Yields update

acceptance & yields

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Yields Drift Summary

Production Settings	Drift Momentum Settings /total Momentum Settings)	Run within drift momentum settings /total Runs	Comments
2.2GeV, 2.5T Tran	6/31	84/259	Around 21/259 runs drift
1.7GeV, 2.5T Tran	4/18	66/213	Around 18/259 runs drift
1.1GeV, 2.5T Tran	4/25	72/344	Around 13/344 runs drift
2.2GeV, 5T Tran	1/15	7/90	Beams seems no drift for 1.6GeV
2.2GeV, 5T Long	2/14	120/179	Actually just 6/179 runs drift >3.5%
3.3GeV, 2.5T Tran	2/6	11/52	Beams seems no drift for 2.342, 2.492GeV

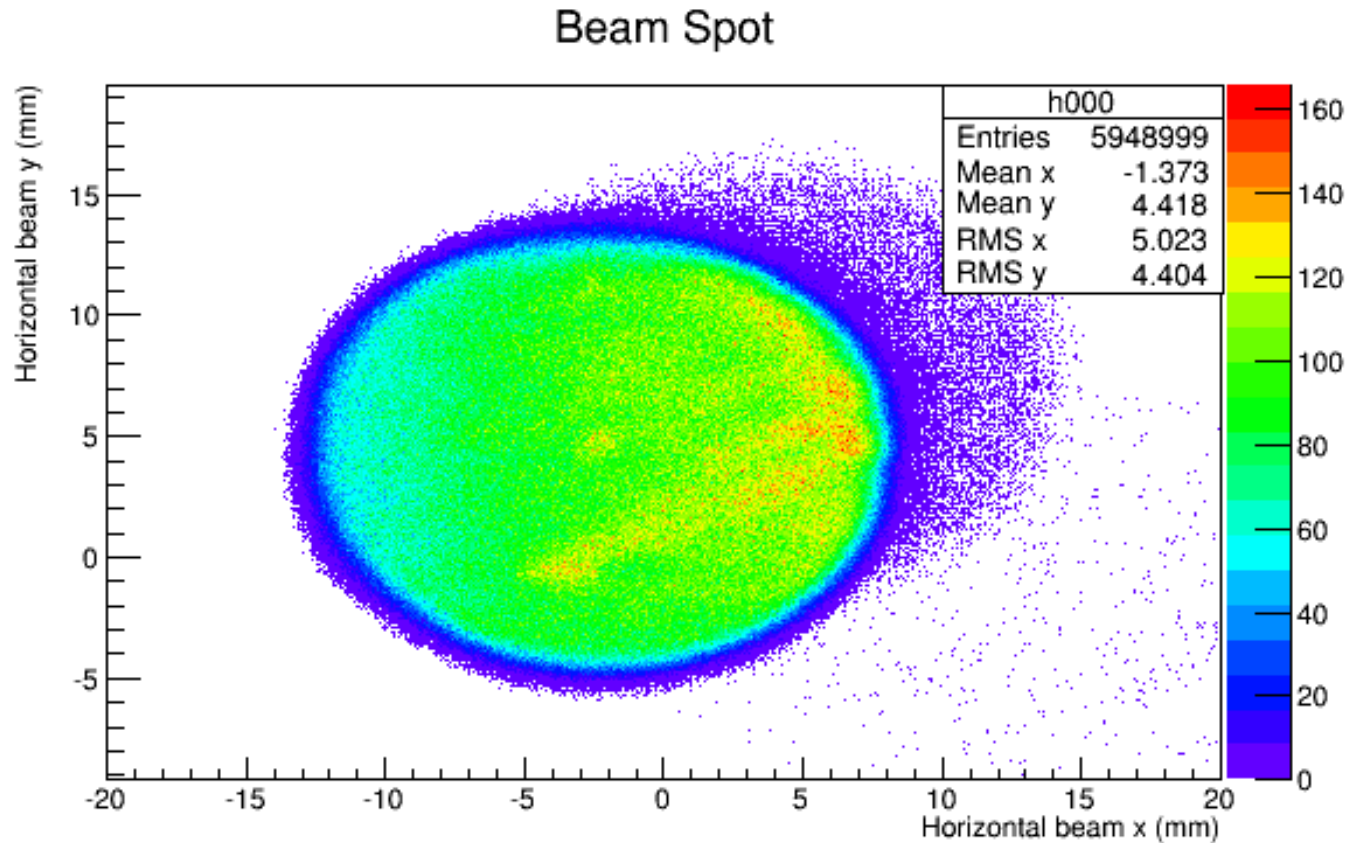Drift settings defined: Yields spread >3.5%

At least 7% (76 runs) have drift (total 1137 runs)   Note: here assume drift runs : smaller run group in settings

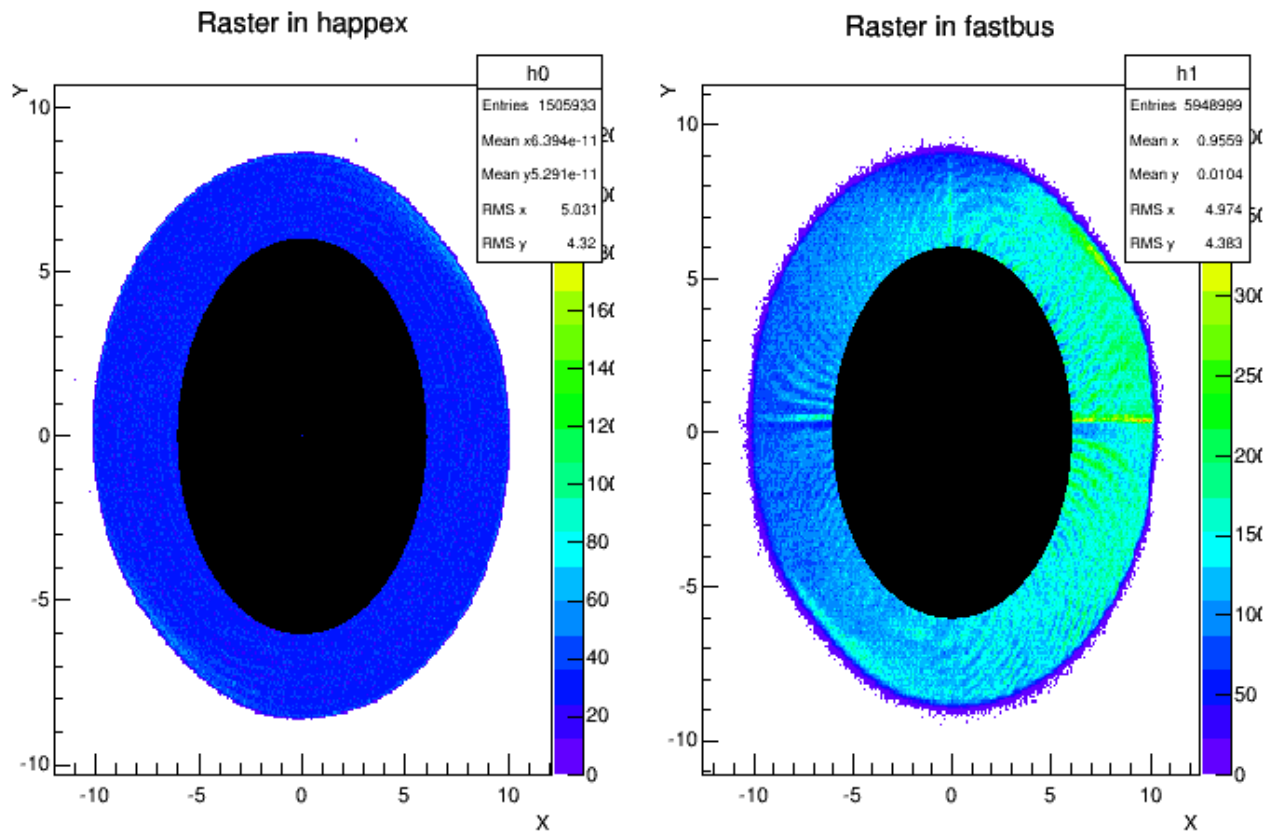32% (360 runs) are in the momentum setting which have drift runs.

Raster Size Cut

✓ Cut the raster size to remove the boundary effects

❑ Run 5858 (x horizontal, y vertical), E2.2GeV, P1.3GeV, 5T, longitudinal
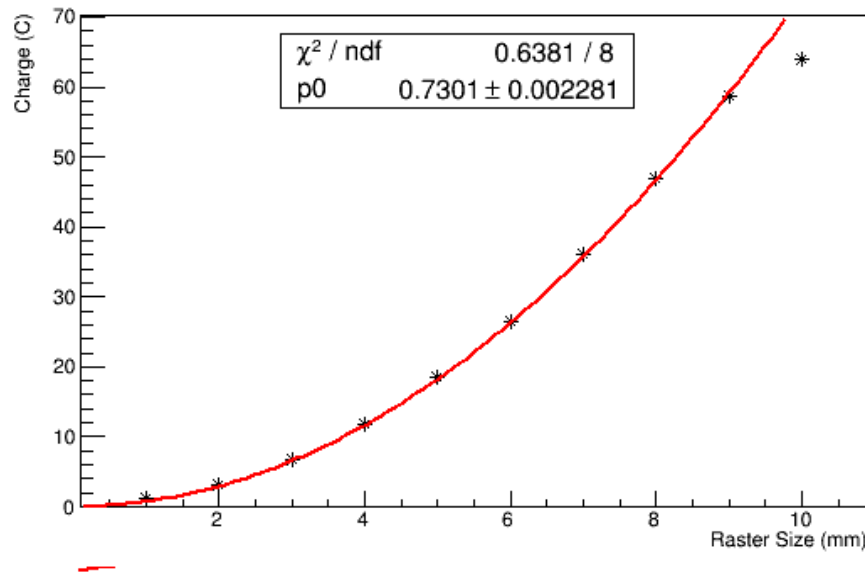

Beam Spot

Raster Size Cut

- ✓ Cut the raster size to remove the boundary effects
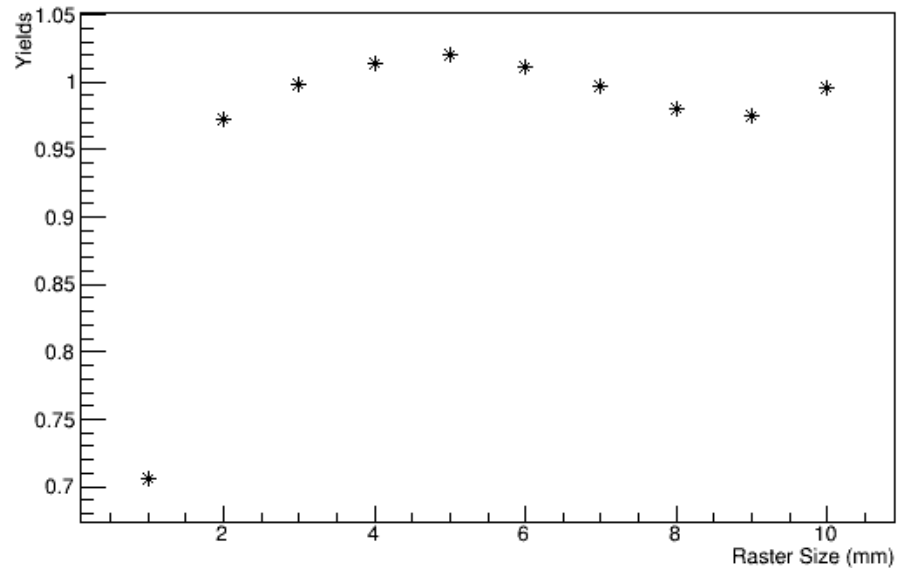- ✓ Black circle is the region selected for radius = 6mm

Raster Size Study -- Data

❑ **Run 5858** , E2.2GeV, P1.3GeV, 5T, longitudinal

Raster Size Study from Simulation

❑ **Run 5858**, E2.2GeV, P1.3GeV, 5T Longitudinal

Raster Radius (mm)	Acceptance ratio	Yields ratio
10	1.00	1.00
9	1.01	0.99
8	0.99	0.99
7	0.99	1.00
6	1.00	1.01
5	1.02	1.02
4	1.01	1.02
3	1.02	1.03
2	0.00	0.00
1	1.01	1.03

The change is within 3%

Raster Size Study

❏ **Run 5858**, E2.2GeV, P1.3GeV, 5T Longitudinal

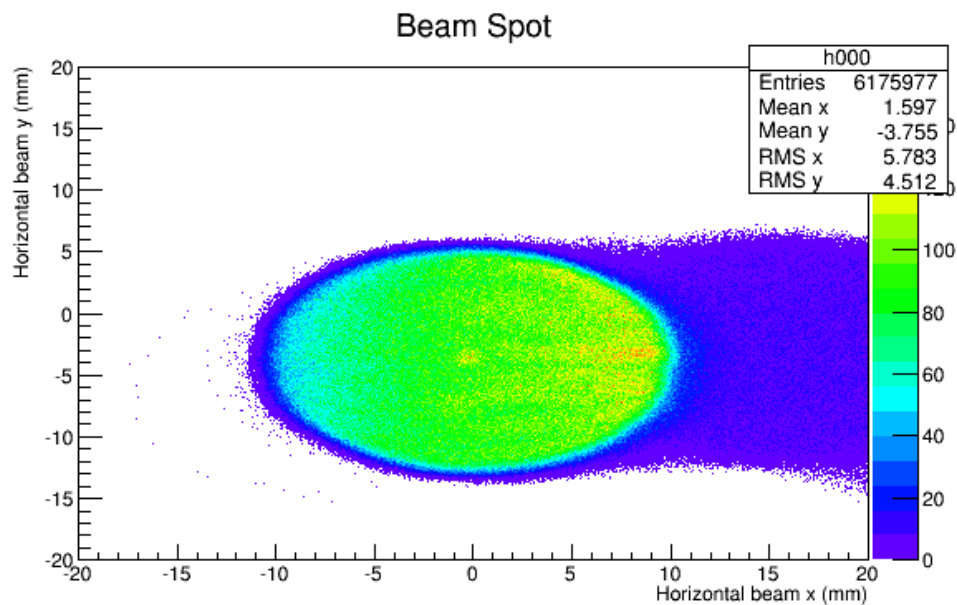| Raster Radius (mm)	Simu Acc. ratio	Simu. Yields ratio	Data Yields
No raster cut			1.00
10	1.00	1.00	1.00
9	1.01	0.99	1.00
8	0.99	0.99	0.98
7	0.99	1.00	0.98
6	1.00	1.01	1.00
5	1.02	1.02	1.01
4	1.01	1.02	1.02
3	1.02	1.03	1.01
2	0.00	0.00	1.00
1	1.01	1.03	0.97

The change is within 2%, compared

Yields Study– E2.2GeV, P1.885 GeV 5T Long

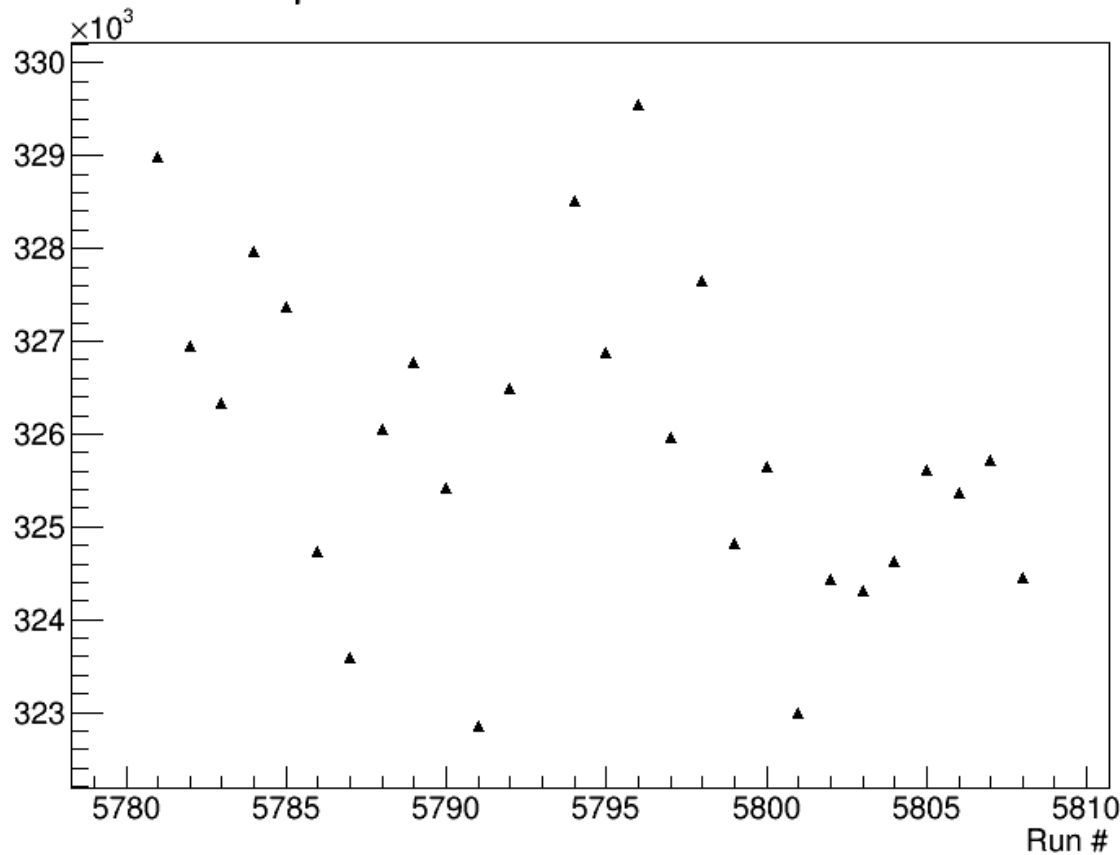☐ **Data Yields Distribution**
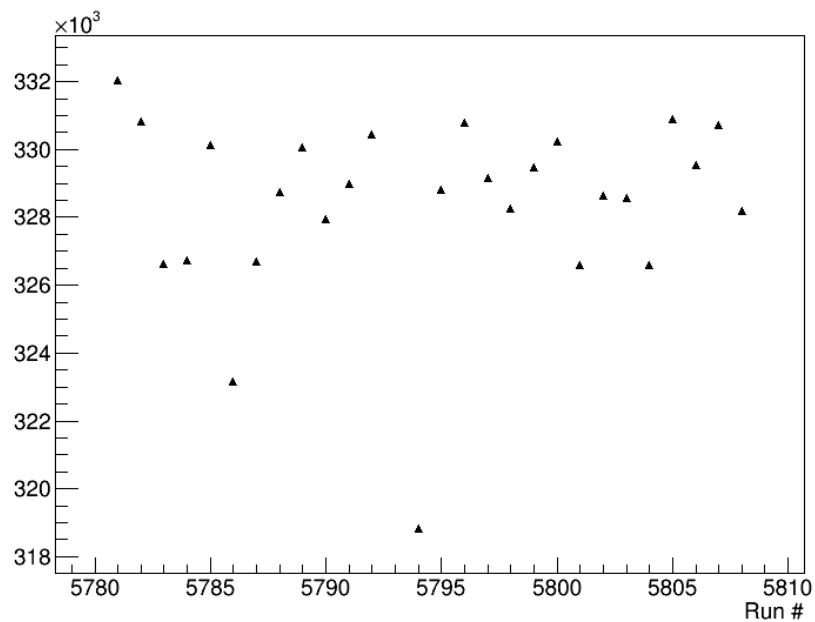
☐ **Run 5794**

Yields Study– E2.2GeV, P1.885 GeV 5T Long

❑ **Data Yields Distribution After Cut**

Spread drop from
4% to 1.8%

Yields – E2.2GeV, 5T Long

Material	Momentum (GeV)	Exp. Yields Spread without cut	Exp. Yields Spread With 6mm cut	comment
18	1.885	4%	1.8%	solved
18	2.228	5.8%	4.3%	Only one run, drift from 4.4% to 3.7%
17	2.049	11%	4.6%	The large drift run reduced from -9.2% to -1.8%, the additional 2.8% comes from data raster cut/fluctuations
17	2.228	6.4%	4.3%	The large drift run reduced from 5.6% to 2.8%,

Yields – E2.2GeV, P2.227GeV, Material ID 17, 5T Long

Run	Yields cut /yields nocut	Exp. Yields Divided by reference run without cut	Exp. Yields Divided by reference run With 6mm cut
5641	1.01	1.00	1.00
5642	1.02	0.99	1.00
5654	0.99	1.05	1.02
5655	0.99	1.06	1.03
5656	0.99	1.04	1.02
5657	0.99	1.05	1.03
5658	1.00	1.04	1.03
5696	0.99	1.04	1.03
5697	0.99	1.04	1.02

Run	Yields cut /yields nocut	Exp. Yields Divided by reference run without cut	Exp. Yields Divided by reference run With 6mm cut
5699	0.99	1.03	1.01
5700	1.00	1.02	1.01
5701	1.00	1.00	0.99
5702	0.99	1.01	0.99
5703	0.99	1.03	1.00
5704	0.99	1.05	1.03

Check the stability of the cuts

Yields – E2.2GeV, P2.227GeV, Material ID 18, 5T Long

Run	Yields cut /yields nocut	Exp. Yields Divided by reference run without cut	Exp. Yields Divided by reference run With 6mm cut	Run	Yields cut /yields nocut	Exp. Yields Divided by reference run without cut	Exp. Yields Divided by reference run With 6mm cut
5630	0.98	1.00	1.00	5636	0.98	1.00	1.00
5631	0.98	0.99	1.00	5637	0.98	1.00	1.00
5632	0.98	1.00	1.00	5638	0.99	0.99	1.00
5633	0.98	0.99	1.00	5639	0.99	0.98	0.99
5634	0.98	1.00	1.00	5652	0.97	1.04	1.04
5635	0.98	0.99	1.00				

a. The yields (cut)/Yields(no cut) within ~3% for each momentum setting
b. The yields (cut)/Yields(no cut) central value can be different for each momentum setting
c. But yields (cut)/Yields(no cut) is from 0.97 to 1.03 for all momentum settings for E2.2, Long
   except for drift runs (due to large raster)

Summary

- Based on the current replayed rootfile (transverse DB not correct), half of productions setting in each energy settings could be resolved, but need check after updated DB

- For transverse settings, especially energy 1.1/1.7 GeV, the ratio yields_cut/yields_nocut is not very close 1…,may due to the acceptance cuts

- Will continue take a look after the rootfile updated

- Have a Wonderful Holiday ☺

Yields Study– E2.2GeV, P2.228, mID 17, GeV 5T Long

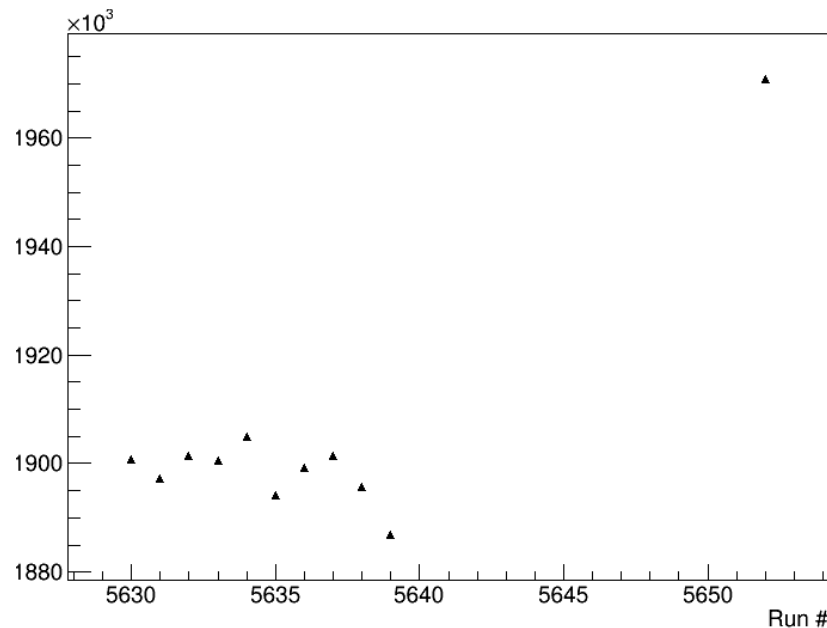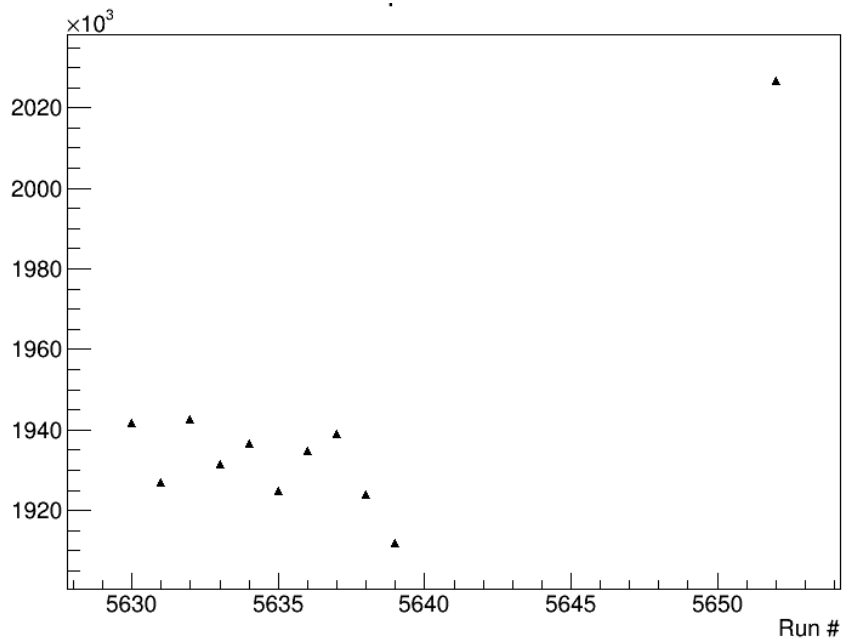❑ **Data Yields Before Cut**

❑ **Data Yields After Cuts**
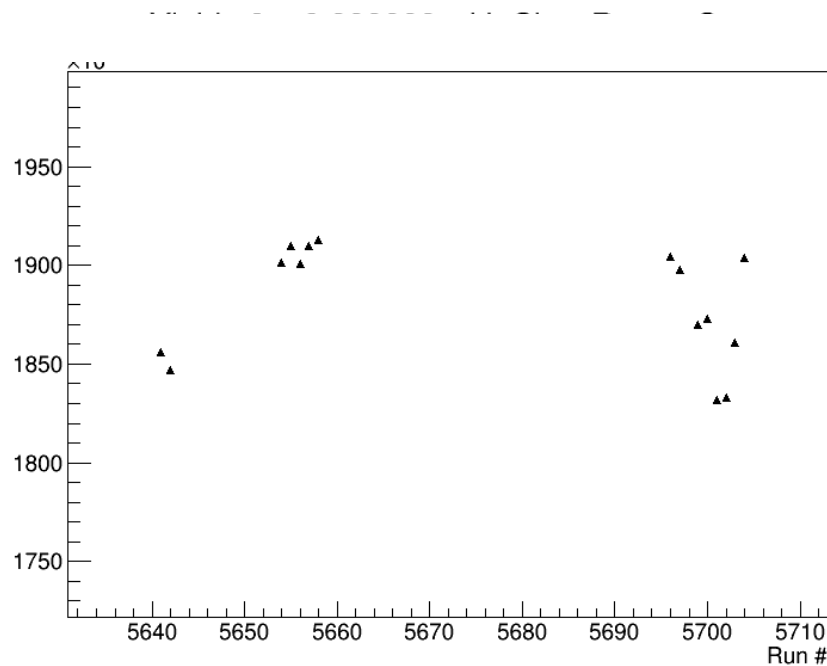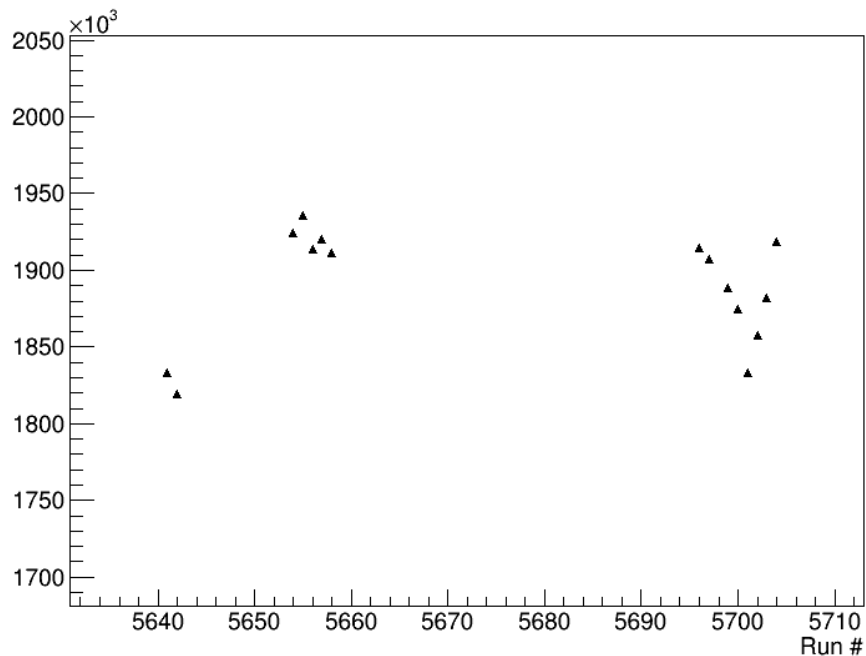
Spread drop from 6.4% to 4.3%

Yields Study– E2.2GeV, P2.228, mID 18, GeV 5T Long

❑ **Data Yields Before Cut**   ❑ **Data Yields After Cuts**

Spread drop from 5.8% to 4.3%

Yields Drift Study from Simulation

❑ **Point Beam** (x horizontal, y vertical), E2.2GeV, P1.4GeV, 2.5T

Horizontal x(mm)	Vertical y(mm)	Acceptance ratio	Yields ratio
0	0	1	1
5	0	1.05	1.12
-5	0	0.93	0.82
0	5	1.00	0.99
0	-5	0.97	1.00

❑ **Point Beam** (ph horizontal, th vertical), E2.2GeV, P1.4GeV, 2.5T

Horizontal ph (mrad)	Vertical th (mrad)	Acceptance ratio	Yields ratio
0	0	1	1
3	0	1.00	1.10
-3	0	1.00	0.92
0	3	1.00	1.05
0	-3	1.00	0.95

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Raster Size Study from Simulation

❑ **Raster Beam** (x horizontal, y vertical), E2.2GeV, P1.4GeV, 2.5T

Raster Radius (mm)	Acceptance ratio	Yields ratio
10	1.00	1.00
8.5	1.01	1.01
7	1.00	1.01
5.5	1.01	1.02
4	1.01	1.03
2.5	1.00	1.02

The change is within 3%

Yields Drift Study from Simulation

❑ **Raster Beam** (x horizontal, y vertical), E2.2GeV, P1.4GeV, 2.5T

Horizontal x(mm)	Vertical y(mm)	Acceptance ratio	Yields ratio
0	0	1	1
5	0	1.02	1.13
-5	0	0.91	0.83
0	5	0.99	0.99
0	-5	0.97	1.02

Slow Raster
Radius 10mm

❑ **Raster Beam** (ph horizontal, th vertical), E2.2GeV, P1.4GeV, 2.5T

Horizontal ph (mrad)	Vertical th (mrad)	Acceptance ratio	Yields ratio
0	0	1	1
3	0	1.00	1.10
-3	0	1.00	0.92
0	3	1.00	1.05
0	-3	1.00	0.95