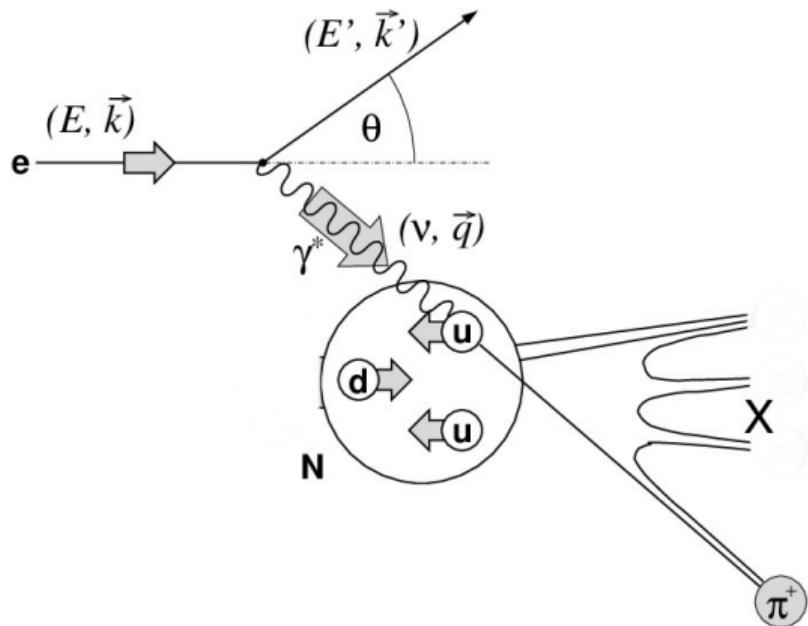


CSV magnet and target status

Shuo Jia

Charge Symmetry Violation



Jlab HallC Sidis

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

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

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

What is 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

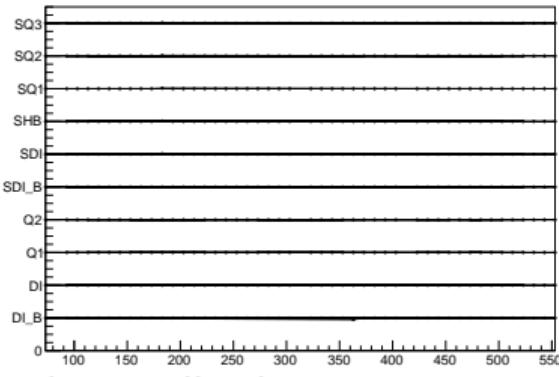
- “group-num” : assigned group number for each group. In order of run number. Group number greater than 420 is spring runs group.
- neg/pos : runs with negative/positive shms momentum.
- D2/H2/Dummy : runs with different target.

What is ratio?

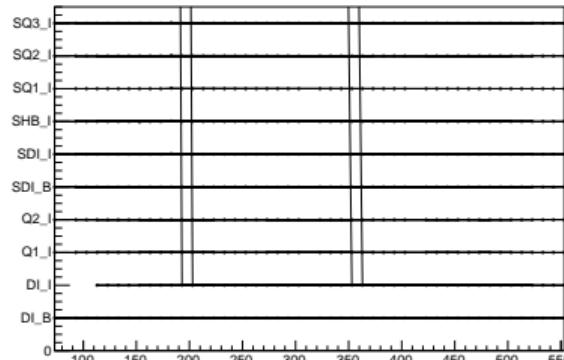
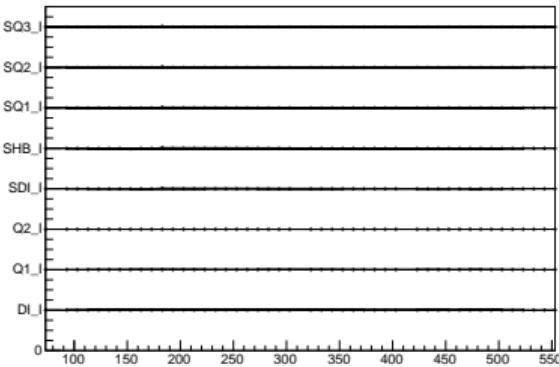
- EPICS : Provide control and feed back of the device. eg. Magnet current values are read out once per 30'
- $average_{neg}$: average of this value for all pi- runs
- $ratio : \frac{average_{neg}}{average_{pos}}$

Set

rs232 readback current



analog readback current



pattern: up

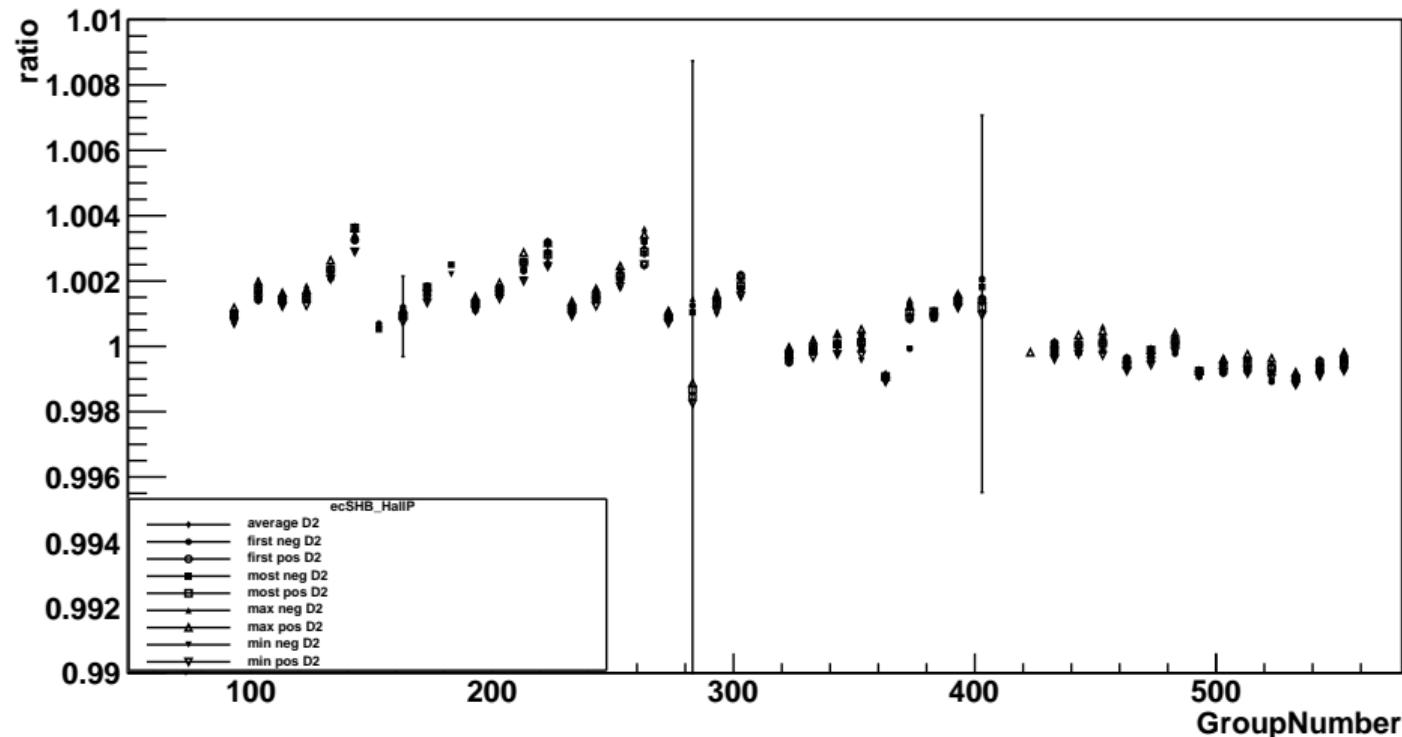
ecSDI_HP : SHMS HP raw Hall probe value
ecSHB_HP : SHMS HB raw Hall probe value
ecSHB_HallIP : SHMS Hall probes HB(corrected)
ecSQ3_HP : SHMS Q3 raw Hall probe value
ecSQ3_HallIP: SHMS Hall probes Q3(corrected)

pattern: down

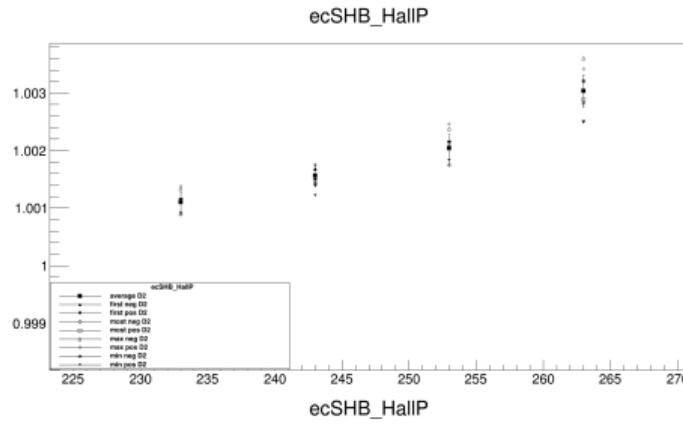
ecsQ1_HP : SHMS Q1 raw Hall probe value
ecsQ1_HallIP : SHMS Hall probes Q1(corrected)
ecsQ2_HP : SHMS Q2 raw Hall probe value
ecsQ2_HallIP : SHMS Hall probes Q2(corrected)

There is a pattern going along with z.

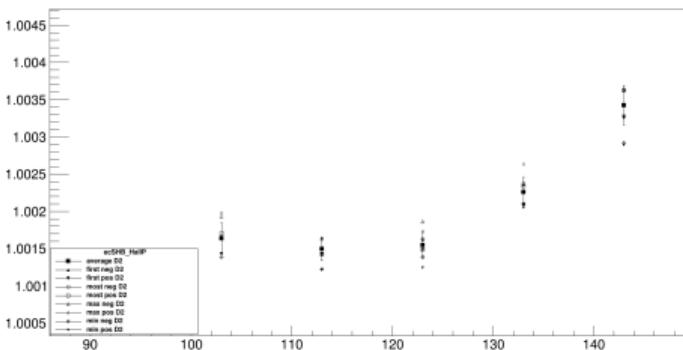
SHMS Hall probes HB (corrected)



ecSHB_HallP



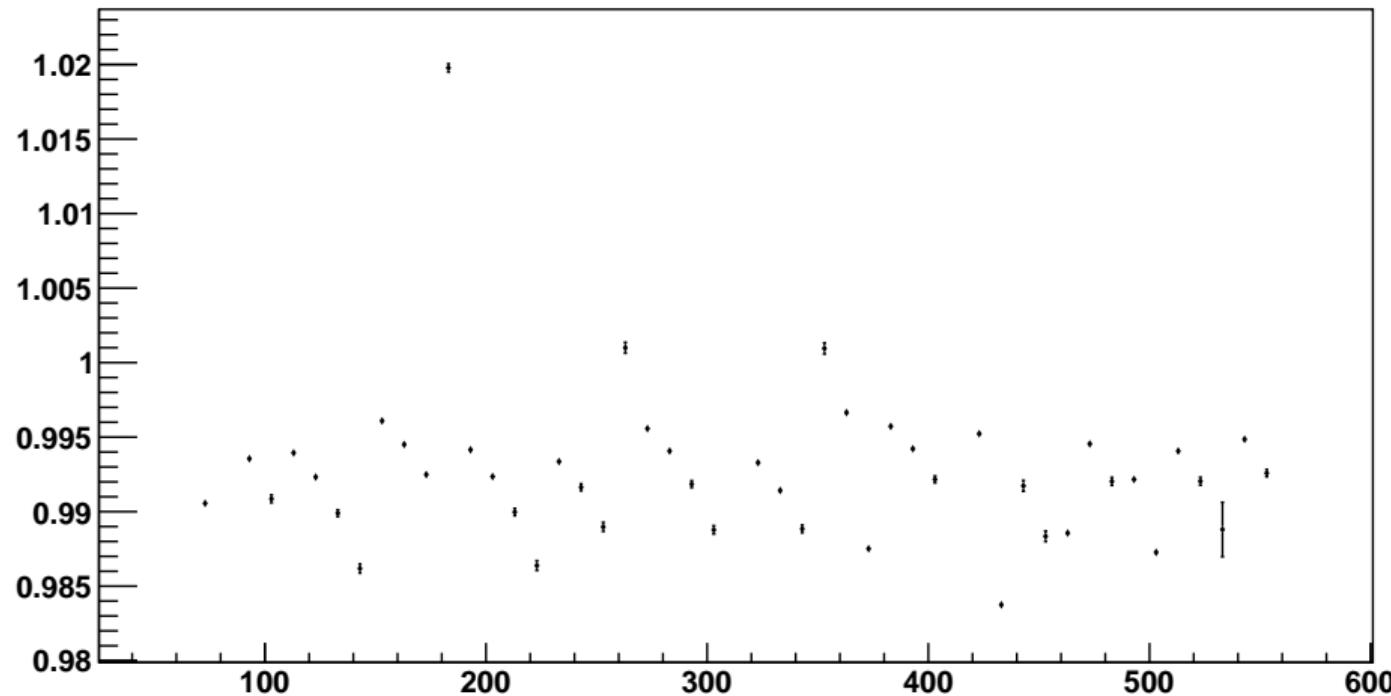
- $hms_P = -6.358$
- 230 : 6359-6365, shms_P = -2.966, z = 0.7
- 240 : 6367-6372, shms_P = -2.541, z = 0.6
- 250 : 6373-6377, shms_P = -2.116, z = 0.5
- 260 : 6378-6383, shms_P = -1.691, z = 0.4



- $hms_P : -5.983$
- 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

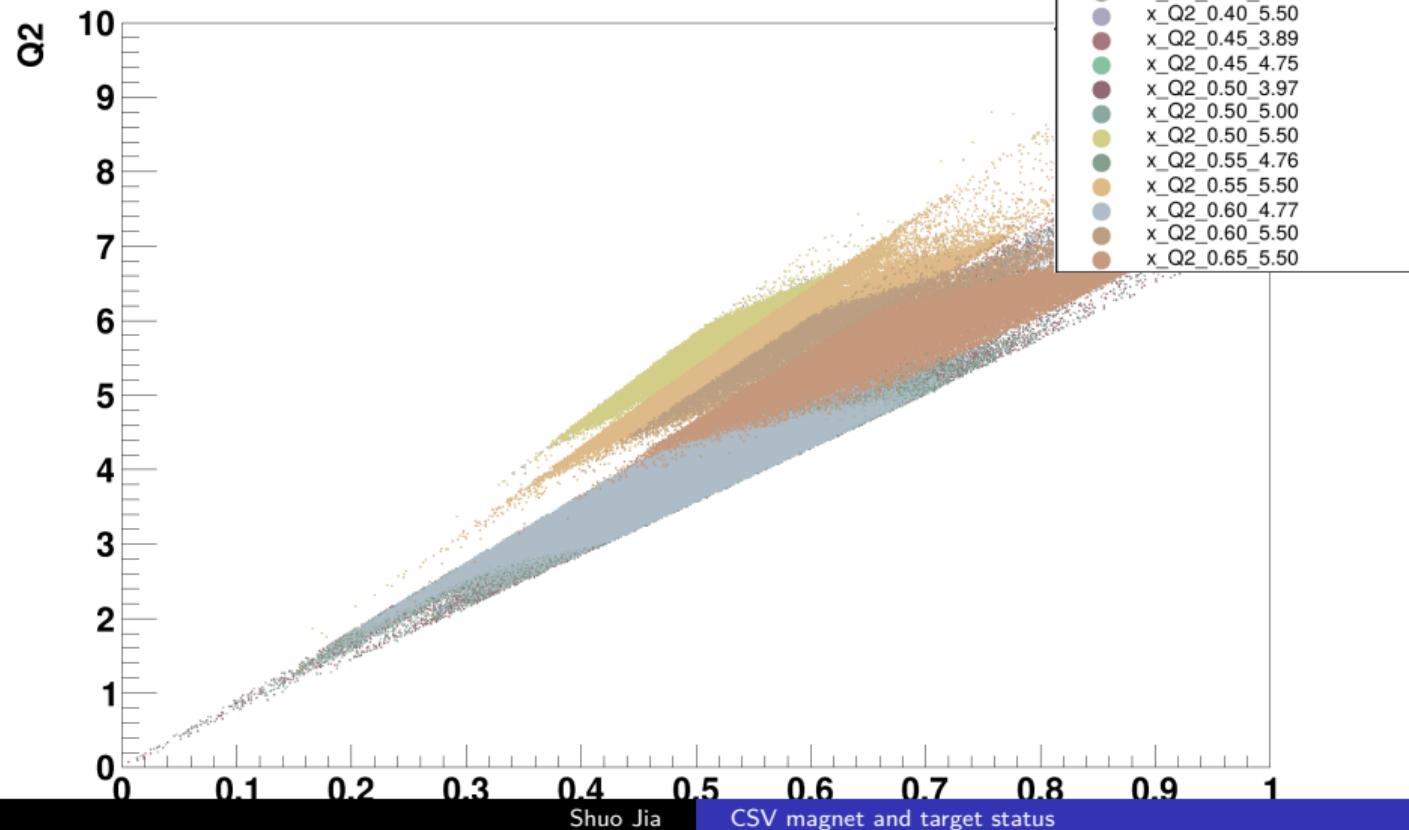
SHMS Q1 Hall probe value corrected

average D2



kinematics

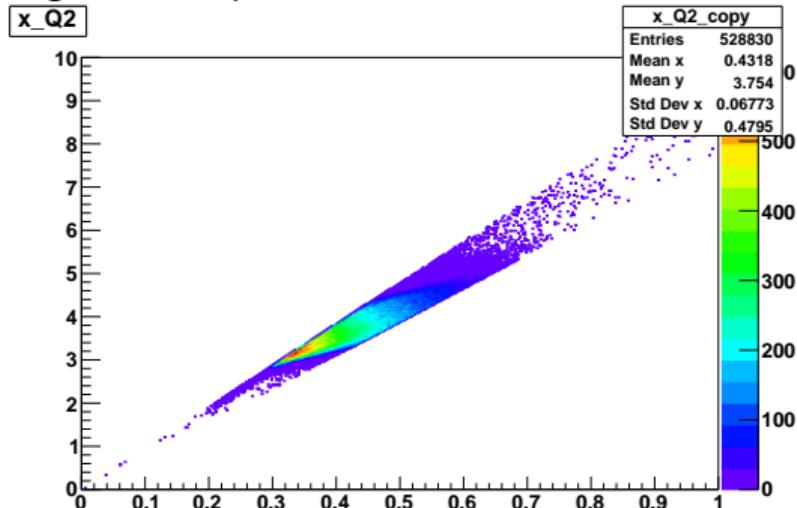
CSV_pi+_x_Q2_0.35_4.00



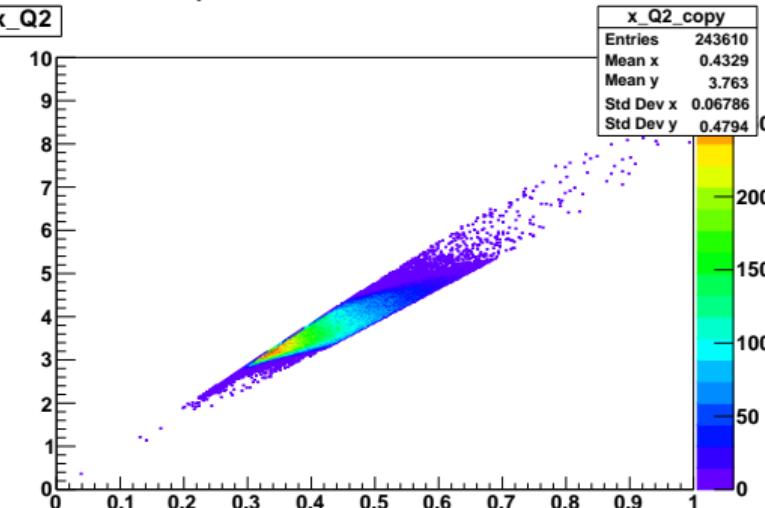
group 140 kinematics

Choose all positive and negative polarity runs in run group 140, $Q^2 = 3.898$, $x = 0.45$

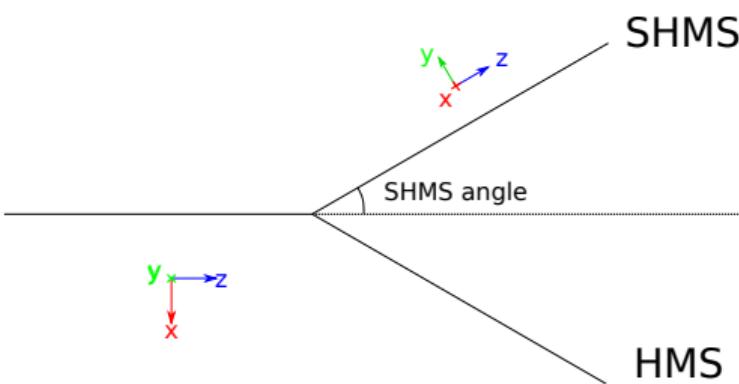
negative for π^-



positive for π^+



Change coordinate system



Rotate along z for $\pi/2$

Rotate along x for shms angle

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

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

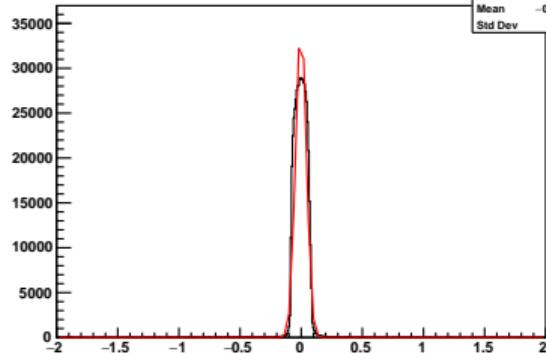
$$\mathcal{R} = \begin{bmatrix} 0 & -1 & 0 \\ \cos(\theta) & 0 & -\sin(\theta) \\ \sin(\theta) & 0 & \cos(\theta) \end{bmatrix}$$

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

group 140

negative runs for rungroup 140

pion momentum x

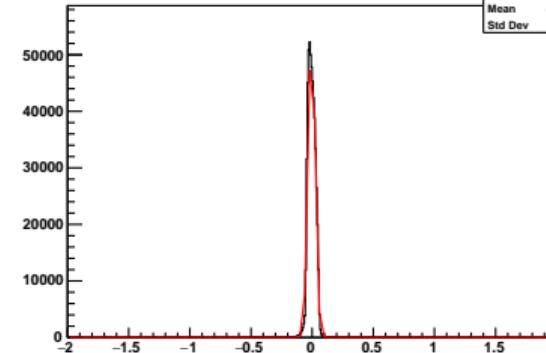


pion p_x copy

Entries
Mean
Std Dev

528830
-0.003865
0.05357

pion momentum y

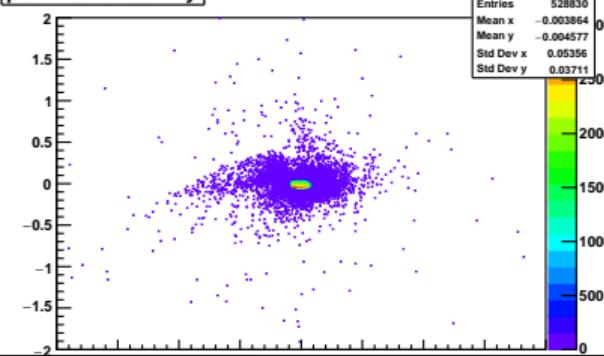


pion p_y copy

Entries
Mean
Std Dev

528830
-0.004578
0.03711

pion momentum x y



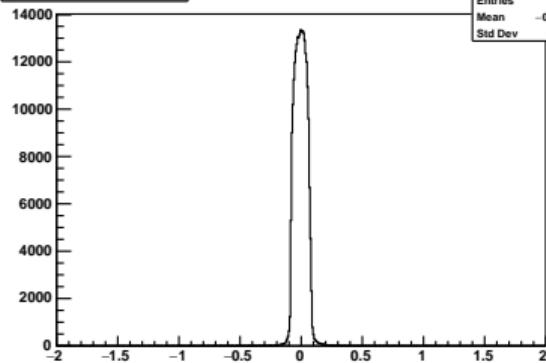
pion p_xy copy

Entries
Mean x
Mean y
Std Dev x
Std Dev y

528830
-0.003864
-0.004577
0.05356
0.03711

positive runs for run group 140

pion momentum x

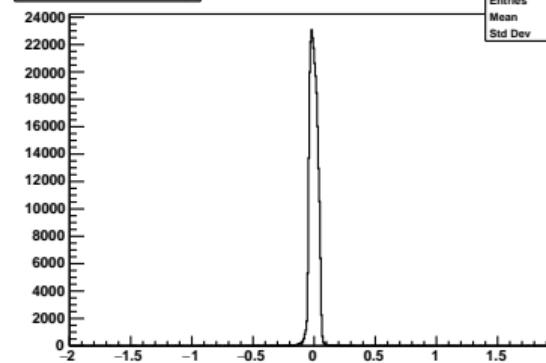


pion_p_x_copy

Entries
Mean
Std Dev

243610
-0.004489
0.05424

pion momentum y

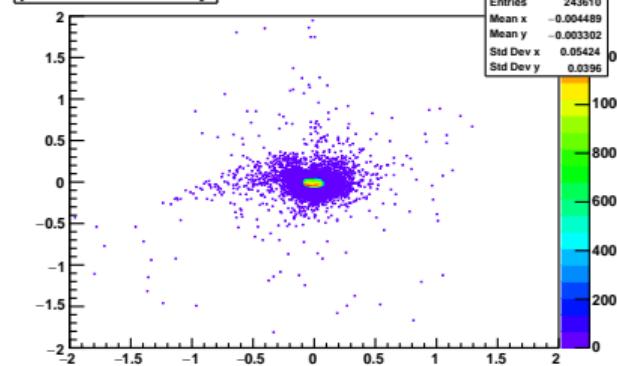


pion_p_y_copy

Entries
Mean
Std Dev

243610
-0.003302
0.0396

pion momentum x y

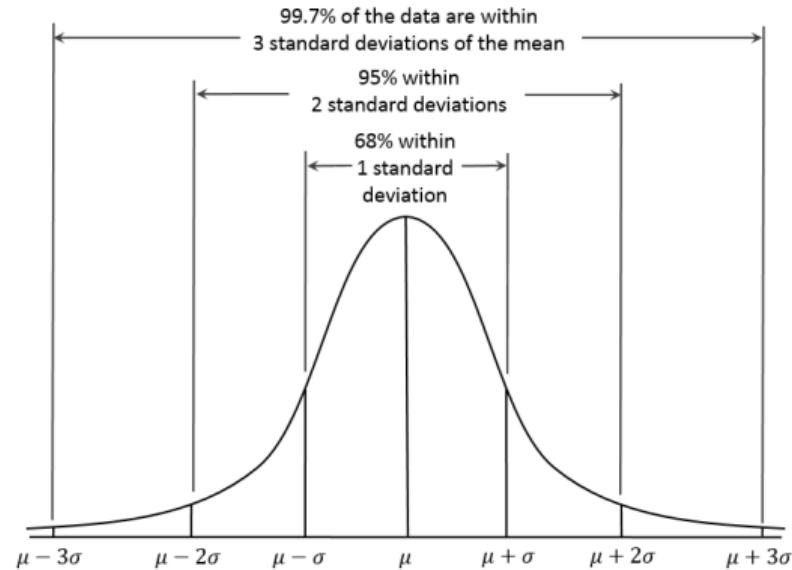
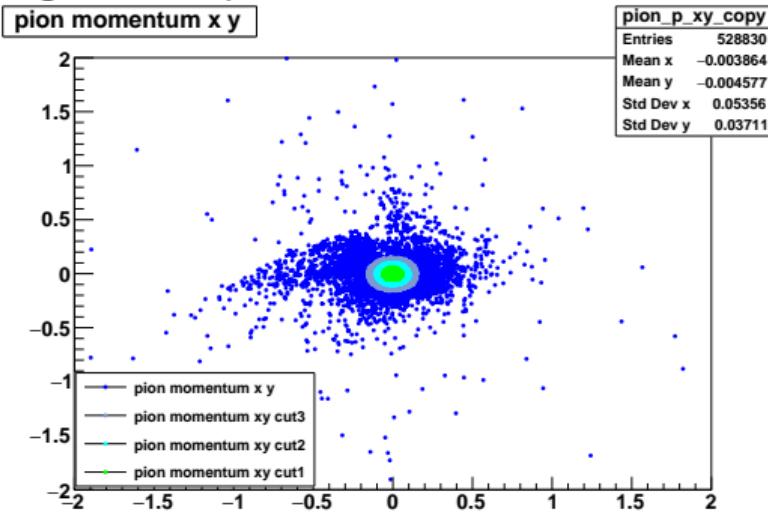


pion_p_xy_copy

Entries
Mean x
Mean y
Std Dev x
Std Dev y

243610
-0.004489
-0.003302
0.05424
0.0396

negative for pi-

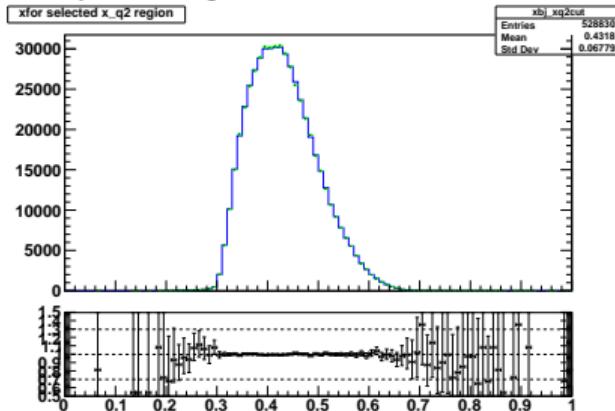


cut1: 68%, cut2: 95%, cut3: 99.7%

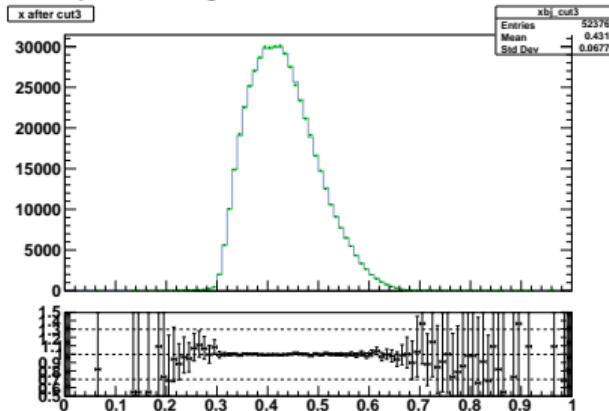
xbj for group 140 pi- runs

for negative run

compare xbj without cut and after cut1



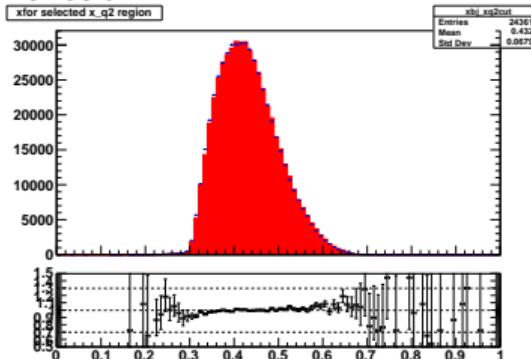
compare xbj after cut3 and cut1



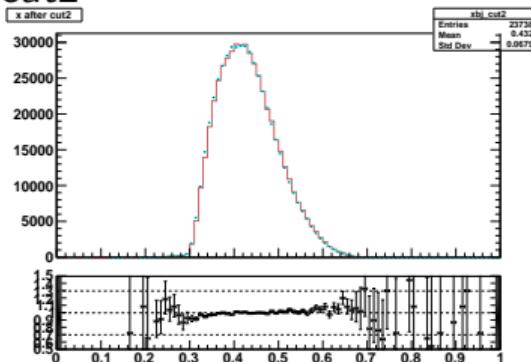
compare pi-pi+ runs xbj for group 140

compare xbj for neg runs and pos runs

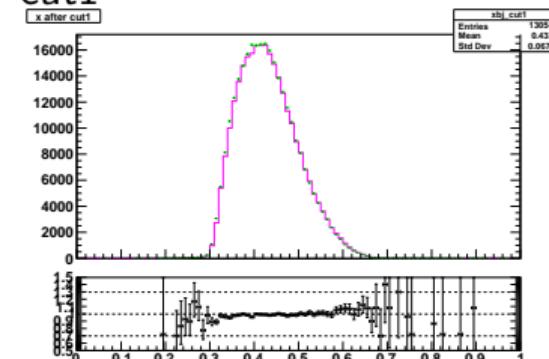
no cut



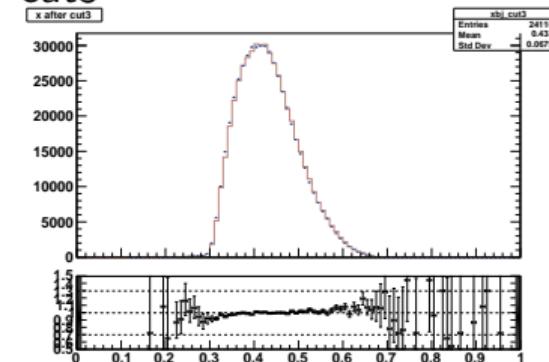
cut2



cut1



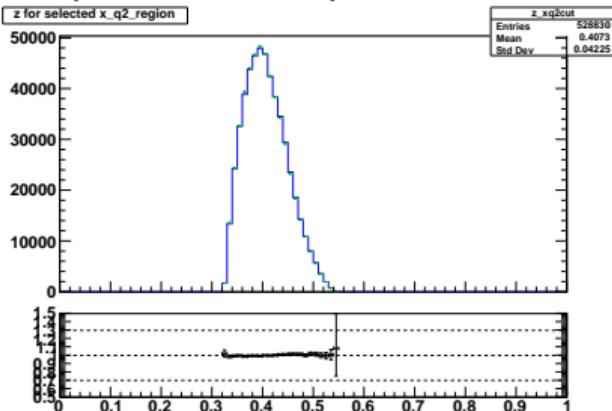
cut3



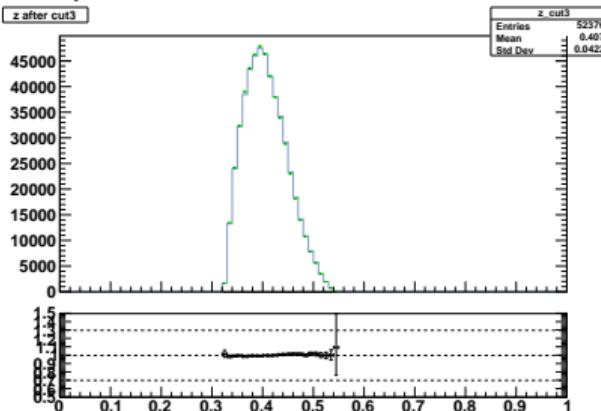
z for group 140 pi- runs

for negative runs

compare z after $xq2cut$ and $cut1$



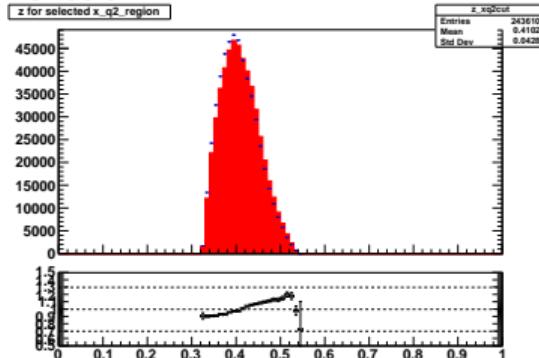
compare z after $cut3$ and $cut1$



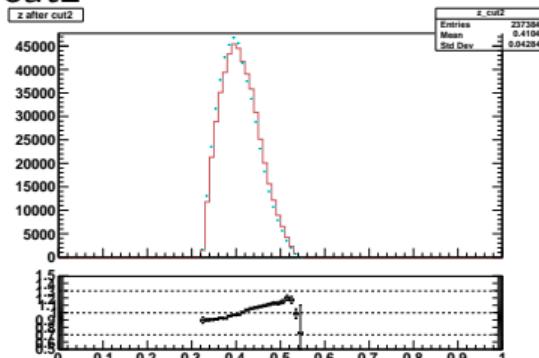
compare pi-pi+ runs z for group 140

compare z for neg runs and pos runs

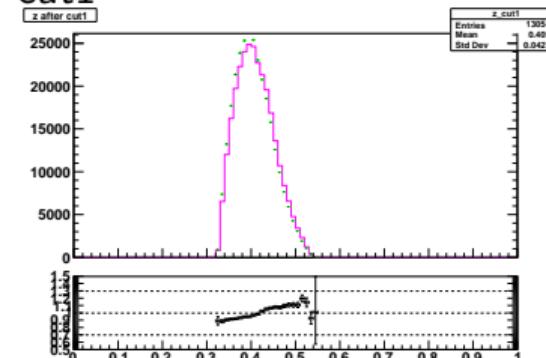
no cut



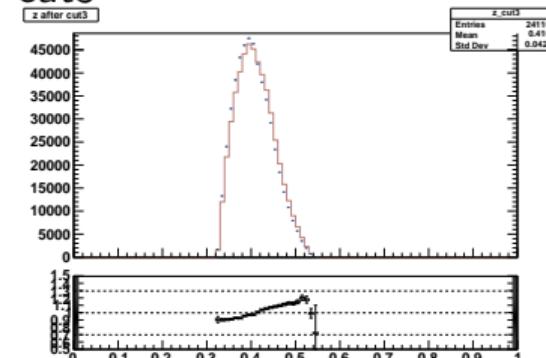
cut2



cut1

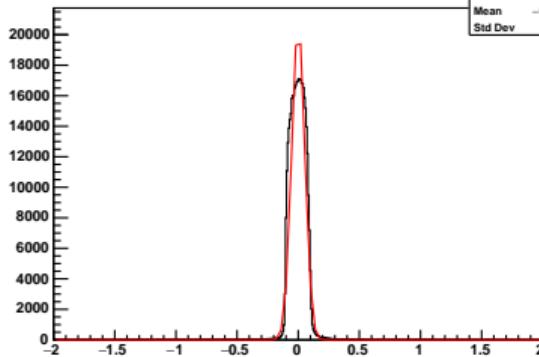


cut3

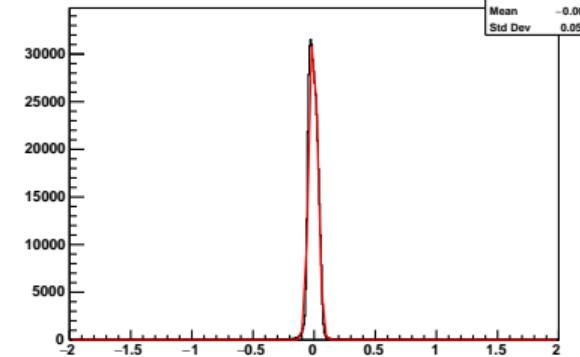


negative run for rungroup 440, hmfp -4.357, shms p -2.928

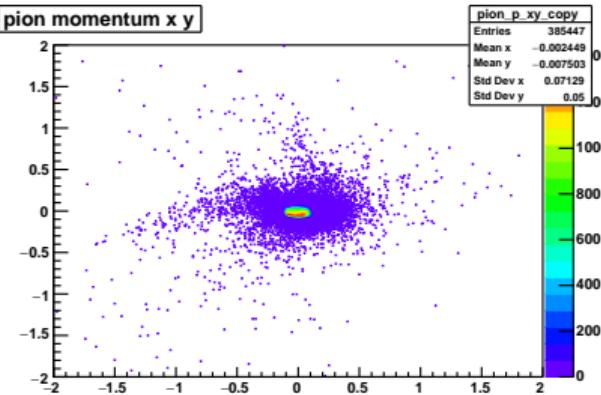
pion momentum x



pion momentum y

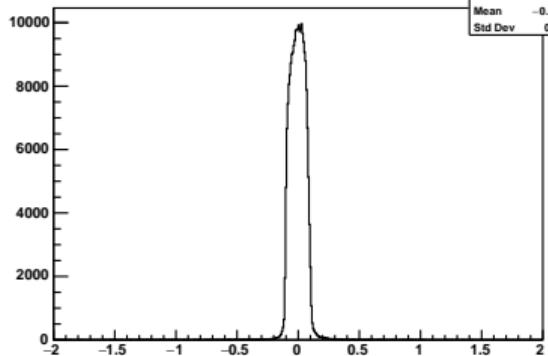


pion momentum x y

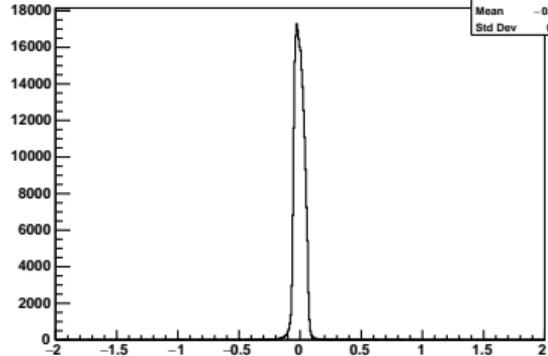


positive runs for run group 440

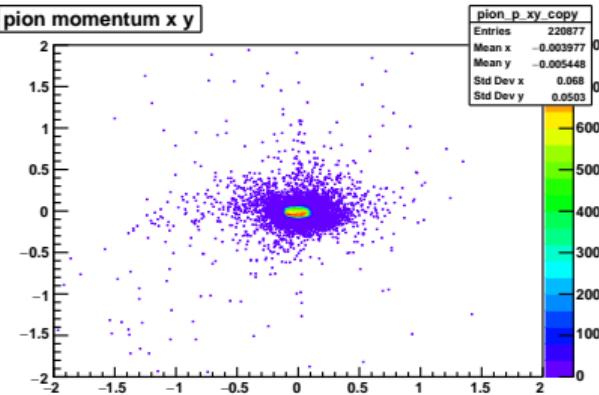
pion momentum x



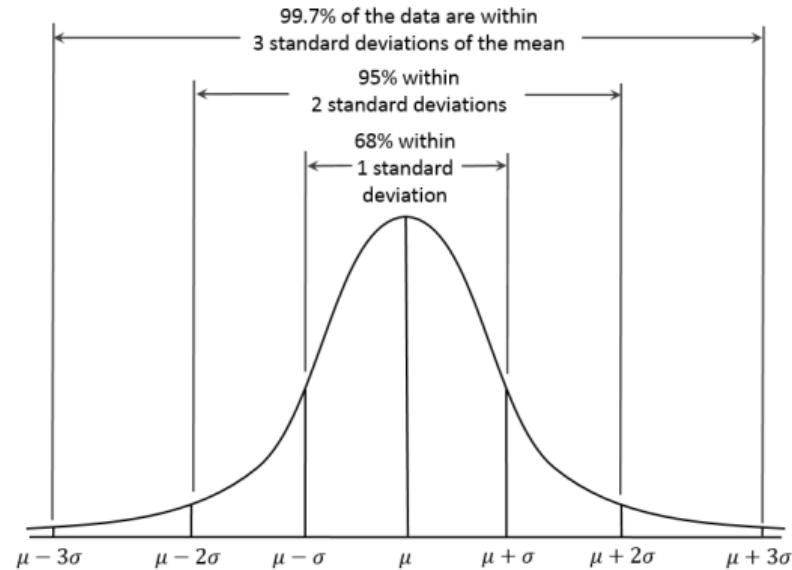
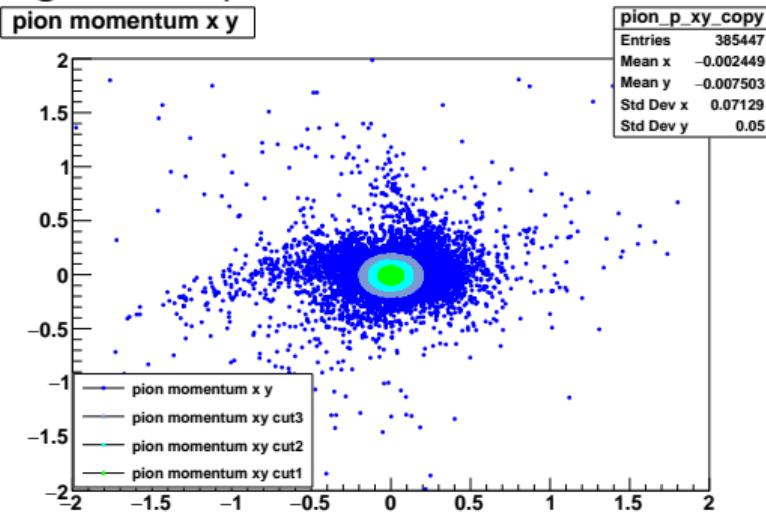
pion momentum y



pion momentum x y



negative for pi-

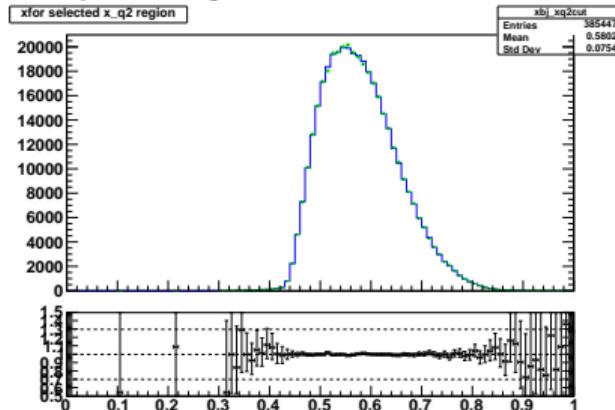


cut1: 68%, cut2: 95%, cut3: 99.7%

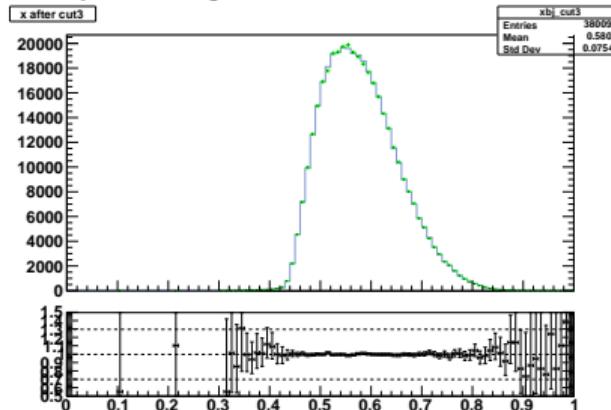
xbj for group 440 pi- runs

for negative run

compare xbj without cut and after cut1



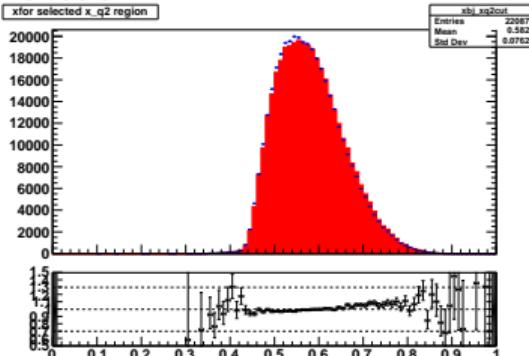
compare xbj after cut3 and cut1



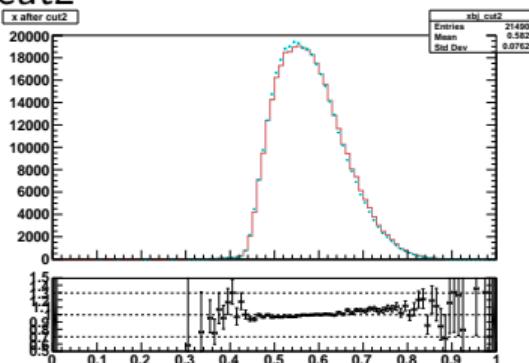
compare pi-pi+ runs xbj for group 440

compare xbj for neg runs and pos runs

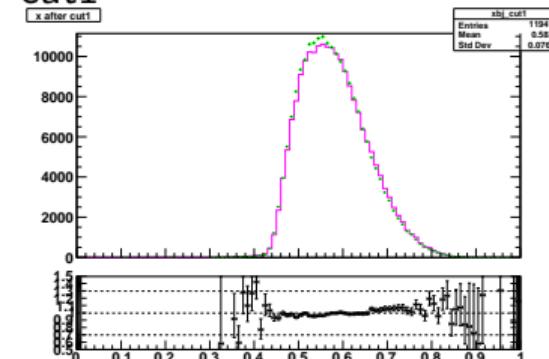
no cut



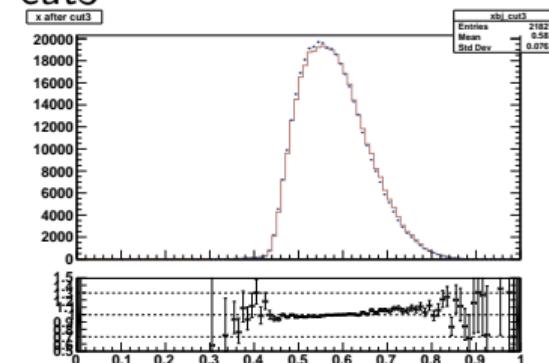
cut2



cut1



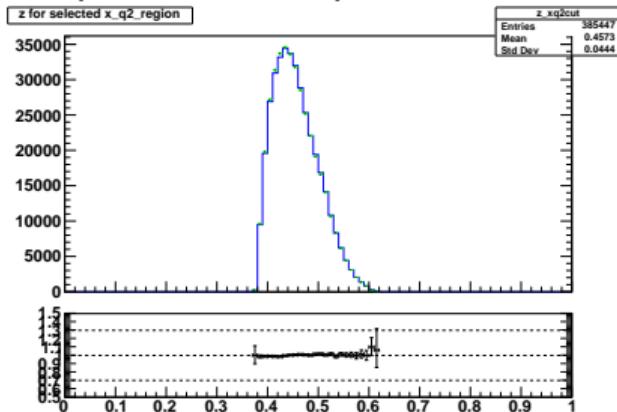
cut3



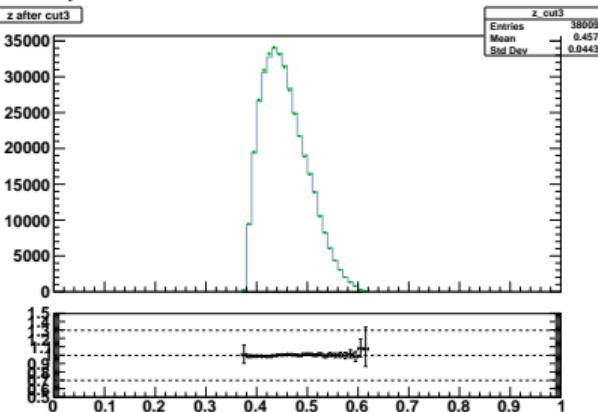
z for group 440 pi- runs

for negative runs

compare z after $xq2cut$ and $cut1$



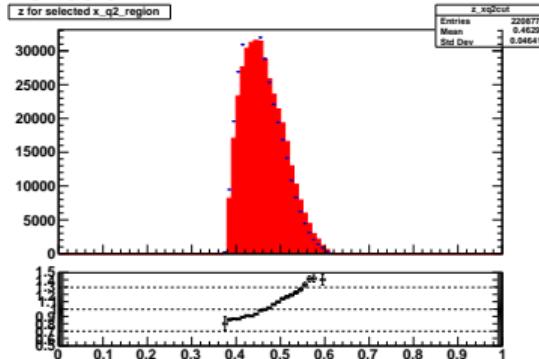
compare z after $cut3$ and $cut1$



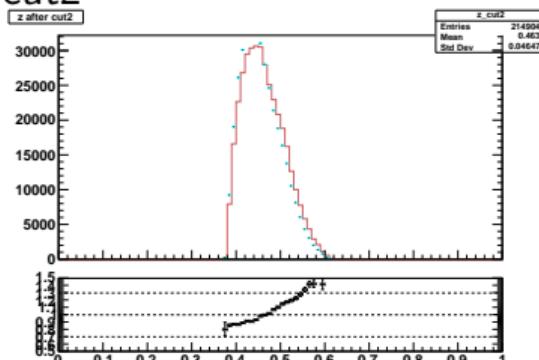
compare pi-pi+ runs z for group 440

compare z for neg runs and pos runs

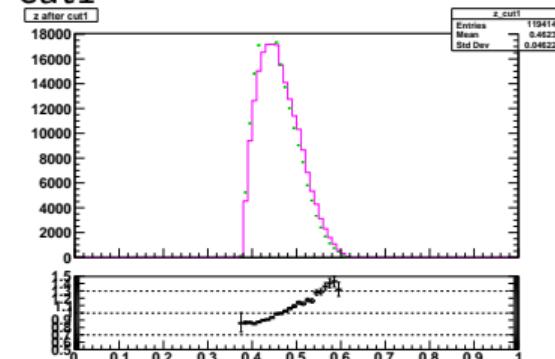
no cut



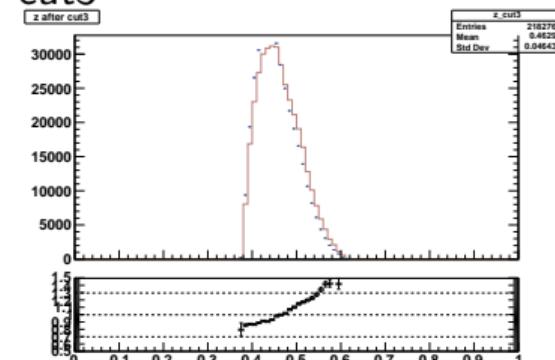
cut2

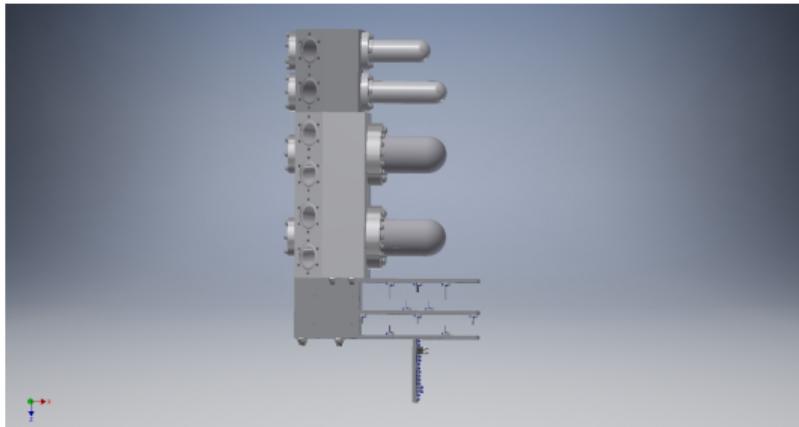


cut1



cut3

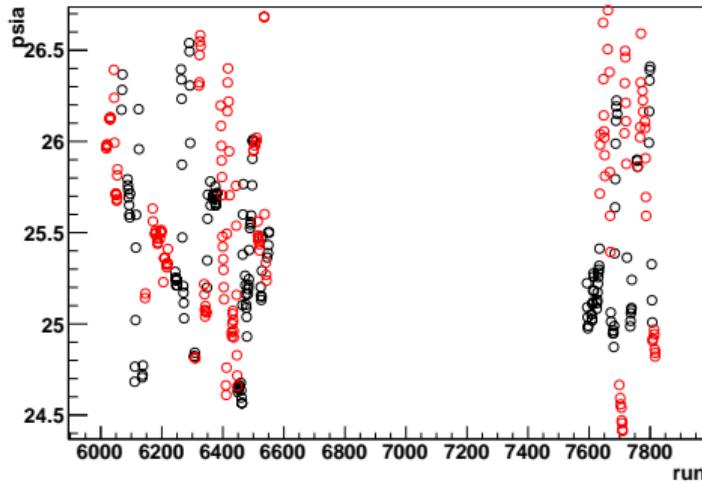




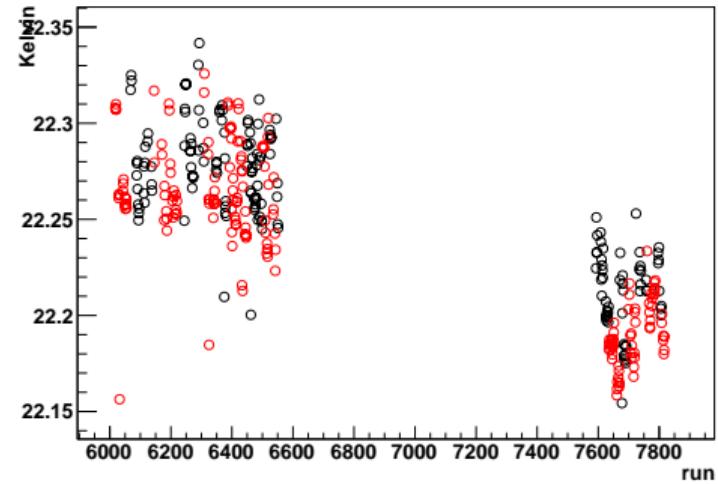
- *pressure1* : hcD2_P_Exhaust_R,
pressure loop D2 return
- *pressure2* : pressure loop D2 before,
around 26 psia
- *temperature1, 2, 3* : Temperature at
different position
- *density* : read from NIST Chemistry
WebBook

D2 status

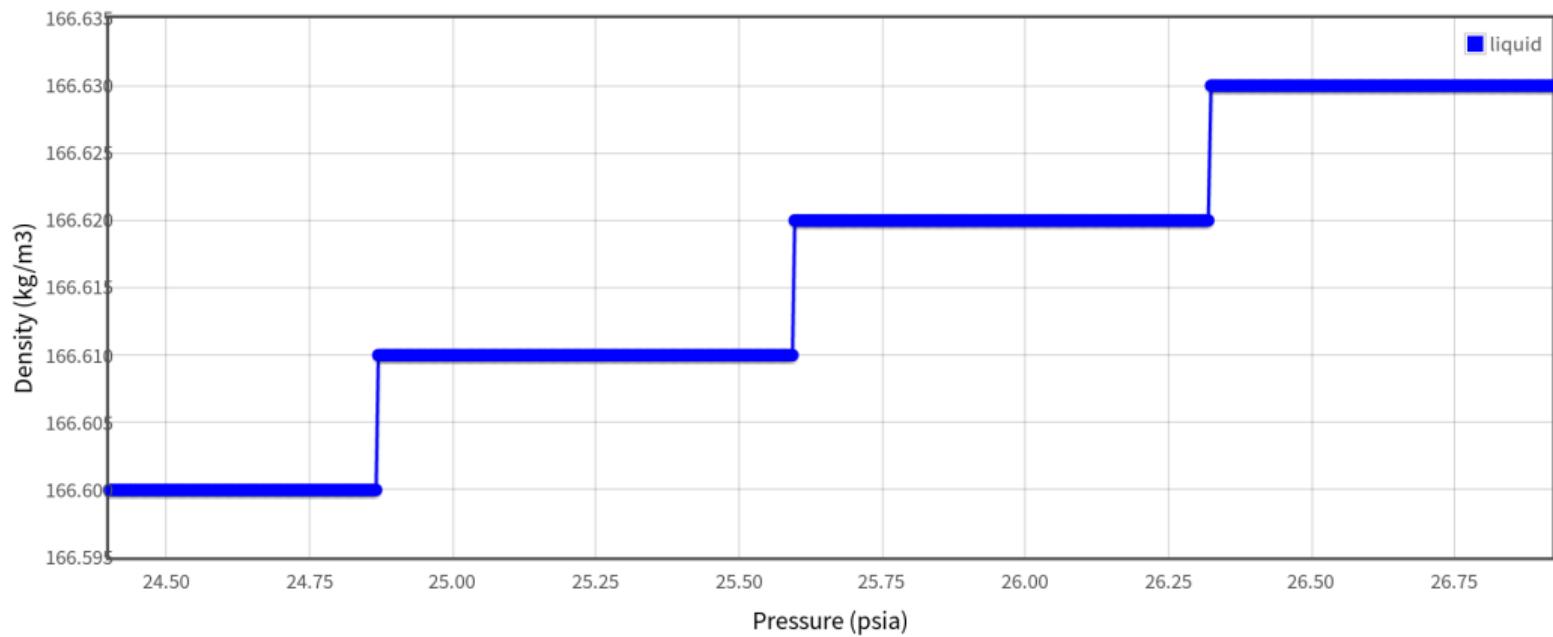
D2 Pressure pi-



D2 Temperature pi-

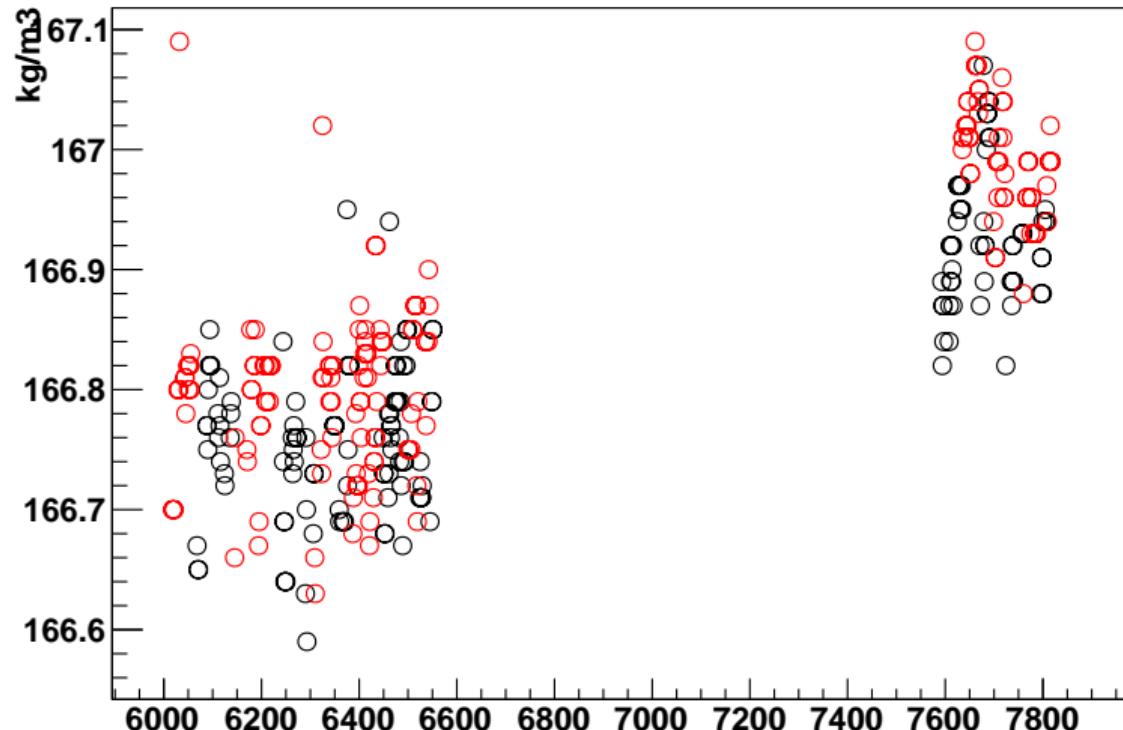


An example for LD2 density, this plot is density for D2 at temperature 22.33K, for different pressure(psia).



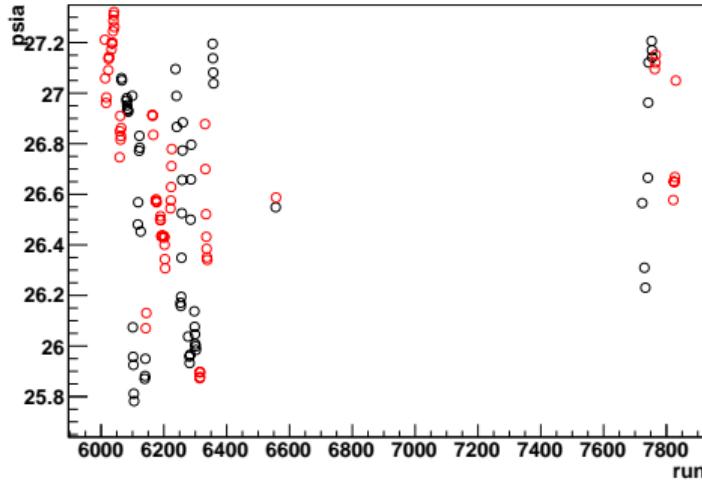
black dot for pi- runs, red dots for pi+ runs.

D2 density pi-

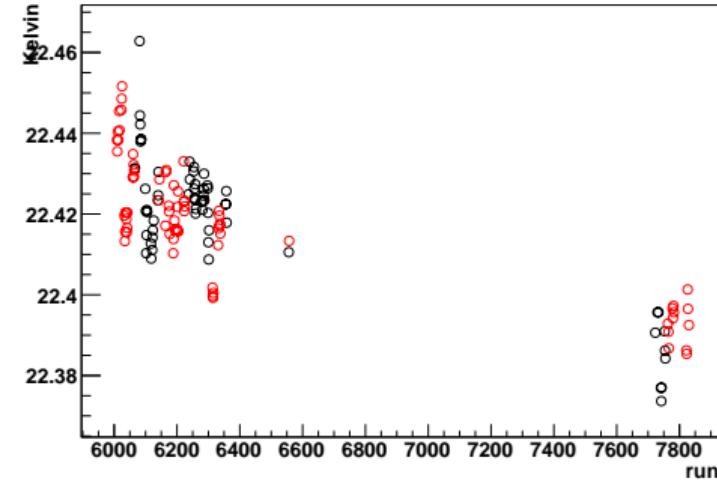


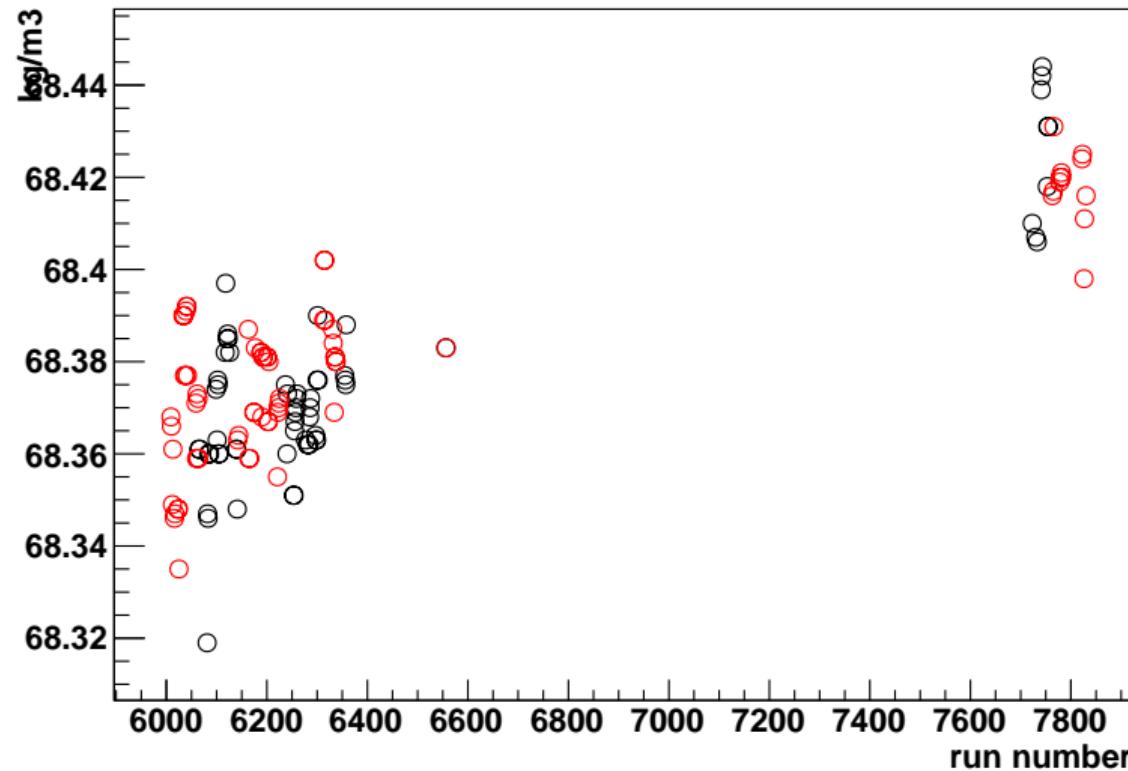
H2 status

H2 Pressure pi-



H2 Temperature pi-



H2 density pi-

back up

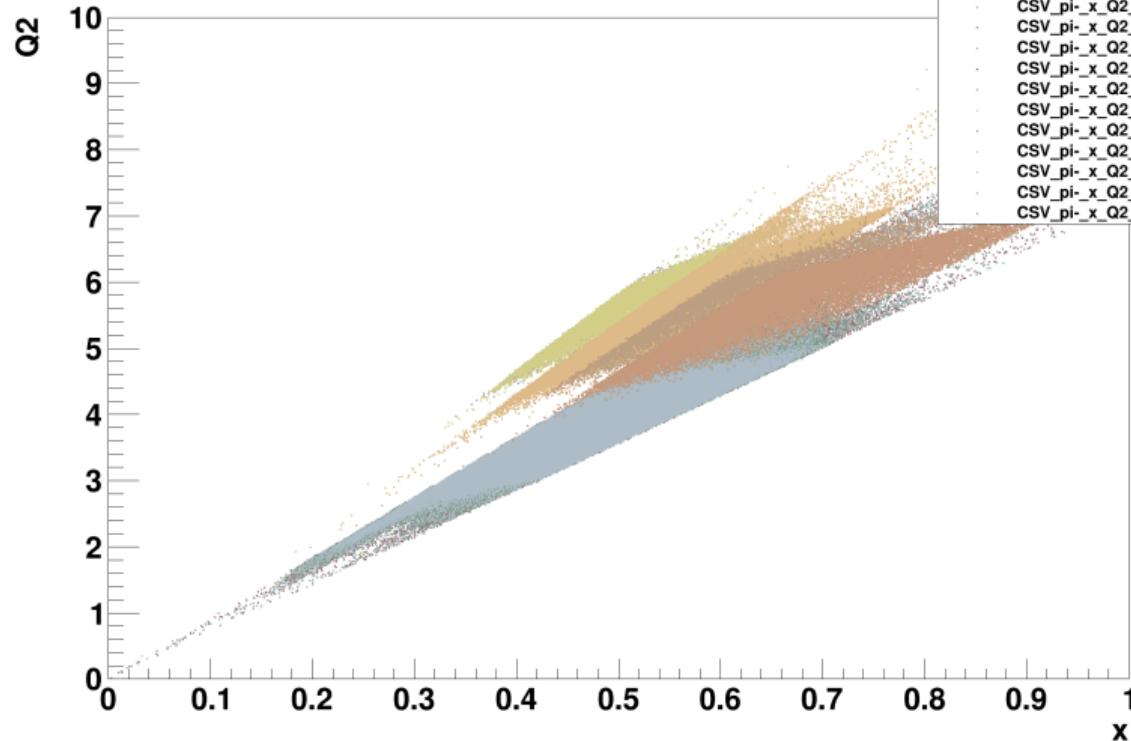
Back Up

group_{num}

```
[{"6009":1,"6010":2,"6012":3,"6013":4,"6015":5,"6017":6,"6018":7,"6027":8,"6038":9,"6049":10,"6104":11,"6115":12,"6122":13,"6129":14,"6192":15,"6197":16,"6202":17,"6213":18,"6285":19,"6292":20,"6300":21,"6334":22,"6359":23,"6367":24,"6373":25,"6378":26,"6419":27,"6427":28,"6434":29,"6441":30,"6482":31,"6486":32,"6488":33,"6490":34,"6495":35,"6518":36,"6527":37,"6537":38,"6538":39,"6542":40,"6553":41,"7593":42,"7605":43,"7611":44,"7620":45,"7671":46,"7675":47,"7684":48,"7723":49,"7726":50,"7737":51,"7750":52,"7793":53,"7798":54,"7803":55,"7822":56,"7826":57,"7829":58}]
```

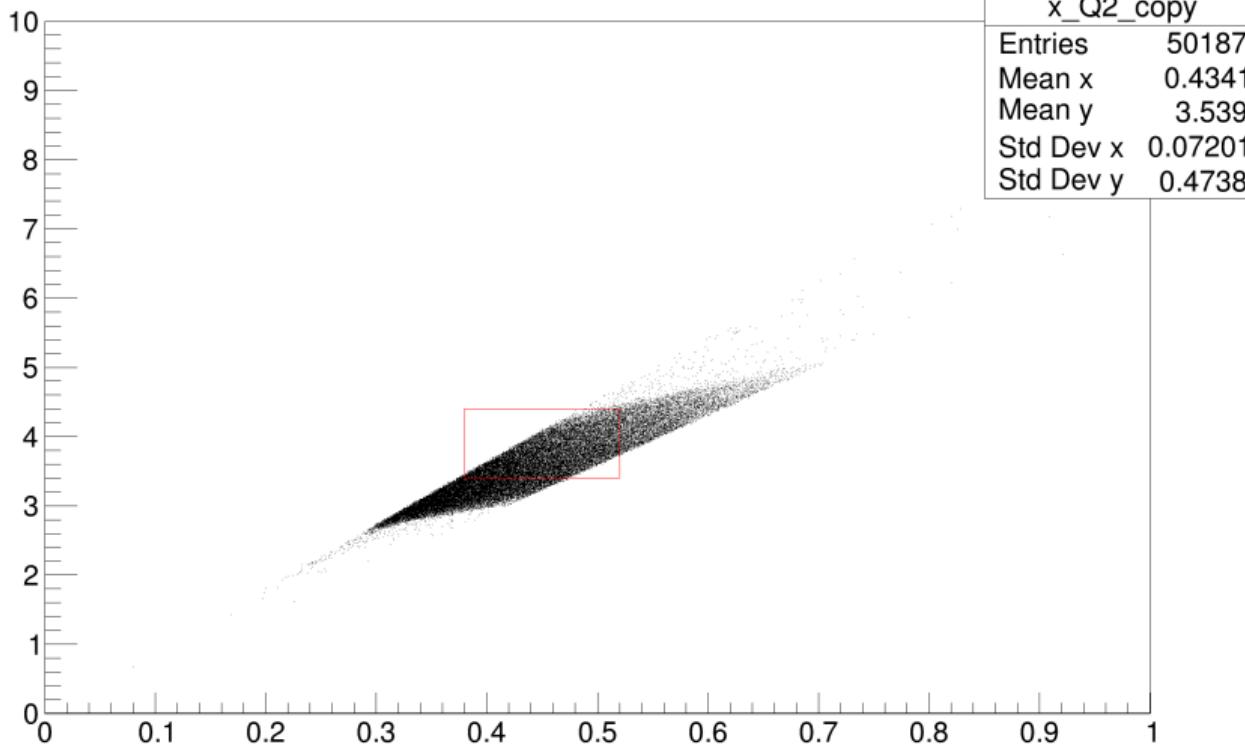
kinematics_{pos}

CSV_pi-x_Q2_0.35_4.00



6111xq2

x_Q2



pion momentum xy

