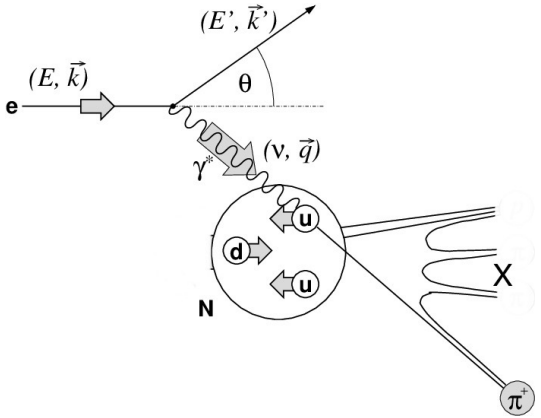
CSV magnet and target status

Shuo Jia

Charge Symmetry Violation



Jlab HallC Sidis

- SHMS: negative polarity for pi-, positive polarity for pi+
- HMS: electrons

$$R^D_{meas}(x,z) = \frac{4N^{D\pi^-}(x,z) - N^{D\pi^+}(x,z)}{N^{D\pi^+}(x,z) - N^{D\pi^-}(x,z)} \quad (1)$$

$$R_Y = \frac{N^{D\pi^-}(x,z)}{N^{D\pi^+}(x,z)} \quad (2)$$

run group

runs with same hms momentum and same absolute shms momentum belongs to same group.

group	polarity	target	runs
140	neg	LH2	6139,6140,6141
		LD2	6136,6137,6138
		Dummy	6129,6130,6132,6133,6135
	pos	LH2	6188,6189,6190
		LD2	6185,6186,6487
		Dummy	6183,6184

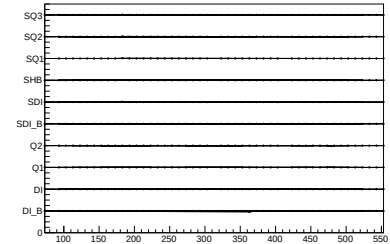
group	polarity	target	runs
440	neg	LH2	
		LD2	7611,7612,7613,7614,7615,7616
		Dummy	7617,7618,7619
	pos	LH2	
		LD2	7646,7647,7648,7649,7650,7651,7652
		Dummy	7654,7655

- "$group\_num$" : assigned group number for each group. In order of run number.Group number greater than 420 is spring runs group.
- neg/pos : runs with negative/positive shms momentum.
- $D2/H2/Dummy$: runs with different target.

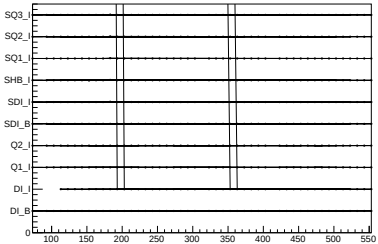
ratio

- $EPICS$: Provide control and feed back of the device. eg. Magnet current values are read out once per 30'
- $average_{neg}$: average of this value for all pi- runs
- $ratio$: $\frac{average_{neg}}{average_{pos}}$

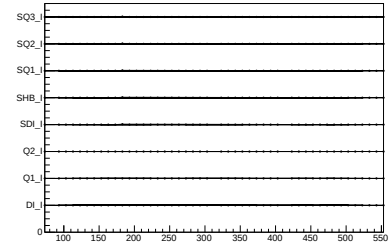
Set



rs232 readback current



analog readback current



HP,HallP

pattern: up

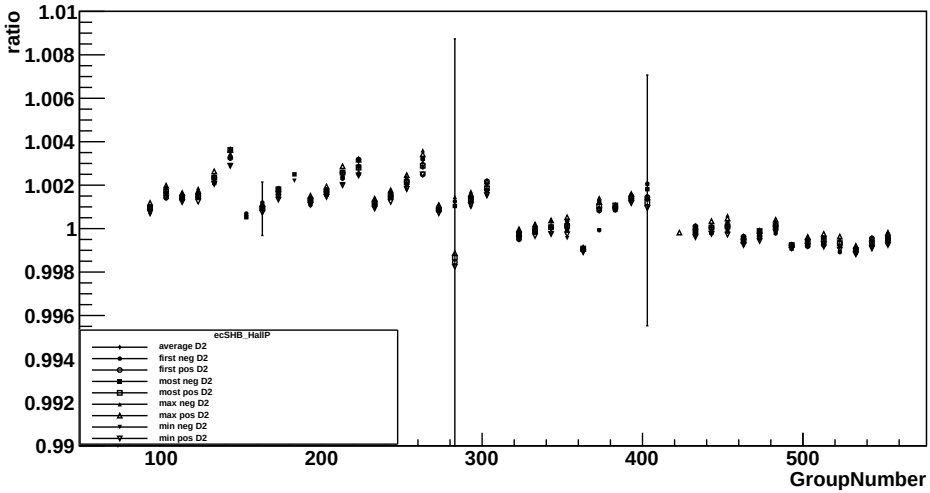
ecSDI_HP : SHMS HP raw Hall probe value
ecSHB_HP : SHMS HB raw Hall probe value
ecSHB_HallP : SHMS Hall probes HB(corrected)
ecSQ3_HP : SHMS Q3 raw Hall probe value
ecSQ3_HallP: SHMS Hall probes Q3(corrected)

pattern: down

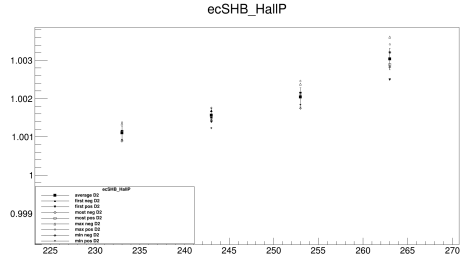
ecsQ1_HP : SHMS Q1 raw Hall probe value
ecsQ1_HallP : SHMS Hall probes Q1(corrected)
ecsQ2_HP : SHMS Q2 raw Hall probe value
ecsQ2_HallP :SHMS Hall probes Q2(corrected)

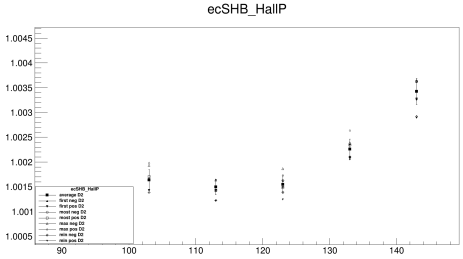
There is a pattern going along with z.

SHMS Hall probes HB (corrected)



ecSHB_HallP

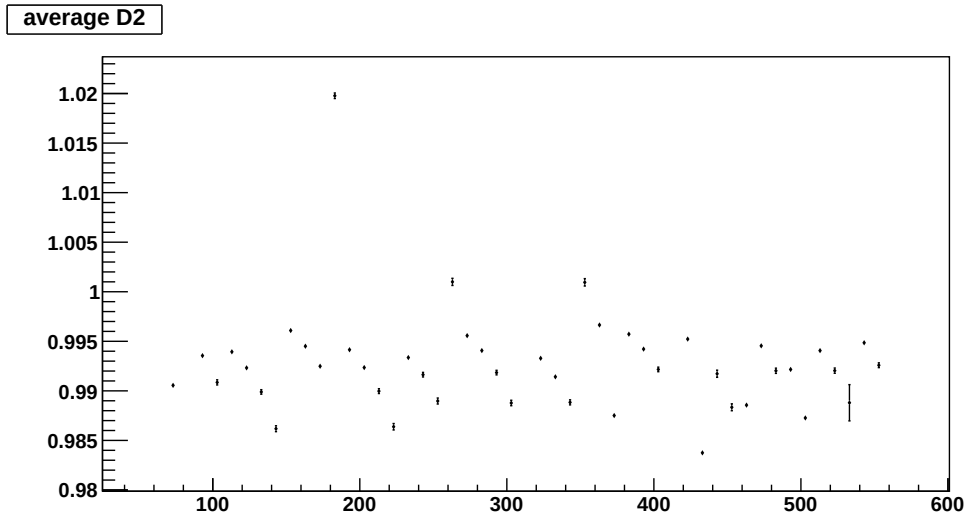




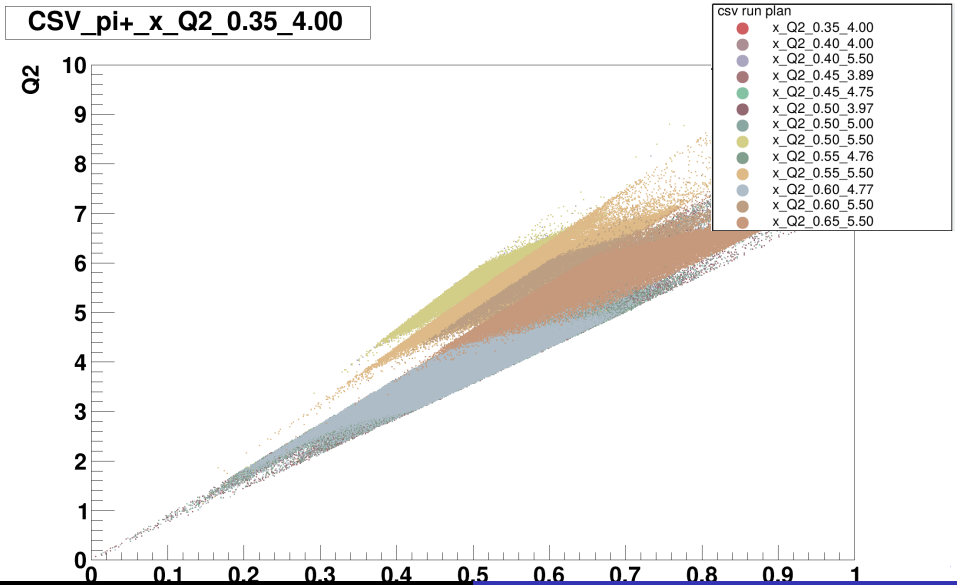
- hms_P = -6.358
- 230 : 6359-6365, shms_P = -2.966,z = 0.7
- 240 : 6367-6372, shms_P = -2.541,z = 0.6
- 250 : 6373-6377, shms_P = -2.116,z = 0.5
- 260 : 6378-6383, shms_P = -1.691,z = 0.4

- hms_P : -5.983
- 110 : 6104-6114, shms_P = -3.229, z = 0.7
- 120 : 6115-6121, shms_P = -2.767, z = 0.6
- 130 : 6122-6128, shms_P = -2.304, z = 0.5
- 140 : 6129-6141, shms_P = -1.842, z = 0.4

SHMS Q1 Hall probe value corrected

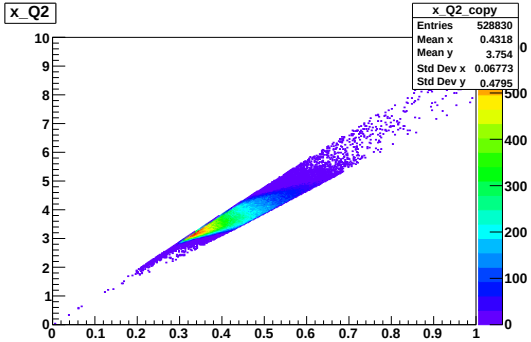


kinematics

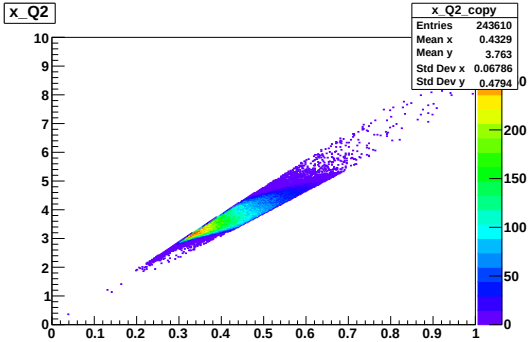

CSV_pi+_x_Q2_0.35_4.00
Q2
csv run plan
x_Q2_0.35_4.00
x_Q2_0.40_4.00
x_Q2_0.40_5.50
x_Q2_0.45_3.89
x_Q2_0.45_4.75
x_Q2_0.50_3.97
x_Q2_0.50_5.00
x_Q2_0.50_5.50
x_Q2_0.55_4.76
x_Q2_0.55_5.50
x_Q2_0.60_4.77
x_Q2_0.60_5.50
x_Q2_0.65_5.50
0
1
2
3
4
5
6
7
8
9
10
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

Choose all positive and negative polarity runs in run group 140, Q2 = 3.898, x = 0.45, shms$_p$1.842, $hms_p - 5.983$

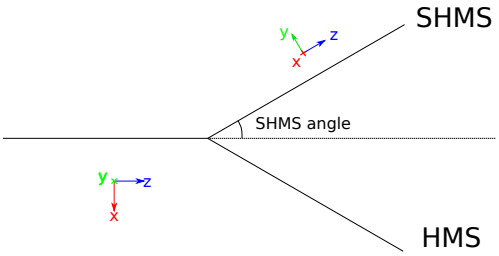
negative for pi-



positive for pi+



Change coordinate system



Rotate along z for $\pi/2$

Rotate along x for shms angle

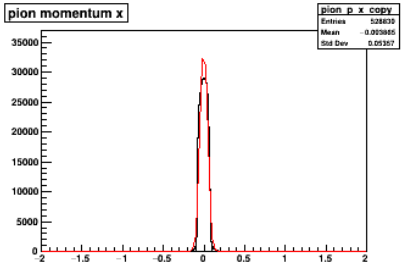
$\vec{p}_{beamline} = (P.gtr.px, P.gtr.py, P.gtr.pz)$

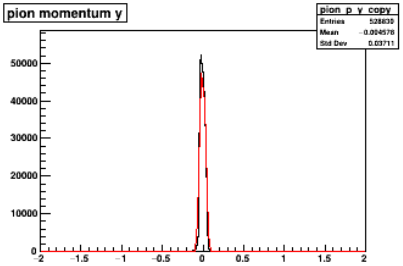
$\mathcal{R} = \mathcal{R}_x * \mathcal{R}_z$

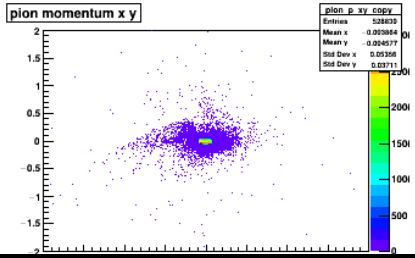
$$\mathcal{R} = \begin{bmatrix} 0 & -1 & 0 \\ cos(\theta) & 0 & -sin(\theta) \\ sin(\theta) & 0 & cos(\theta) \end{bmatrix}$$

$\vec{p}_{spectrometer} = \mathcal{R} * \vec{p}_{beamline}$

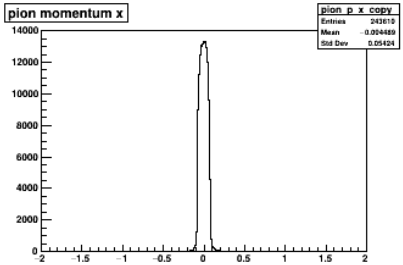
negative runs for rungroup 140

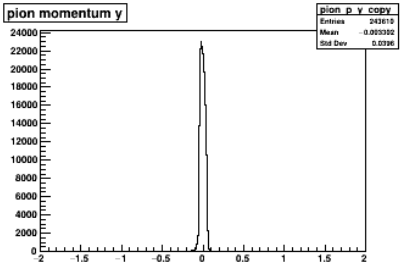


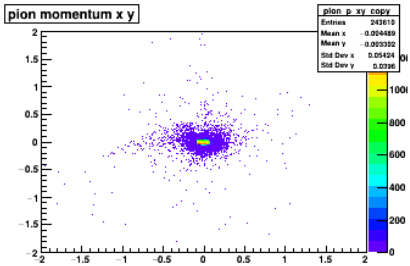




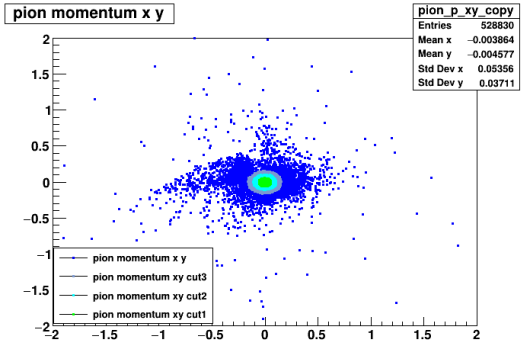
positive runs for run group 140

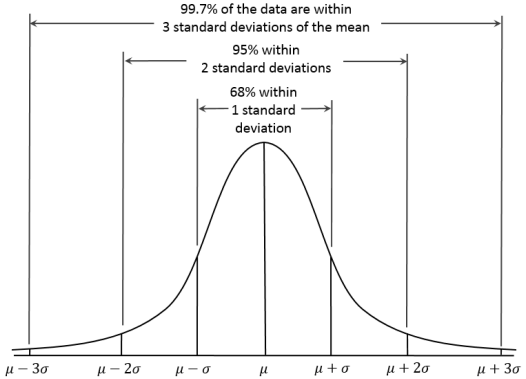






negative for pi-



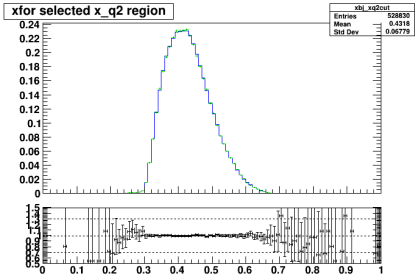


cut1: 68%, cut2: 95%,cut3: 99.7%

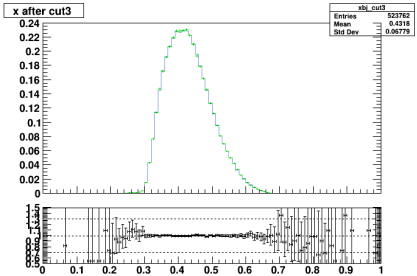
xbj for group 140 pi- runs

for negative run

compare xbj without cut and after cut1



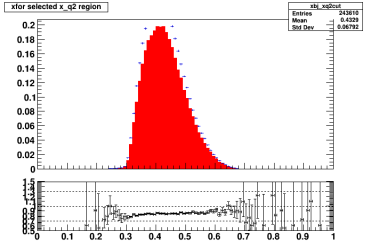
compare xbj after cut3 and cut1



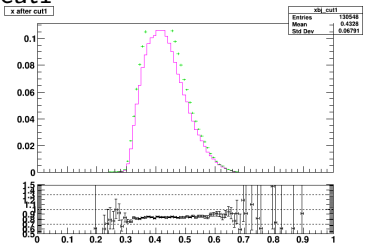
compare pi-pi+ runs xbj for group 140

compare xbj for neg runs and pos runs

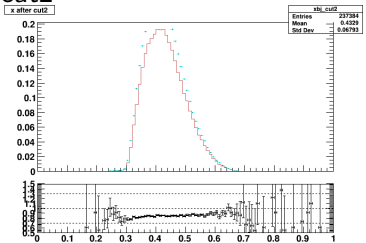
no cut



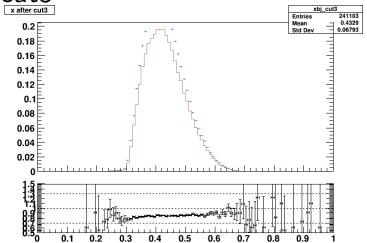
cut1



cut2



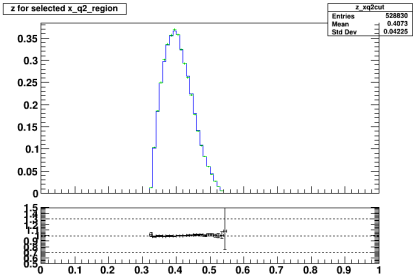
cut3



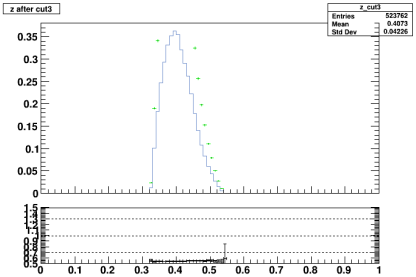
z for group 140 pi- runs

for negative runs

compare z after xq2cut and cut1



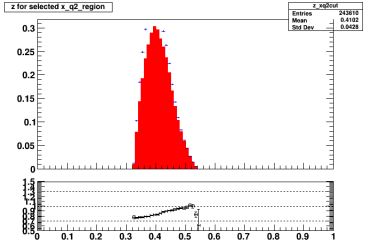
compare z after cut3 and cut1



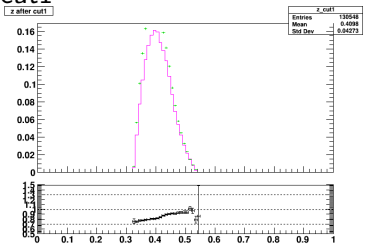
compare pi-pi+ runs z for group 140

compare z for neg runs and pos runs

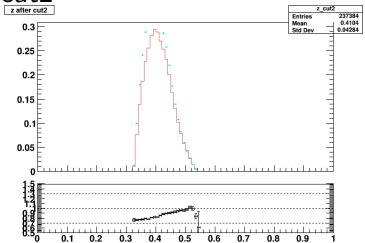
no cut



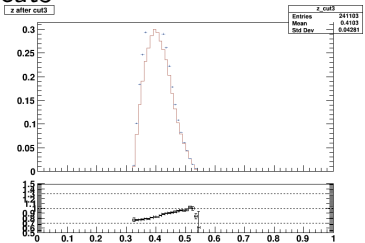
cut1



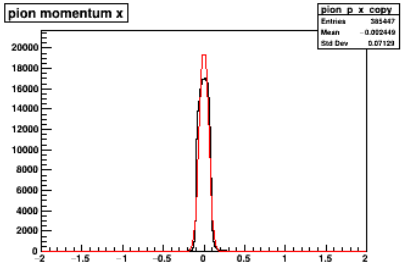
cut2

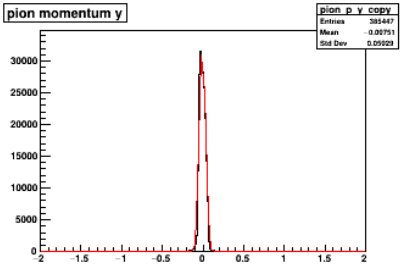


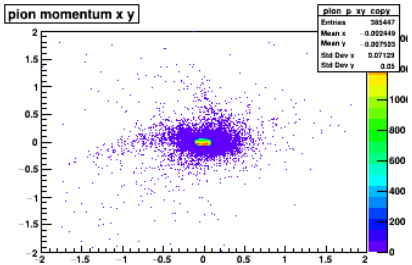
cut3



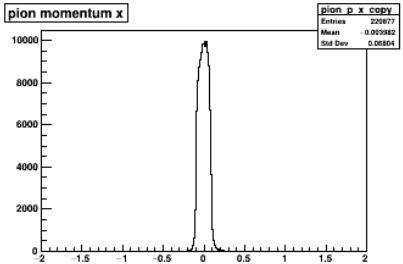
negative run for rungroup 440, Q2 = 5.5, x = 0.65, hmsp -4.357, shms p -2.928

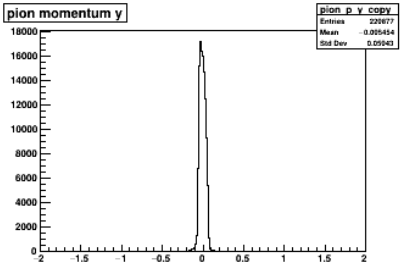


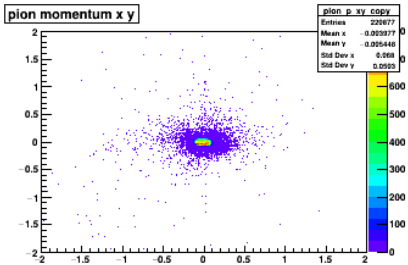




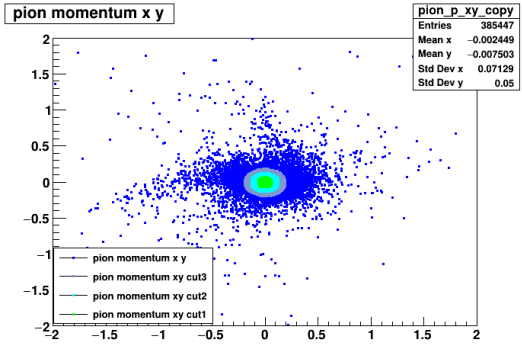
positive runs for run group 440

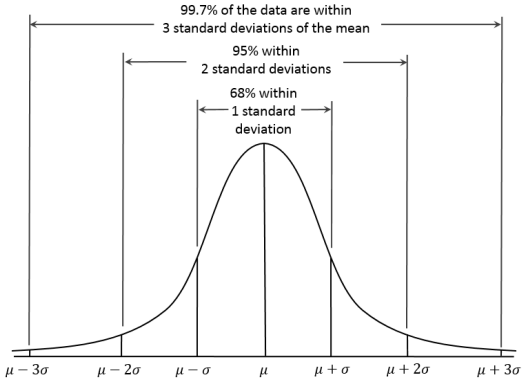






negative for pi-



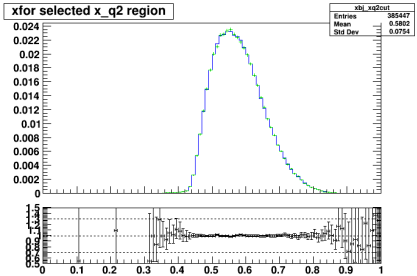


cut1: 68%, cut2: 95%,cut3: 99.7%

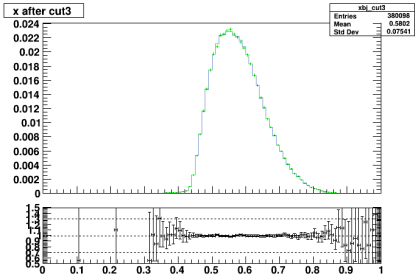
xbj for group 440 pi- runs

for negative run

compare xbj without cut and after cut1



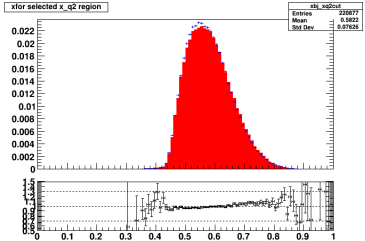
compare xbj after cut3 and cut1



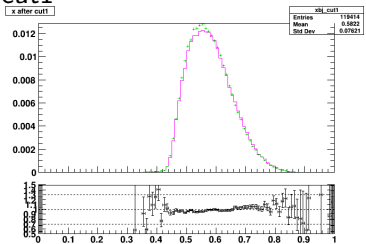
compare pi-pi+ runs xbj for group 440

compare xbj for neg runs and pos runs

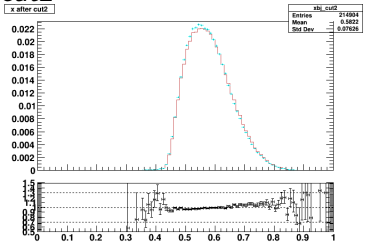
no cut



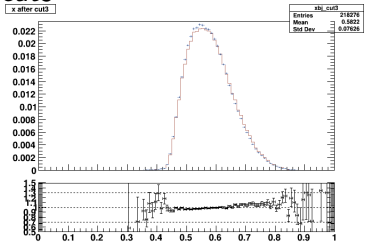
cut1



cut2



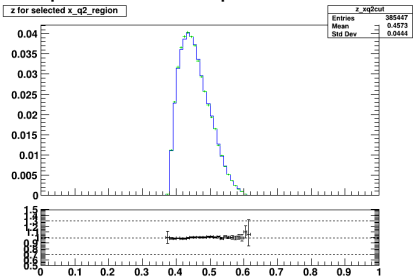
cut3



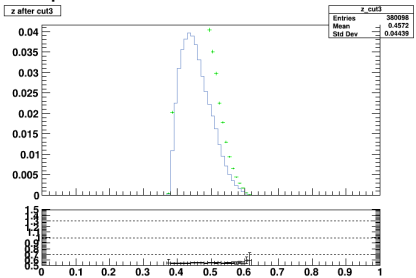
z for group 440 pi- runs

for negative runs

compare z after xq2cut and cut1



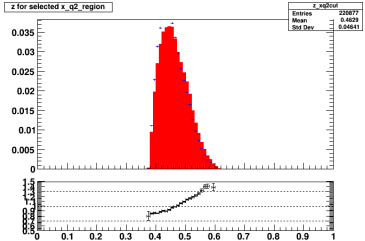
compare z after cut3 and cut1



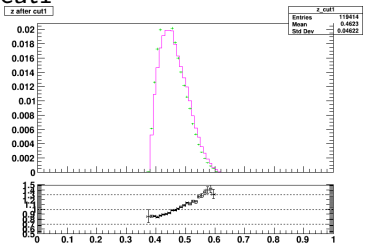
compare pi-pi+ runs z for group 440

compare z for neg runs and pos runs

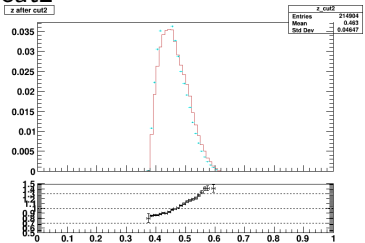
no cut



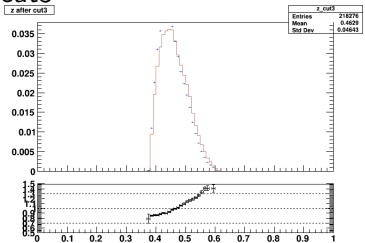
cut1



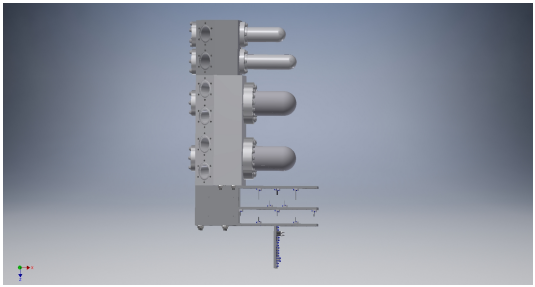
cut2



cut3

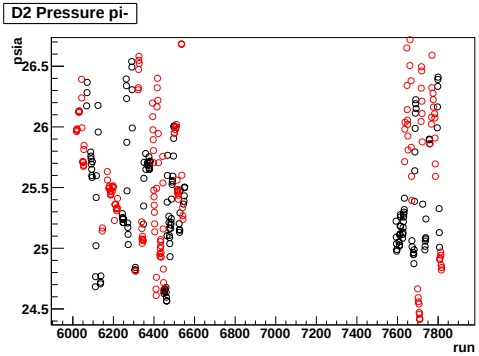


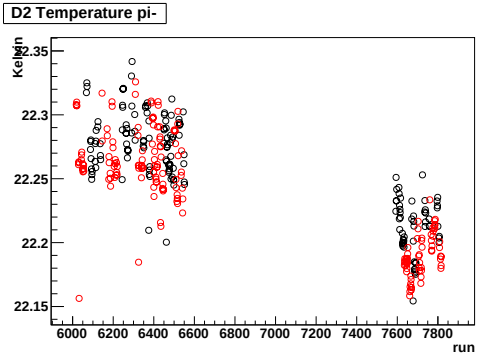
Target



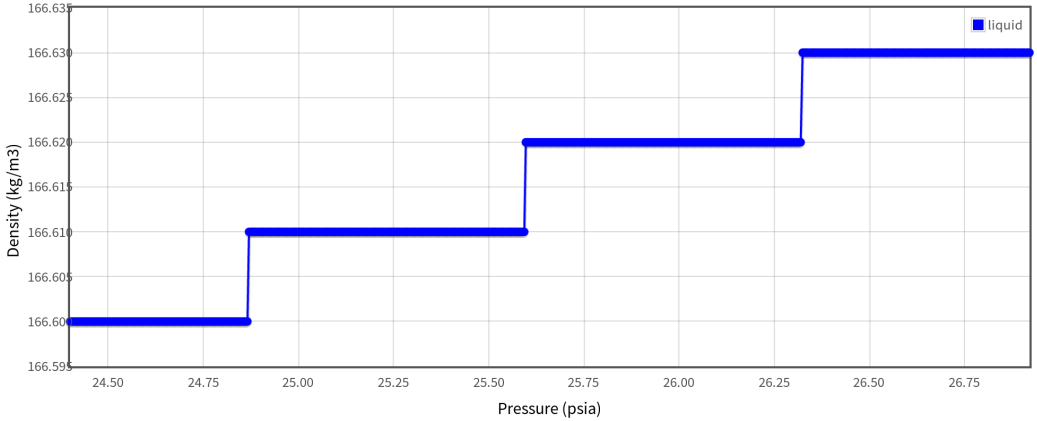
- $pressure1$: hcD2_P_Exhaust_R, pressure loop D2 return
- $pressure2$: pressure loop D2 before, around 26 psia
- $temperature1, 2, 3$: Temperature at different position
- $density$: read from NIST Chemistry WebBook

D2 status

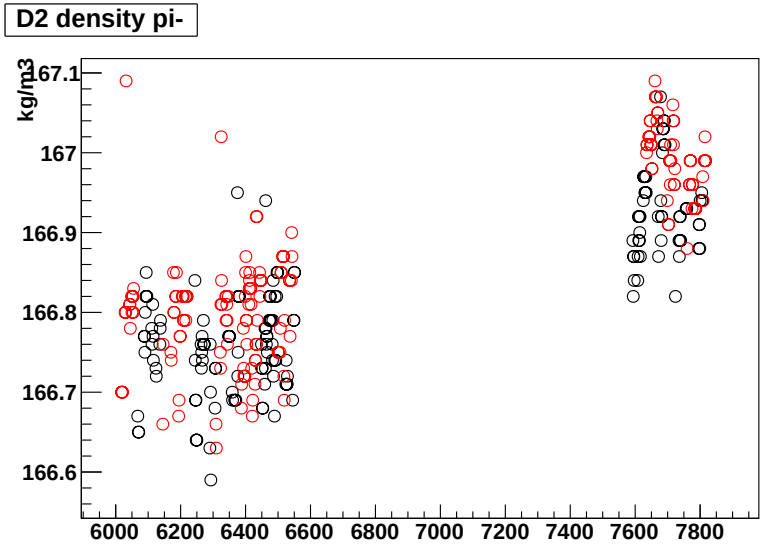

D2 Pressure pi-
psia
26.5
26
25.5
25
24.5
6000 6200 6400 6600 6800 7000 7200 7400 7600 7800
run


D2 Temperature pi-
Kelvin
22.35
22.3
22.25
22.2
22.15
6000 6200 6400 6600 6800 7000 7200 7400 7600 7800
run

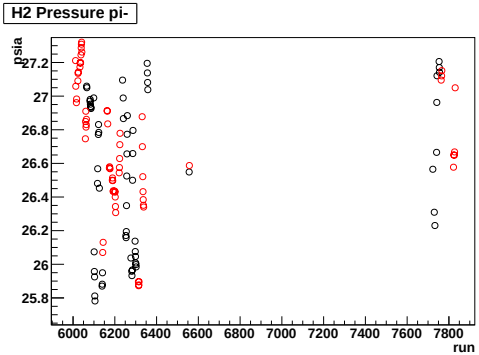
An example for LD2 density, this plot is density for D2 at temperature 22.33K, for different pressure(psia).

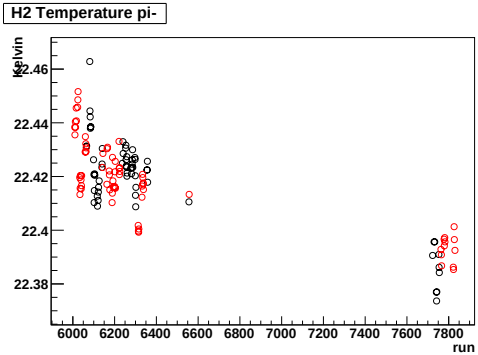


black dot for pi- runs, red dots for pi+ runs.

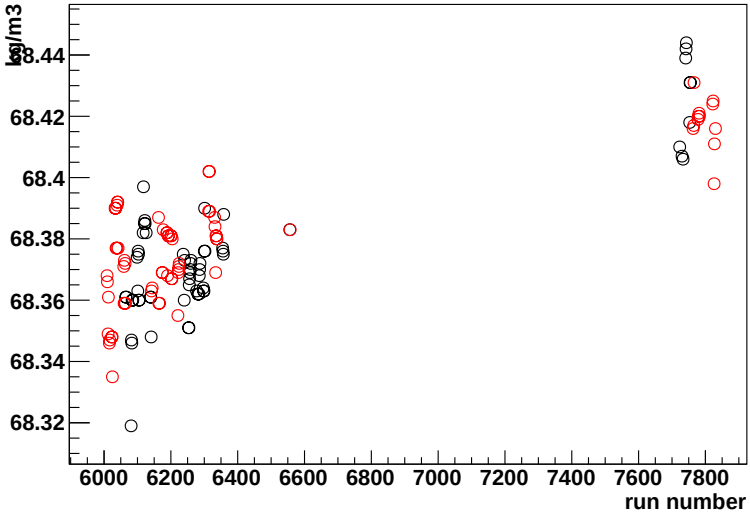


H2 status


H2 Pressure pi-
psia
27.2
27
26.8
26.6
26.4
26.2
26
25.8
6000 6200 6400 6600 6800 7000 7200 7400 7600 7800
run


H2 Temperature pi-
Kelvin
22.46
22.44
22.42
22.4
22.38
6000 6200 6400 6600 6800 7000 7200 7400 7600 7800
run

H2 density pi-



Back Up

group$_num$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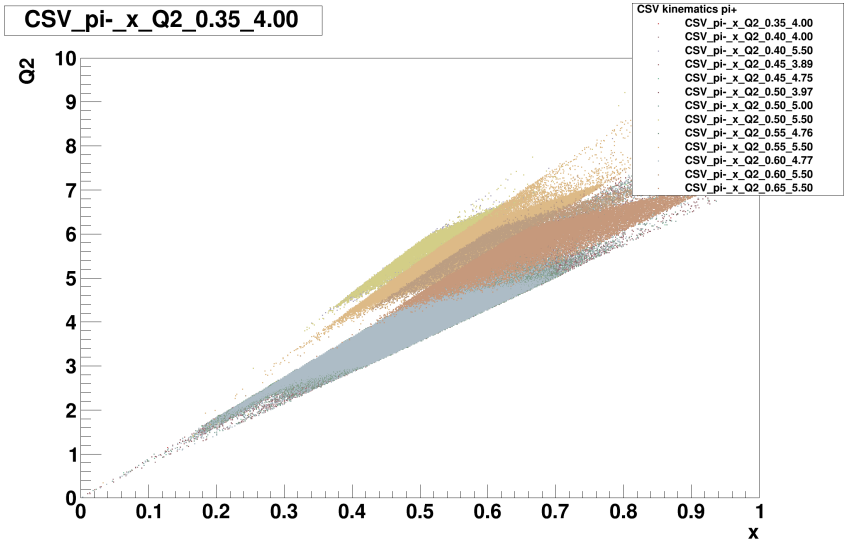
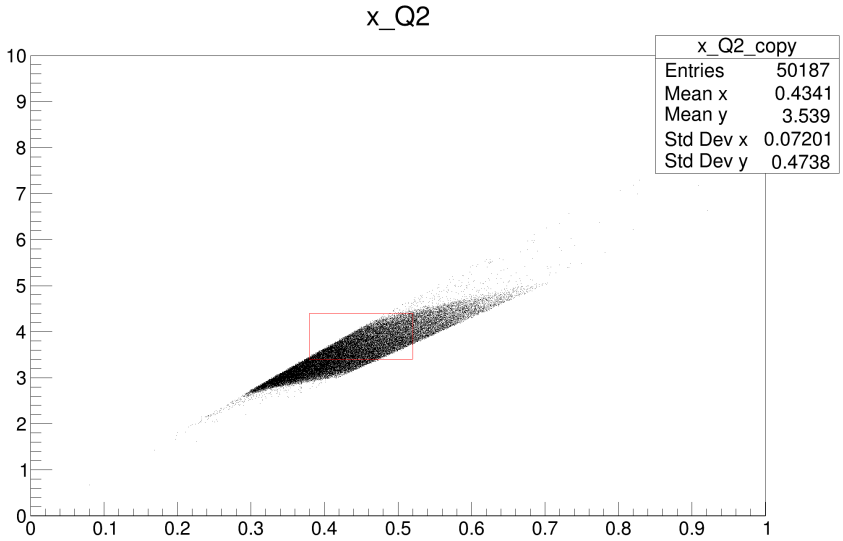
kinematics$_{pos}$



6111xq2


x_Q2
x_Q2_copy
Entries 50187
Mean x 0.4341
Mean y 3.539
Std Dev x 0.07201
Std Dev y 0.4738
0
1
2
3
4
5
6
7
8
9
10
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

pion momentum xy