

# SHMS Single Arm Monte Carlo & Sieve and Collimator Design



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**Mississippi State**  
**University**



**Hall-C Users Meeting**  
**Jan 14-15, 2012**



# MC SHMS Working Group

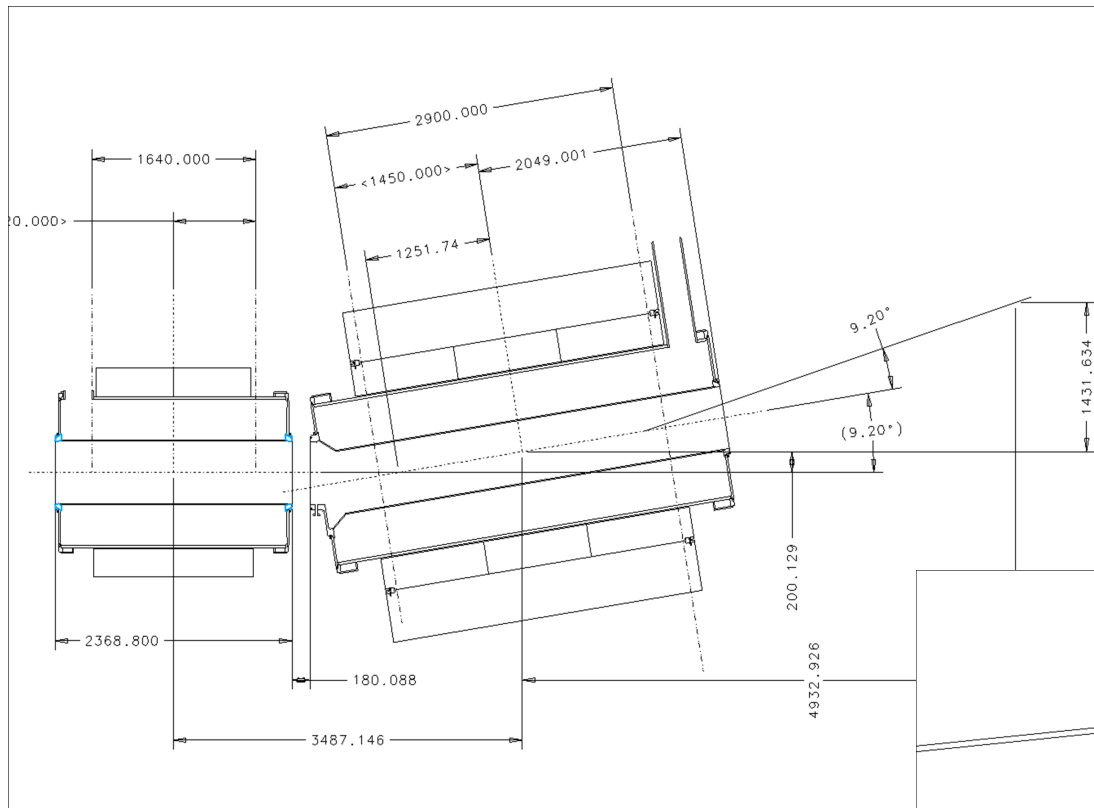
J. Arrington, D. Dutta, R. Ent, H. Fenker, D. Gaskell,  
T. Horn, M. Jones, and P. Monaghan

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](https://hallcweb.jlab.org/wiki/index.php/SHMS_MC_Working_Group)

The screenshot shows a wiki page with a navigation menu on the left and a main content area on the right. The navigation menu includes links for 'Main Page', 'Community portal', 'Current events', 'Recent changes', 'Random page', and 'Help'. Below the navigation menu is a search box with 'Go' and 'Search' buttons. The main content area has a title 'SHMS MC Working Group' and a 'Contents [hide]' section. The contents list includes: 1 Meetings, 2 SHMS Characteristics, 3 SNAKE (with sub-items 3.1 Field maps of magnets, 3.2 Determine the magnet setting for 11 GeV/c, 3.3 Study of changing the vertical offset of dipole, 3.4 Study comparing SHMS tuned to  $D/M = -1.1$  to  $D = -0.8$ , 3.5 Study of changing the vertical opening of the HB, 3.6 SNAKE versus COSY comparison, 3.7 Collimator study), 4 COSY (with sub-items 4.1 Aperture study, 4.2 Collimator study), 5 SLITS & COLLIMATORS, and 6 Detector Positions. At the top of the page, there are tabs for 'page', 'discussion', 'view source', and 'history'.

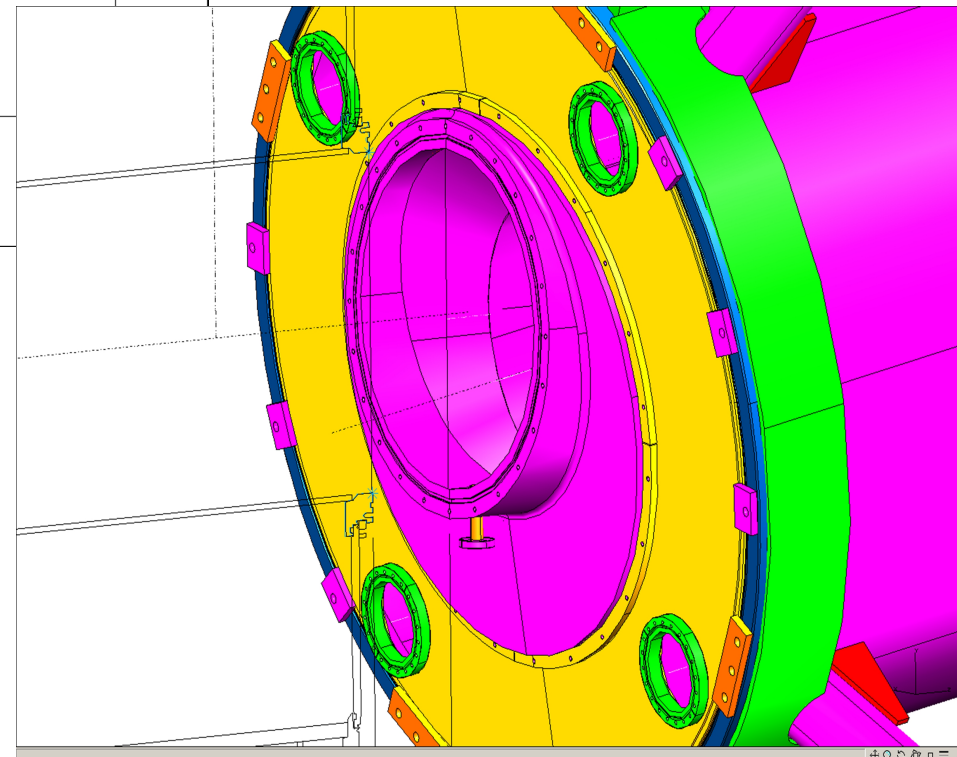


# Validating the SHMS COSY Model



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

**Redo dipole apertures using latest drawing and dimensions**





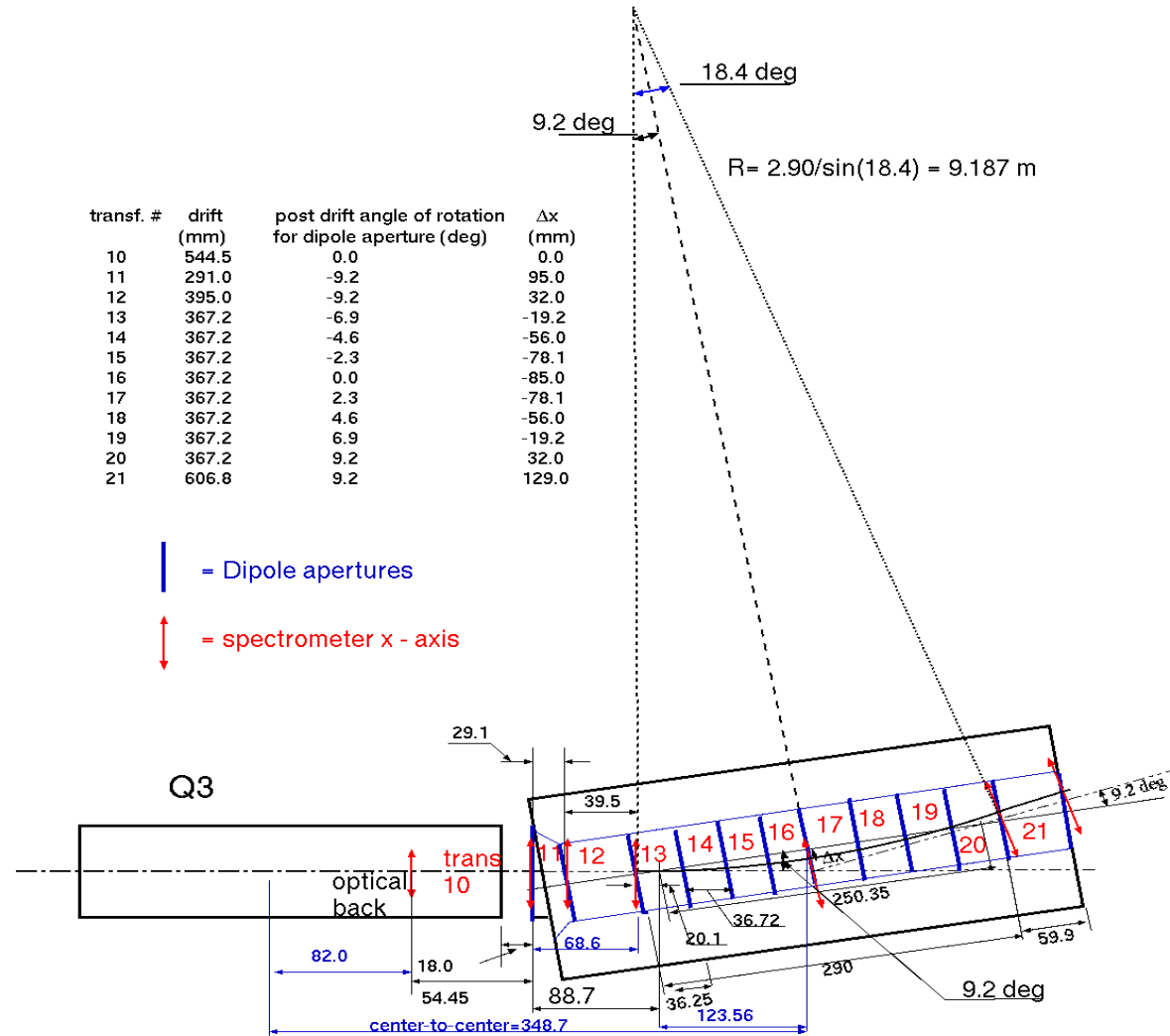
# Validating the SHMS COSY Model

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)	$\Delta x$ (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

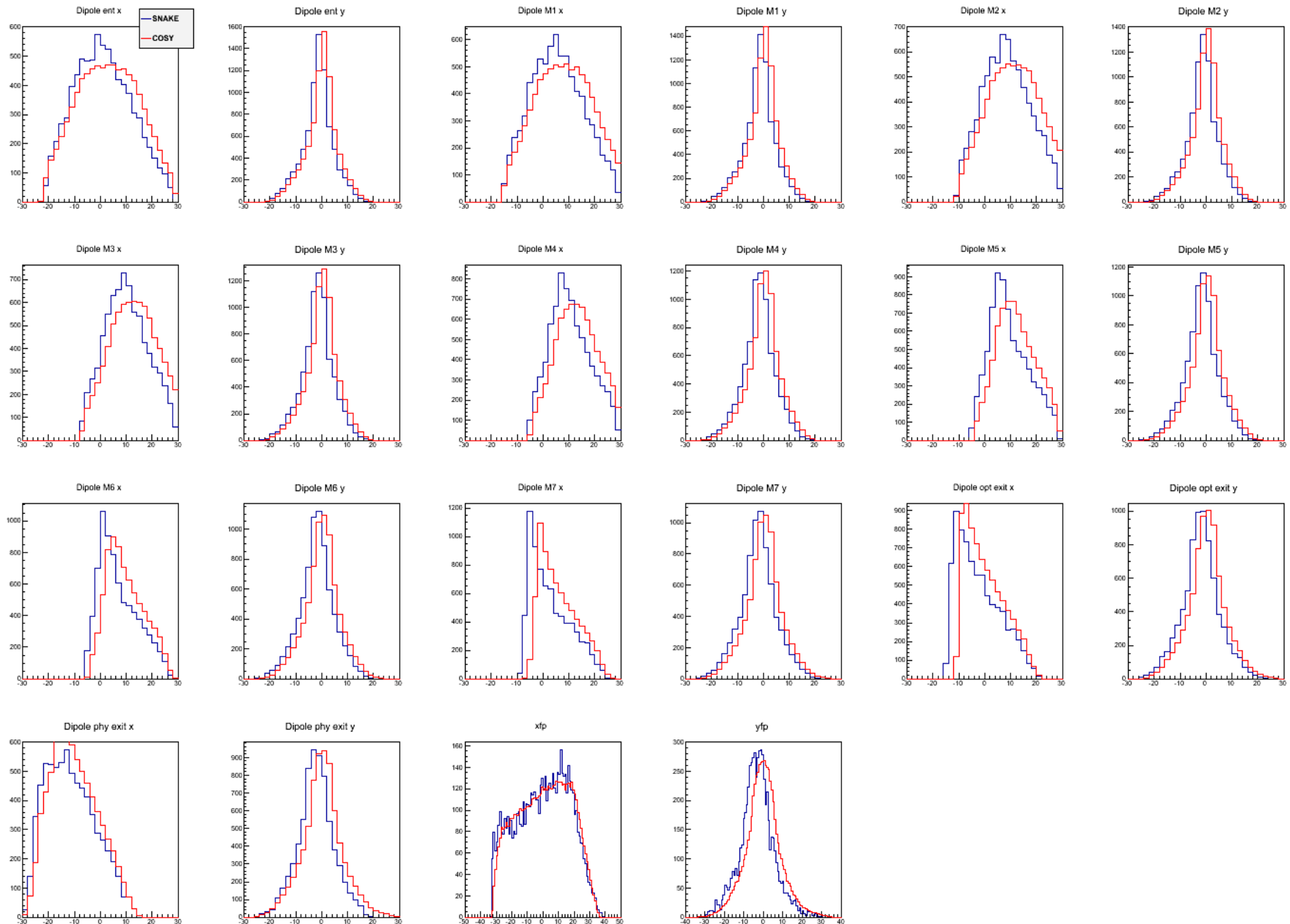
= Dipole apertures  
 = spectrometer x - axis



$\text{drift } 11 = 29.1$  and  $\Delta x = (88.7 - 29.1) \cdot \sin 9.2 = 9.5 = (\text{dipole-drop}) \cdot 59.6 / 125.2$   
 $\text{drift } 12 = 88.7 - ((145 - 125.2) / \cos 9.2) = 68.6$ ;  $\Delta x = (145 - 125.2) \cdot \sin 9.2 = 3.2 \text{ cm}$  parametrized in terms of dipole drop  
 $\Delta x = (\text{dipole-drop}) \cdot (145 - 125.2) / 125.2$   
 $\text{drift } 13-20 = (290/8) / \cos 9.2 = 36.72$ ;  
 for transf. 13-15 and 17-20  
 $\Delta x = (n \cdot 36.7 - 20.1) \cdot \tan 9.2 - R \cdot (\sec(n \cdot 2.3) - 1) \cdot \cos(9.2 - n \cdot 2.3) - R \cdot (\sec(n \cdot 2.3) - 1) \cdot \sin(9.2 - n \cdot 2.3) \cdot \tan 9.2$ , for  $n=1-3, 5-8$   $R=918.7$   
 for transf. 16  $\Delta x = (4 \cdot 36.7 - 20.1) \cdot \tan 9.2 - R \cdot (\sec(9.2) - 1)$ , for  $R=918.7$   
 To parametrize in terms of dipole drop use  $20.1 = 145 / \cos 9.2 - 2 \cdot \text{dipole\_drop} / \sin 18.4$   
 $\text{drift } 21 = 0.599 / \cos 9.2 = 60.68$ ;  $\Delta x = \Delta x(20) + 59.9 \cdot \tan 9.2$

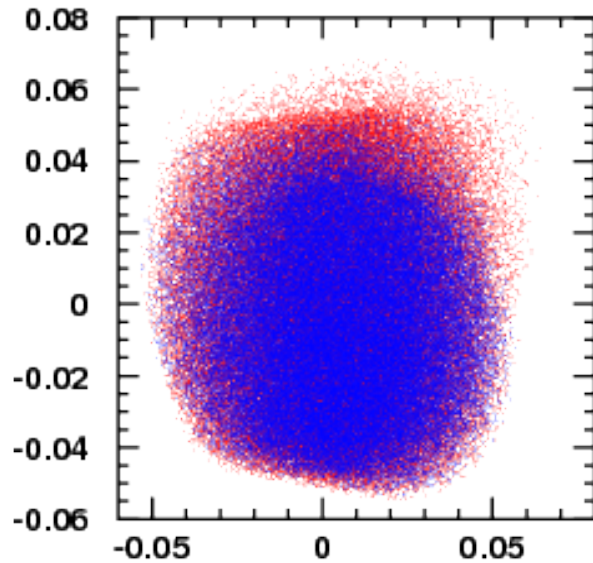


# SHMS COSY vs SNAKE Models

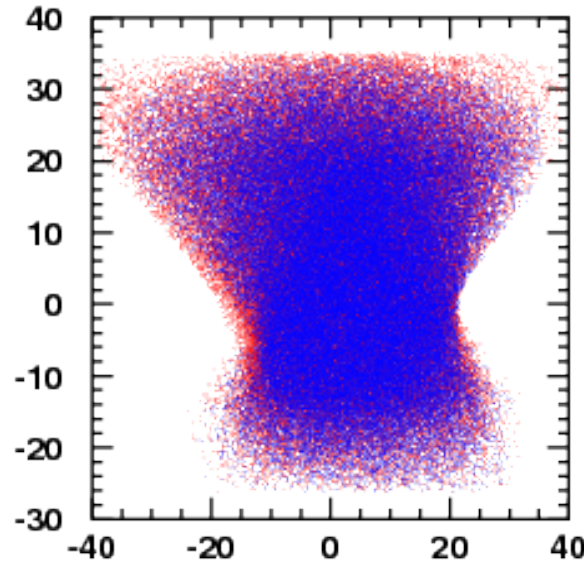




# Reproducing pre-2009 distributions



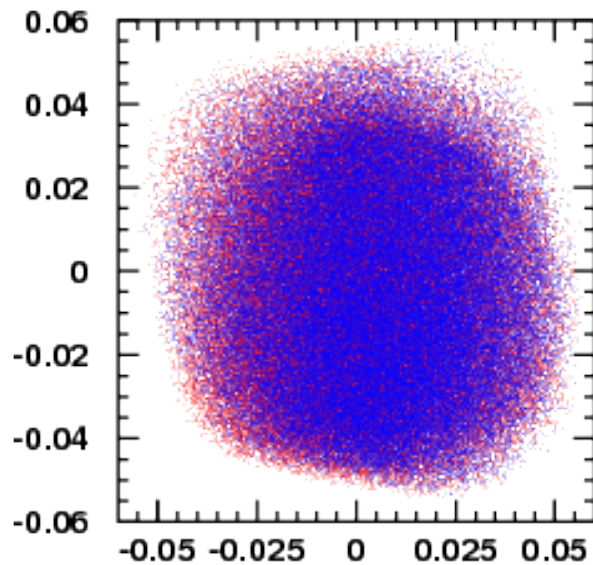
hsxptar VS. hsyptar



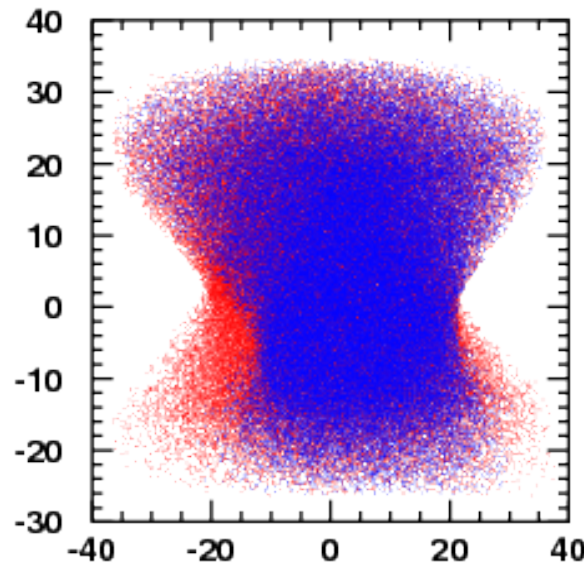
hsxfp VS. hsyfp

**Blue: all apertures  
(final acceptance)  
~ 4 msr**

**Red: No dipole  
aperture**



hsxptar VS. hsyptar



hsxfp VS. hsyfp

**Blue: all apertures  
(final acceptance)**

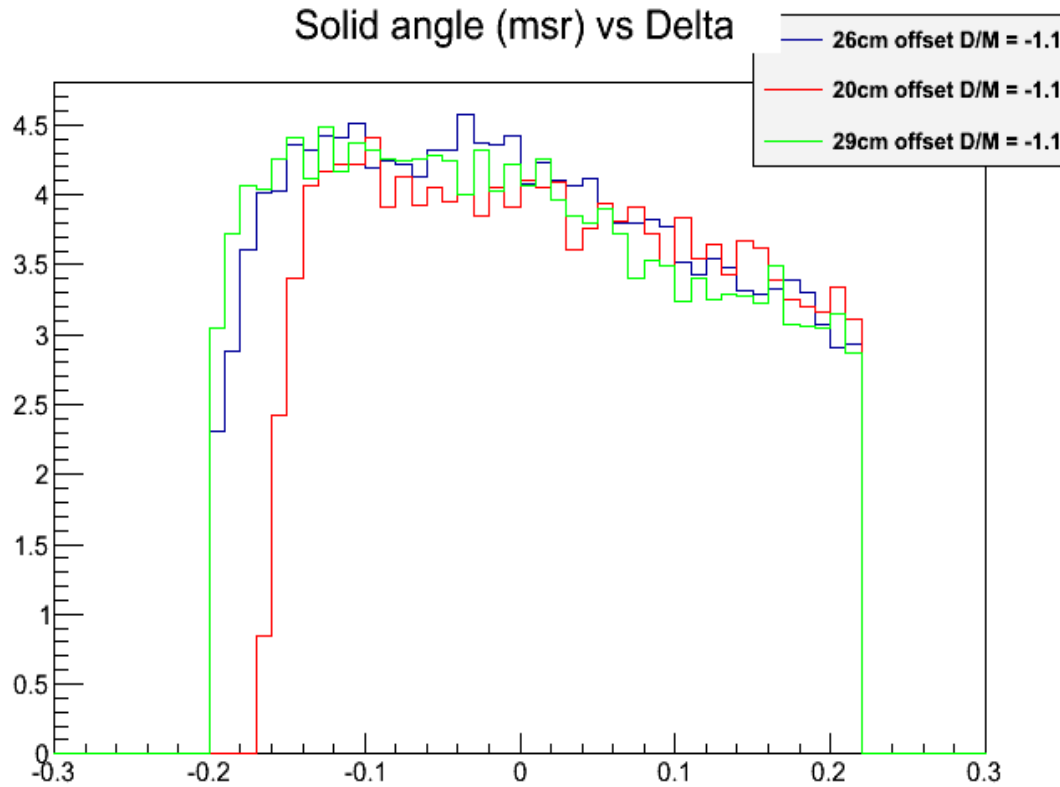
**Red: No HB,  
No Q1, Q2 and Q3  
mech. apertures**

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

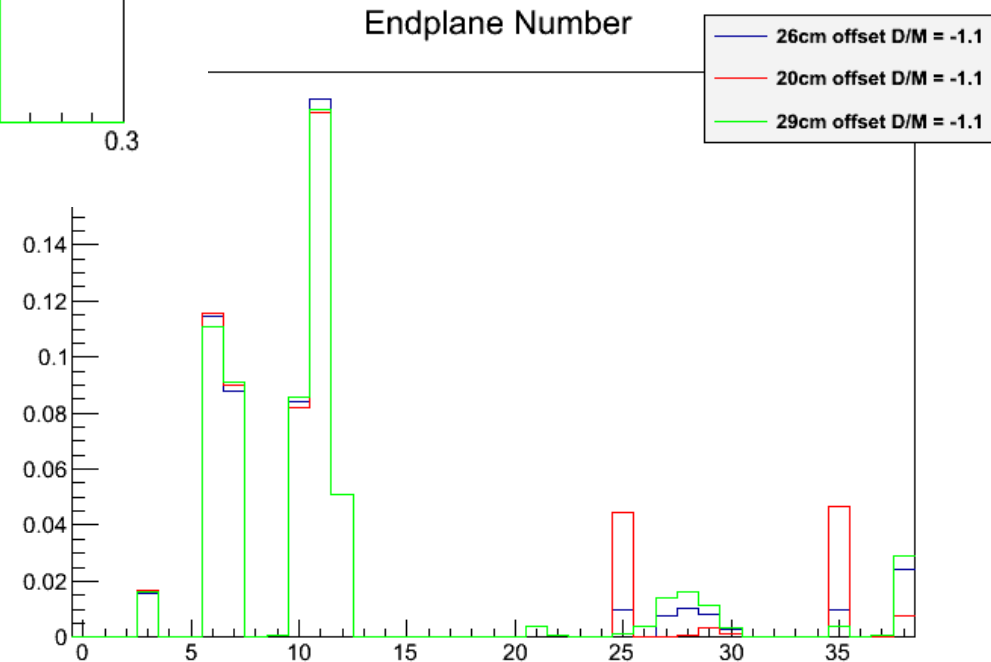




# SHMS Dipole Vertical Offset

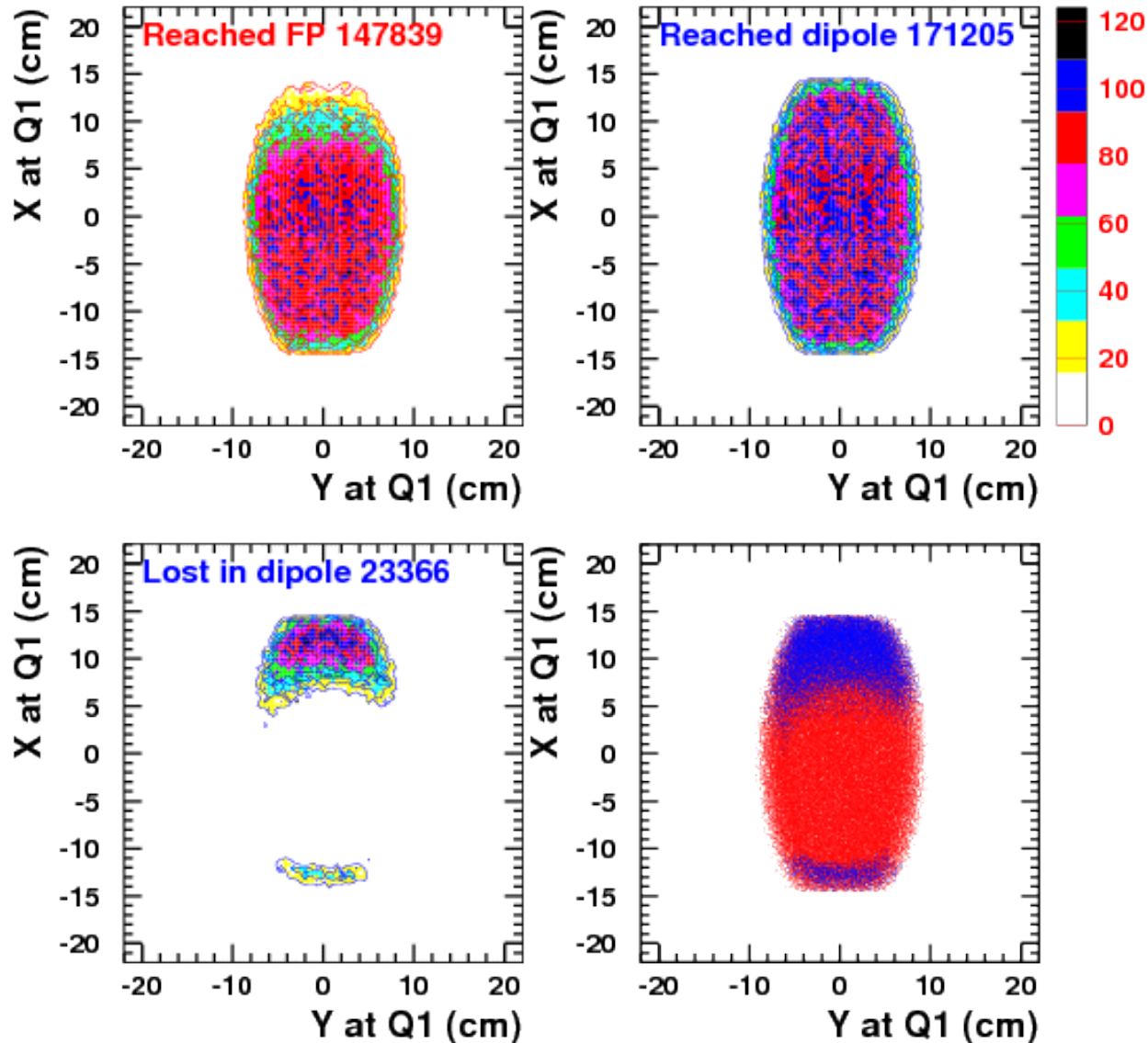


Three vertical offsets were studied  
20, 26 and 29 cm





# SHMS Dipole Vertical Offset

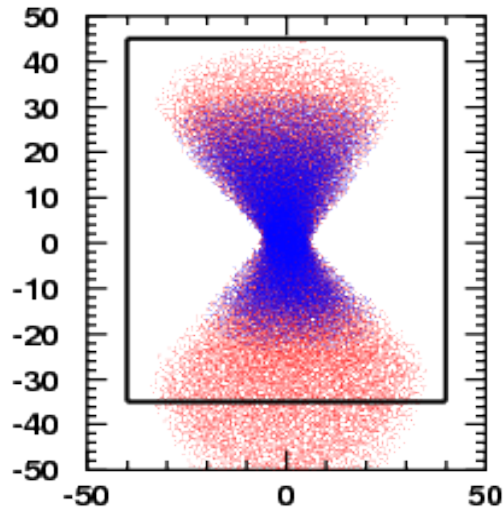


Three vertical offsets were studied  
20, 26 and 29 cm

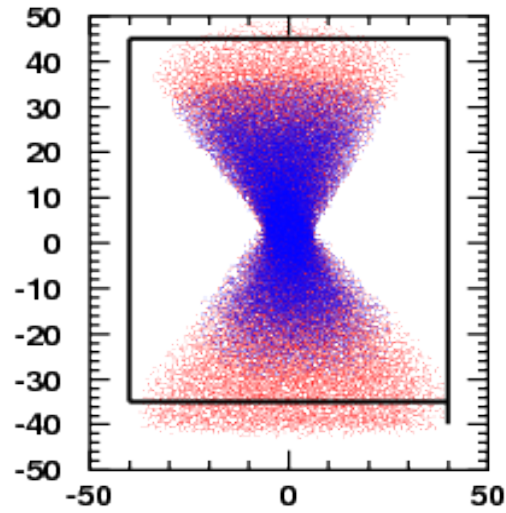




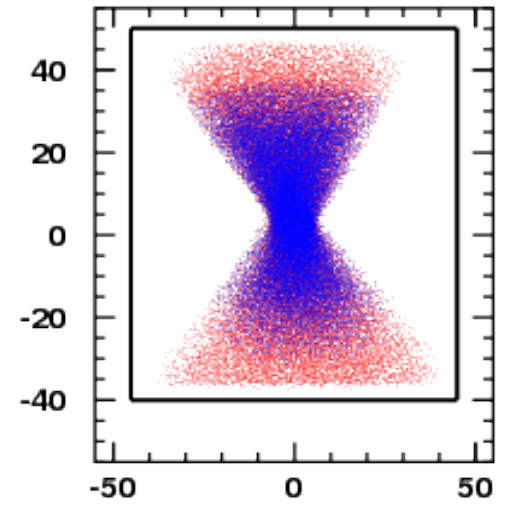
# Beam Envelopes at the Drift Chamber



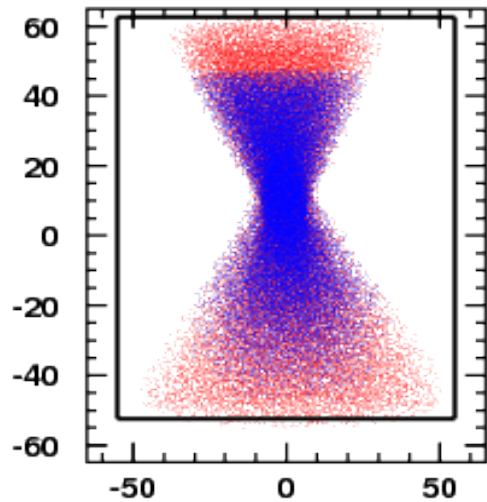
DC1 x vs y



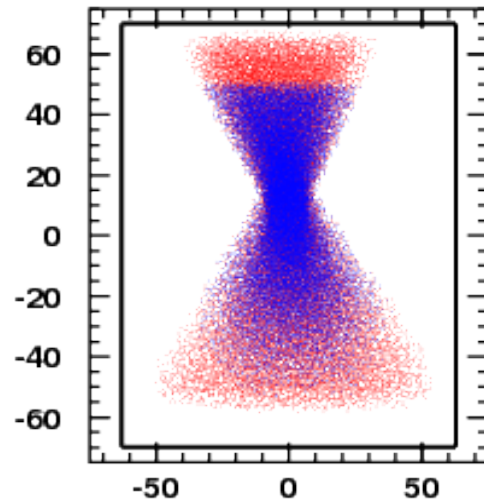
DC2 x vs y



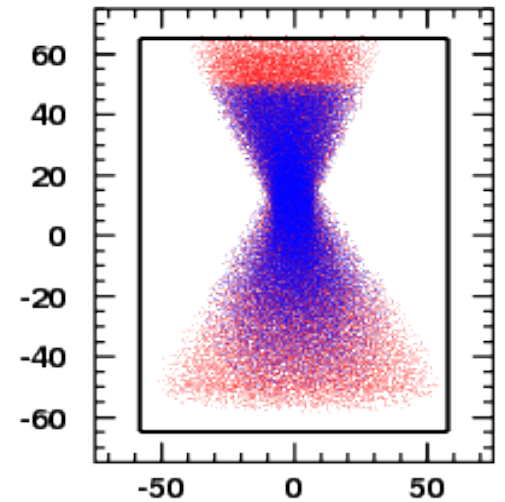
S1 x vs y



S2 x vs y



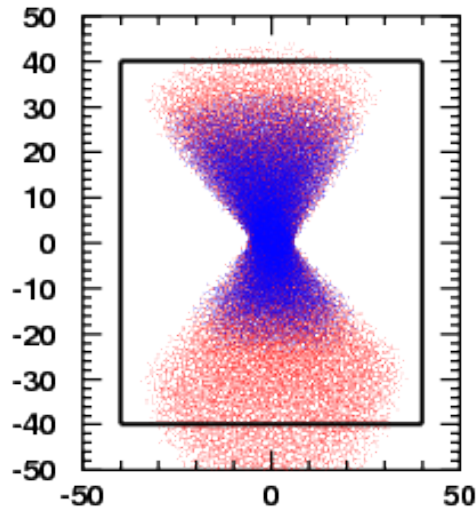
Cal x vs y



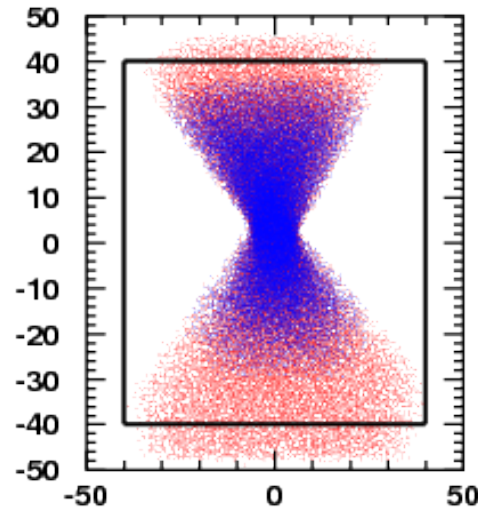
feduc x vs y



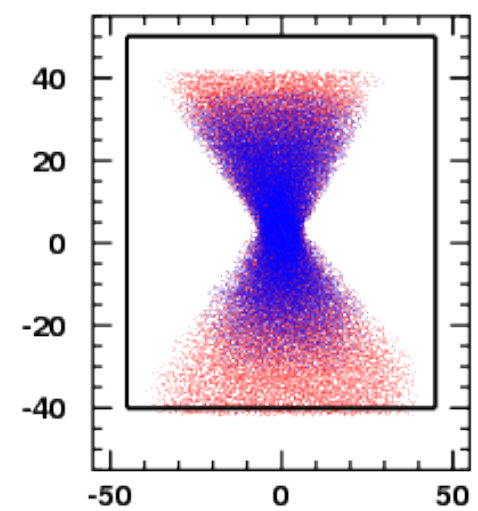
# Beam Envelopes at the Drift Chamber



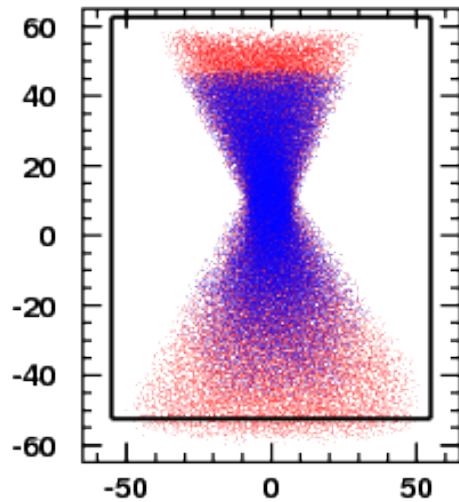
DC1 x vs y



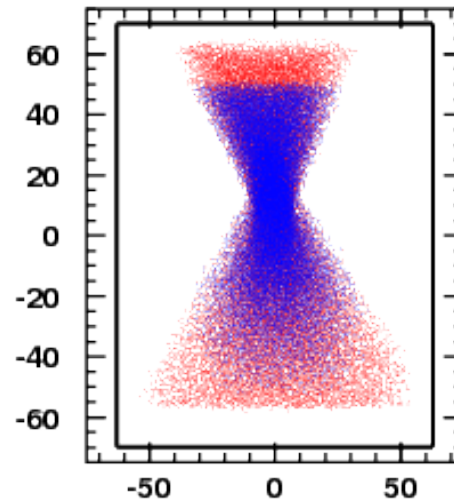
DC2 x vs y



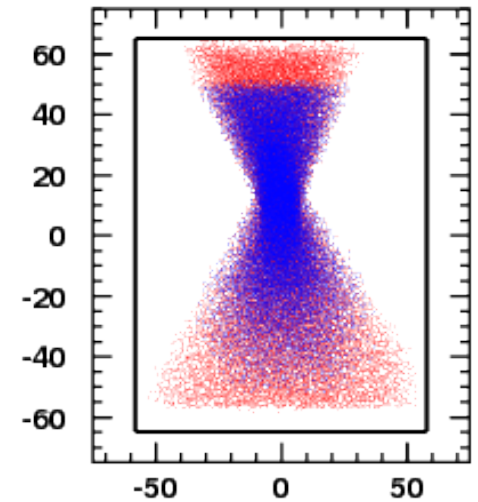
S1 x vs y



S2 x vs y



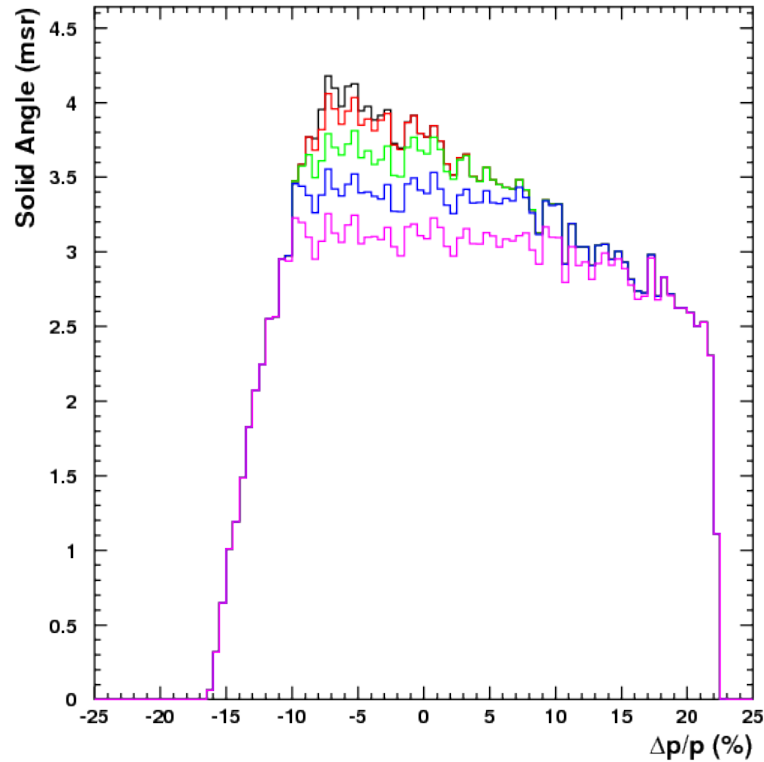
Cal x vs y



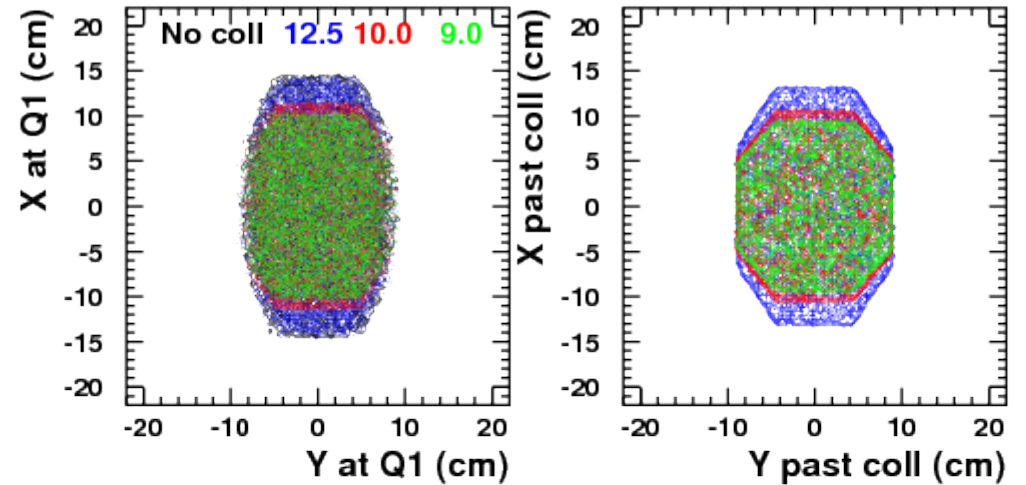
feduc x vs y



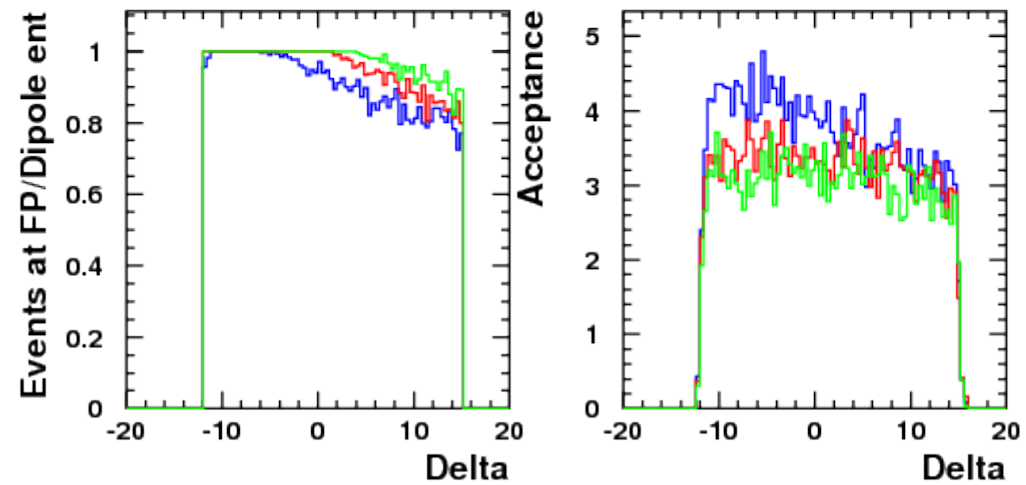
# Collimators



**Collimators and sieve slits will be placed  $\sim 33$ cm in from of the Q1.**

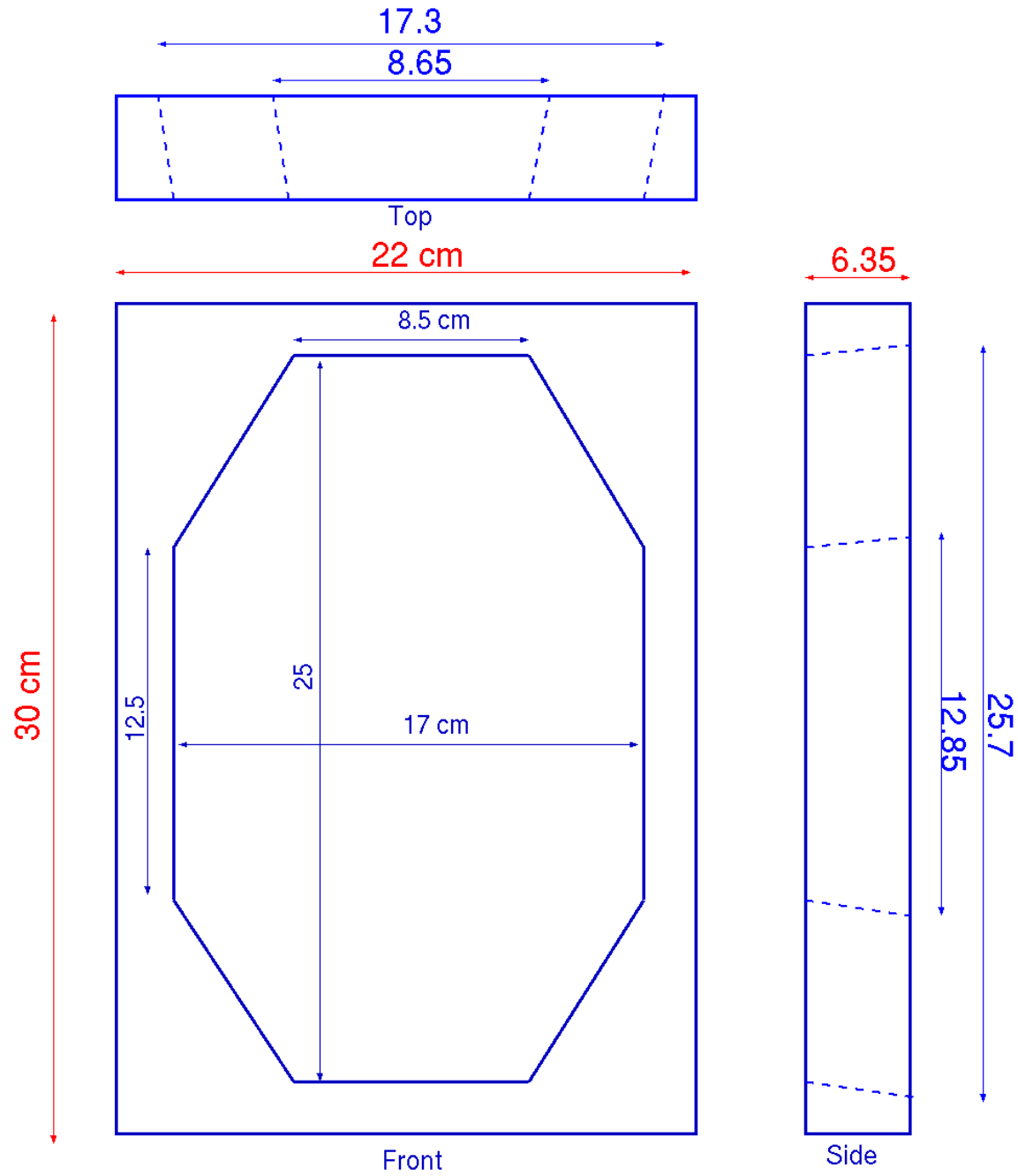


**A single 25 cm x 17 cm Collimator will be used**



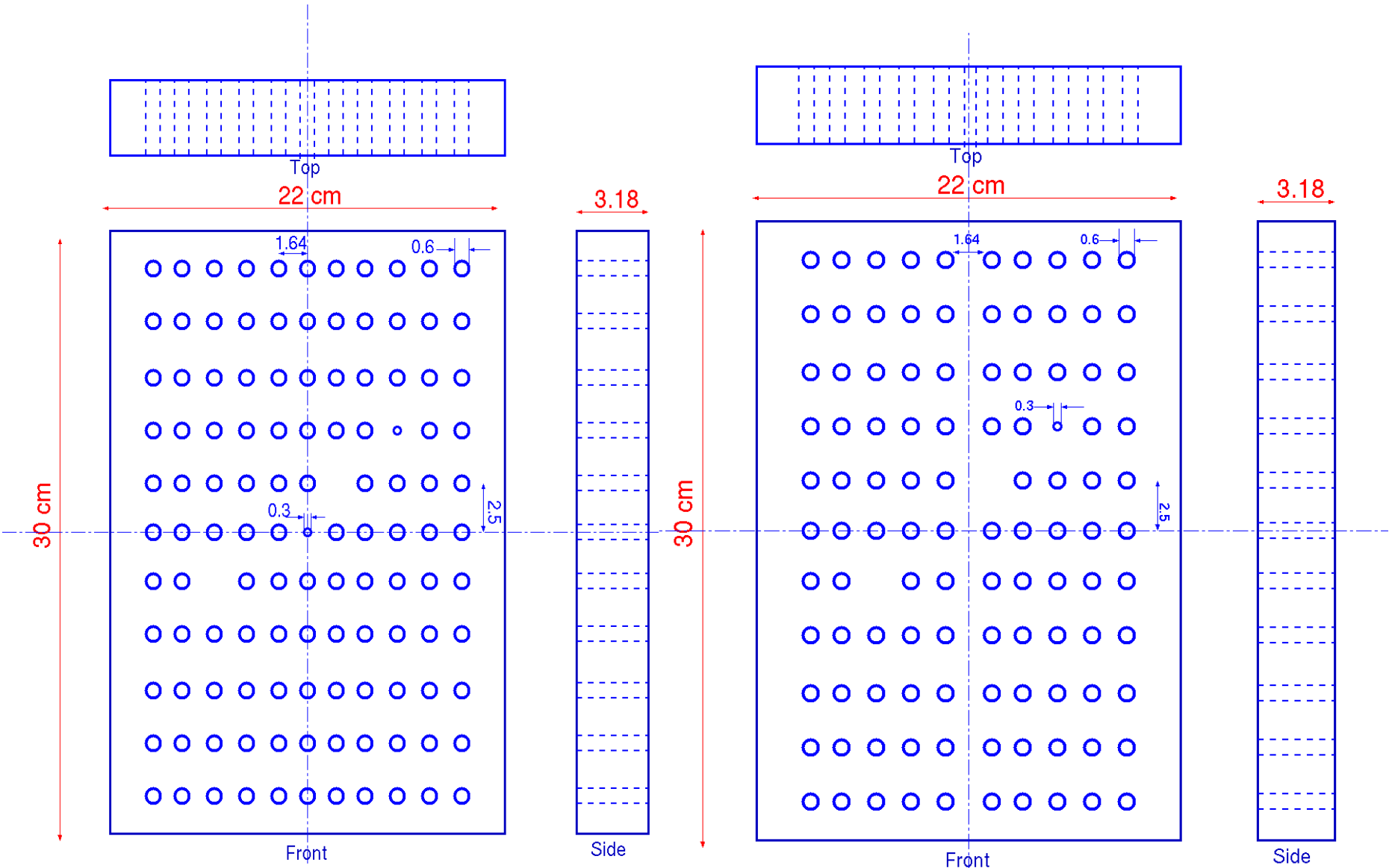


# Collimators



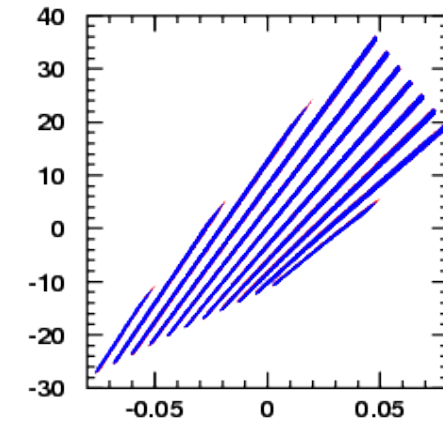


# Sieve Slits

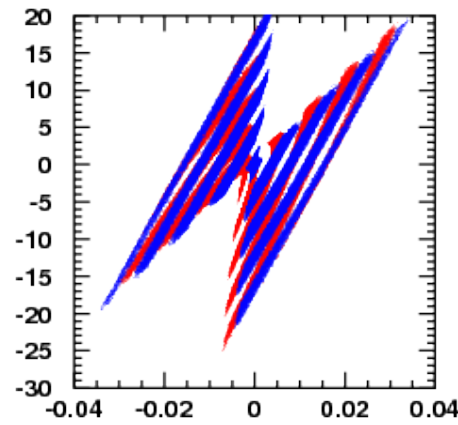




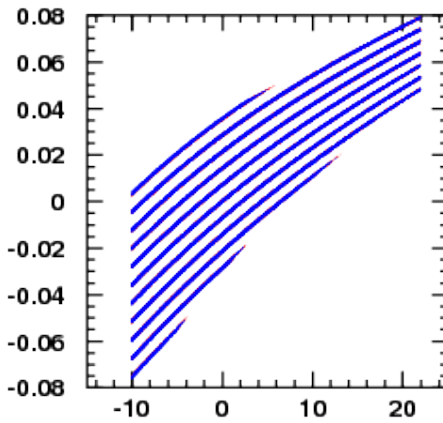
# Sieve Slits



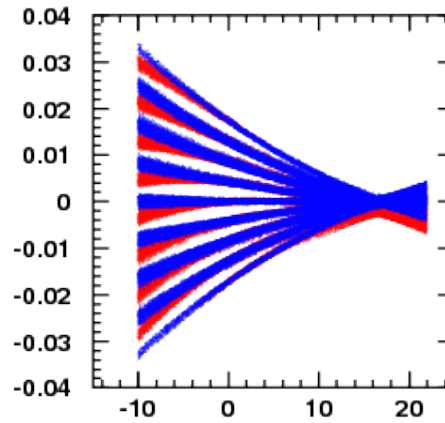
hsxftp VS. hsxftp



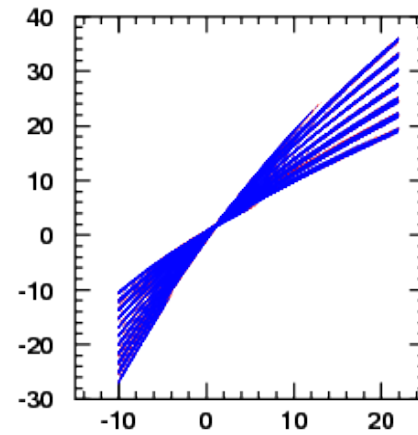
hsyfp VS. hsyfp



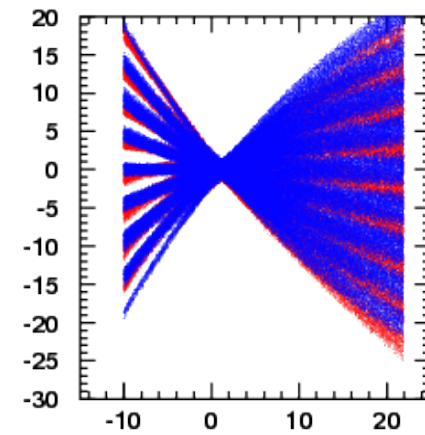
hsxftp VS. hsdeltai



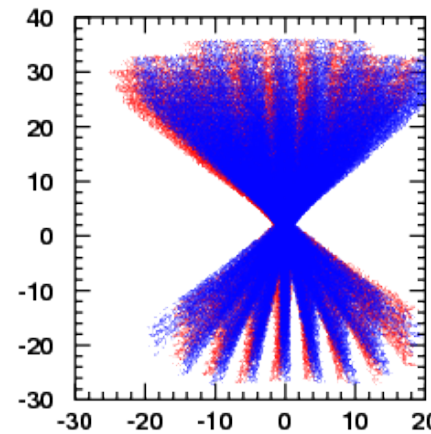
hsyfp VS. hsdeltai



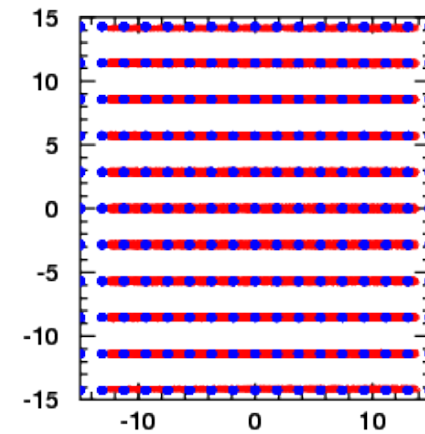
hsxftp VS. hsdeltai



hsyfp VS. hsdeltai



hsxftp VS. hsyfp



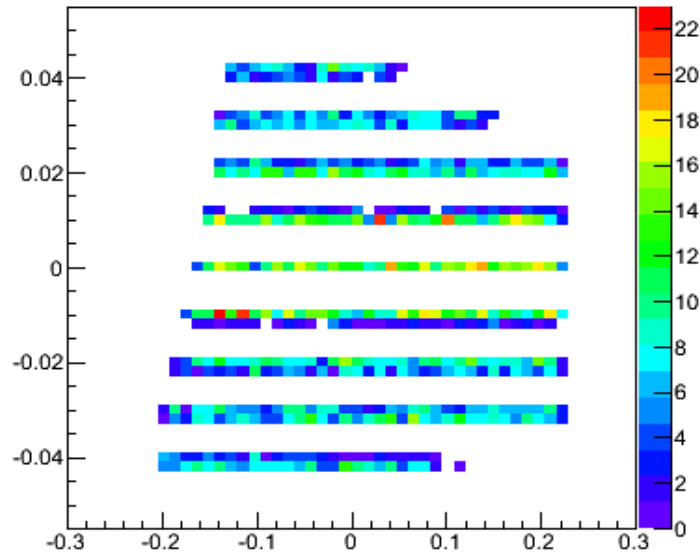
s\_q1\_x VS. s\_q1\_y



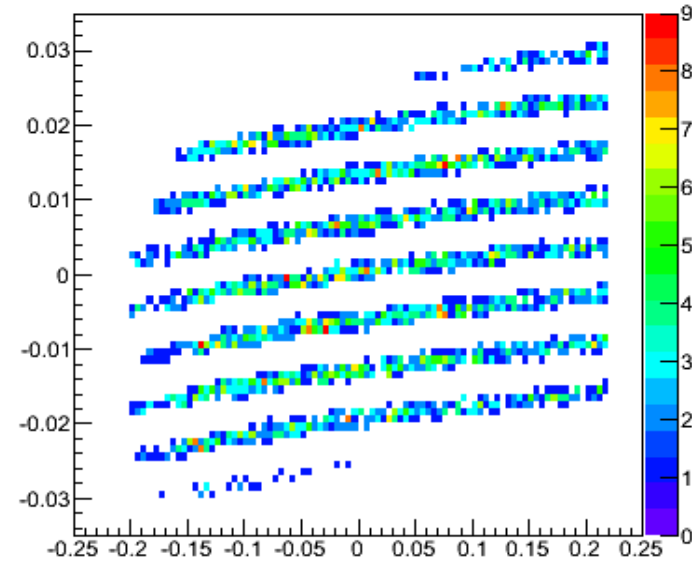


# Sieve Slits

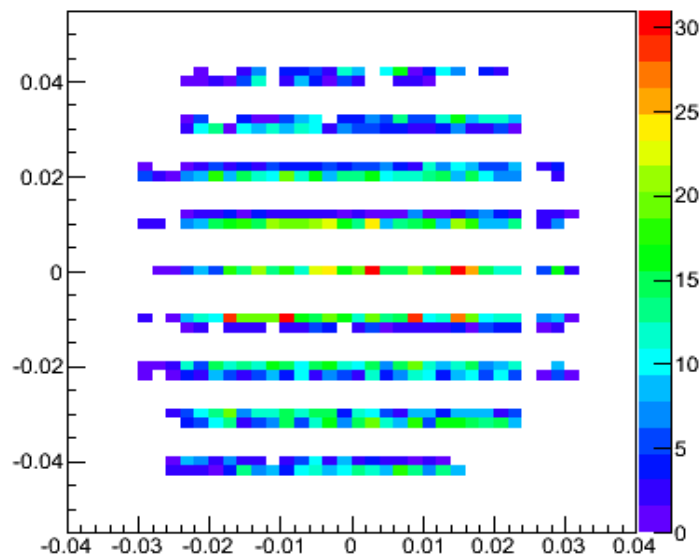
xptar vs delta



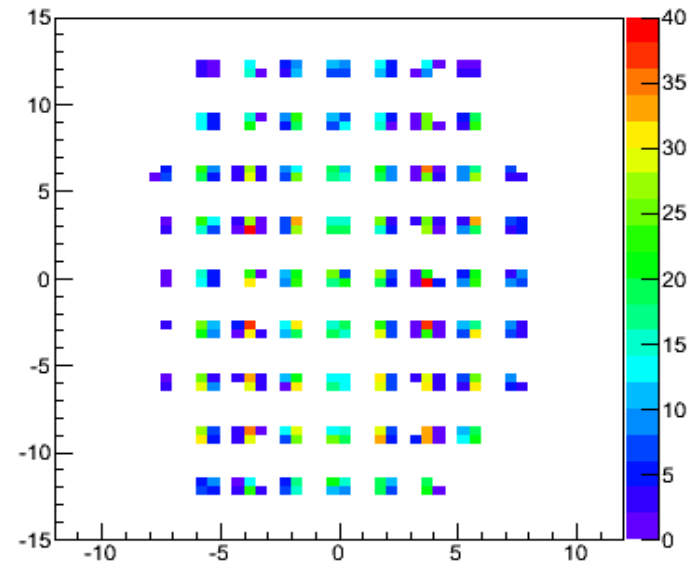
yptar vs delta



xptar vs yptar



xs vs ys before Q1





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