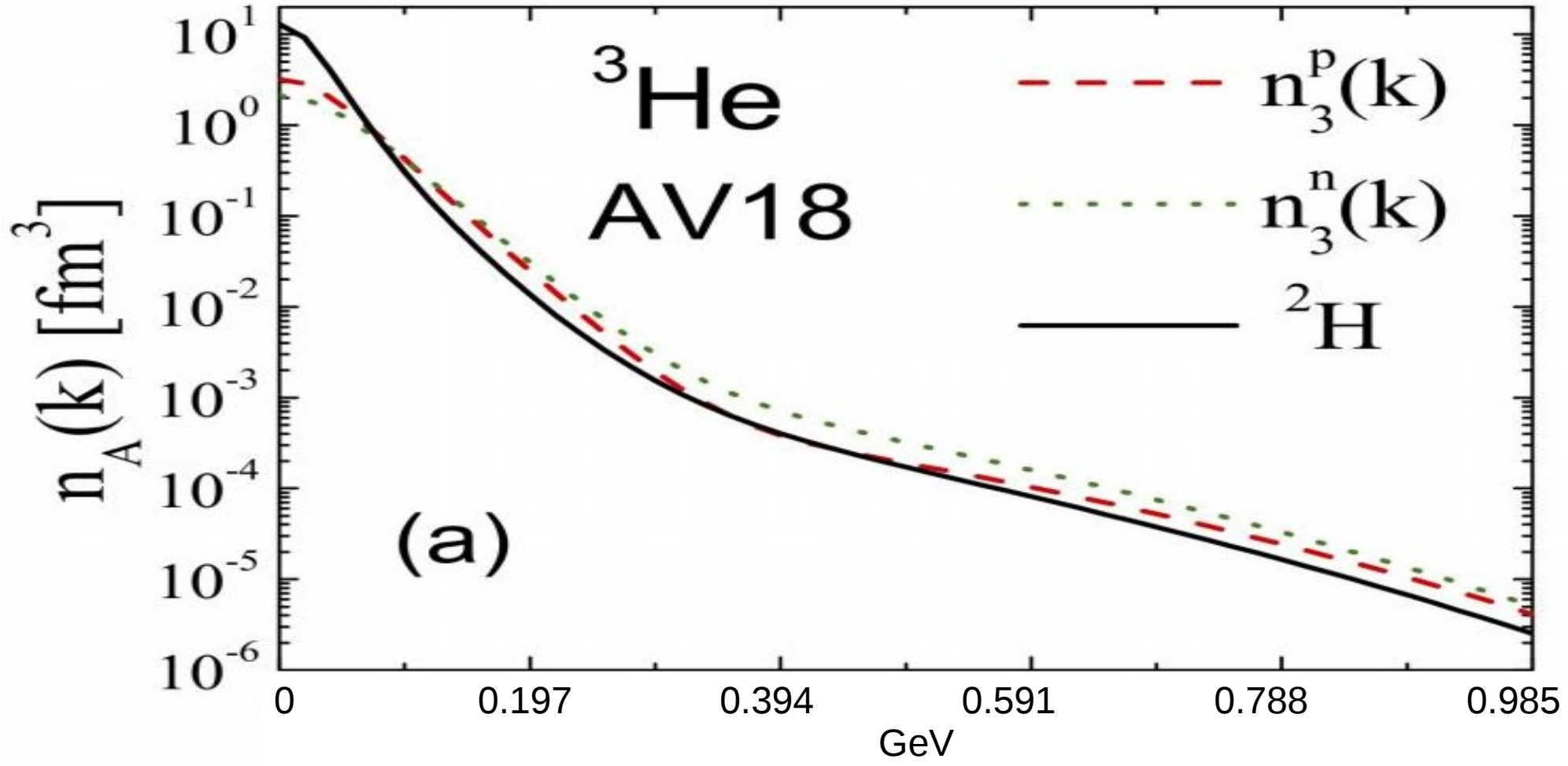
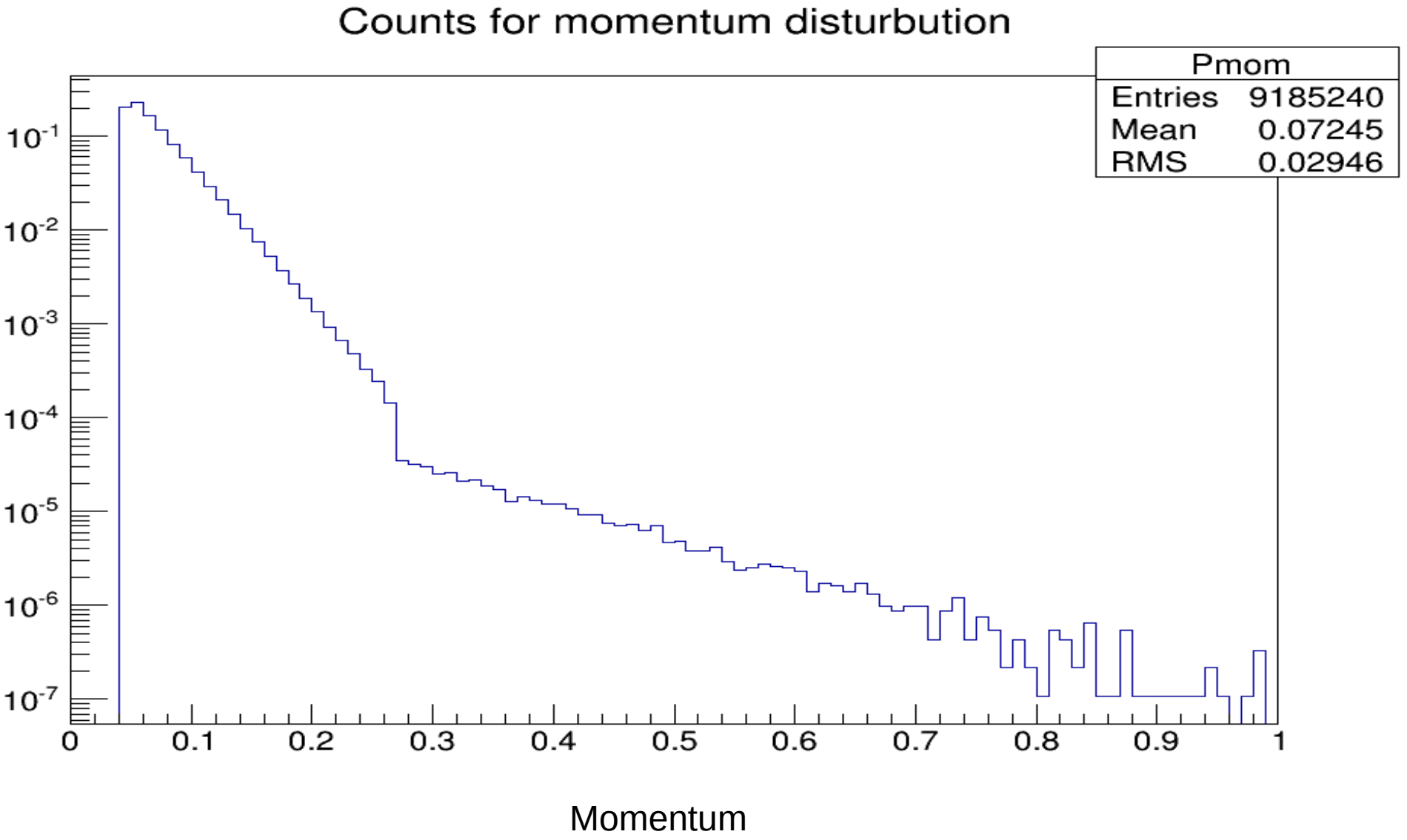
Analysis Meeting

- Simulation update
- Analyzer Practice
- BPMs

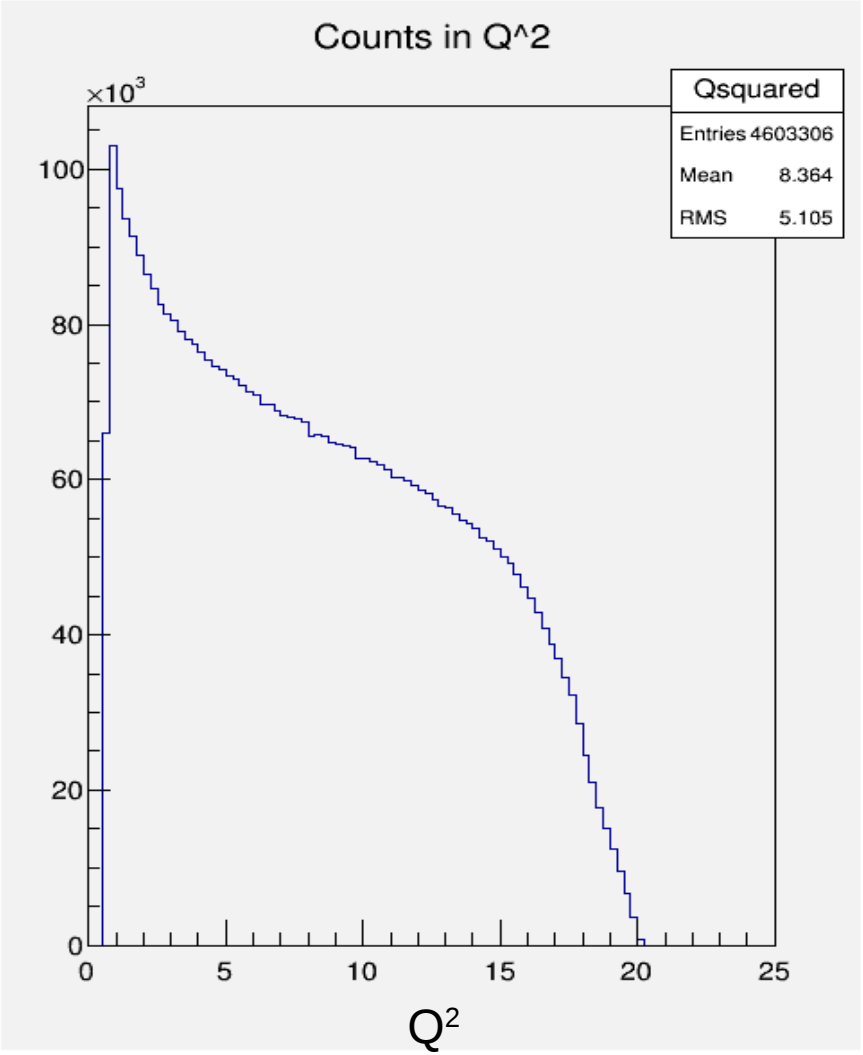
The momentum distribution I am trying to match

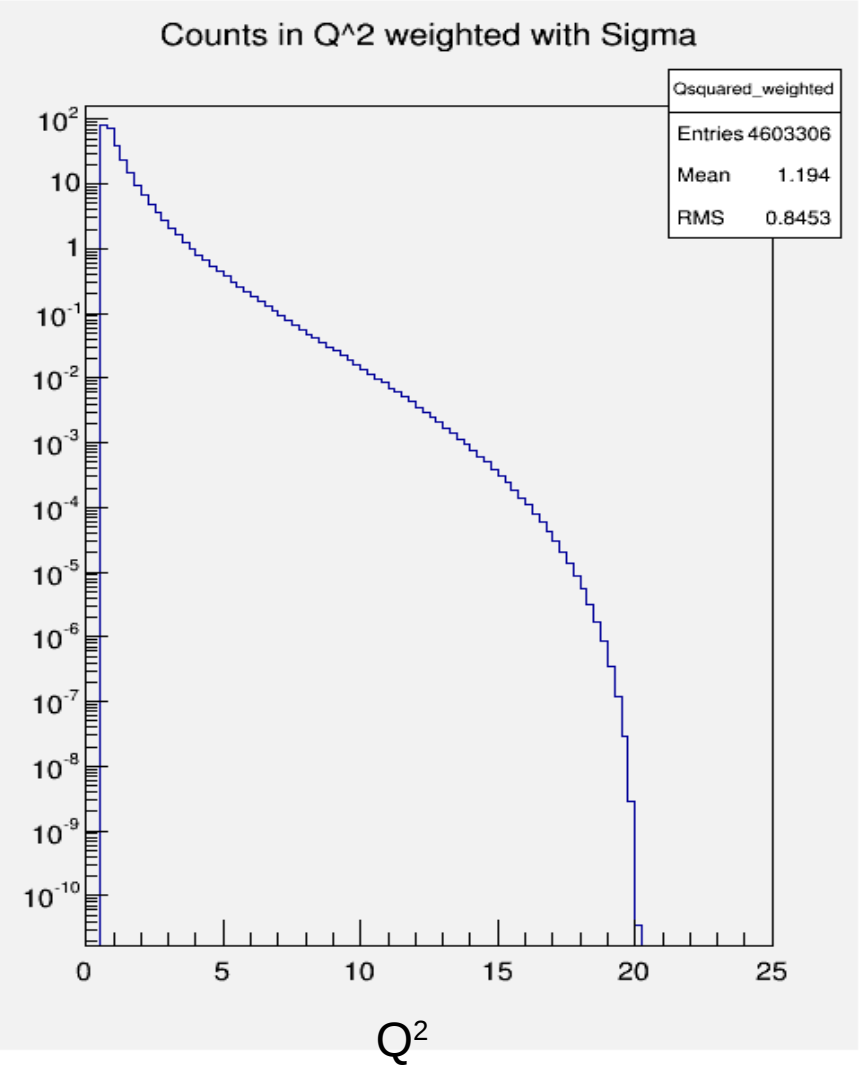


Momentum distribution: Separating two sections by if statement



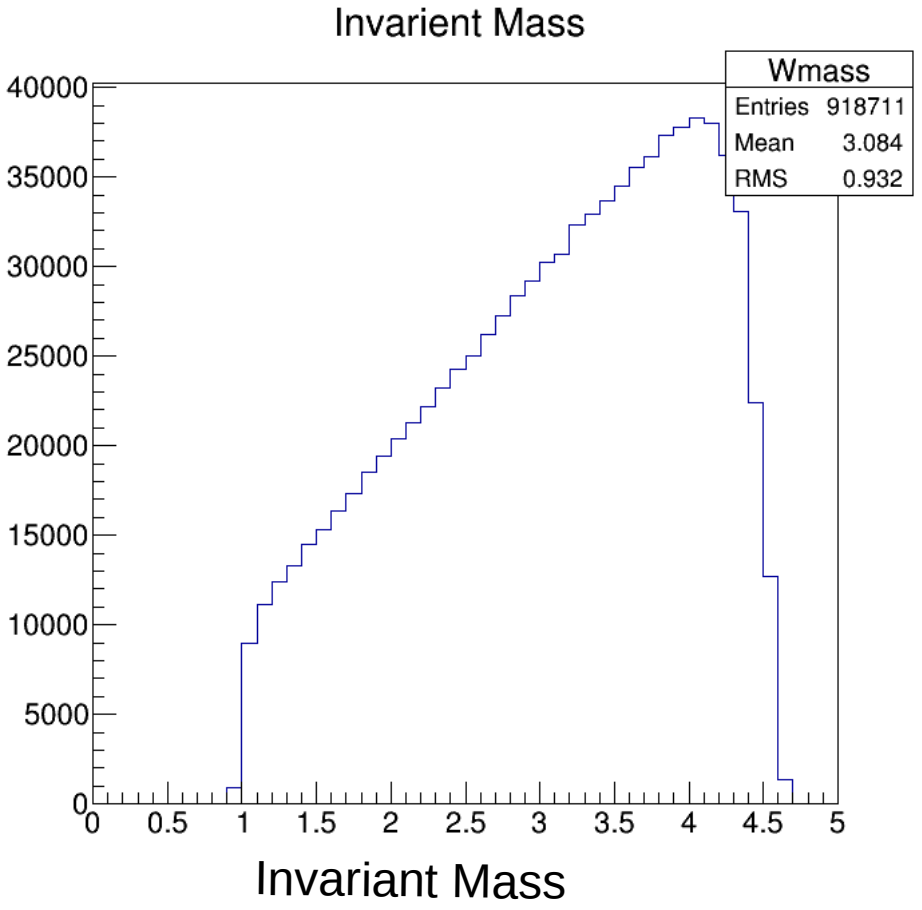
Using a momentum distribution: Counts in Q^2

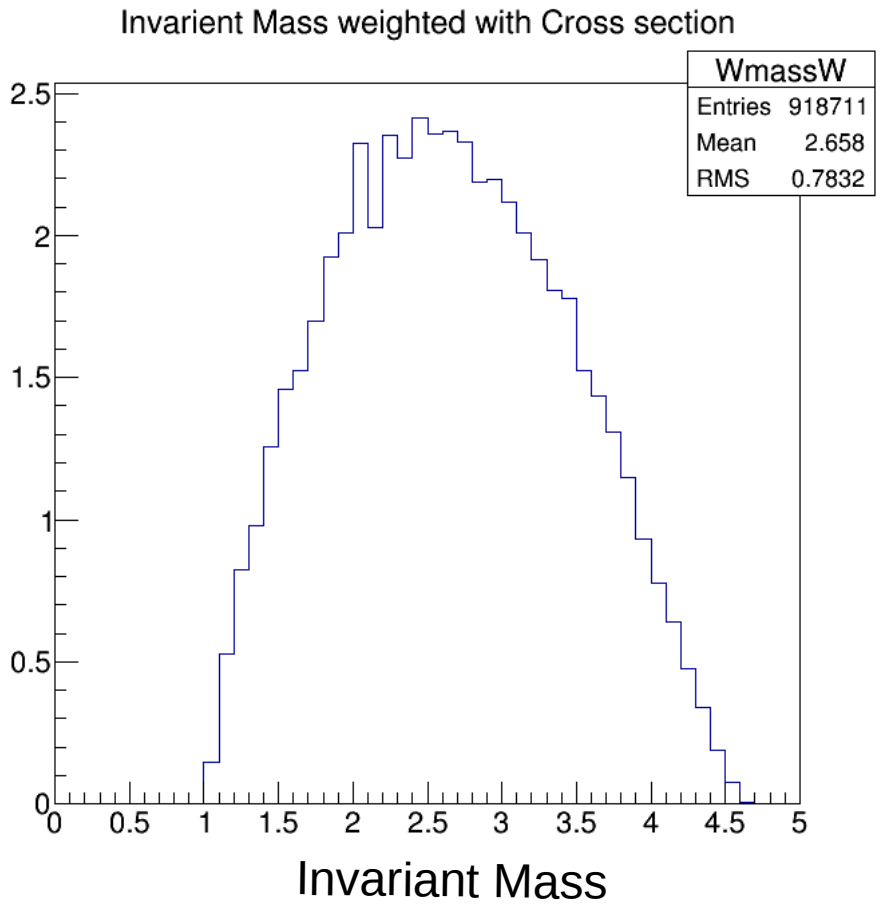




Using a momentum distribution: Counts in invariant mass in the Rest Frame

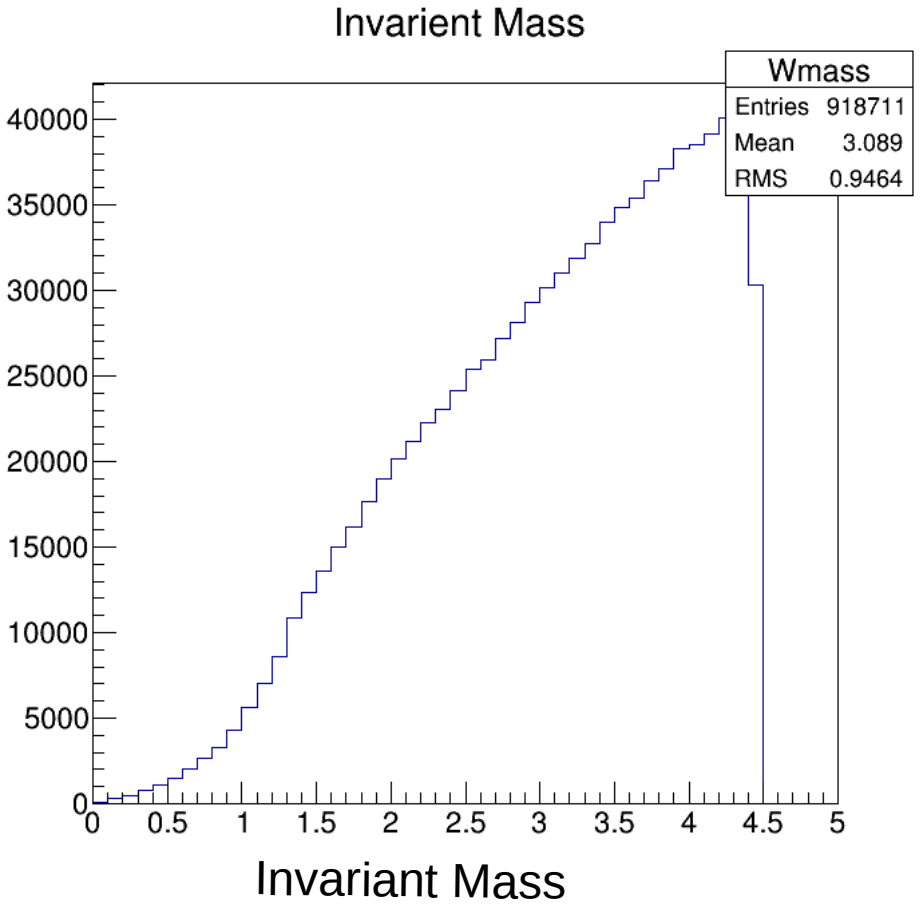
$W = \sqrt{Mp^2 - Q^2 + 2 \cdot Mp \cdot \nu}$

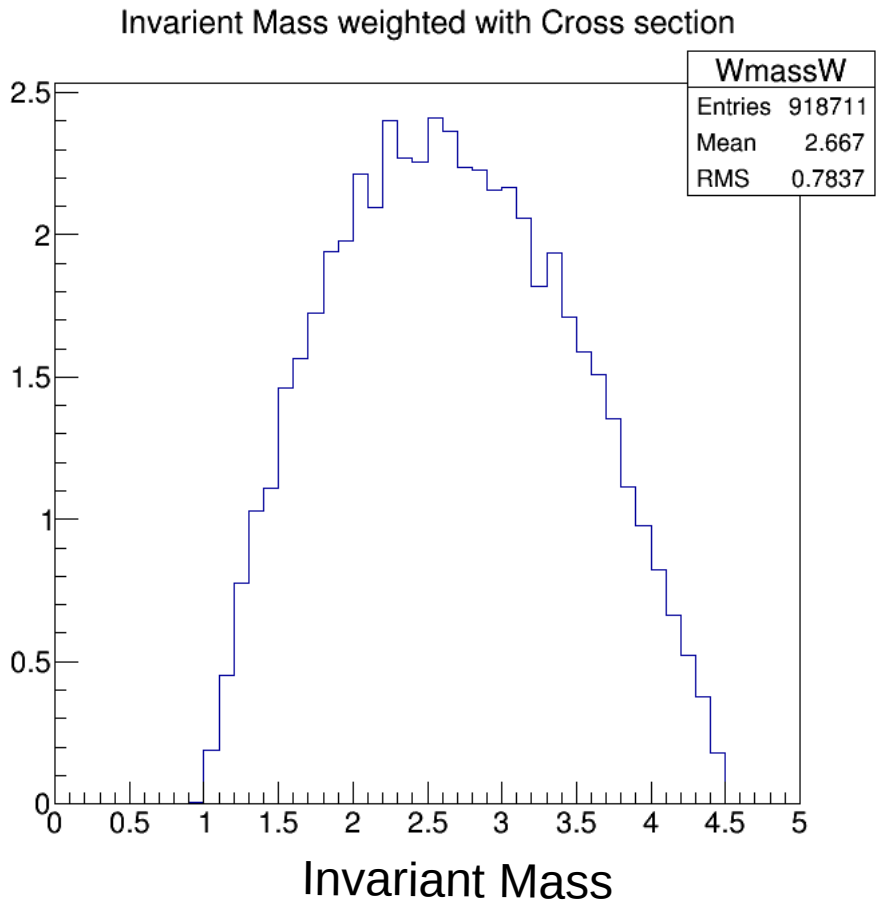




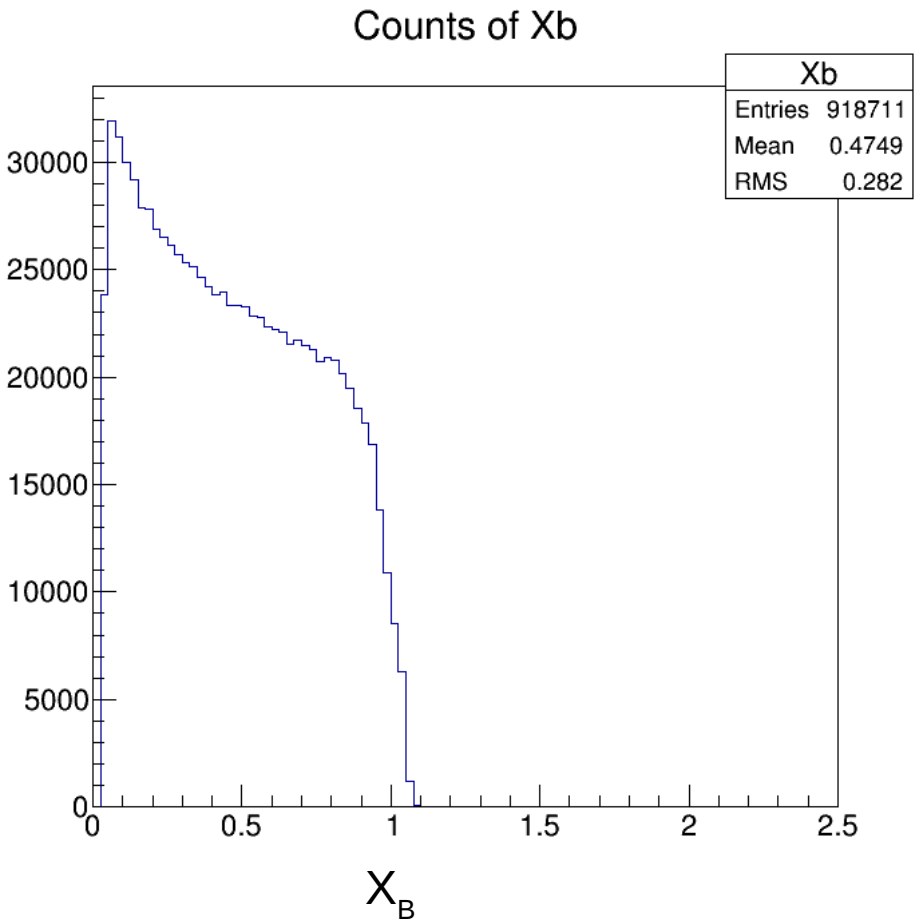
Using a momentum distribution: Counts in invariant mass in the Lab Frame

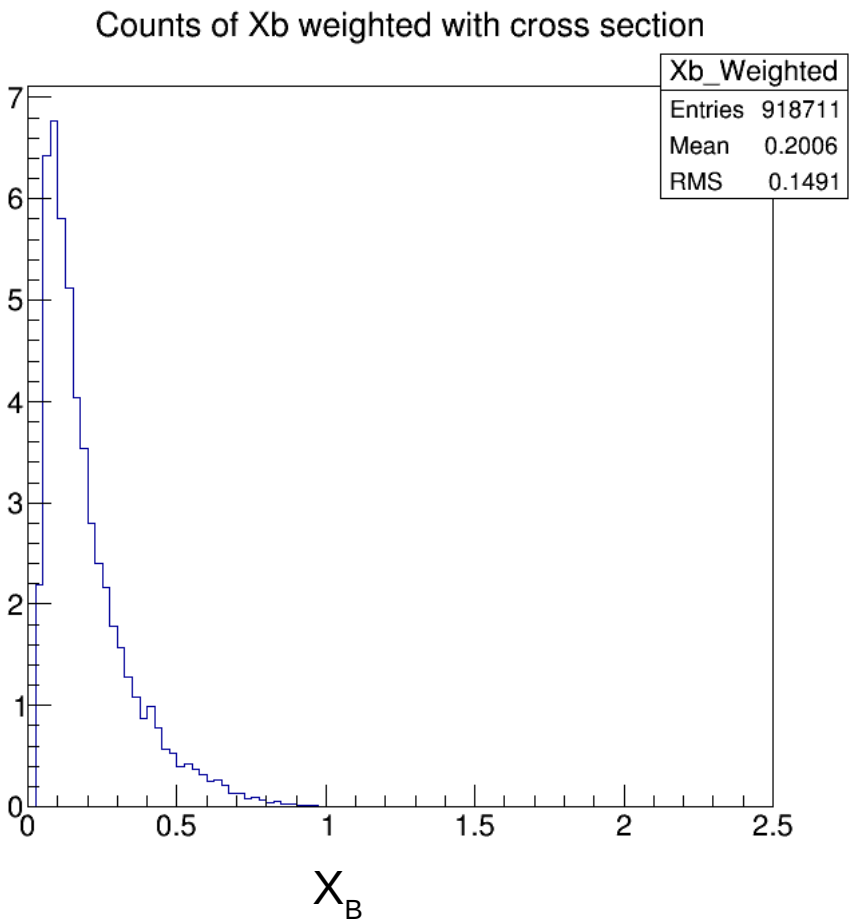
$W = \sqrt{Mp^2 - Q^2 + 2 * Mp * \nu}$



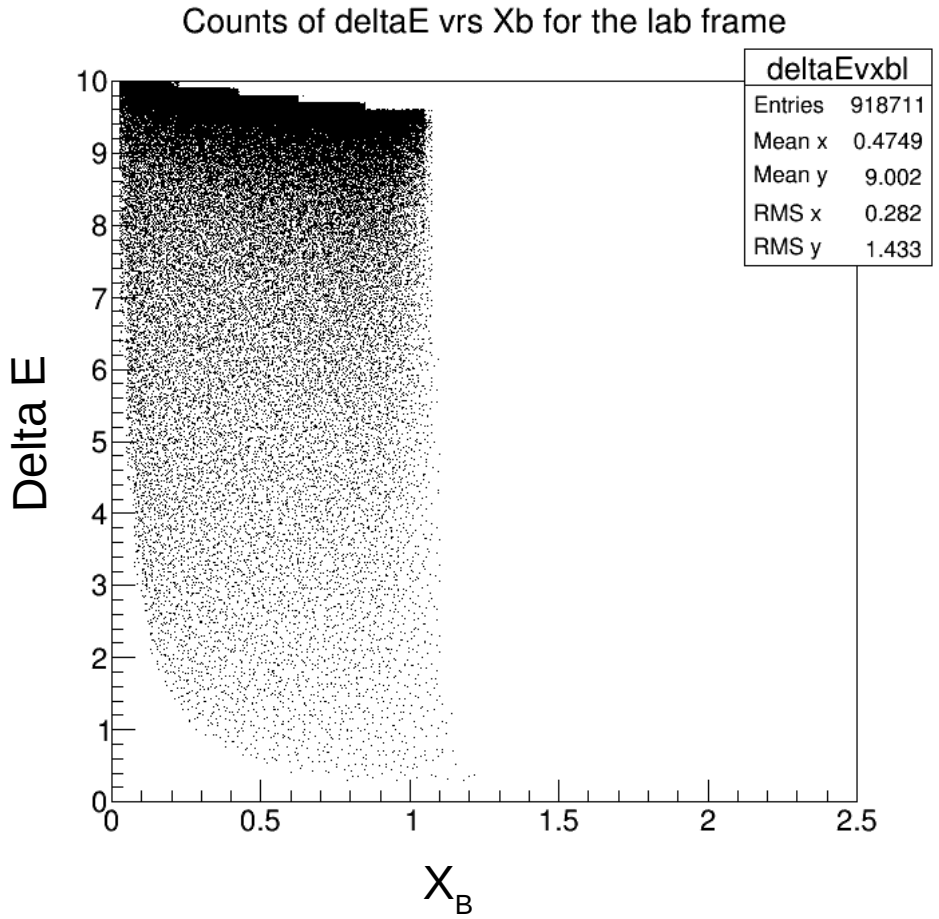


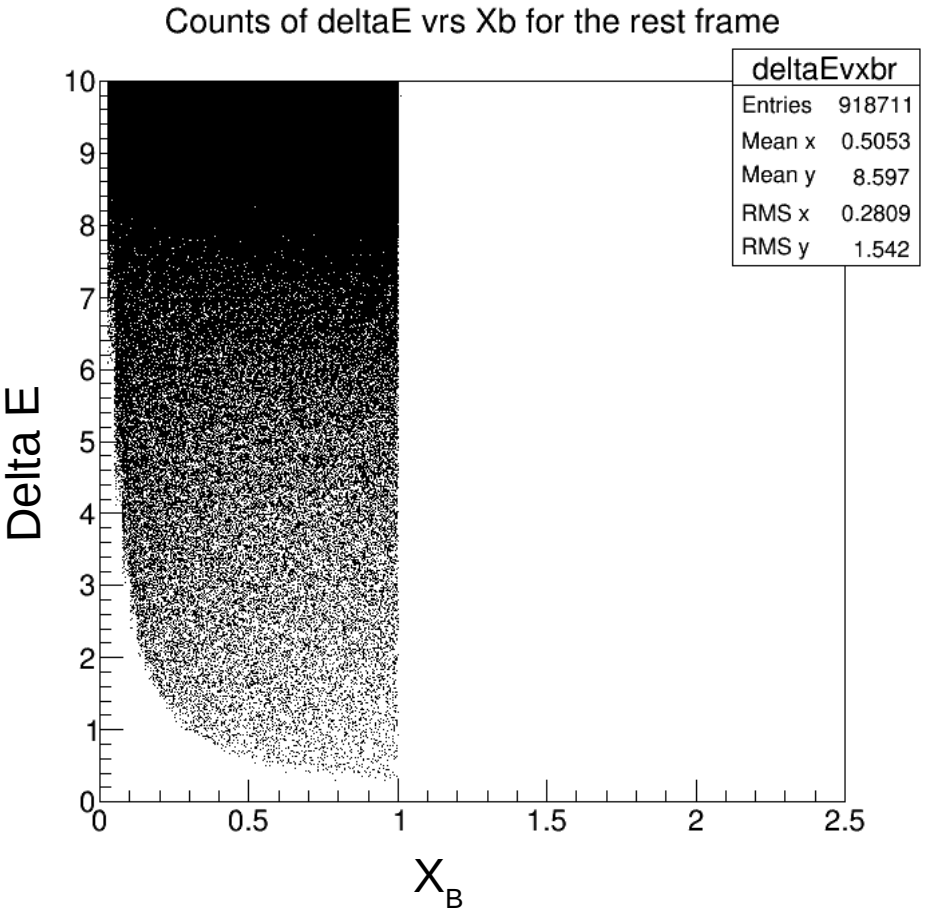
Counts of X_B for W greater than 2.





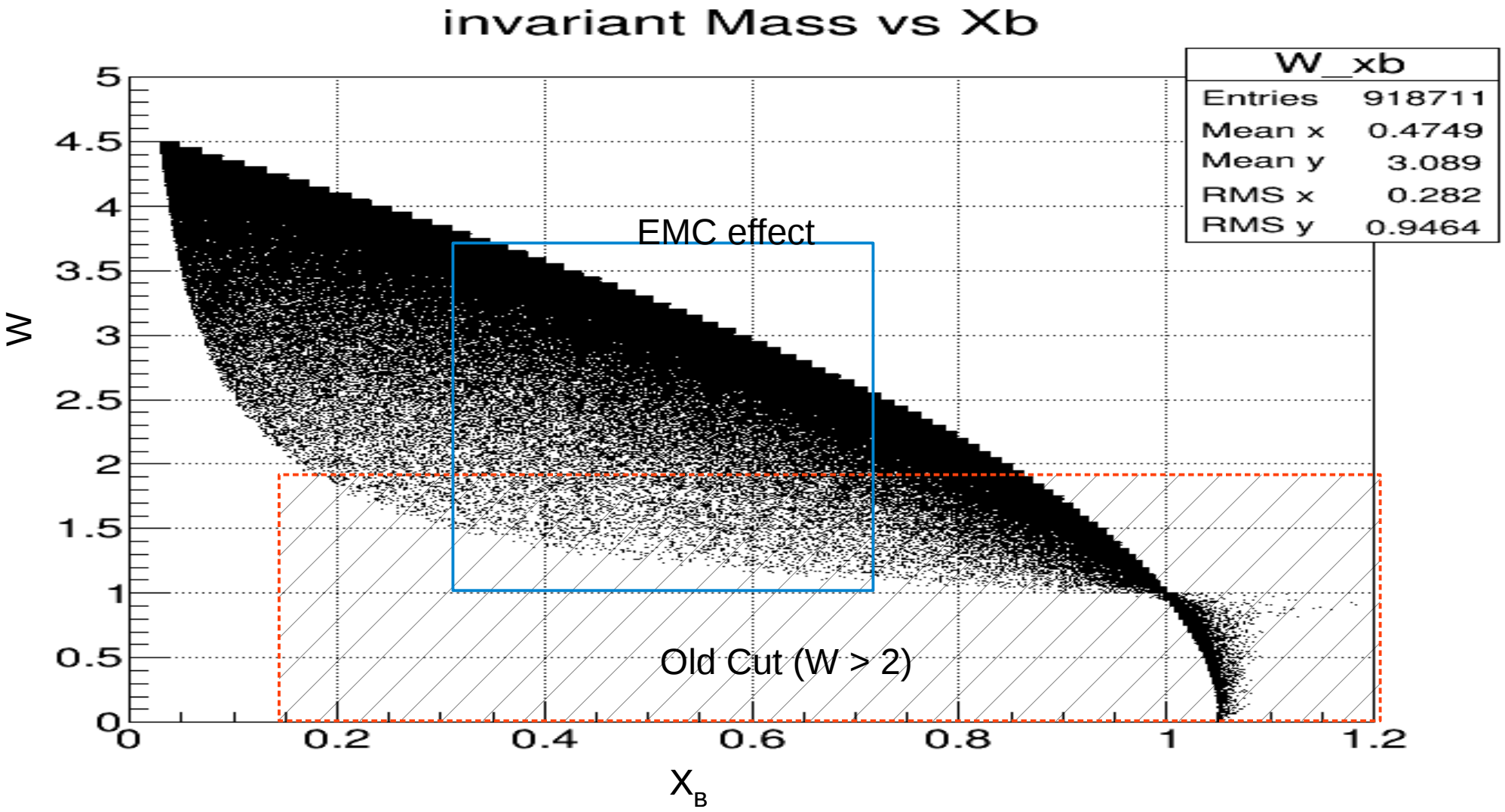
Delta v X_B for W > 2

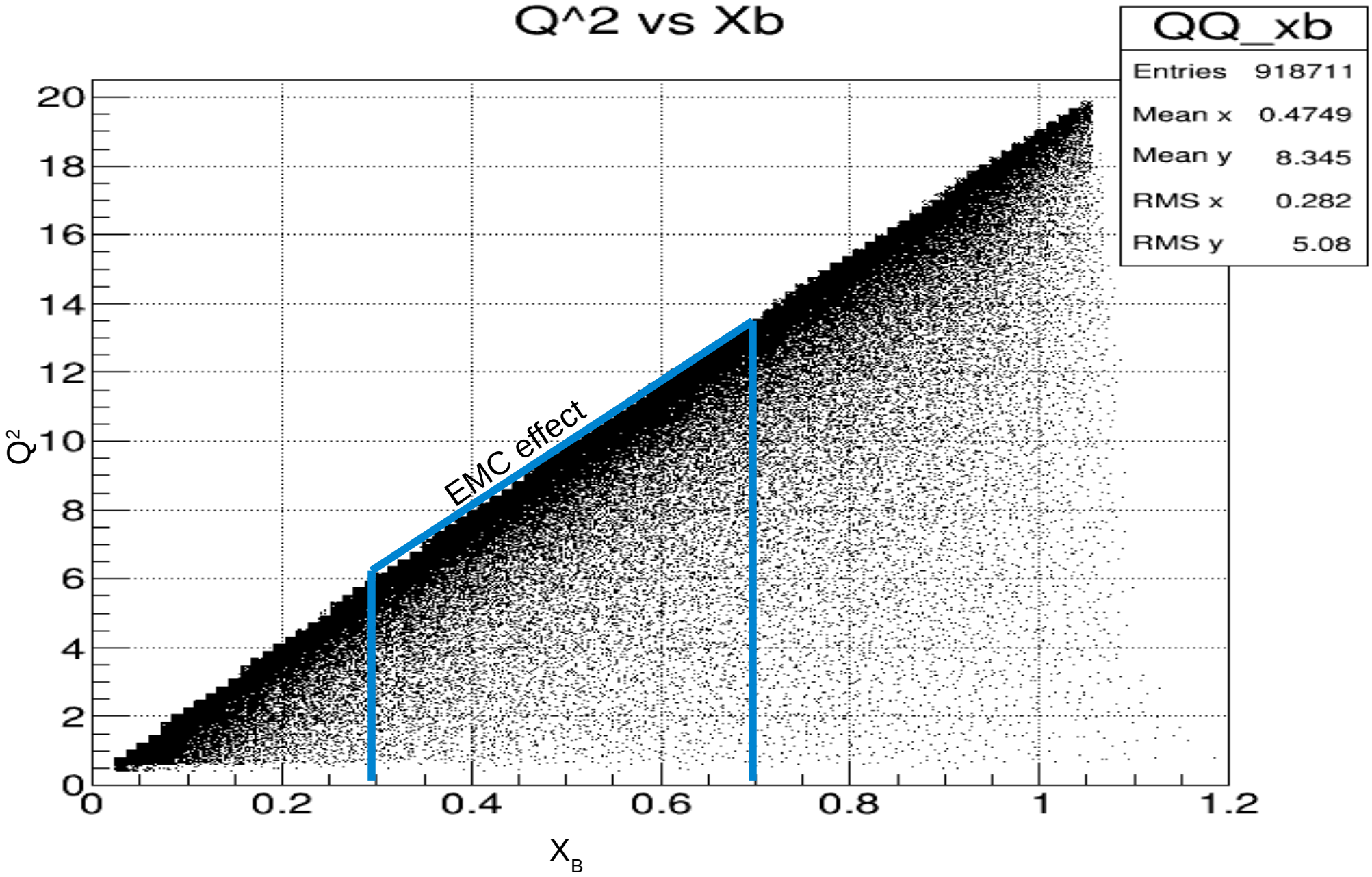


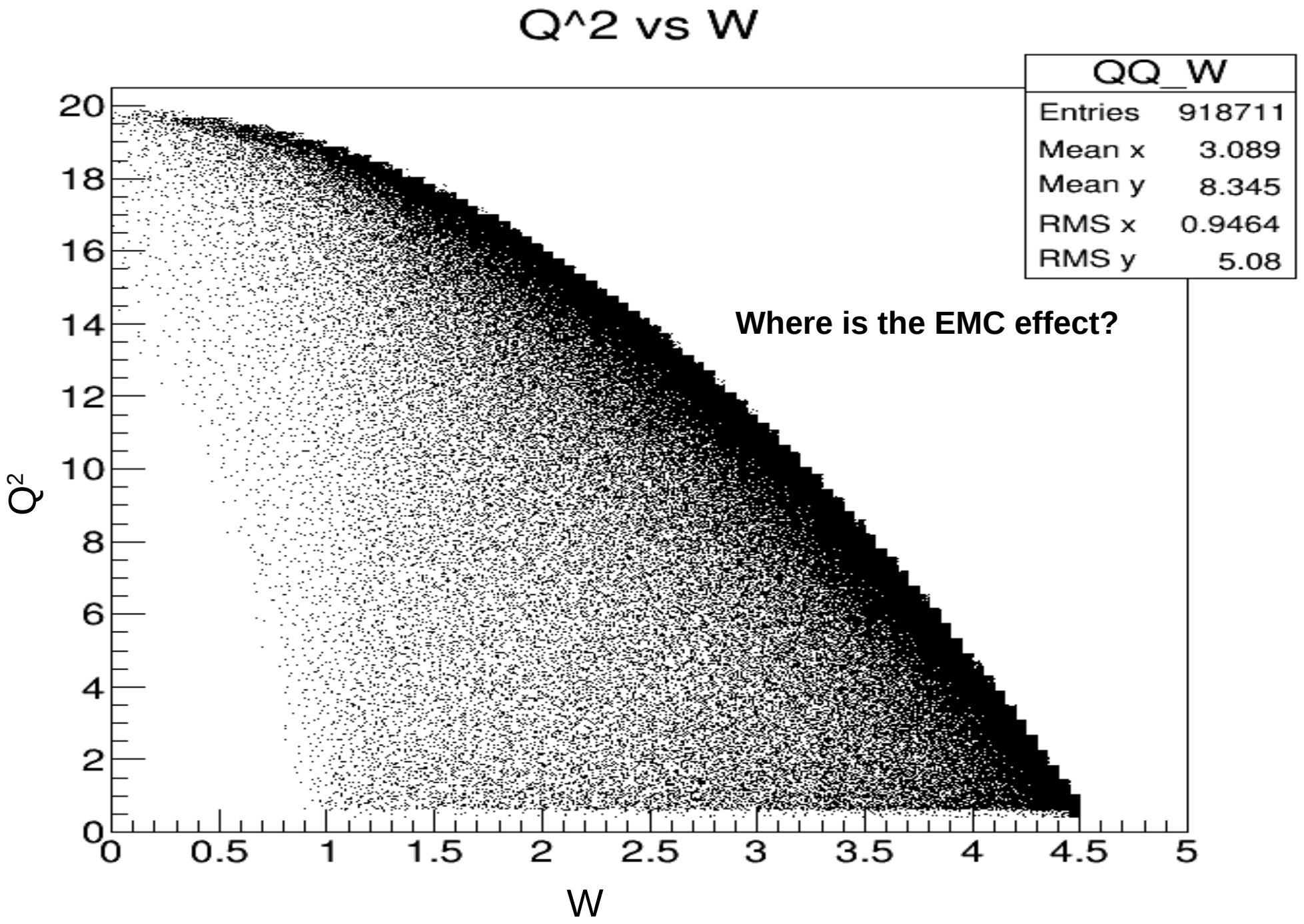


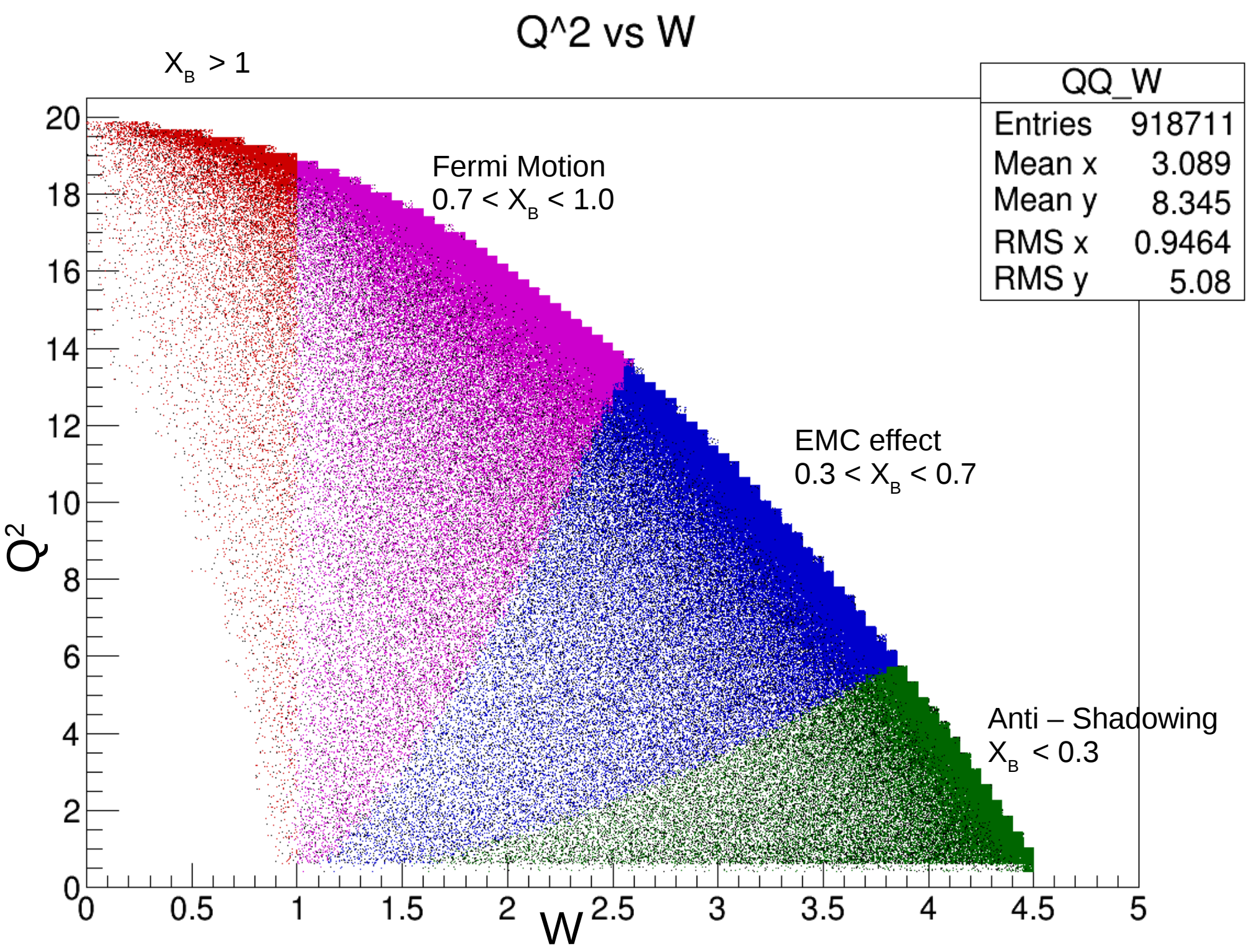
Invariant Mass vs X_B :

With the old cut in W, should of still received some counts in the EMC effect range.

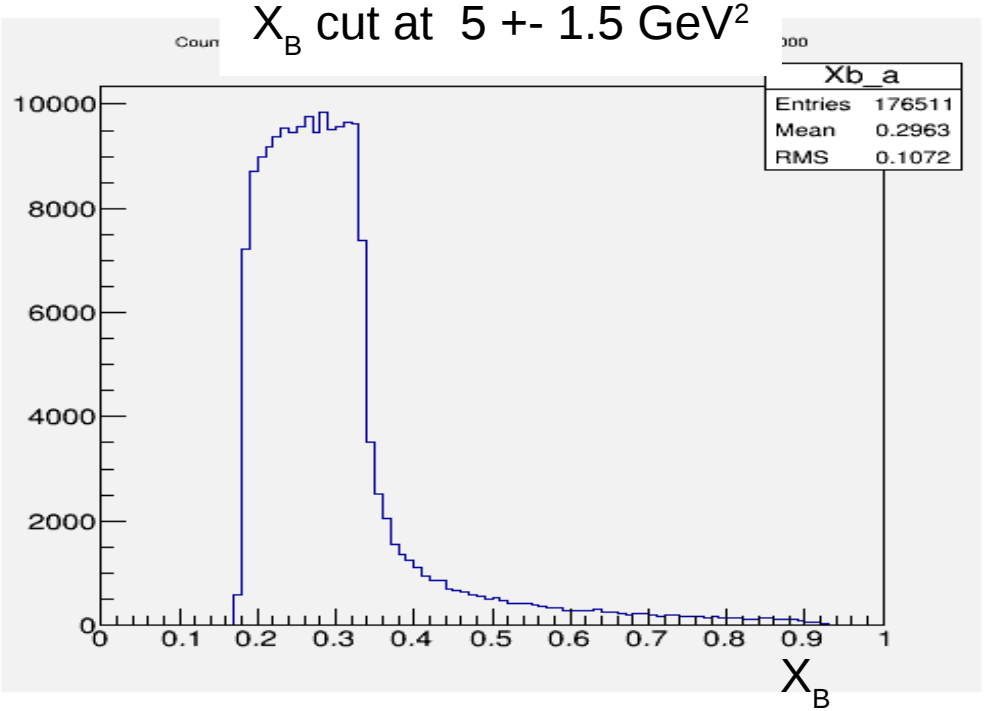



Q^2 vs Xb
QQ_xb
Entries 918711
Mean x 0.4749
Mean y 8.345
RMS x 0.282
RMS y 5.08
EMC effect
Q²
X_B
0
2
4
6
8
10
12
14
16
18
20
0
0.2
0.4
0.6
0.8
1
1.2

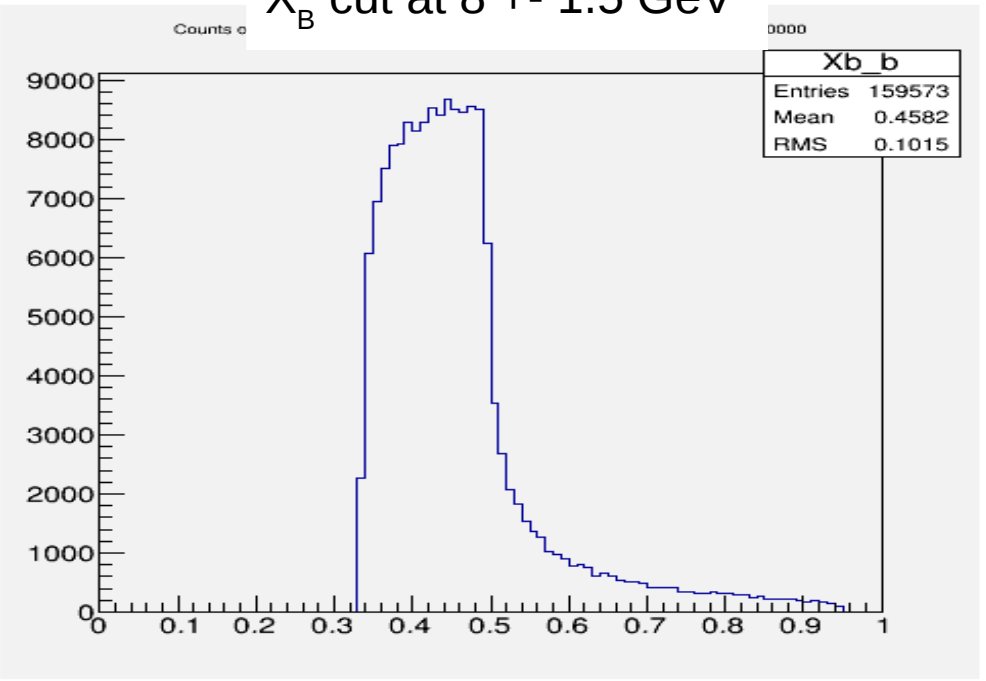

Q^2 vs W
QQ_W
Entries 918711
Mean x 3.089
Mean y 8.345
RMS x 0.9464
RMS y 5.08
Where is the EMC effect?
Q²
W
0
2
4
6
8
10
12
14
16
18
20
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5


Q^2 vs W
$X_B > 1$
QQ_W
Entries 918711
Mean x 3.089
Mean y 8.345
RMS x 0.9464
RMS y 5.08
Fermi Motion
$0.7 < X_B < 1.0$
EMC effect
$0.3 < X_B < 0.7$
Anti – Shadowing
$X_B < 0.3$
Q^2
W
0
2
4
6
8
10
12
14
16
18
20
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

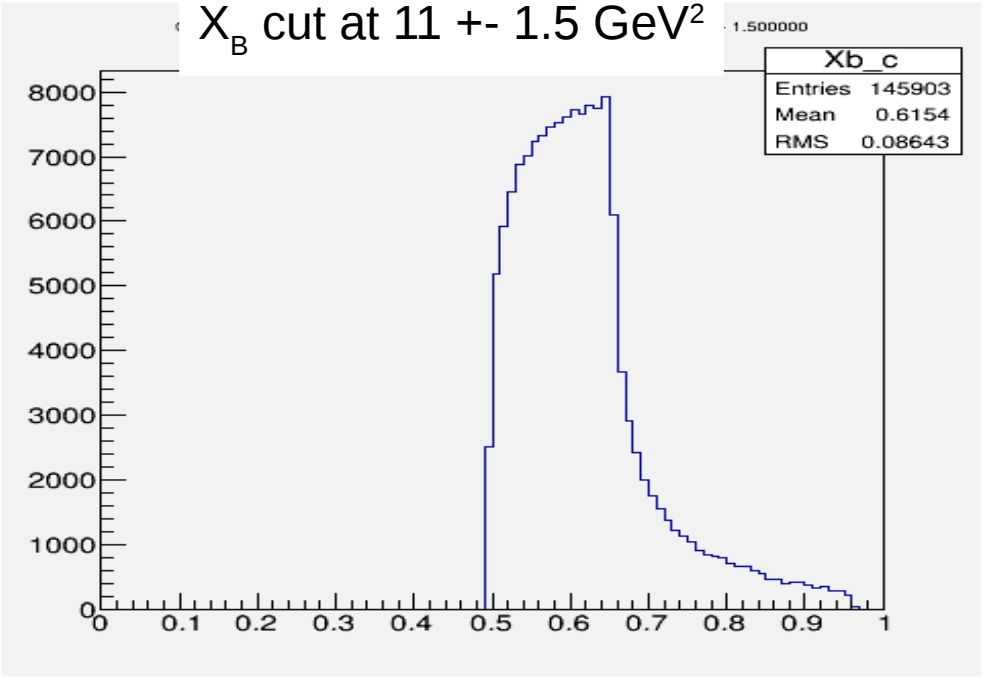
X_B cut at 5 +- 1.5 GeV^2



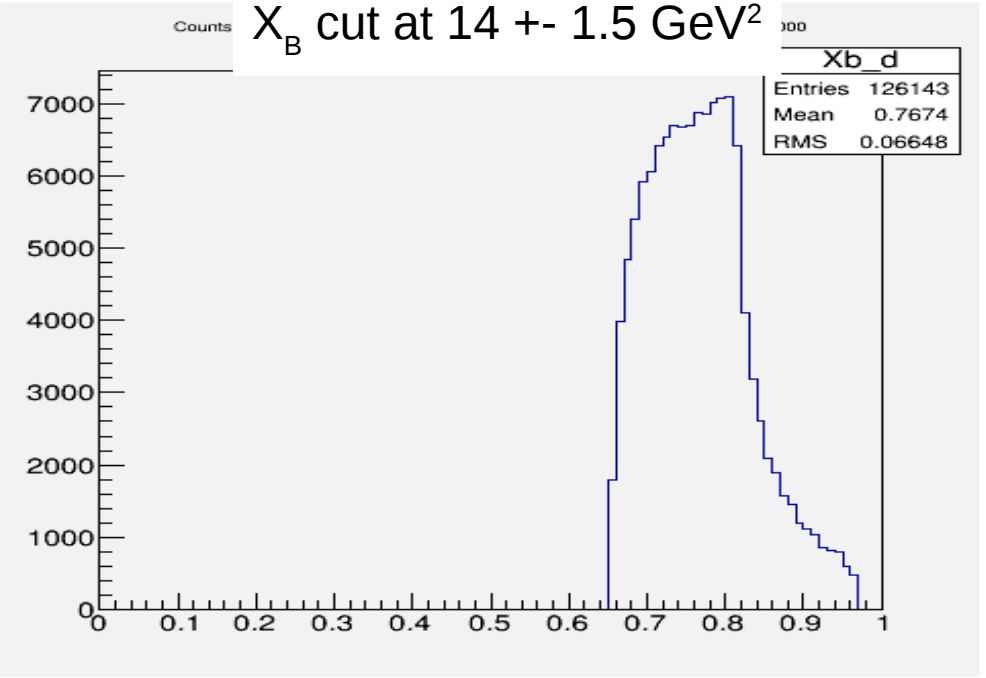
X_B cut at 8 +- 1.5 GeV^2



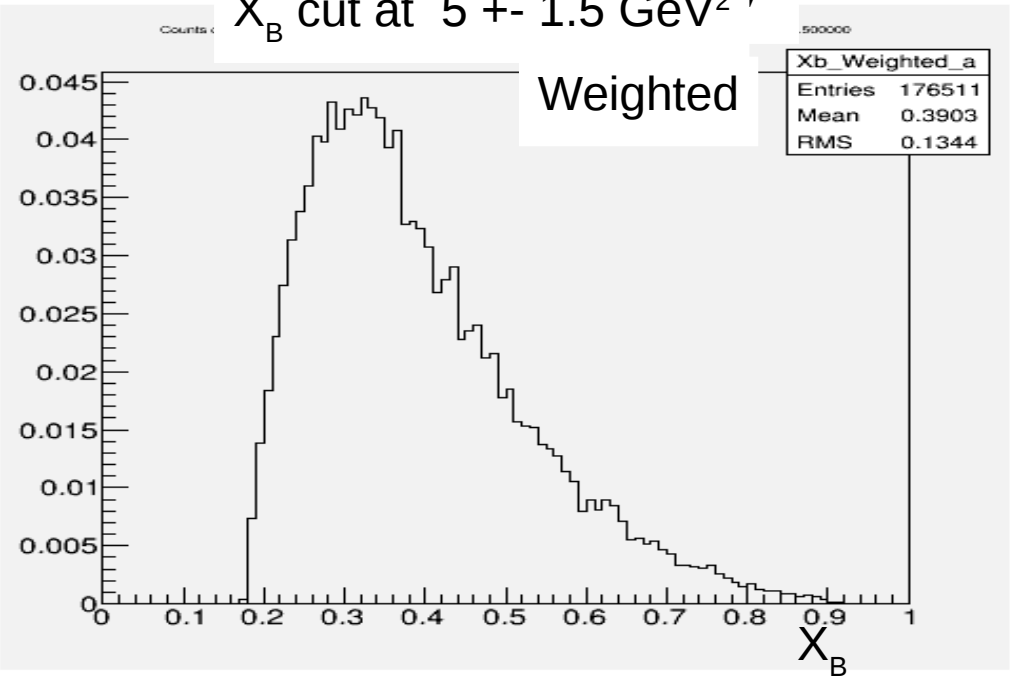
X_B cut at 11 +- 1.5 GeV^2



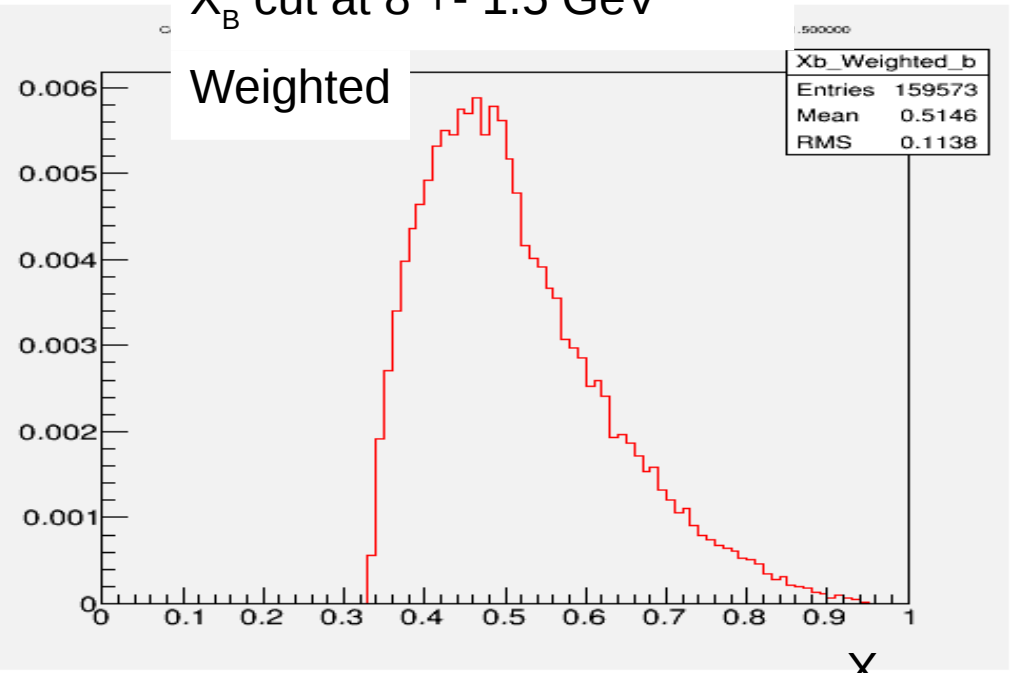
X_B cut at 14 +- 1.5 GeV^2



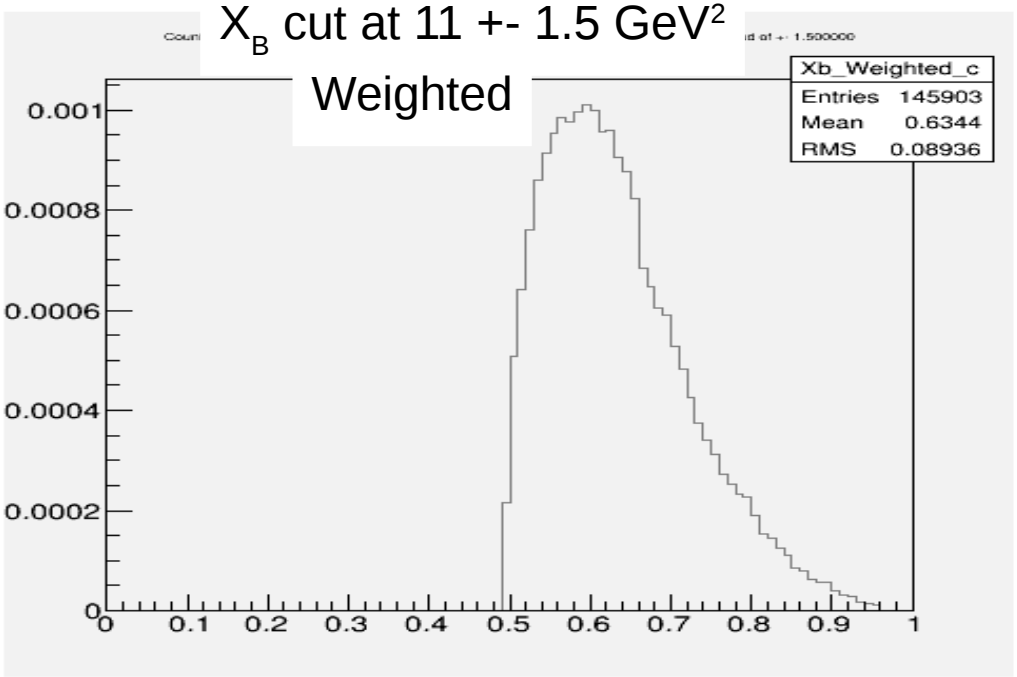
X_B cut at 5 +- 1.5 GeV^2



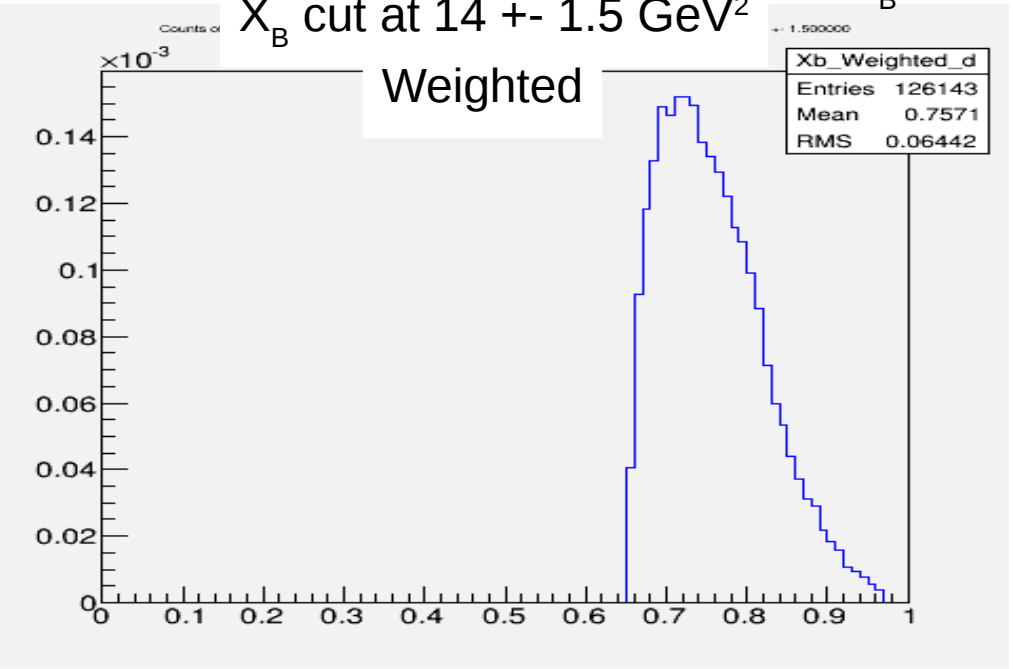
X_B cut at 8 +- 1.5 GeV^2



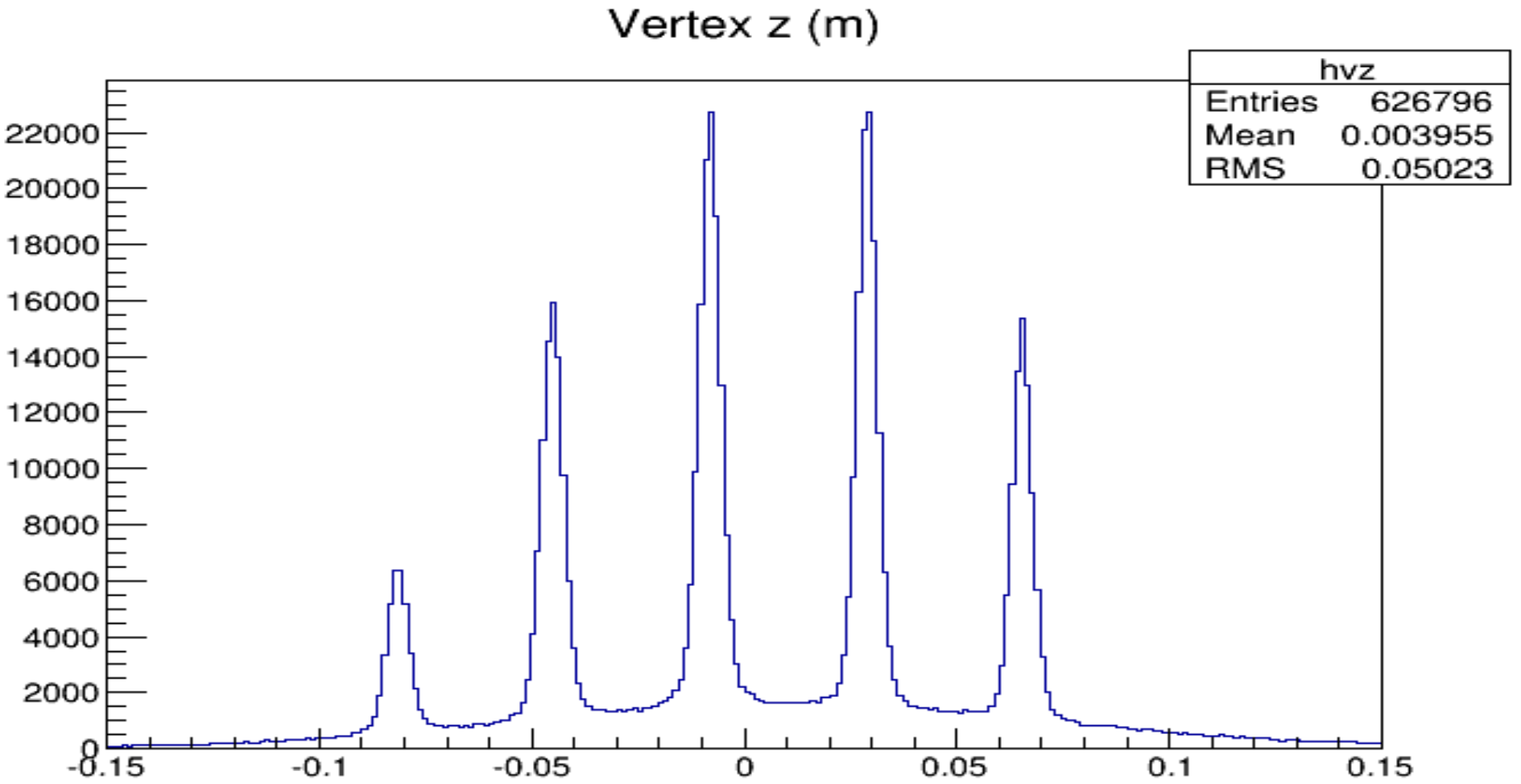
X_B cut at 11 +- 1.5 GeV^2



X_B cut at 14 +- 1.5 GeV^2



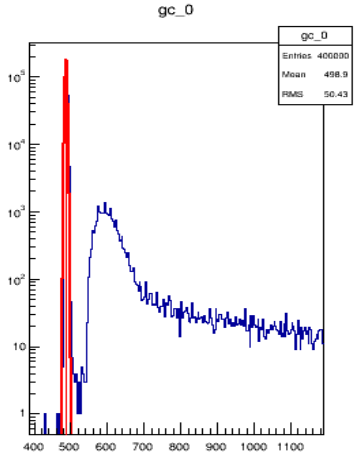
Analysis: gmp multifoil run

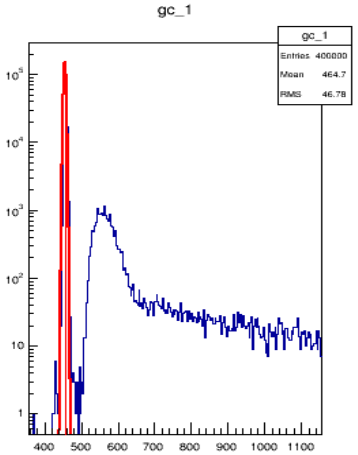


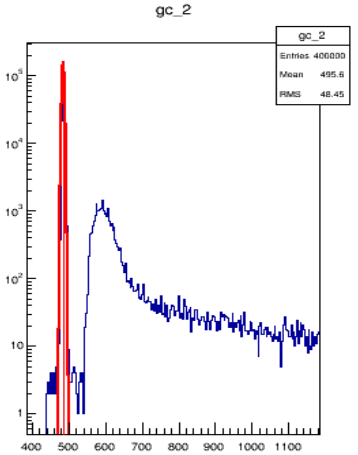
Looking at gmp_12152.dat.0

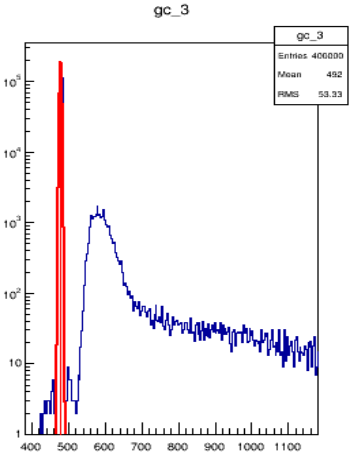
Finding the pedestal

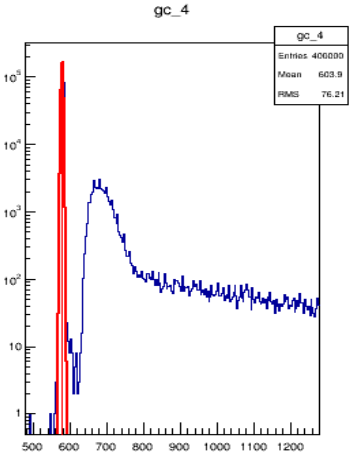
488.2 455.8 485.7 479.5 579.2 559.3 583.3 518.5 514 489.3

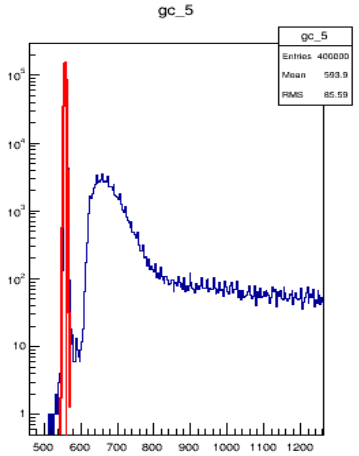


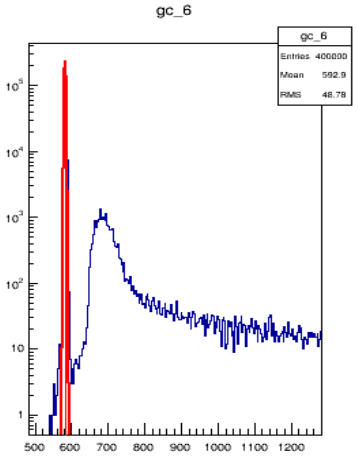


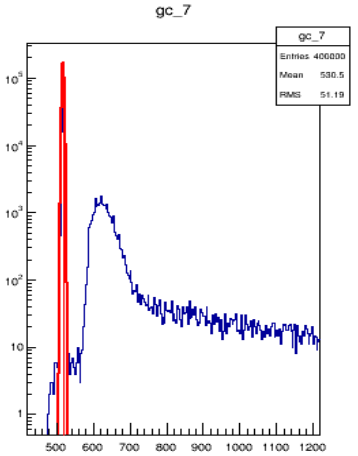


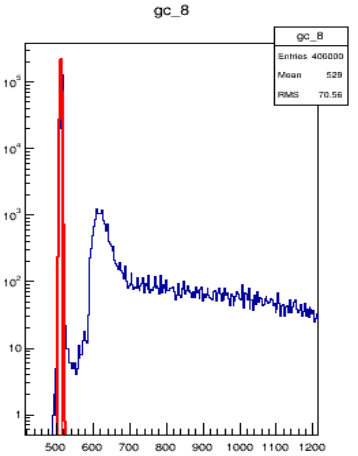


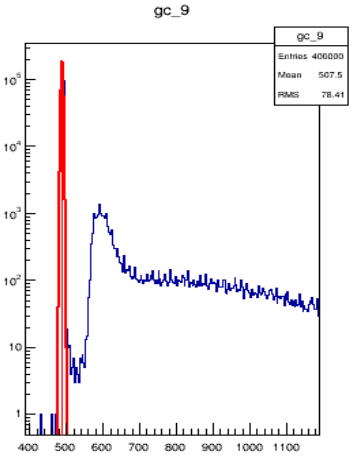






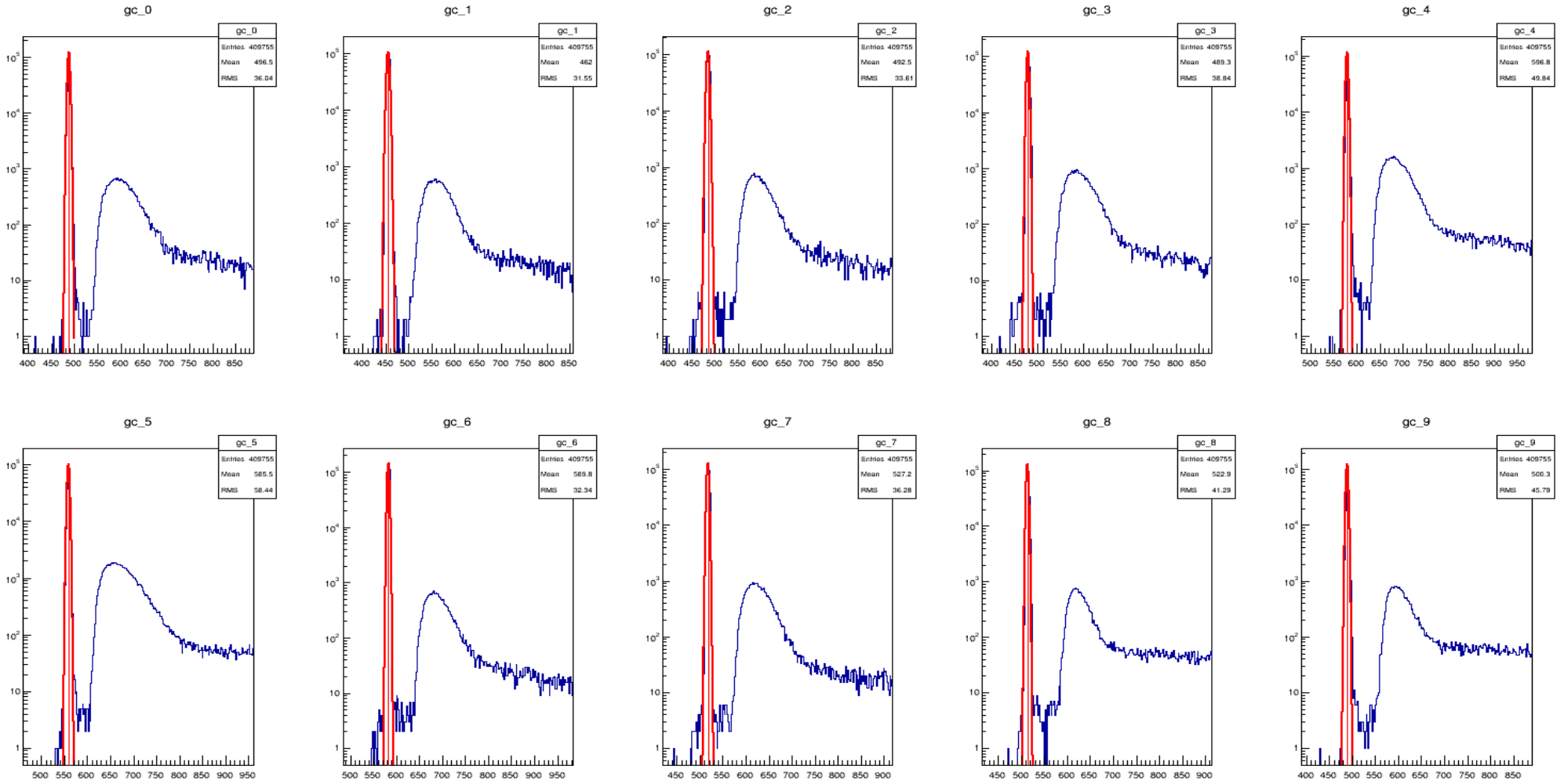






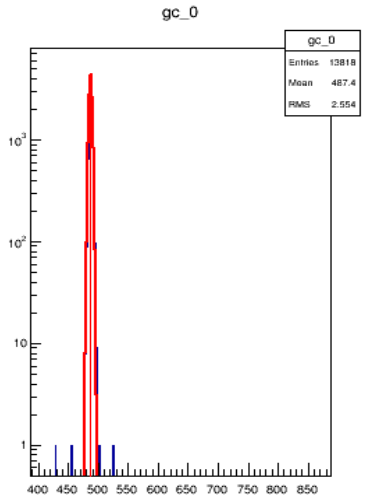
gmp_12151.dat.0

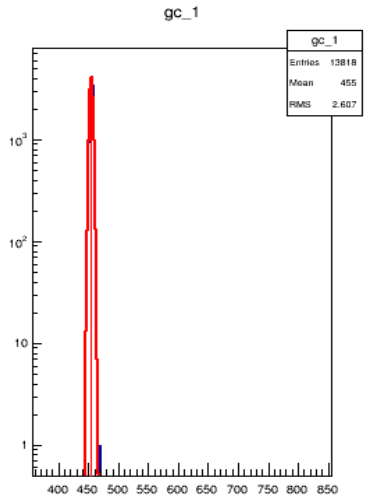
487.9 455.4 485 478.8 579.1 559 582.9 517.8 513.8 489.1

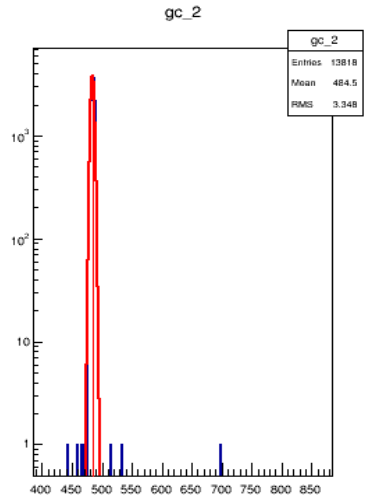


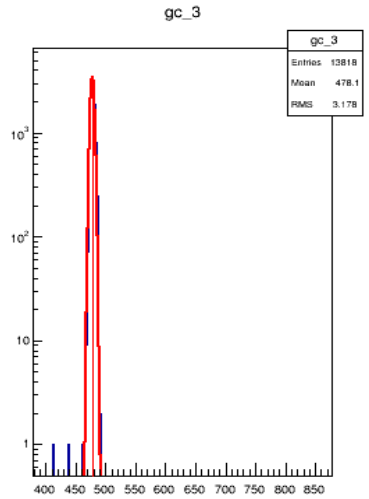
gmp_13421_dat_0

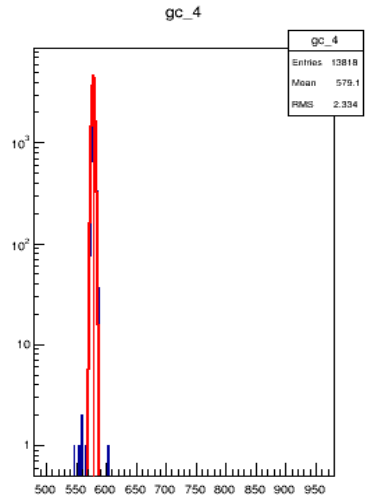
487.4 455 484.5 478.1 579.1 559.2 583.3 517.7 513.6 488.

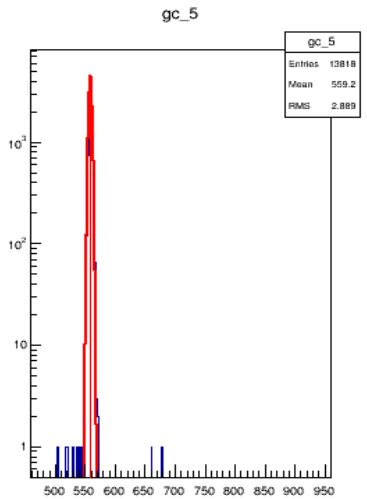


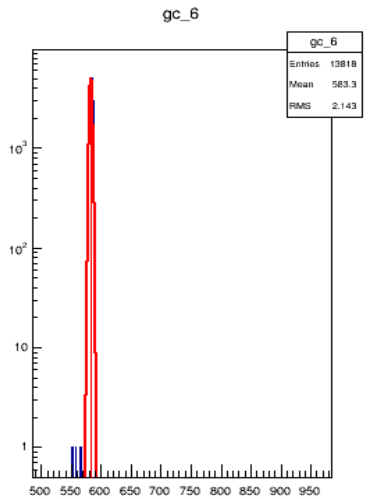


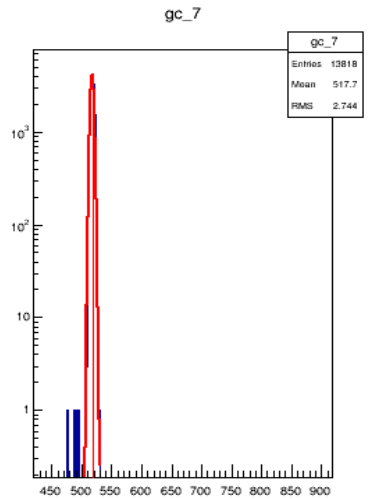


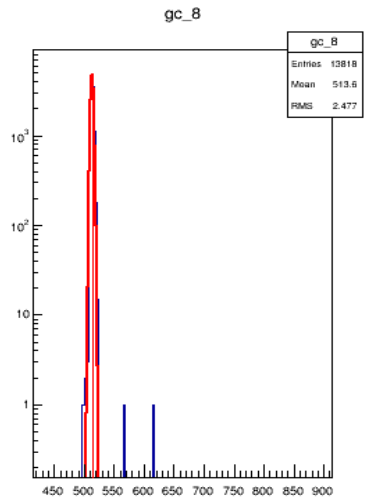


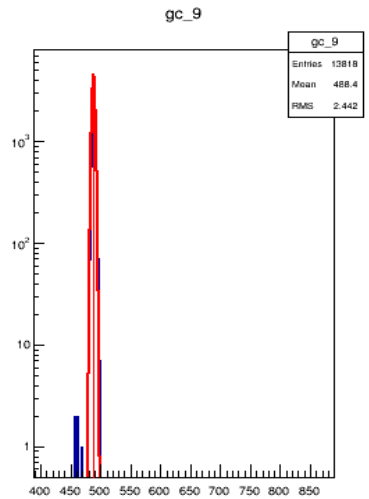












Pedestals

12152

488.2 455.8 485.7 479.5 579.2 559.3 583.3 518.5 514 489.3

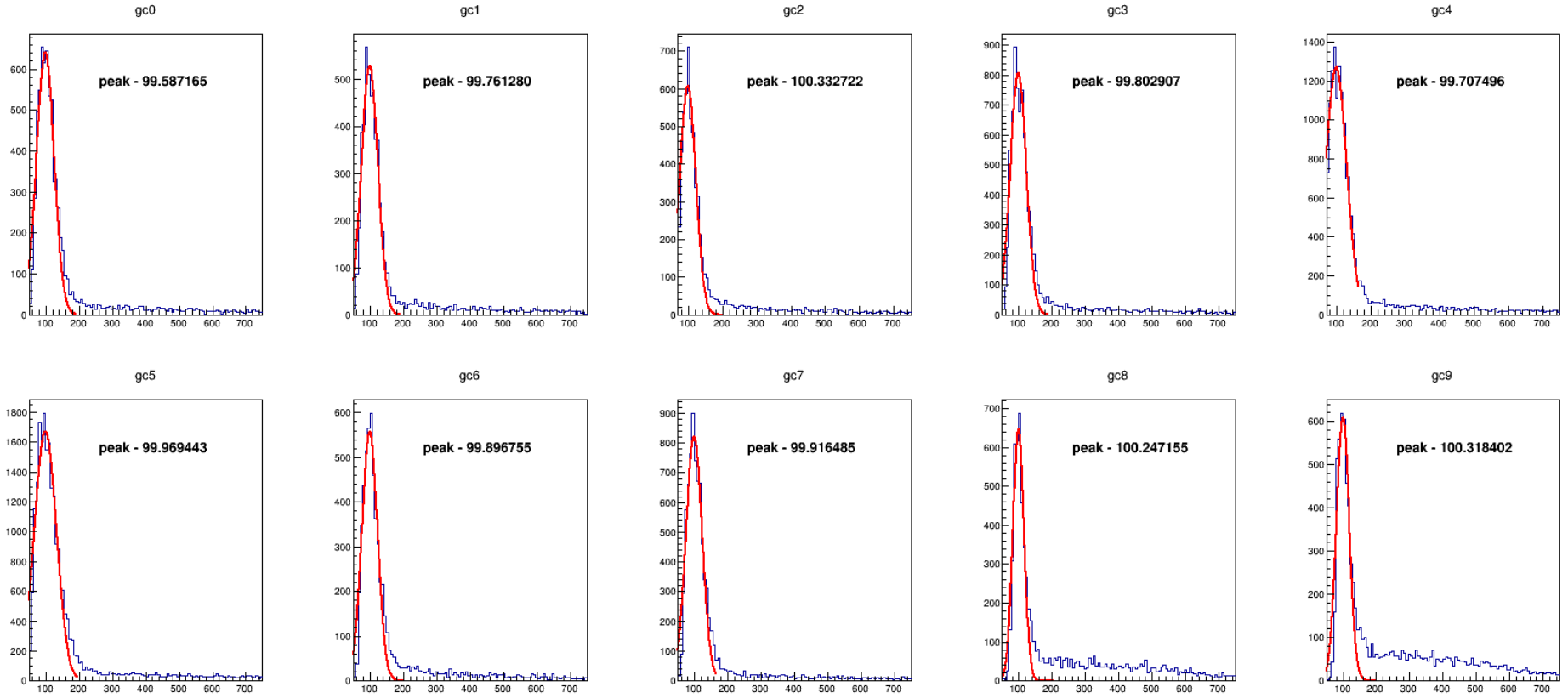
12151

487.9 455.4 485 478.8 579.1 559 582.9 517.8 513.8 489.1

13421

487.4 455 484.5 478.1 579.1 559.2 583.3 517.7 513.6 488.

Apply those gain factors to bring the SPE for each PMT to 100.



Double check the gain factors and iterate again if needed. Run 12152

$$C_i^{\bullet} = \frac{100}{M_i^{SPE} - M_i^{ped}} \cdot C_i$$

GC#	Peak_obs	Peak_need	Ratio	Percent error
0	99.5872	100	1.00415	0.412835
1	99.7613	100	1.00239	0.23872
2	100.333	100	0.996684	0.332722
3	99.8029	100	1.00197	0.197093
4	99.7075	100	1.00293	0.292504
5	99.9694	100	1.00031	0.0305573
6	99.8968	100	1.00103	0.103245
7	99.9165	100	1.00084	0.0835154
8	100.247	100	0.997535	0.247155
9	100.318	100	0.996826	0.318402

Looked at multiple calibration runs: 12152,12151,12150 using all events in each run.

	SPE	Needed	Ratio	%error
0	99.4655	100	1.00537	0.534512
1	99.4743	100	1.00528	0.525674
2	100.016	100	0.999843	0.0156781
3	100.159	100	0.998409	0.159397
4	100.171	100	0.998293	0.171028
5	99.8869	100	1.00113	0.113096
6	100.222	100	0.997783	0.222213
7	100.683	100	0.993216	0.683029
8	100.198	100	0.998024	0.197979
9	100.642	100	0.993624	0.641662

	SPE	Needed	Ratio	%error
0	101.668	100	0.98359	1.66842
1	99.0021	100	1.01008	0.997884
2	98.9617	100	1.01049	1.03832
3	101.729	100	0.983006	1.72879
4	100.369	100	0.996326	0.368775
5	99.8583	100	1.00142	0.141719
6	99.7406	100	1.0026	0.259371
7	99.9496	100	1.0005	0.0503845
8	102.426	100	0.976316	2.42587
9	103.785	100	0.963534	3.78464

	SPE	Needed	Ratio	%error
0	107.003	100	0.934551	7.00327
1	104.803	100	0.954172	4.80291
2	99.8031	100	1.00197	0.196908
3	104.752	100	0.954631	4.75249
4	103.069	100	0.970227	3.06867
5	99.871	100	1.00129	0.129036
6	99.819	100	1.00181	0.180917
7	105.49	100	0.947959	5.48984
8	106.088	100	0.94261	6.08838
9	108.195	100	0.924253	8.1955

BPM source: Powers, Doolittle, Ursic and Wagner in “Design, commissioning and operational results of wide dynamic range BPM switched electrode electronics” '

Barry in “A general analysis of thin wire pickups for high frequency beam position monitors”

BPM

Design requirements

- Operate with linac currents ranging from 1 micro Amp to 1 mili Amp.
- Detected beam with a relative accuracy of 100 micro meters.
- Cover a range of + or – 5 millimeters

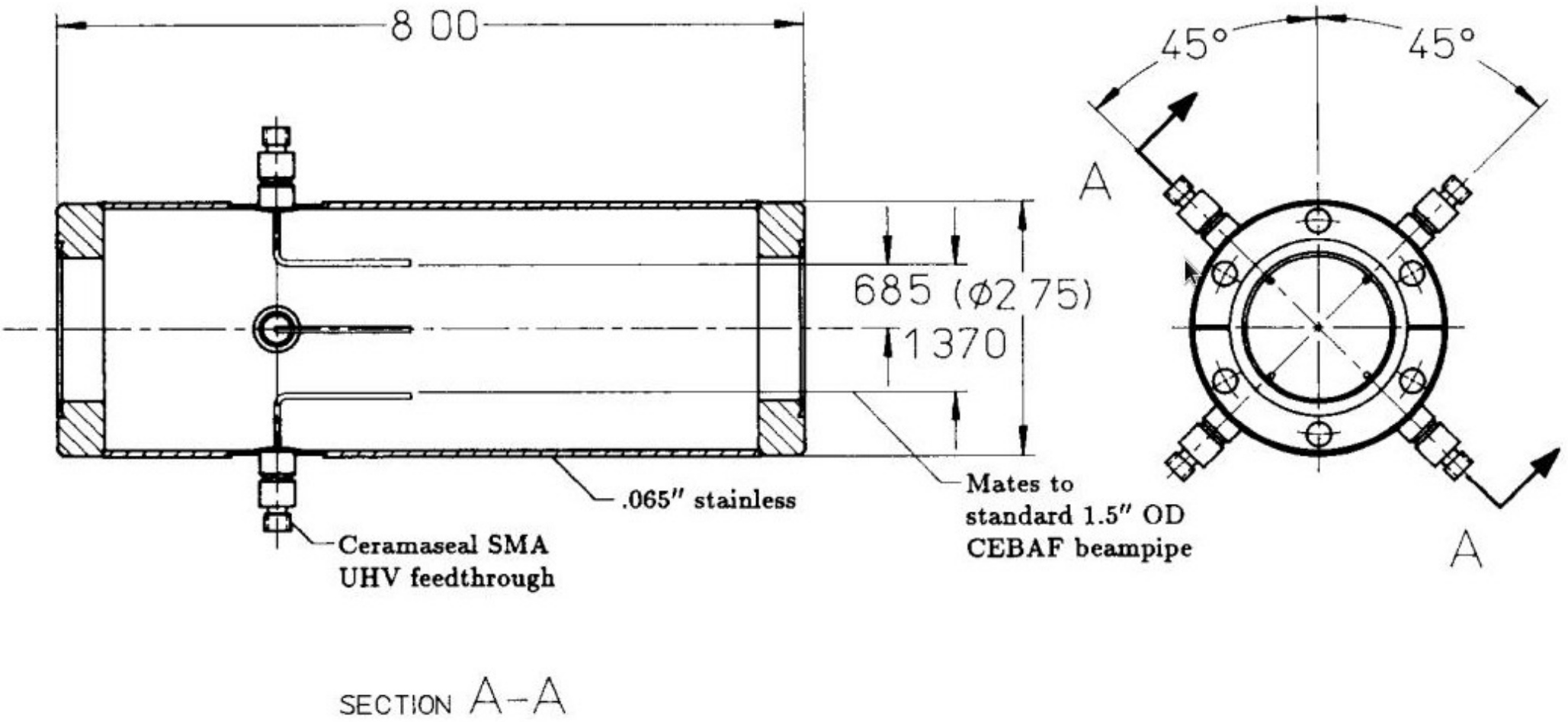


Fig. 7. Open-circuited wireline BPM.

A drawing of an open-circuited wireline BPM with four wire antennas connected to ultra-high vacuum feedthroughs.