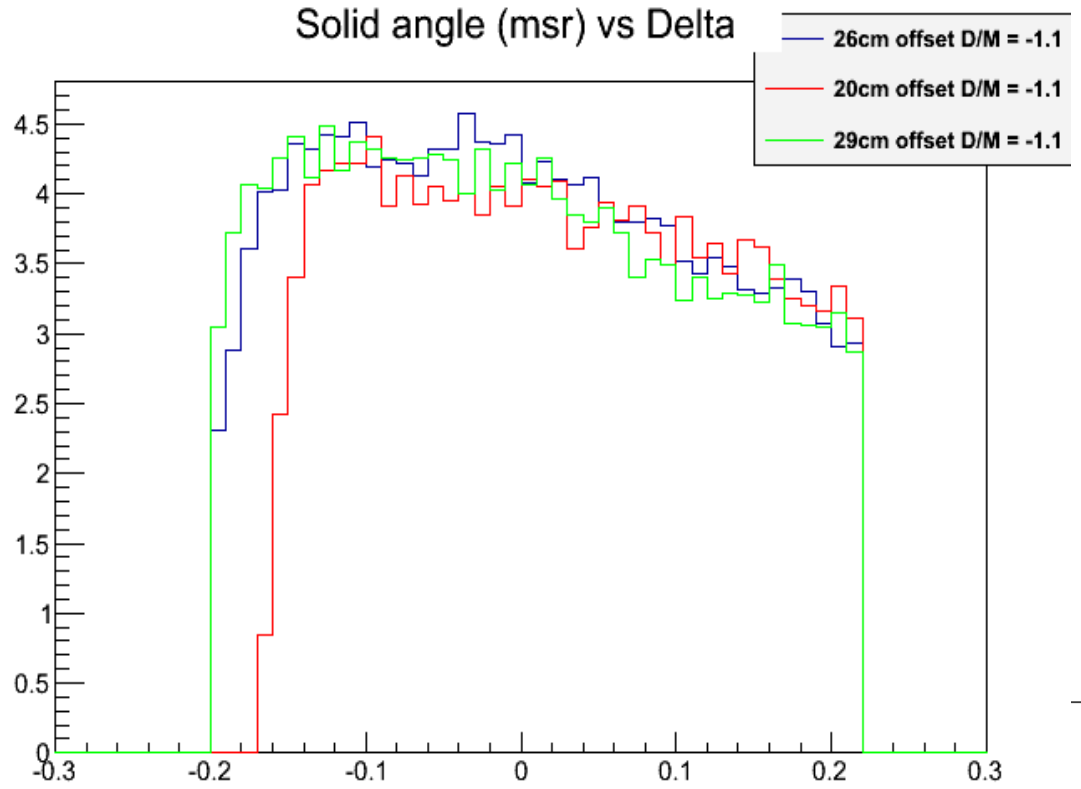
hsxfp VS. hsyfp

Blue: all apertures (final acceptance)

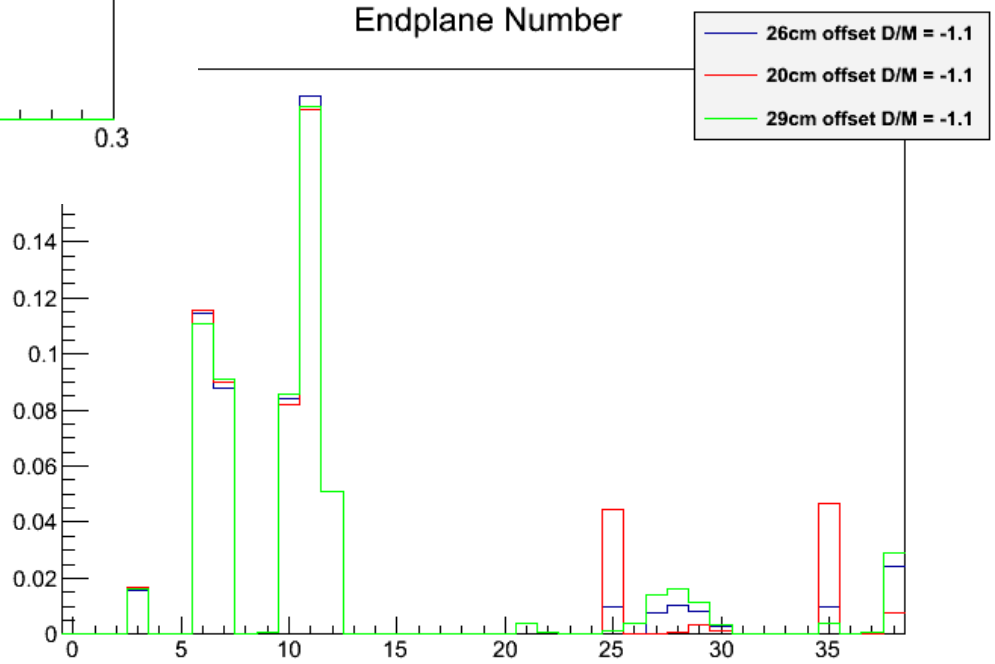
Red: No HB, No Q1, Q2 and Q3 mech. apertures

Closest we can get to pre-2009 distributions Solid angle = 4.7 msr

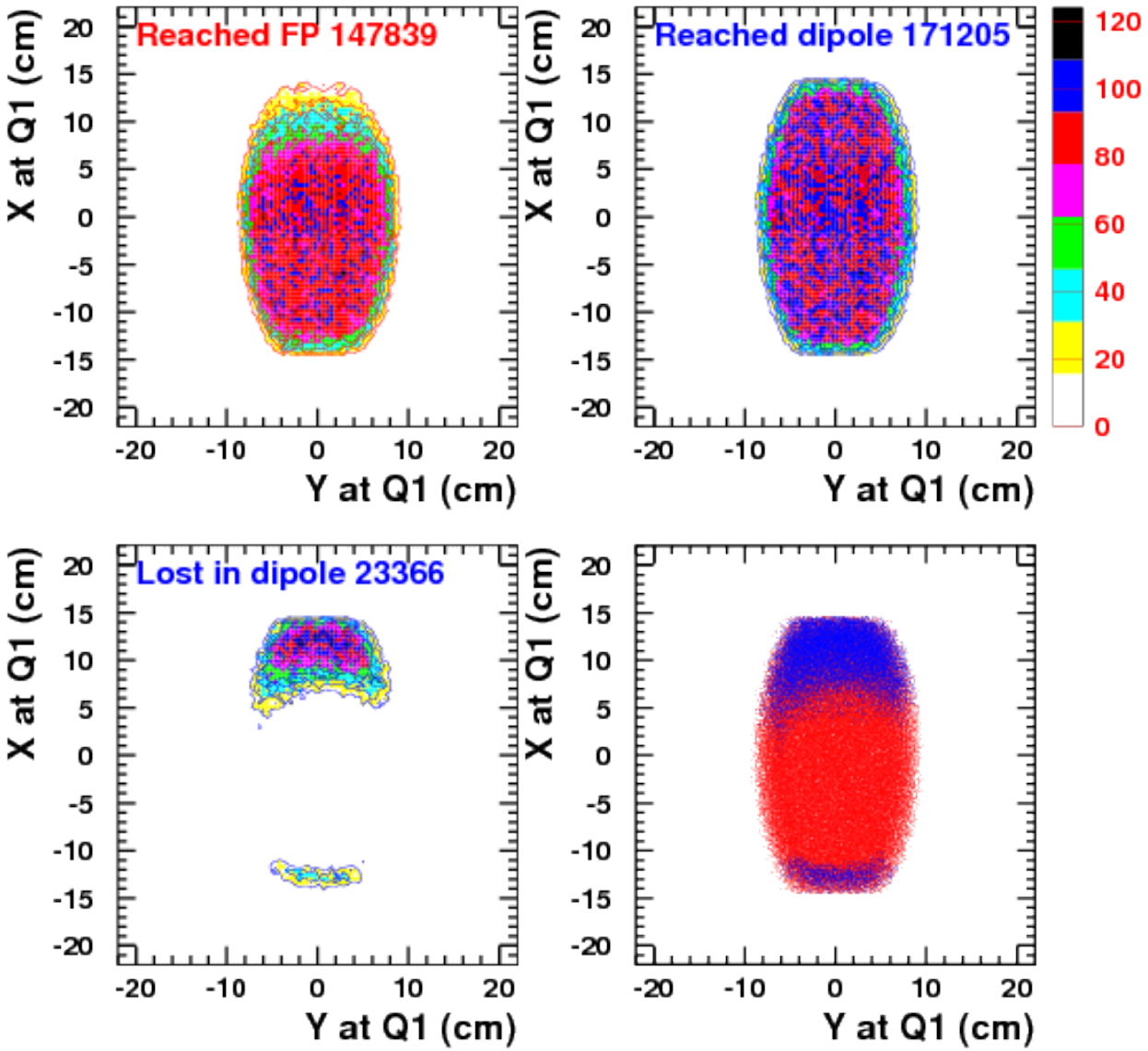
SHMS Dipole Vertical Offset



Three vertical offsets were studied
20, 26 and 29 cm

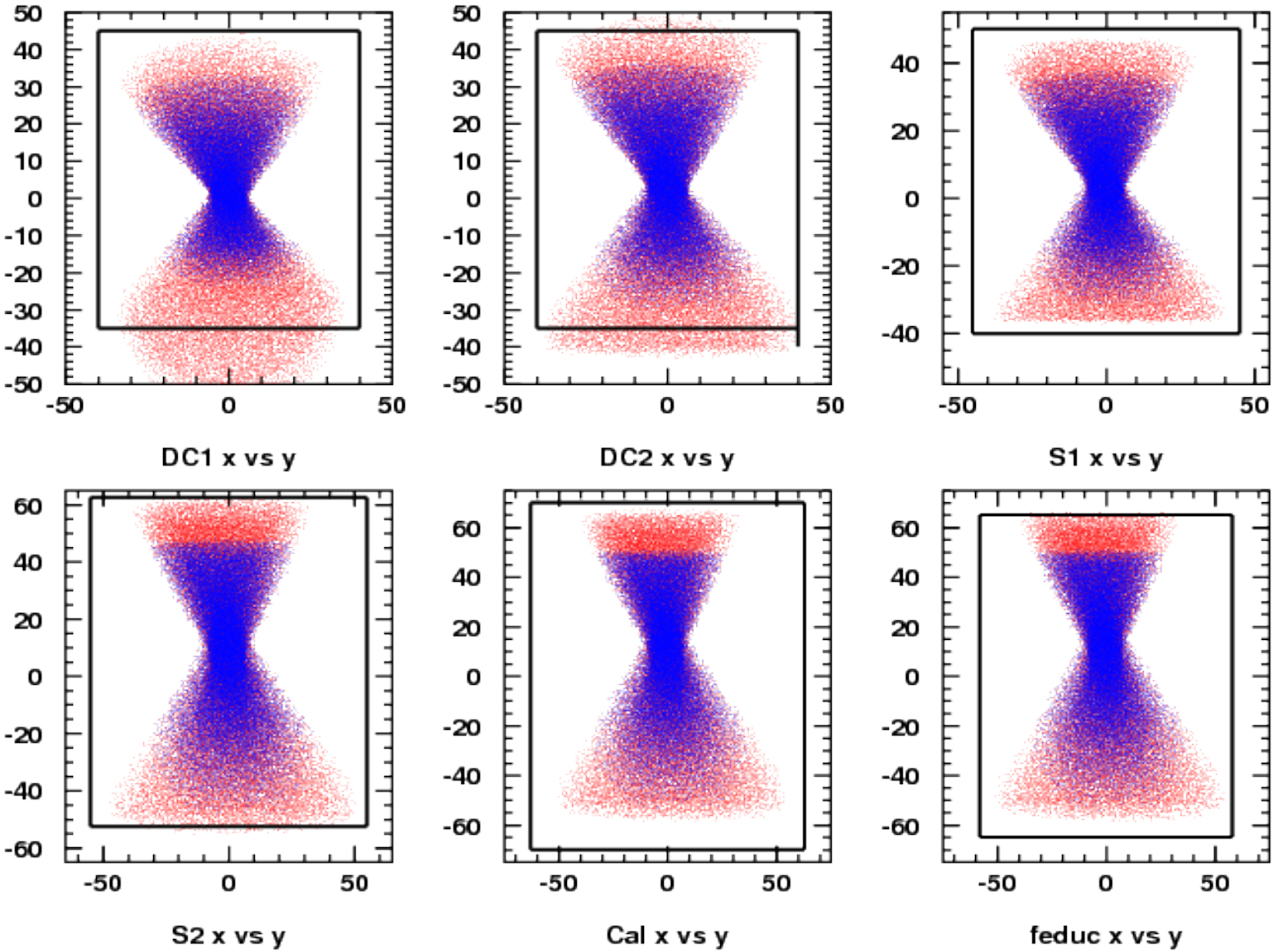


SHMS Dipole Vertical Offset

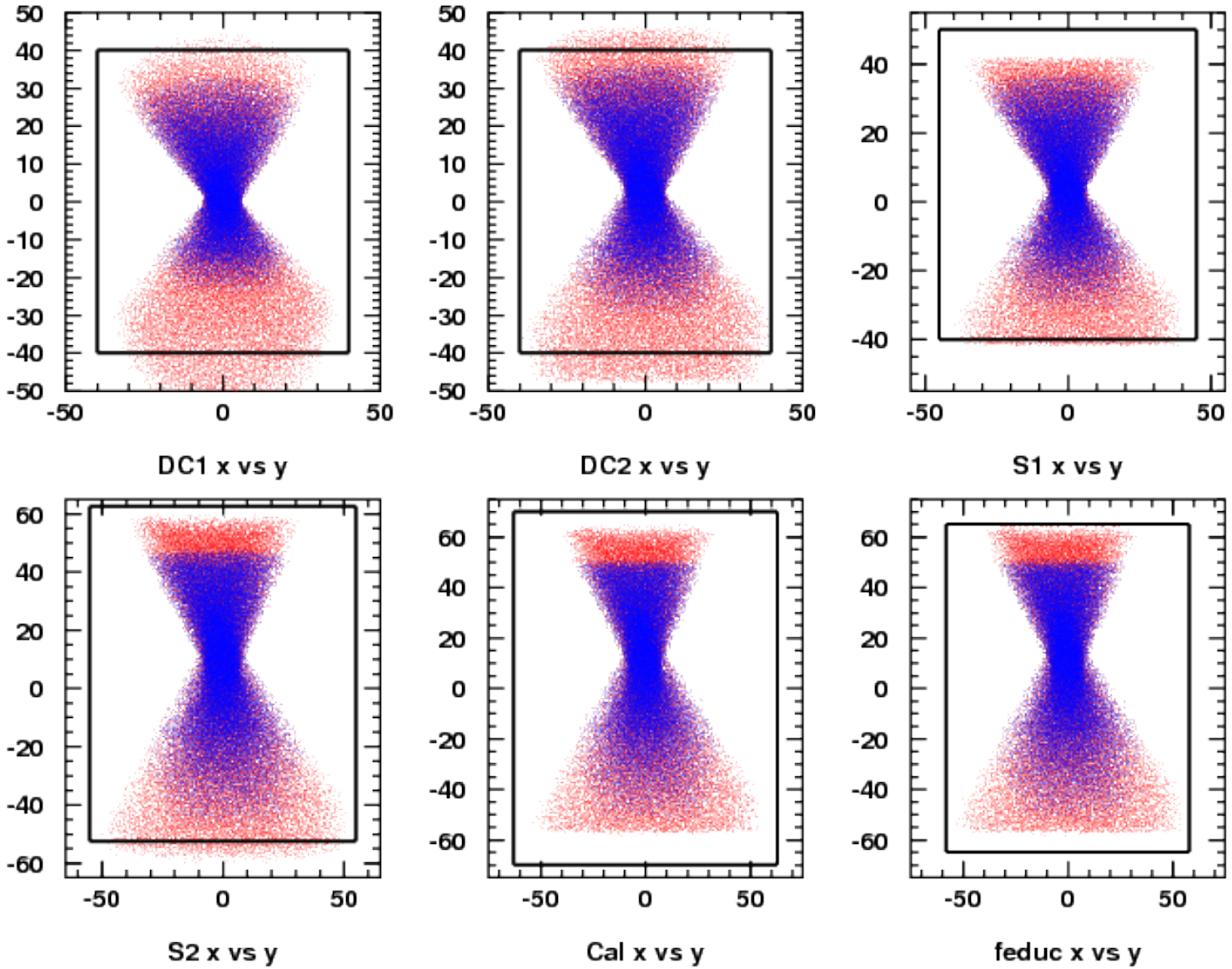


Three vertical offsets were studied
20, 26 and 29 cm

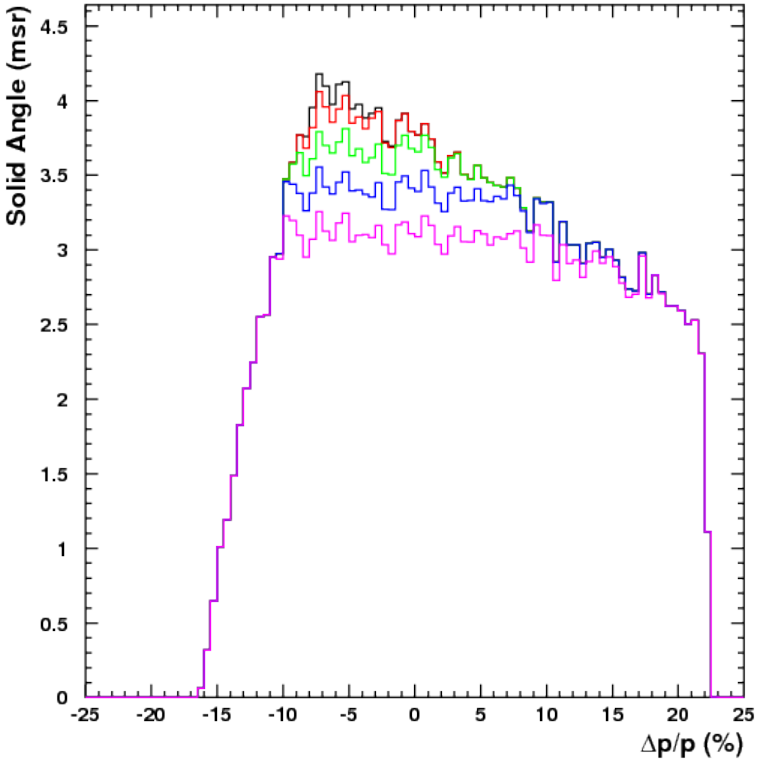
Beam Envelopes at the Drift Chamber



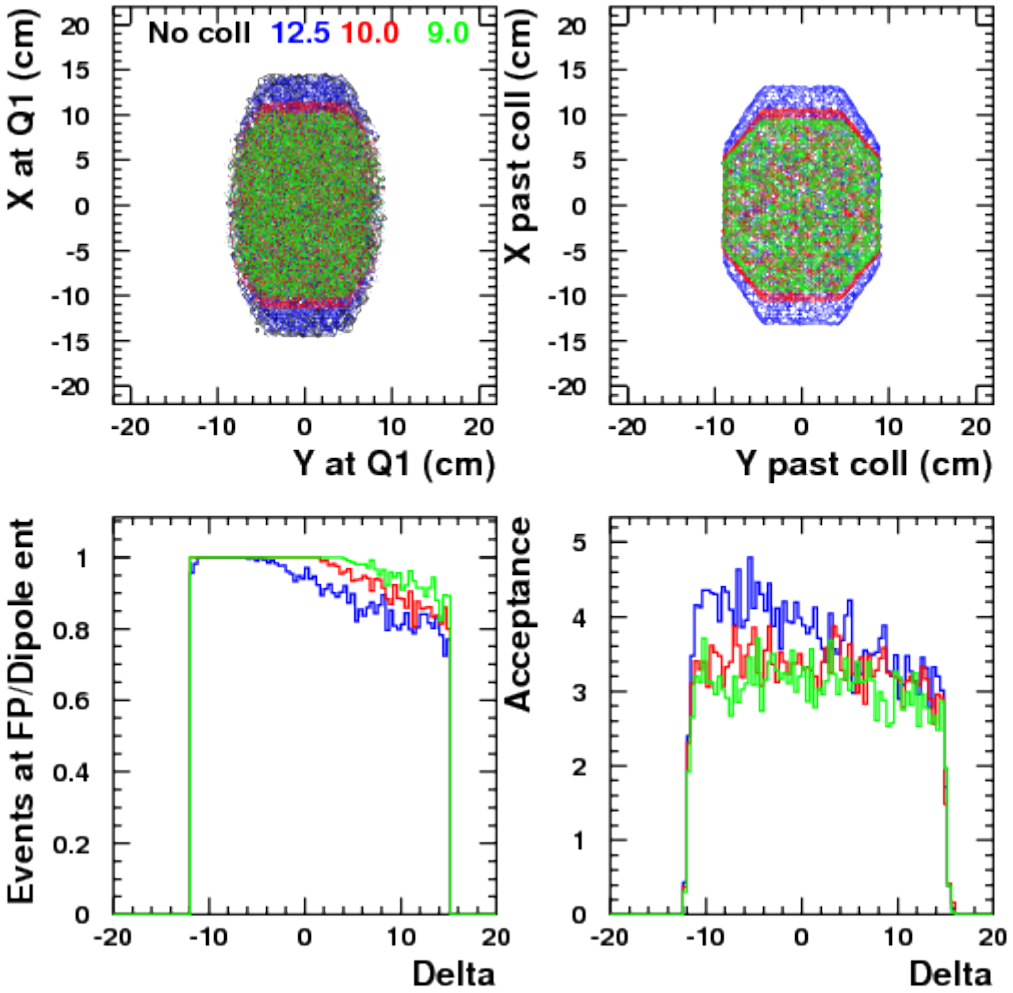
Beam Envelopes at the Drift Chamber



Collimators

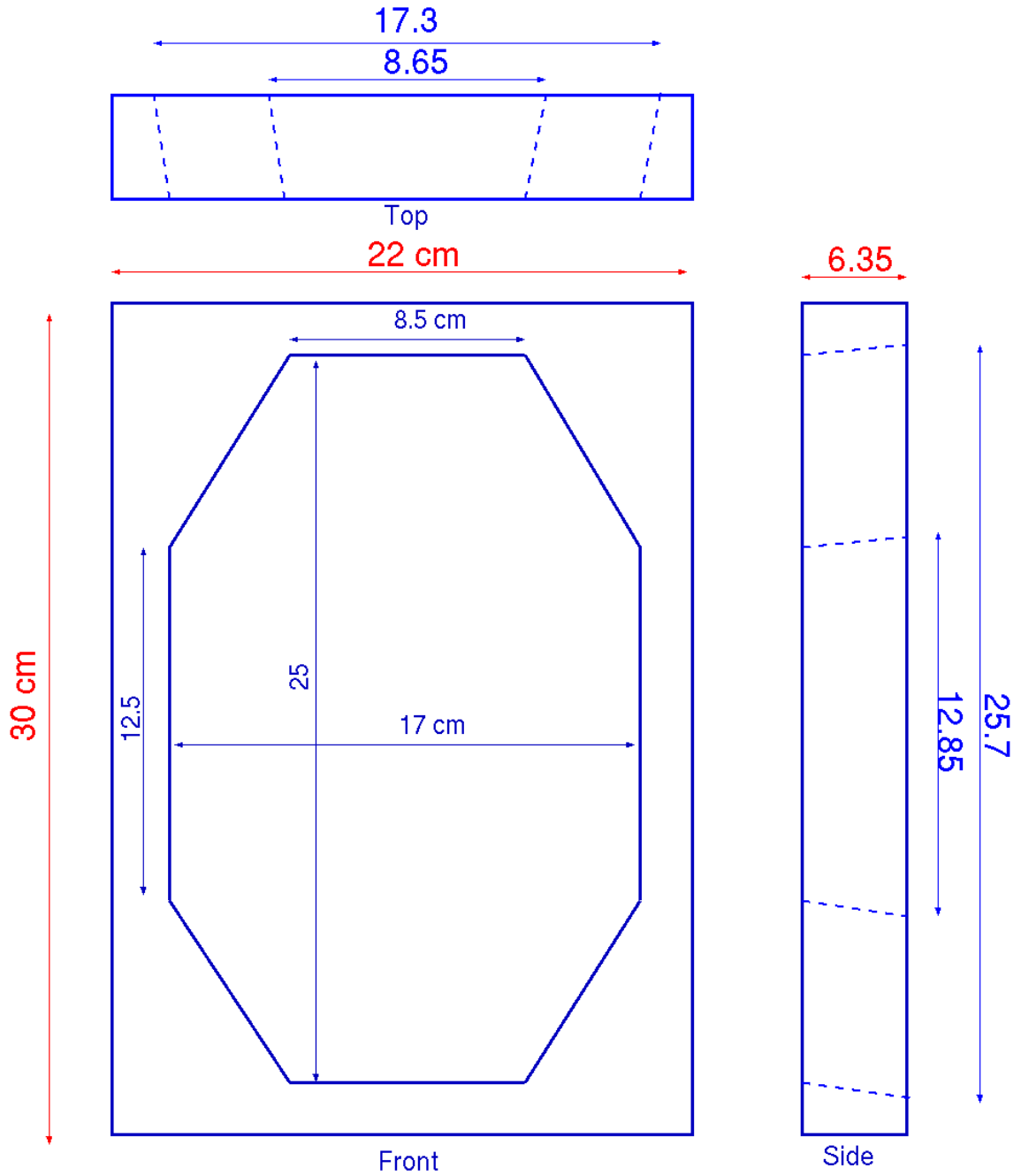


Collimators and sieve slits will be placed ~33cm in from of the Q1.

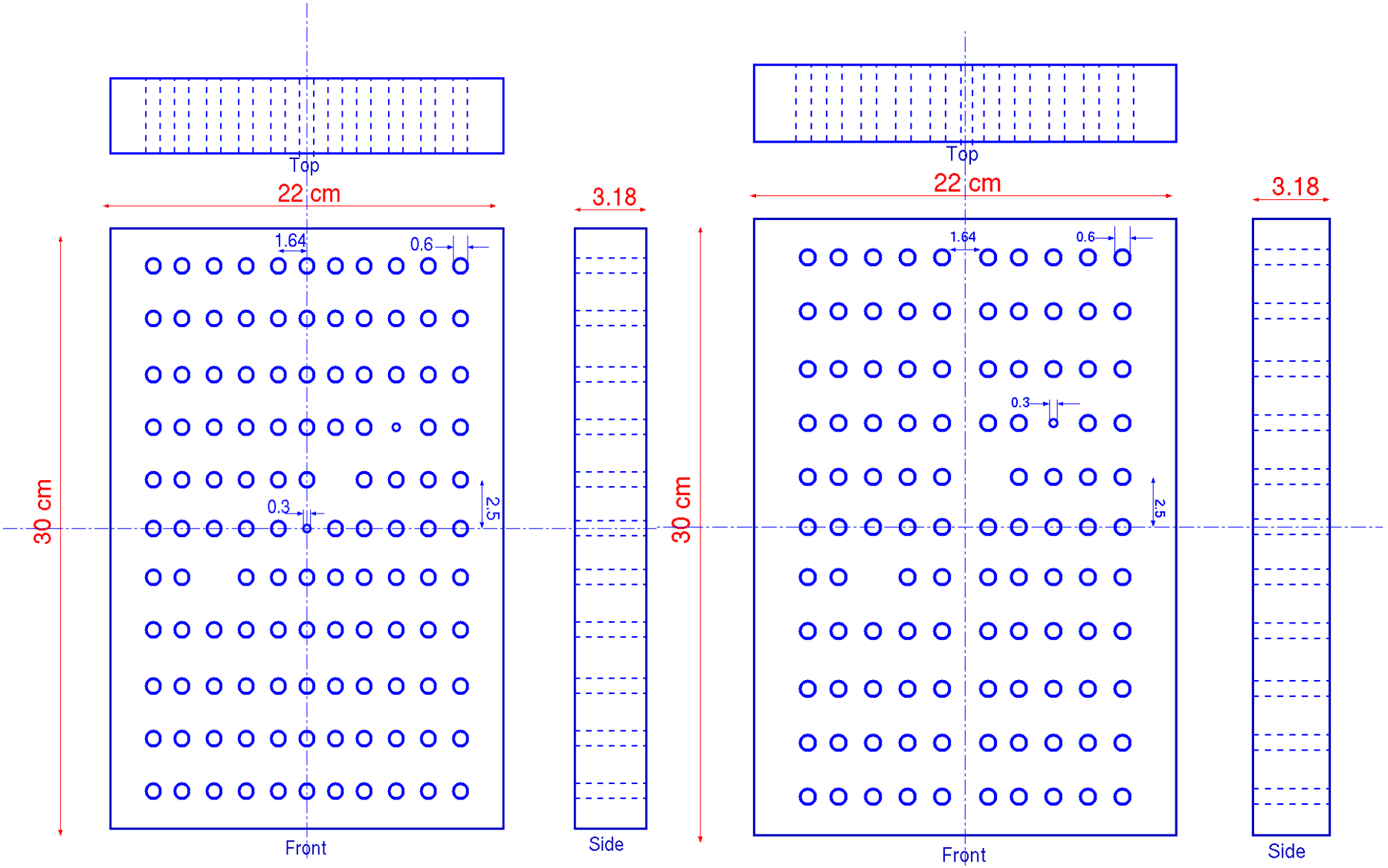


A single 25 cm x 17 cm Collimator wil be used

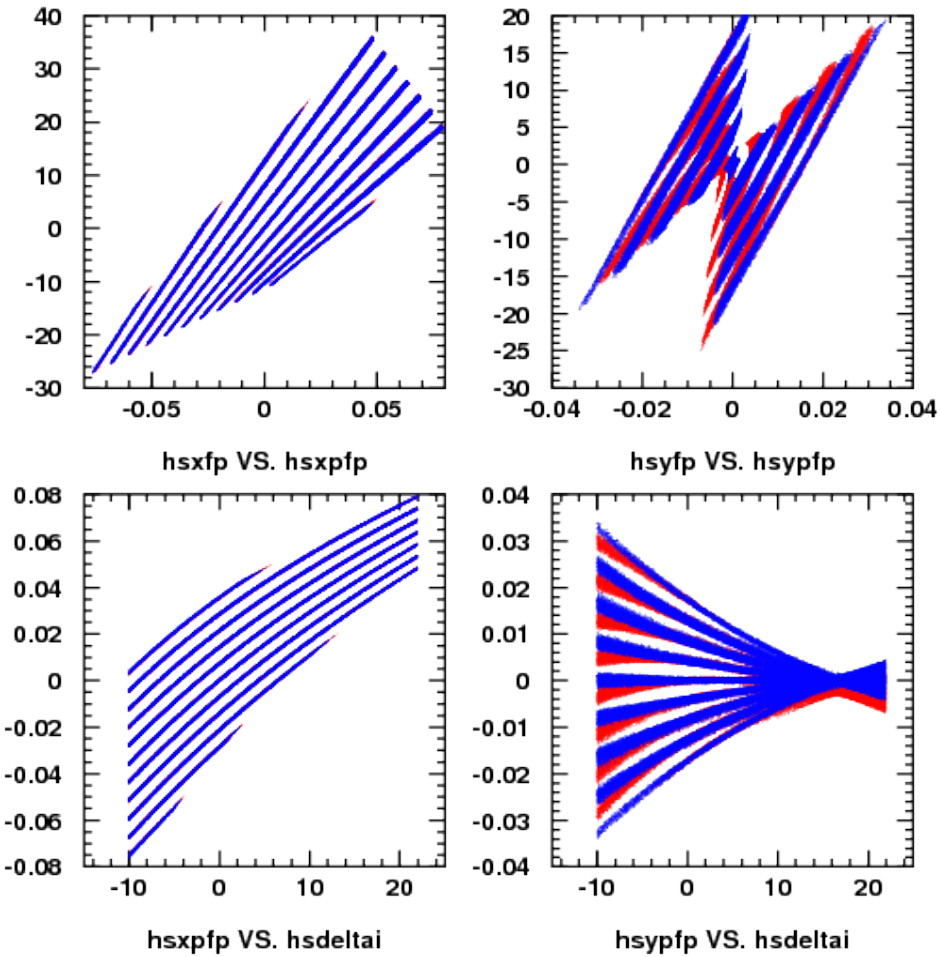
Collimators

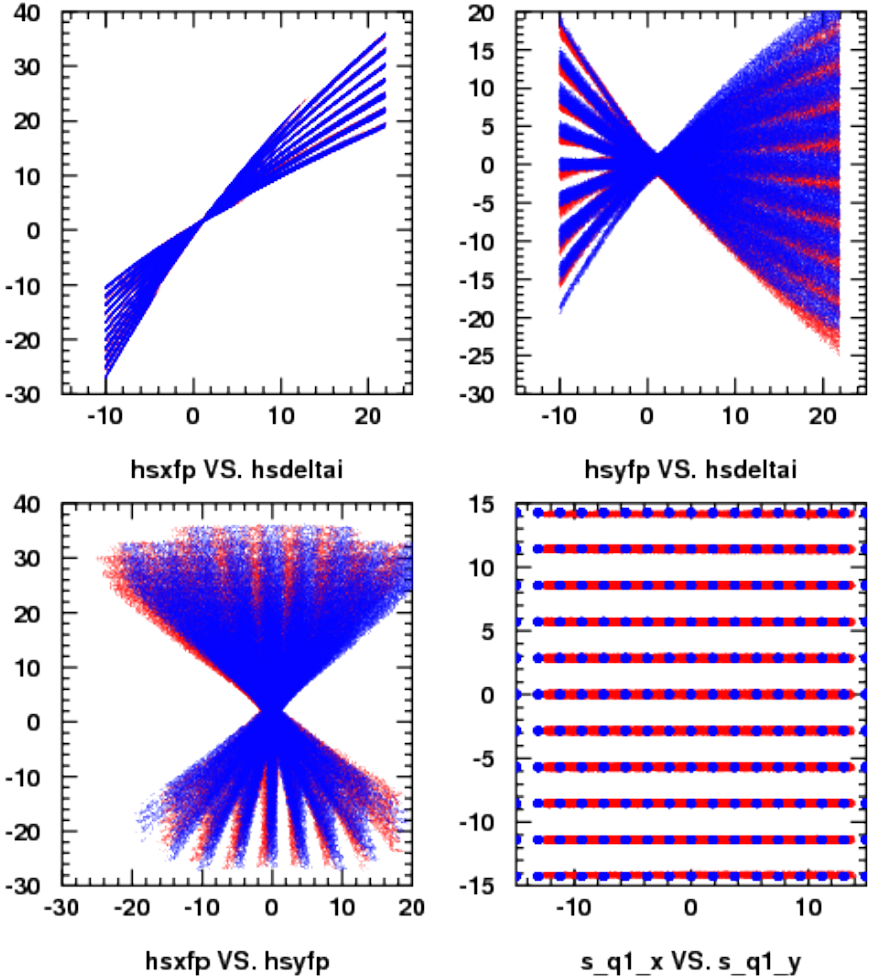


Sieve Slits

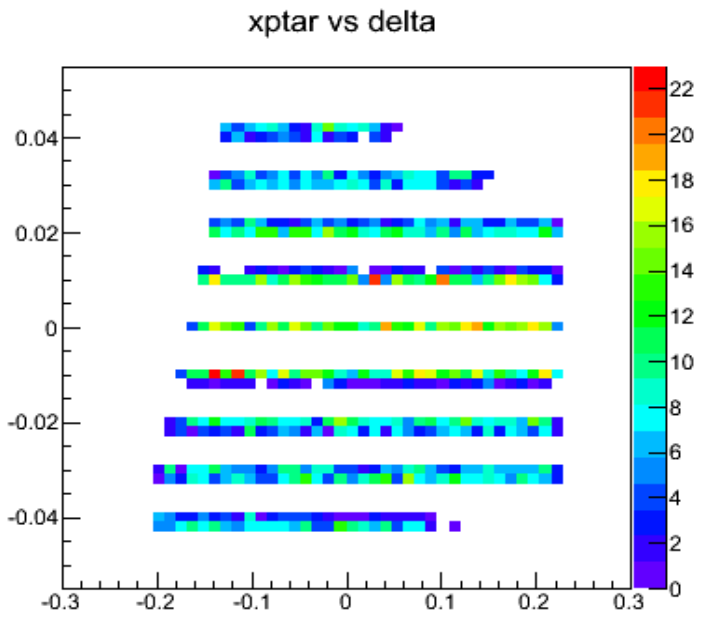

Top
22 cm
3.18
1.64
0.6
30 cm
0.3
2.5
Front
Side
Top
22 cm
3.18
1.64
0.6
30 cm
0.3
2.5
Front
Side

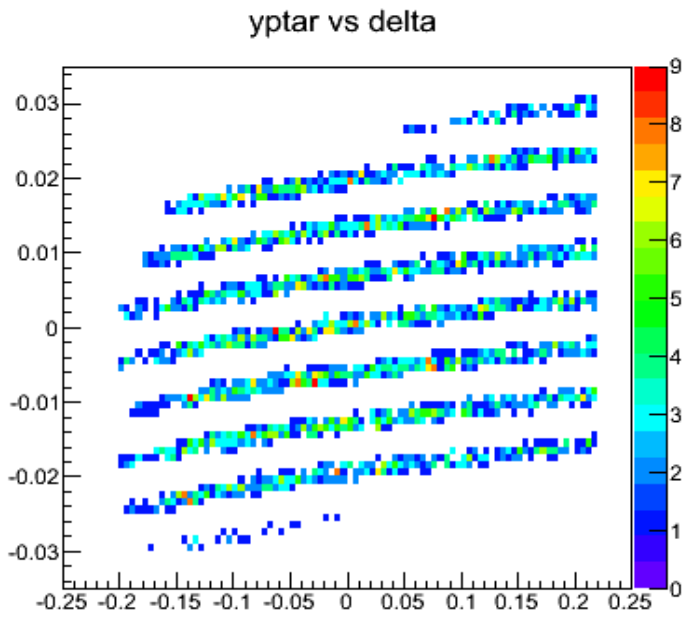
Sieve Slits

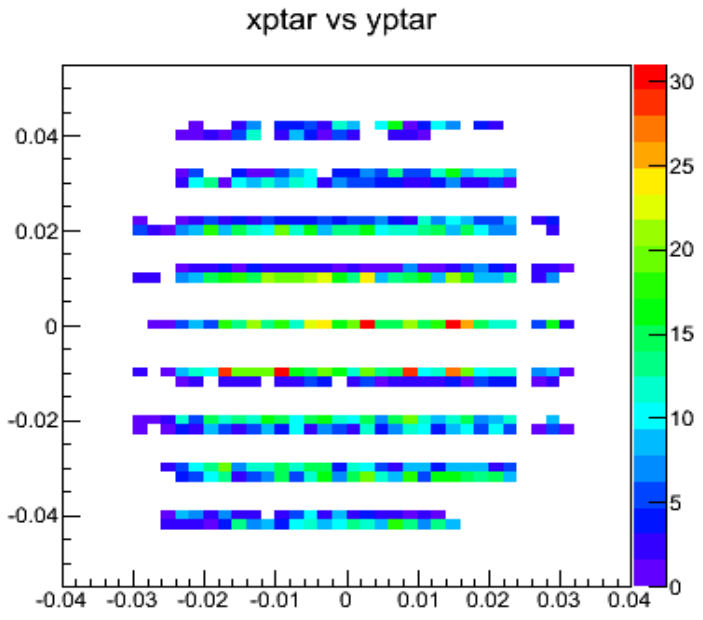

hsxfp VS. hsxpfp
hsyfp VS. hsypfp
hsxpfp VS. hsdeltai
hsypfp VS. hsdeltai

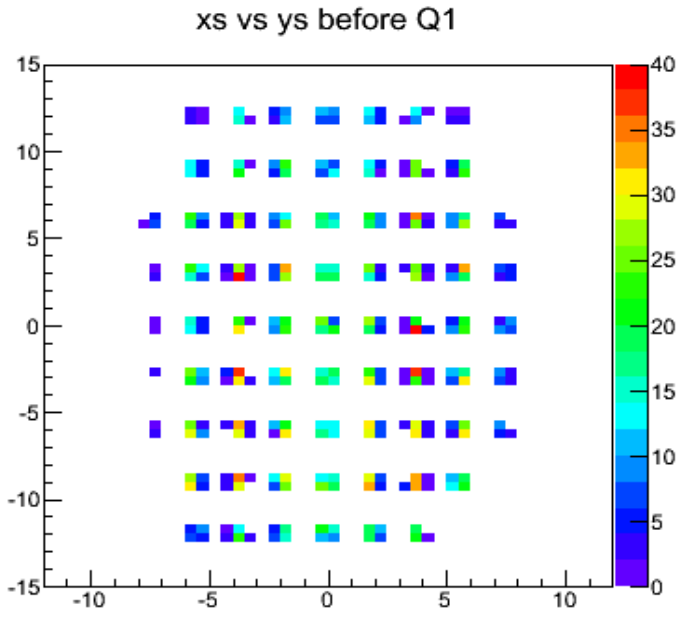

hsxfp VS. hsdeltai
hsyfp VS. hsdeltai
hsxfp VS. hsyfp
s_q1_x VS. s_q1_y

Sieve Slits


xptar vs delta
0.04
0.02
0
-0.02
-0.04
-0.3 -0.2 -0.1 0 0.1 0.2 0.3
22 20 18 16 14 12 10 8 6 4 2 0


yptar vs delta
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.25 -0.2 -0.15 -0.1 -0.05 0 0.05 0.1 0.15 0.2 0.25
9 8 7 6 5 4 3 2 1 0


xptar vs yptar
0.04
0.02
0
-0.02
-0.04
-0.04 -0.03 -0.02 -0.01 0 0.01 0.02 0.03 0.04
30 25 20 15 10 5 0


xs vs ys before Q1
15
10
5
0
-5
-10
-15
-10 -5 0 5 10
40 35 30 25 20 15 10 5 0

A new release of the SHMS single arm MC is coming soon