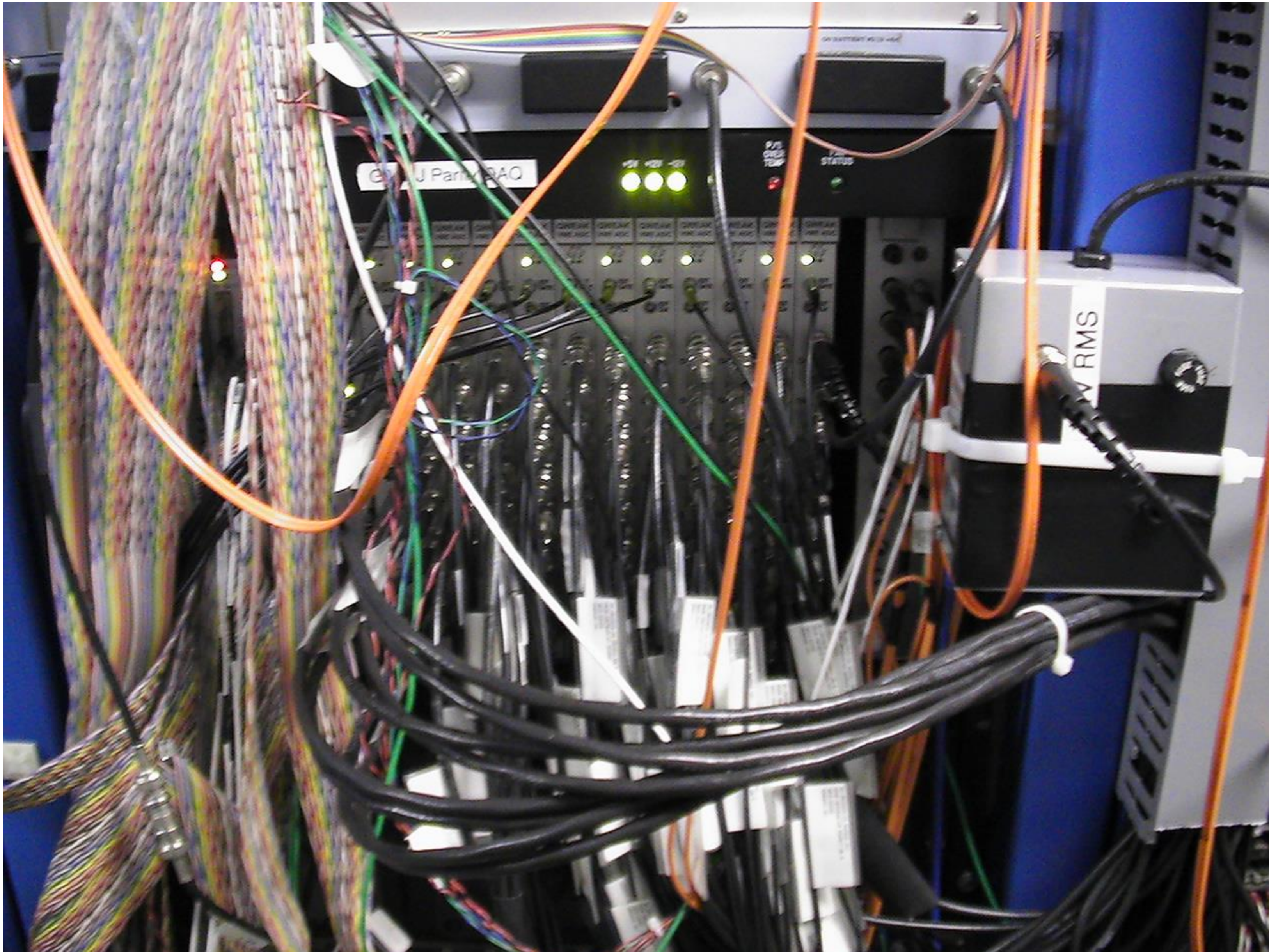
Parity Quality Beam (PQB) Study

Injector Group

November 10, 2008

Thanks to:

Roger Flood, Pete Francis, Paul King, Bob Michaels, Julie Roche


RMS

	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Chan 7	Chan 8
ADC1	QPD pm	QPD pp	QPD mm	QPD mp			Battery 1	Battery 2
ADC2	1I02				1I04			
ADC3	1I06				0I02			
ADC4	0I02A				0I05			
ADC5	0I07				0L01			
ADC6	0L02				0L03			
ADC7	0L04				0L05			
ADC8	0L06				0L07			
ADC9	0L08				0L09			
ADC10	0L10				0R01			
ADC11	0R02				0R05			
ADC12	0R06				BCM 0L02	Battery 3	Battery 4	Phase Monitor

Notes:

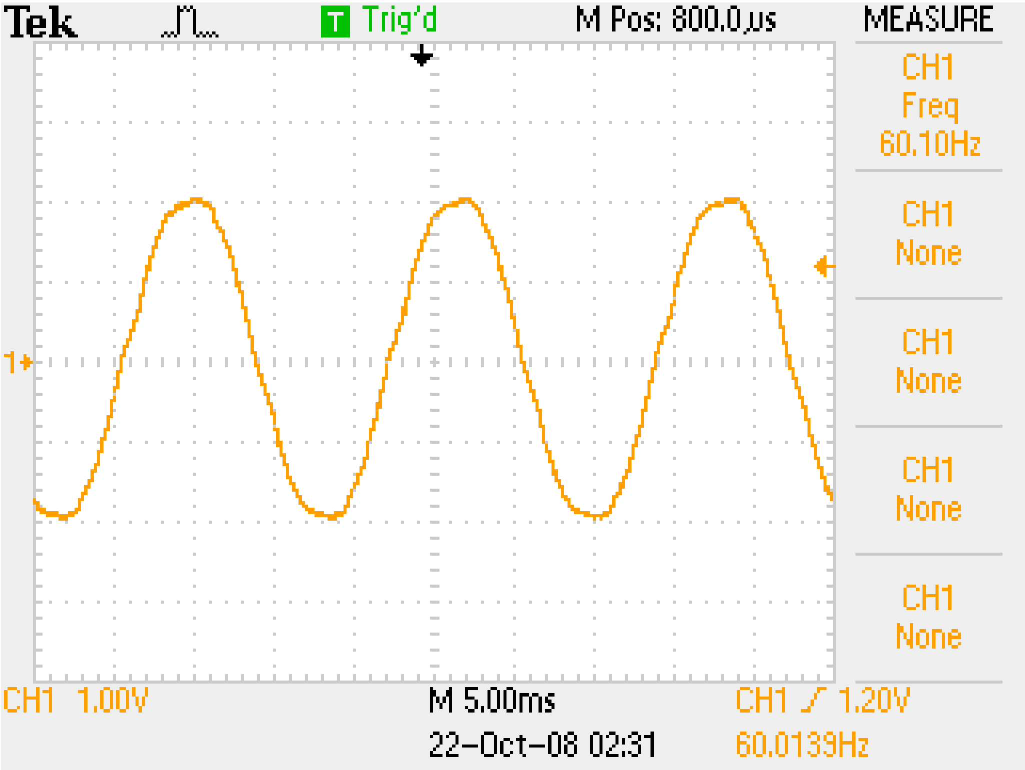
1. For each BPM, the wires are: +X+, +X-, +Y+, +Y-.
2. BPM 0R06 is not connected as of October 16, 2008.
3. There are only two injector BPMs we are not reading: 0R03 and 0R04.

DAQ Signals

Notes:

1. At 100 µA, BCM0L02 signal is +2.6 V.
2. The average BPM wire signal is +4 V.
3. The Battery signal is +3.0 V.
4. The Phase Monitor signal is ±2 V_{pp}

Phase Monitor

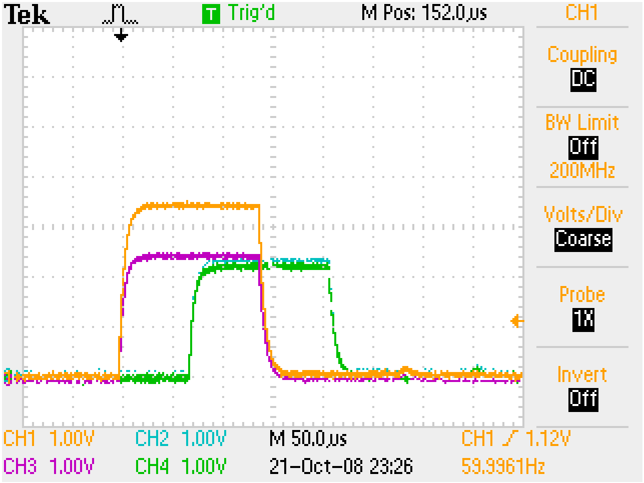


Injector BPMs

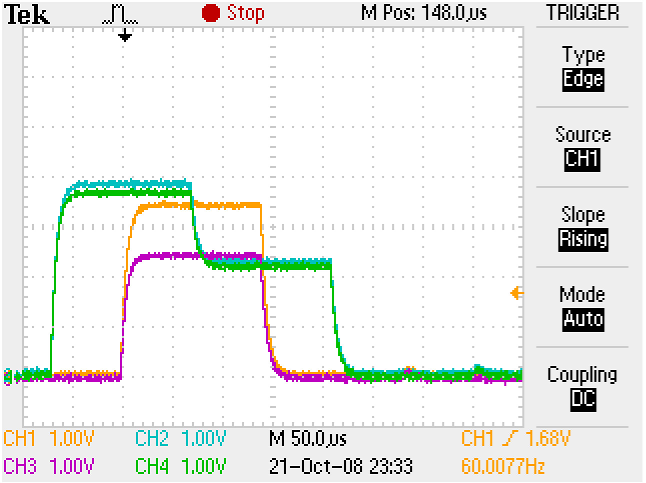
Notes:

1. iocse11, iocse12, and iocse19 have “TRANSPORT” style IF cards
2. Sampling time is 140 μs

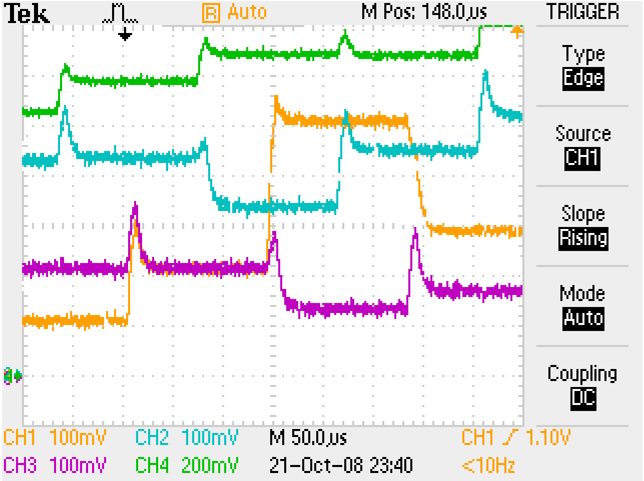
1I02, tune beam



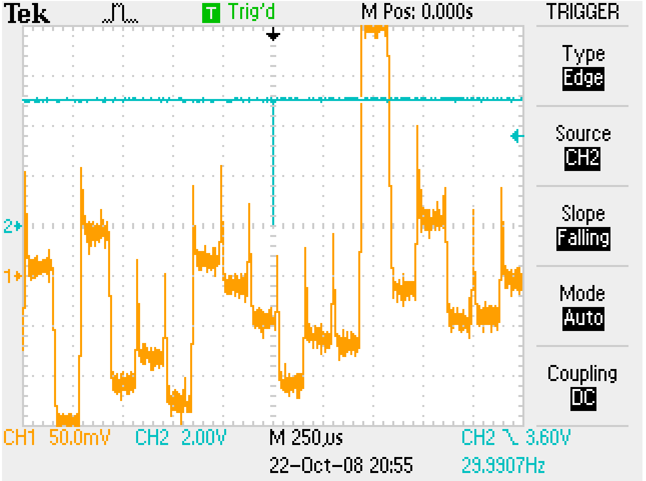
1I02, tune beam



1I02, no beam



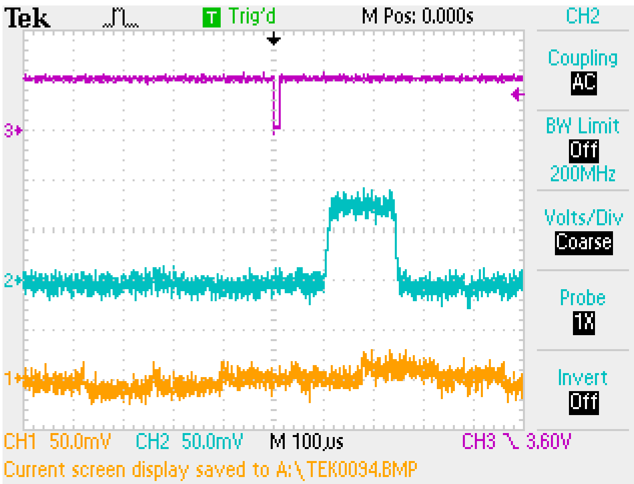
1I02 X+, no beam



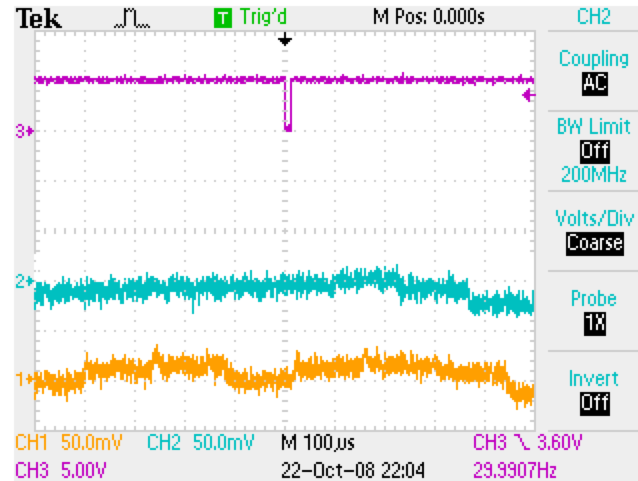
Notes:

1. Chan 1: X+, Chan 2: X-, Chan 3: MPS (Trigger)

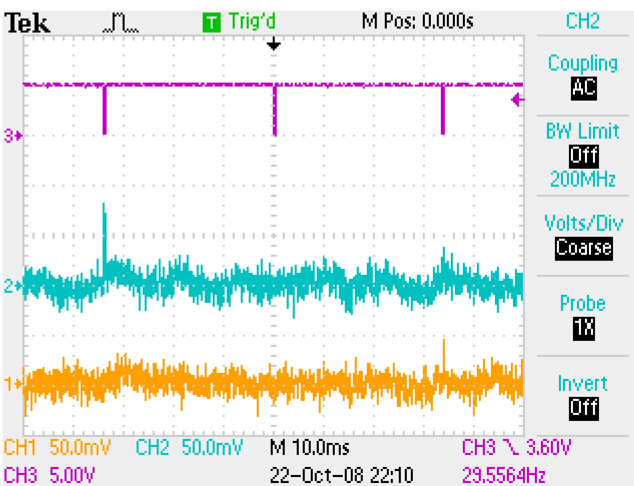
CW
PC ON



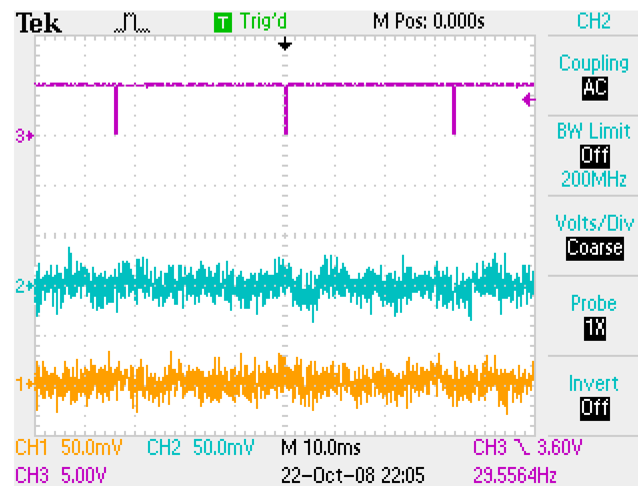
CW
PC OFF



CW
PC ON



CW
PC OFF



Helicity Board

Inputs:

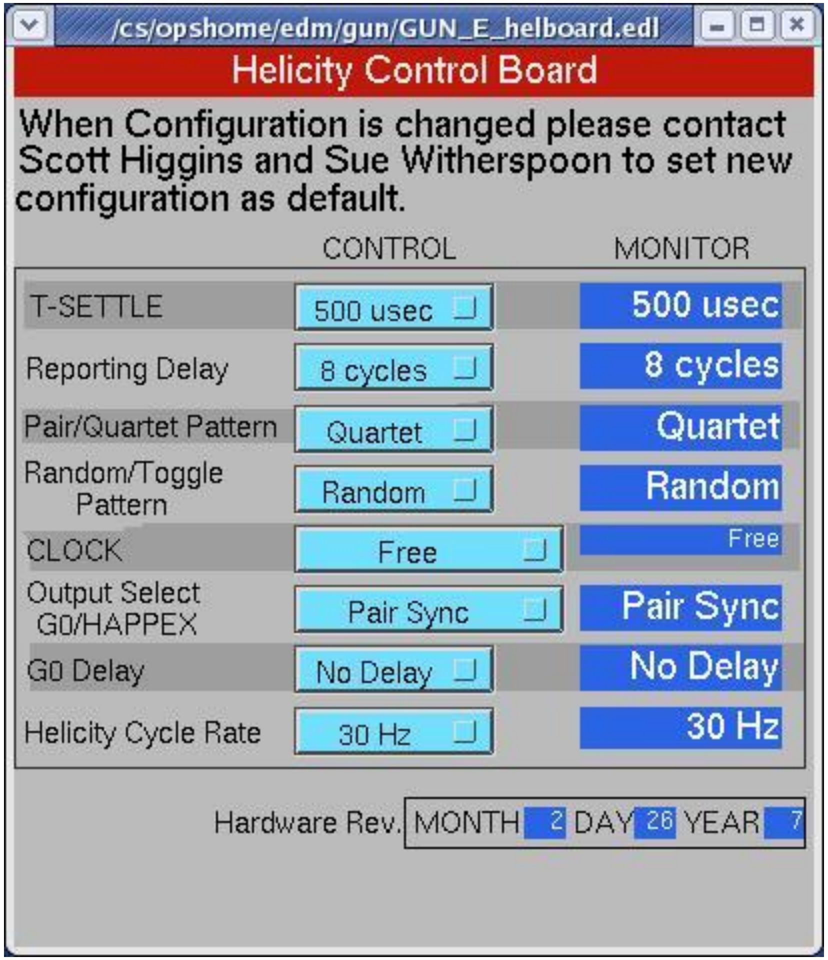
1. LEMO_0: Beam Sync FIBER_9

Outputs (Fiber-optic Signals):

1. Real time helicity: FIBER_2 to Helicity Magnets, FIBER_10 to Pockels Cell
2. QRT: FIBER_3 to Halls and Mott Polarimeters
3. MPS: FIBER_4 to Halls and Mott Polarimeters
4. T120: FIBER_5 (¼ T_Stable = 8.3333 ms)
5. Reporting Helicity: FIBER_6 to Halls and Mott Polarimeters, iocse9 and iocse14
6. Pair Sync or Helicity Delay: FIBER_7 to Halls and Mott Polarimeters

Software:

1. MPS (T-Settle): 500, 200, 100, and 60 µs
2. Reporting Delay: No Delay, 2, 4, or 8 Cycles
3. Helicity Pattern: Pair (+- or -+) or Quartet (-++- or +--+)
4. Pattern: Toggle or Random
5. Integration Window (T_Stable): 33.3332 ms or 3.920 ms
6. CLOCK: Free running (f = 29.xx = 1/(T_Settle+33.3332 ms) or 30 Hz Beam Sync (f = 30 = 1/(T_Settle + T_Stable)
7. Output Select: Pair Sync or Helicity Delay (used with G0 dummy Pockels Cell)
8. G0 Delay: No Delay, 1, 2, or 4 Cycles. Delay of helicity signal for Helicity Delay
9. Helicity Cycle Rate: 30 Hz or 250 Hz



Should we build a new Helicity Board?

- ✓ Easy to program
- ✓ More choices of T_Settle and helicity reversal frequencies

Notes:

1. The 30 Hz Beam Sync signal is missing

2. On Monday October 13, 2008, the Helicity Board was re-programmed:
   - ✓ T_Settle: 10, 60, 100, 500 μs
   - ✓ Helicity Cycle Rates: 30 Hz or 1 kHz
   - ✓ Integration Window (T_Stable) is 980 μs for 1 kHz

3. Parity ADC internal programming:
   I. For 30 Hz helicity reversal:
      - ✓ Acquisition starts 40 μs after the gate begins
      - ✓ There are 4 blocks of 4161 samples/block for each gate.
      - ✓ The acquisition time is 33.328 ms

   II. For 250 Hz helicity reversal:
      - ✓ Acquisition starts 40 μs after the gate begins
      - ✓ There are 4 blocks of 485 samples/block for each gate.
      - ✓ The acquisition time is 3.880 ms

   III. For 1 kHz helicity reversal:
      - ✓ Acquisition starts 40 μs after the gate begins
      - ✓ There are 4 blocks of 117 samples/block for each gate.
      - ✓ The acquisition time is 936 μs

Cycle Rae (HZ)	MPS (μs)	MPS (Hz)	QRT (Hz)	Helicity (ms)	Helicity (Hz)
30	500	29.58	7.386	33.83	14.78
30	200	29.76	7.451	33.53	14.91
30	100	29.90	7.474	33.43	14.96
30	60	29.94	7.485	33.39	14.97
250	500	226.3	56.56	4.420	113.1
250	200	242.7	60.68	4.120	121.4
250	100	248.8	62.68	4.020	124.4
250	60	251.3	62.81	3.980	125.6

Notes:

1. These values as measured by a scope
2. Signals to Parity DAQ: MPS (T-Settle), QRT, Reporting Helicity, and Pair-Sync
3. The length and frequency of Pair-Sync are identical to Helicity
4. The length of QRT is identical to Helicity
5. The integration window is generated by MPS AND Pair-Sync
6. The integration window for 30 Hz is 33.33 ms and for 250 Hz it is 3.92 ms

Parity ADCs

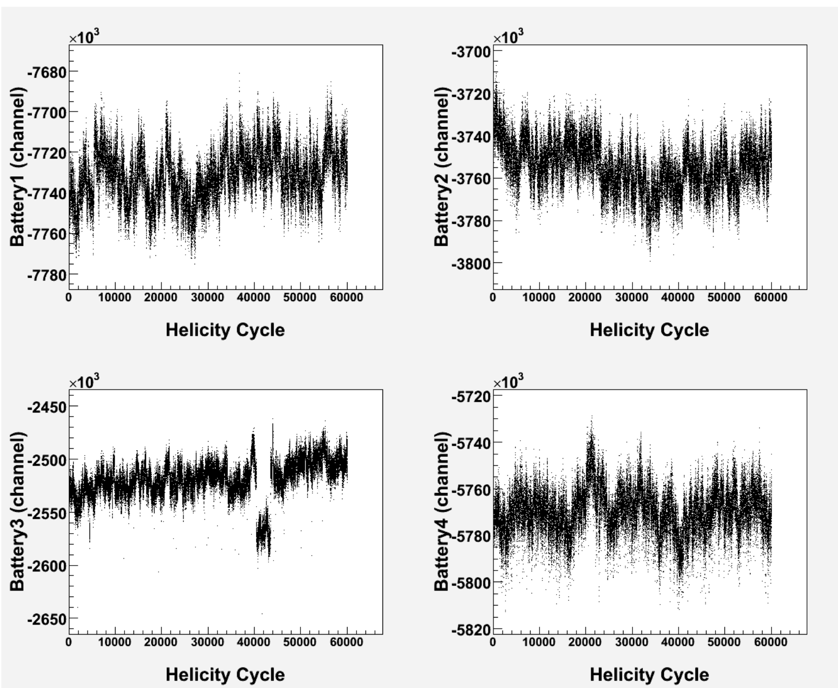
- Accepts bi-polar signals of ±10 V
- Maximum sample period is 500 kHz
- Each sample is 18-bit measurement
- Single bit error on one sample is 76.29 µV

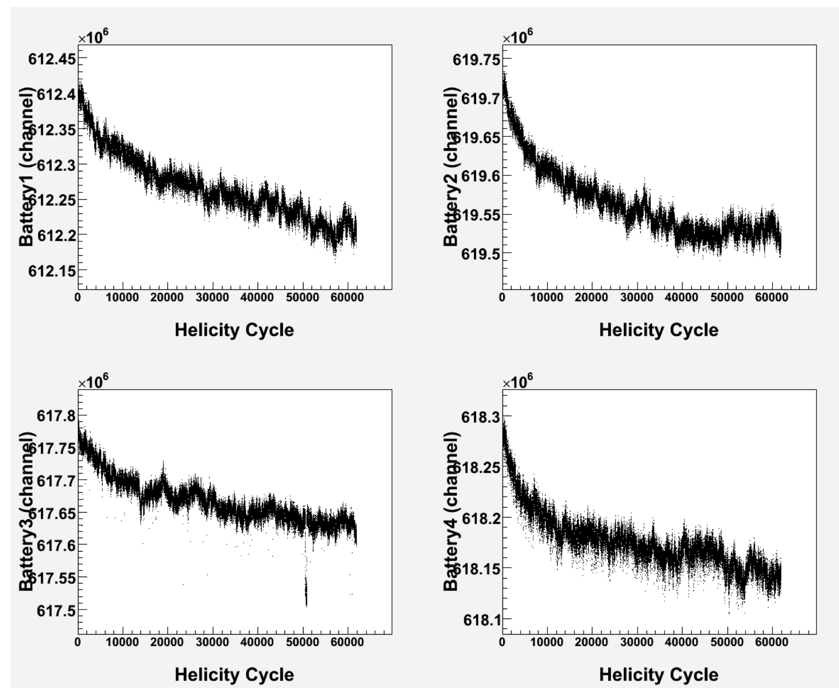
Helicity Reversal Rate (Hz)	Acquisition Window (µs)	Number of Samples	Error on Event Mean (µV)	Maximum Number of ADC Channels
30	33,328	16,664	0.59	±2,184,183,808
250	3,880	1,940	1.73	±254,279,680
1,000	936	468	3.53	±61,341,696

Battery Signals

Pedestals, Run 504

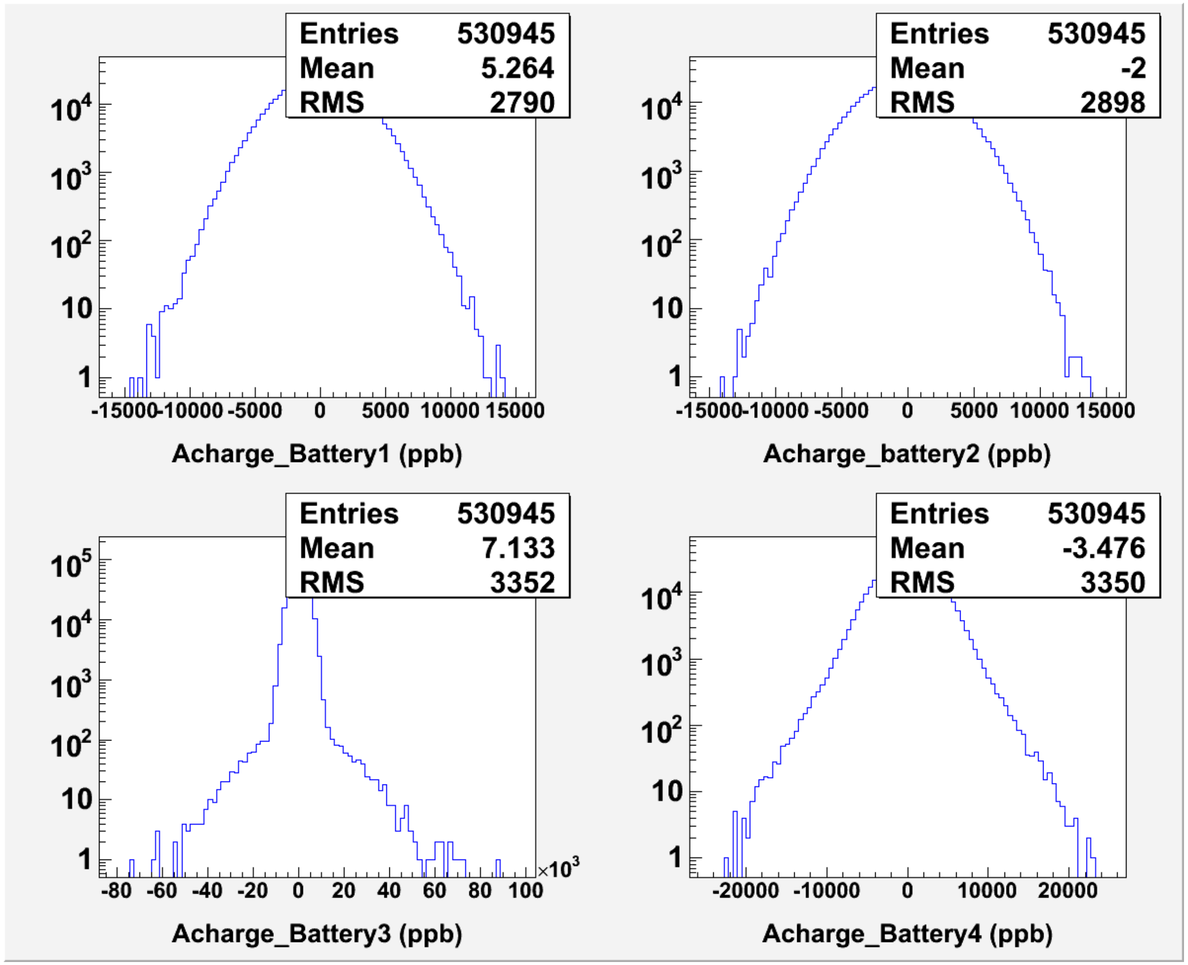
Random, No Delay, Run 505





Battery Signals (3 V)

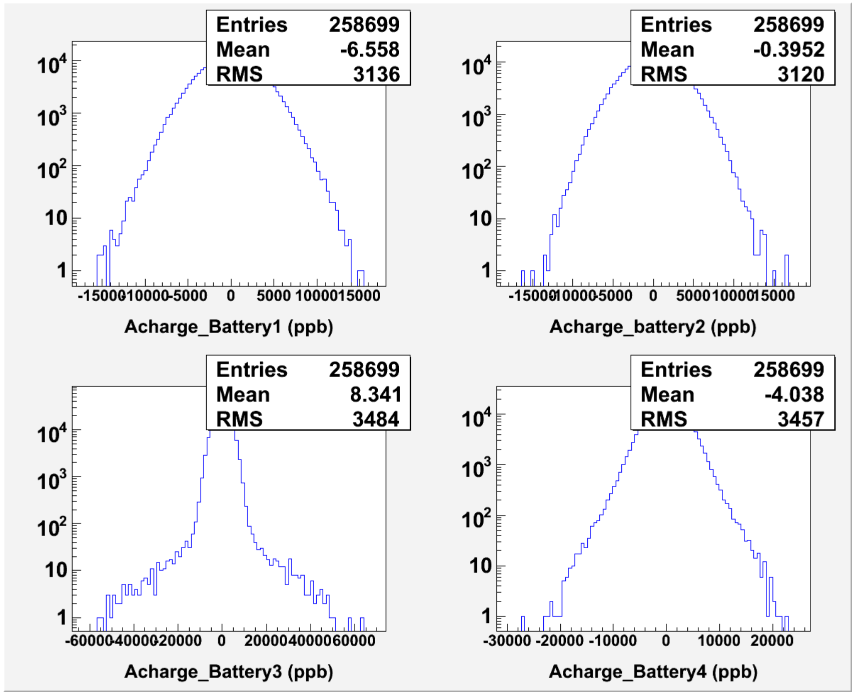
Random, 8-Cycles Delay, Run 361



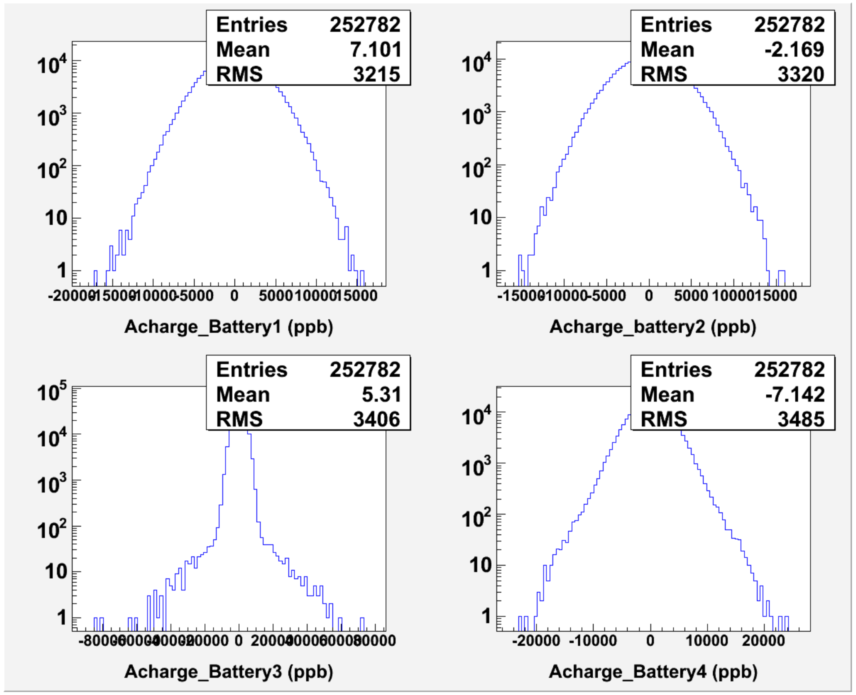
Battery Signals

Battery1 and Battery2 Round Trip to Laser Table

Random, 8-Cycles Delay, Run 398



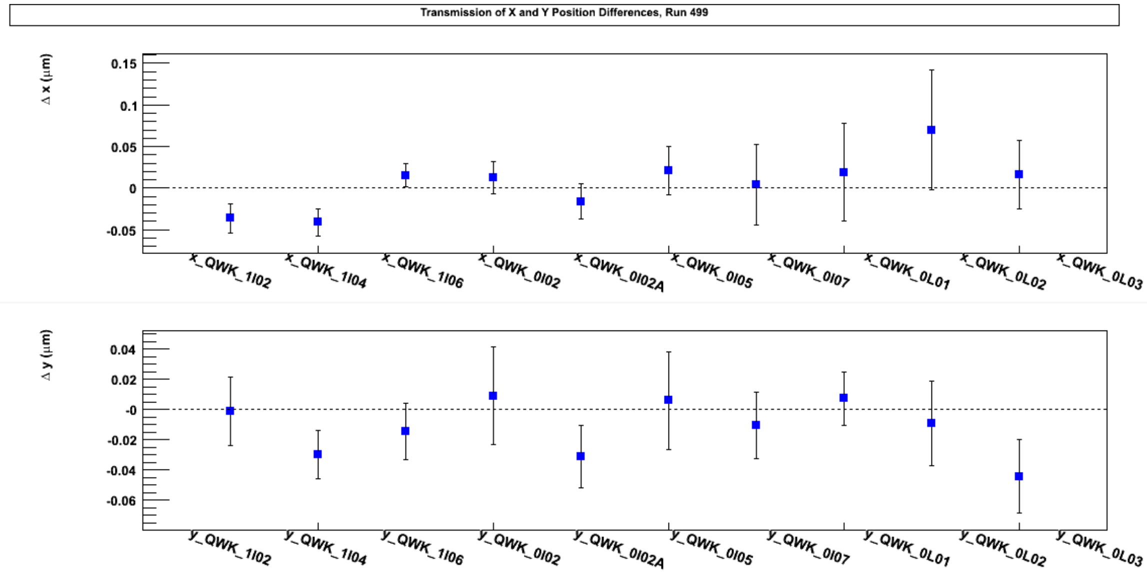
Random, No Delay, Run 406



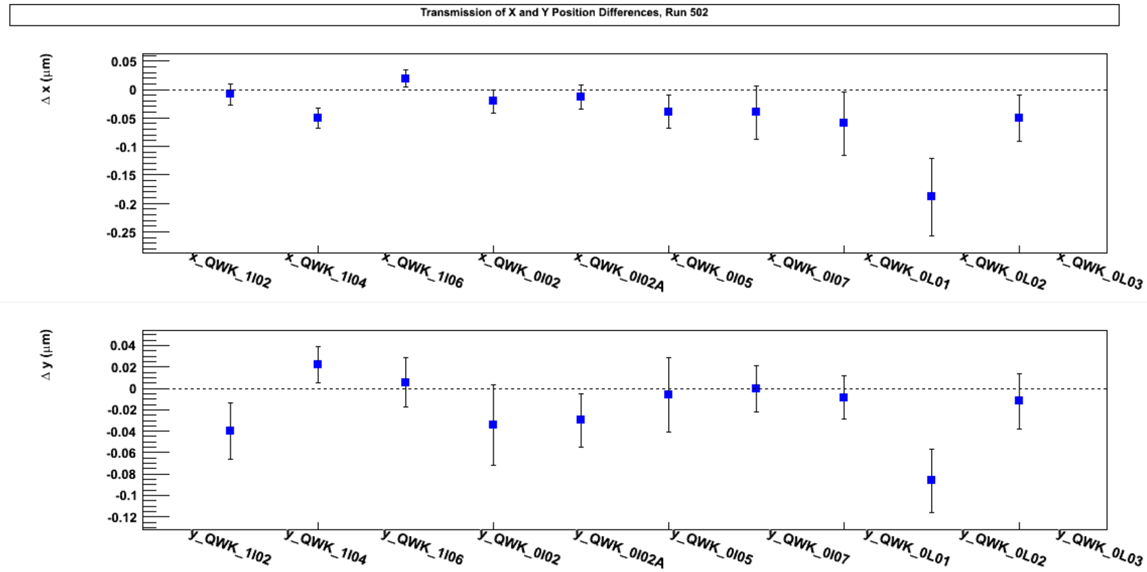
Pockels Cell OFF

No Helicity Pickup

Random, 8-Cycles Delay, Run 499



Random, No Delay, Run 502

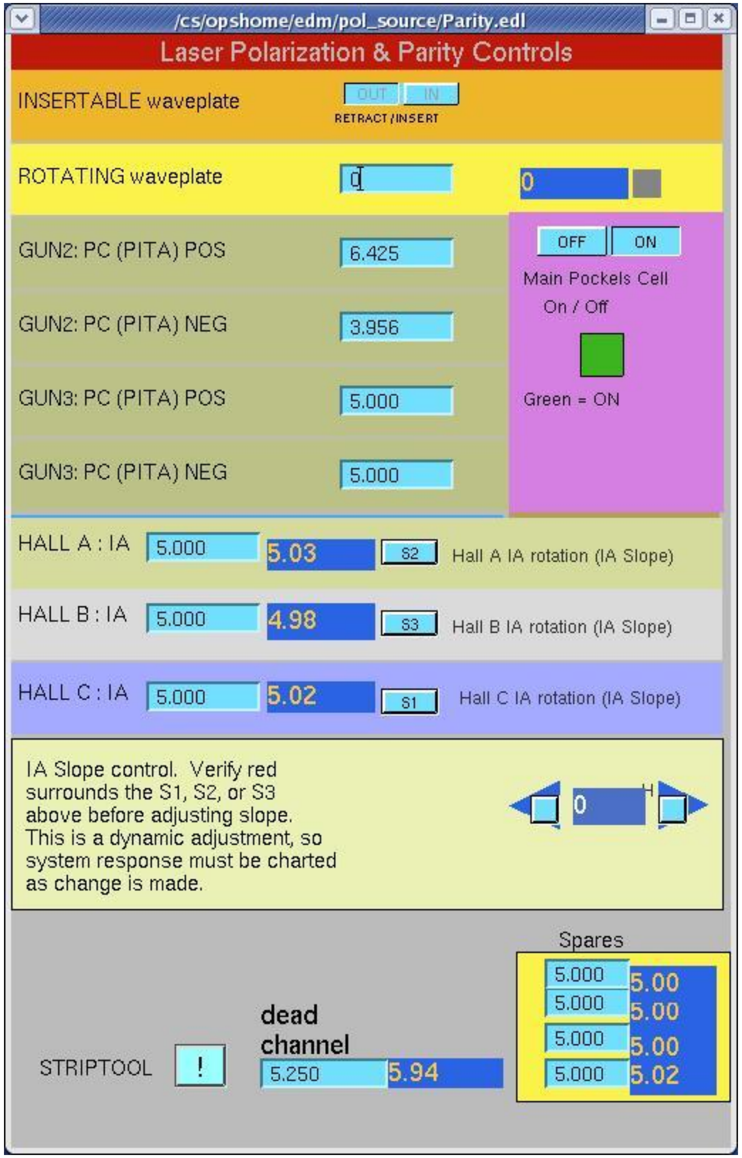


Pockels Cell Alignment

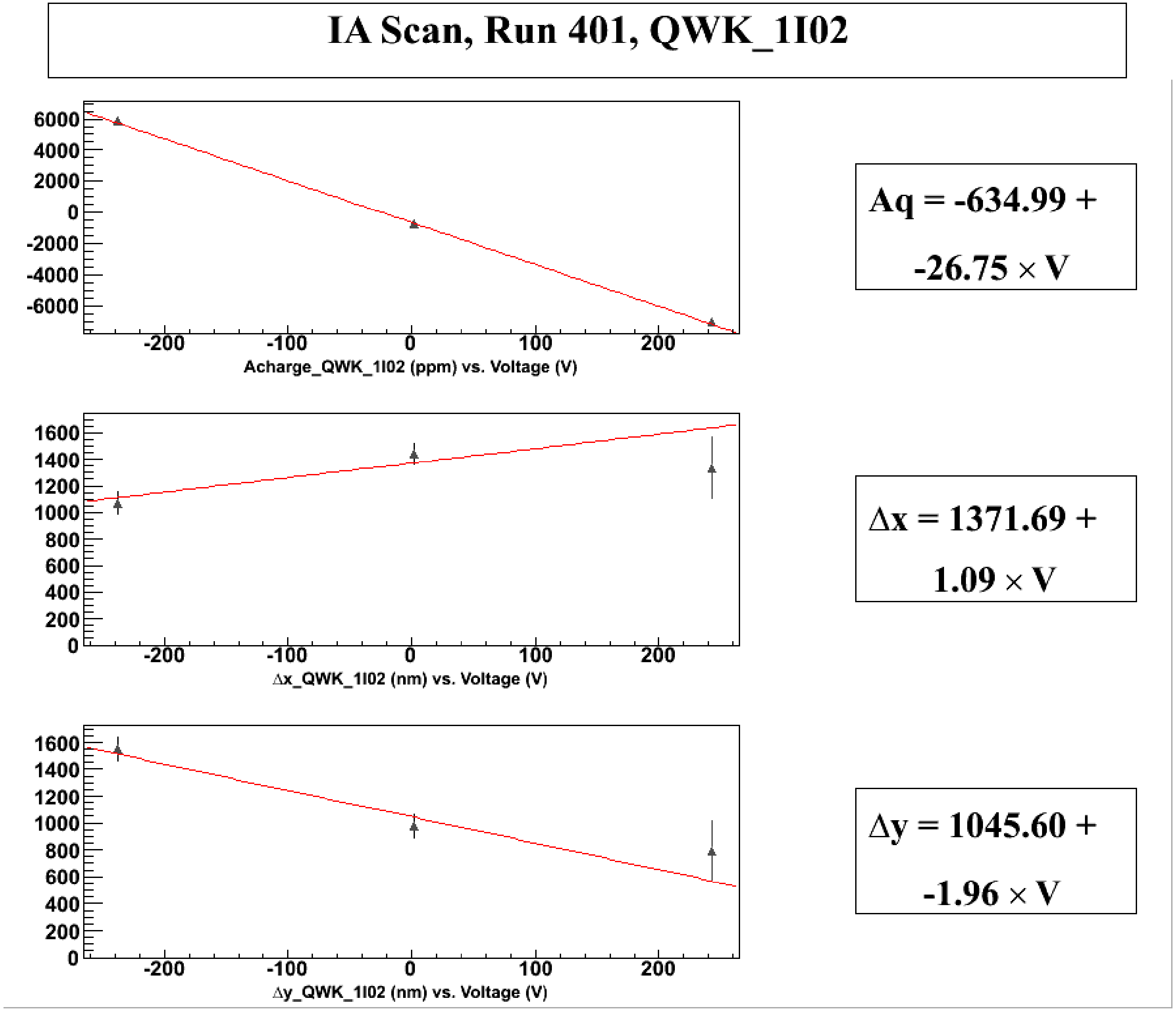
- With a Spinning Half Wave Plate or a Spinning Linear Polarizer and a Scope, the Circular polarization was maximized by checking:
    1. Laser isogyro pattern
    2. Pockels Cell Pitch, Yaw, Roll, X & Y
    3. Pockels Cell Voltages

- The above was checked for IHWP IN and OUT and for 30 Hz and 250 Hz helicity reversal

- The Circular polarization = 99.97 % and the Linear Polarization = 2.56 %

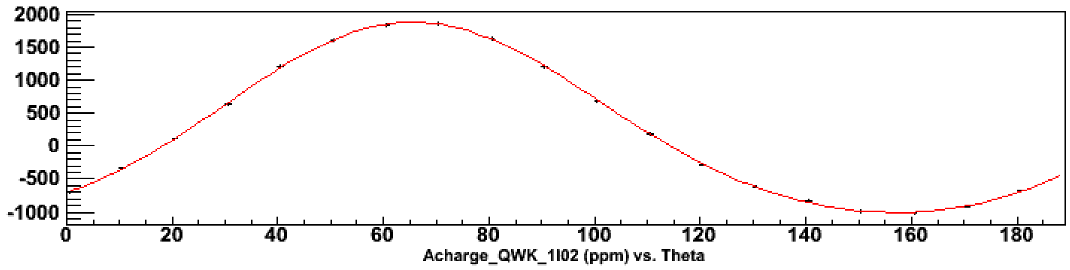


Hall A IA

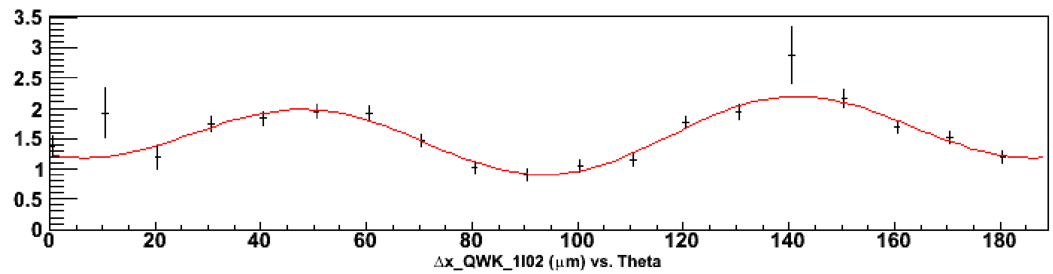

IA Scan, Run 401, QWK_1I02
6000
4000
2000
0
-2000
-4000
-6000
-200
-100
0
100
200
Acharge_QWK_1I02 (ppm) vs. Voltage (V)
Aq = -634.99 +
-26.75 × V
1600
1400
1200
1000
800
600
400
200
0
-200
-100
0
100
200
Δx_QWK_1I02 (nm) vs. Voltage (V)
Δx = 1371.69 +
1.09 × V
1600
1400
1200
1000
800
600
400
200
0
-200
-100
0
100
200
Δy_QWK_1I02 (nm) vs. Voltage (V)
Δy = 1045.60 +
-1.96 × V

RHWP Study

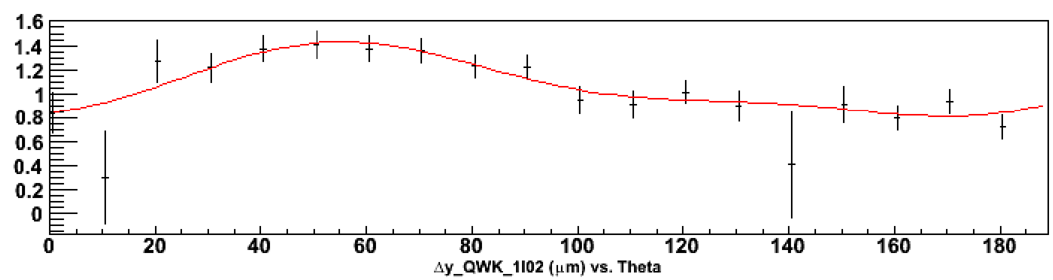
RHWP scan, Run 388, PITA = 0, IHWP IN, QWK_1I02



$$Aq = 297.09 + -1444.16 \sin(2\theta + 137.71) + -145.99 \sin(4\theta + 13.20)$$

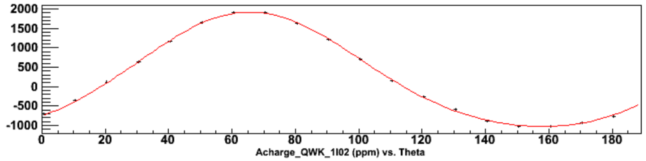


$$\Delta x = 1.56 + 0.17 \sin(2\theta + 117.68) + -0.52 \sin(4\theta + 70.80)$$

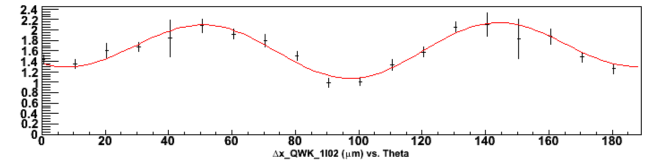


$$\Delta y = 1.07 + -0.28 \sin(2\theta + 148.12) + -0.09 \sin(4\theta + 64.98)$$

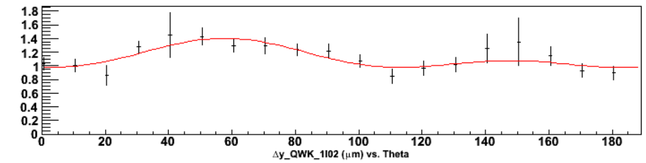
RHWP scan, Run 402, PITA = 0, IHWP IN, QWK_1I02



$$A_q = 290.84 + -1467.73 \sin(2\theta + 137.42) + -157.97 \sin(4\theta + 14.76)$$

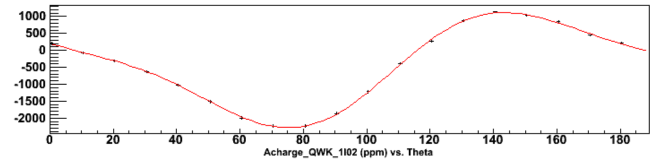


$$\Delta x = 1.65 + 0.11 \sin(2\theta + 85.80) + -0.47 \sin(4\theta + 60.41)$$

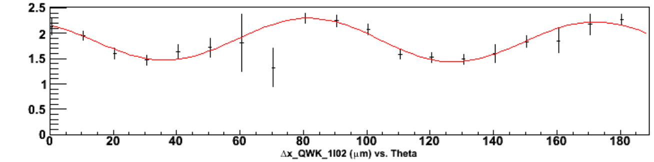


$$\Delta y = 1.12 + -0.16 \sin(2\theta + 154.60) + -0.12 \sin(4\theta + 39.36)$$

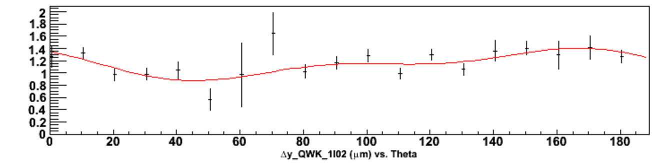
RHWP scan, Run 405, PITA = 0, IHWP OUT, QWK_1I02



$$A_q = -482.88 + 1542.49 \sin(2\theta + 136.94) + -402.93 \sin(4\theta + 114.20)$$

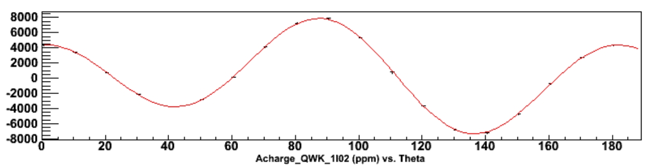


$$\Delta x = 1.86 + -0.04 \sin(2\theta + 131.72) + 0.41 \sin(4\theta + 122.94)$$

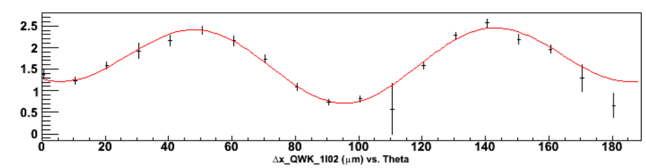


$$\Delta y = 1.14 + 0.20 \sin(2\theta + 148.67) + 0.11 \sin(4\theta + 114.61)$$

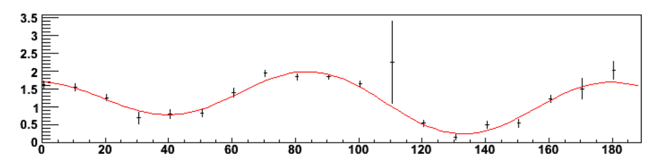
RHWP scan, Run 403, PITA = -180, IHWP IN, QWK_1I02



$$A_q = 292.53 + -2494.23 \sin(2\theta + 136.13) + 5754.85 \sin(4\theta + 92.33)$$

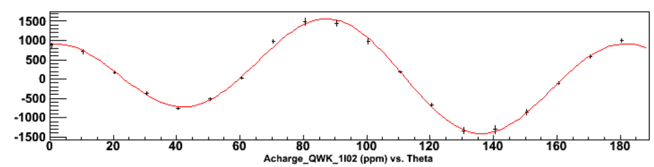


$$\Delta x = 1.70 + 0.25 \sin(2\theta + 84.17) + -0.73 \sin(4\theta + 67.87)$$

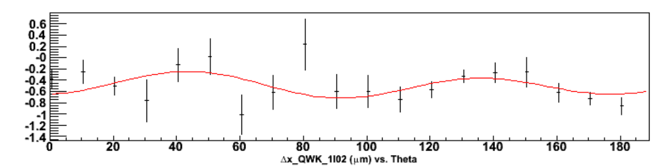


$$\Delta y = 1.17 + -0.31 \sin(2\theta + 157.96) + 0.66 \sin(4\theta + 103.73)$$

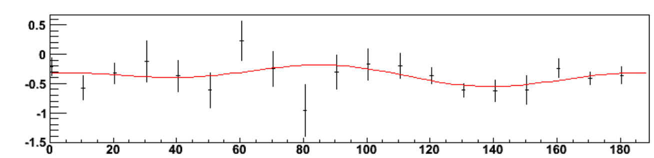
RHWP scan, Run 404, PITA = -180, IHWP OUT, QWK_1I02



$$A_q = 86.71 + -473.49 \sin(2\theta + 138.49) + 1140.63 \sin(4\theta + 92.69)$$



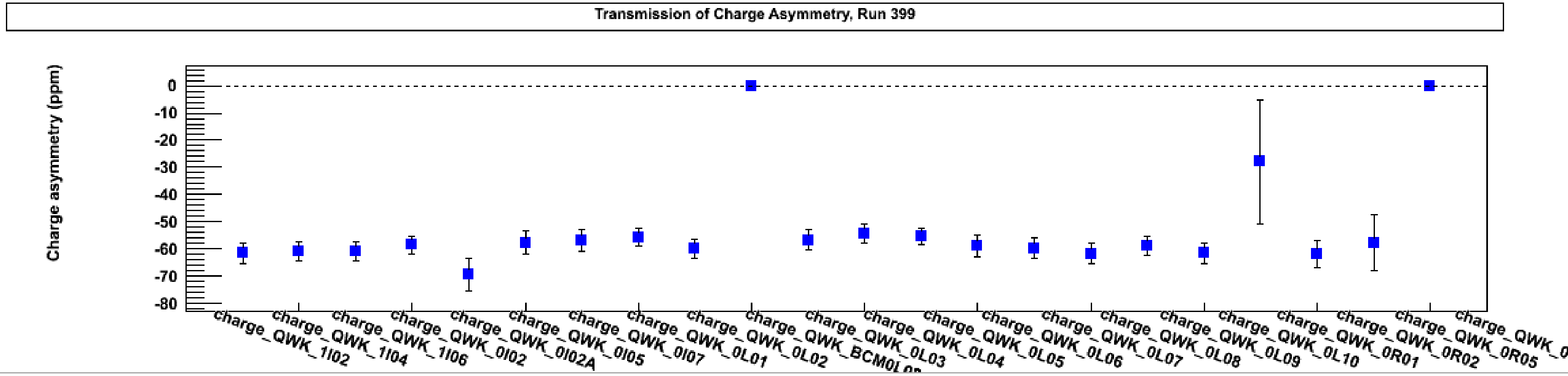
$$\Delta x = -0.49 + 0.07 \sin(2\theta + 29.89) + -0.19 \sin(4\theta + 91.57)$$

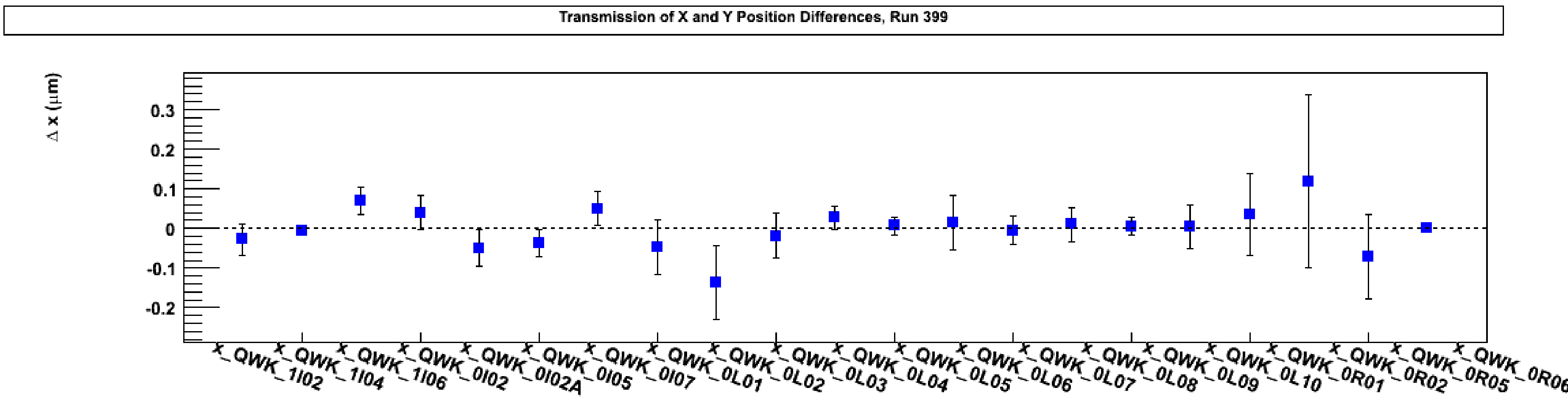


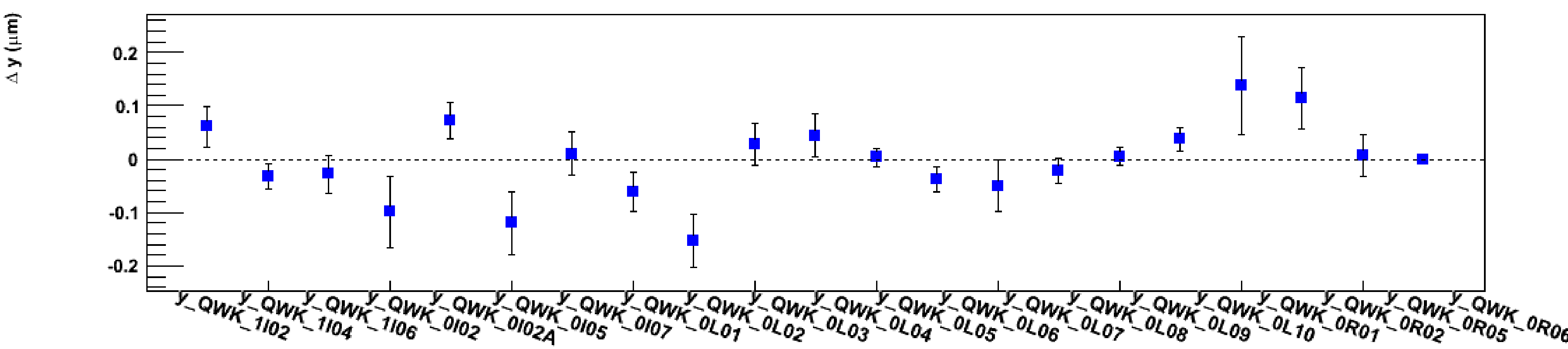
$$\Delta y = -0.36 + -0.11 \sin(2\theta + 138.05) + 0.10 \sin(4\theta + 90.00)$$

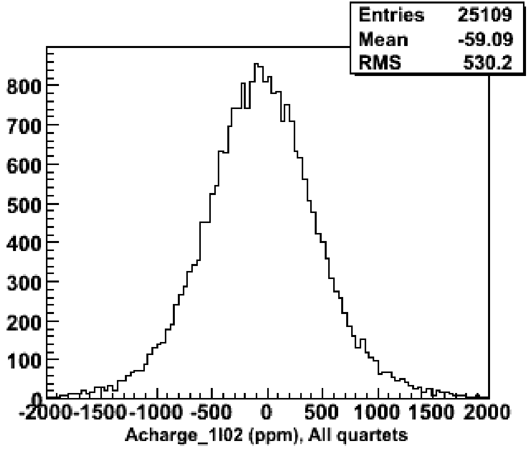
T-Settle Study
(500, 200, 100, 60 μs)

- 30 Hz
  1. Run 399: PC OFF, IHWP IN, 500 μs
  2. Run 381: IHWP OUT, 500 μs
  3. Run 382: IHWP IN, 500 μs
  4. Run 383: IHWP IN, 200 μs
  5. Run 384: IHWP IN, 100 μs
  6. Run 385: IHWP IN, 60 μs


Transmission of Charge Asymmetry, Run 399
Charge asymmetry (ppm)
0
-10
-20
-30
-40
-50
-60
-70
-80
charge_QWK_1I02
charge_QWK_1I04
charge_QWK_1I06
charge_QWK_0I02
charge_QWK_0I02A
charge_QWK_0I05
charge_QWK_0I07
charge_QWK_0L01
charge_QWK_0L02
charge_QWK_BCM0L02
charge_QWK_0L03
charge_QWK_0L04
charge_QWK_0L05
charge_QWK_0L06
charge_QWK_0L07
charge_QWK_0L08
charge_QWK_0L09
charge_QWK_0L10
charge_QWK_0R01
charge_QWK_0R02
charge_QWK_0R05

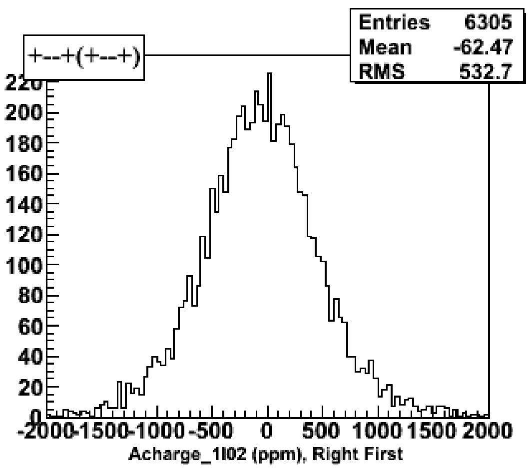

Transmission of X and Y Position Differences, Run 399
Δ x (μm)
0.3
0.2
0.1
0
-0.1
-0.2
x_QWK_1I02
x_QWK_1I04
x_QWK_1I06
x_QWK_0I02
x_QWK_0I02A
x_QWK_0I05
x_QWK_0I07
x_QWK_0L01
x_QWK_0L02
x_QWK_0L03
x_QWK_0L04
x_QWK_0L05
x_QWK_0L06
x_QWK_0L07
x_QWK_0L08
x_QWK_0L09
x_QWK_0L10
x_QWK_0R01
x_QWK_0R02
x_QWK_0R05
x_QWK_0R06

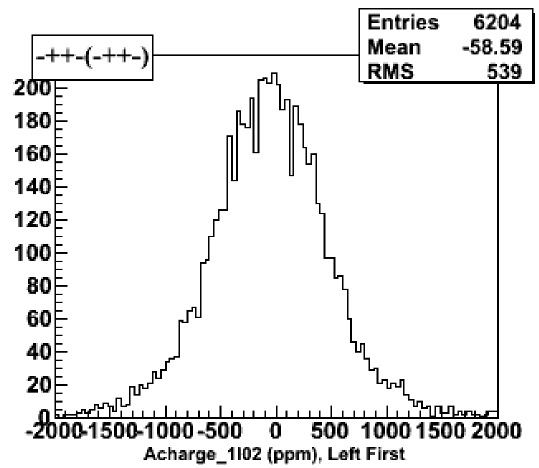

Δ y (μm)
0.2
0.1
0
-0.1
-0.2
y_QWK_1I02
y_QWK_1I04
y_QWK_1I06
y_QWK_0I02
y_QWK_0I02A
y_QWK_0I05
y_QWK_0I07
y_QWK_0L01
y_QWK_0L02
y_QWK_0L03
y_QWK_0L04
y_QWK_0L05
y_QWK_0L06
y_QWK_0L07
y_QWK_0L08
y_QWK_0L09
y_QWK_0L10
y_QWK_0R01
y_QWK_0R02
y_QWK_0R05
y_QWK_0R06

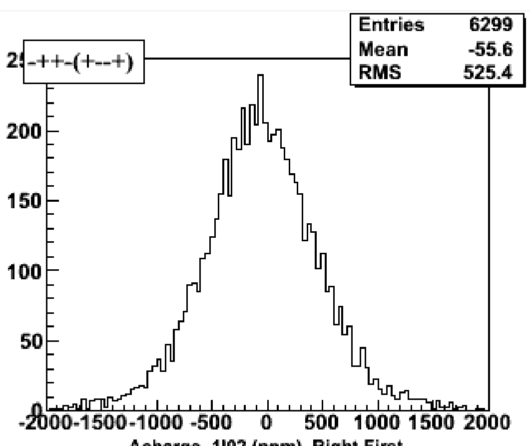


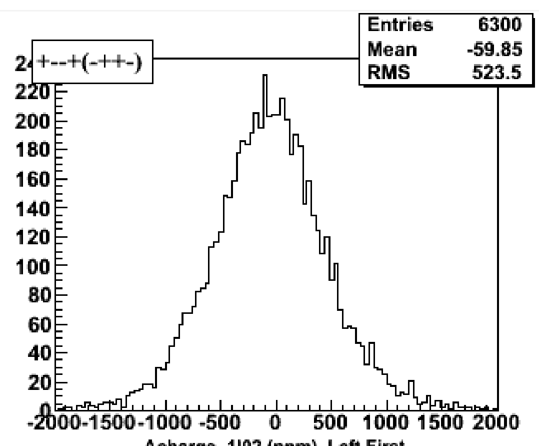
Run 399

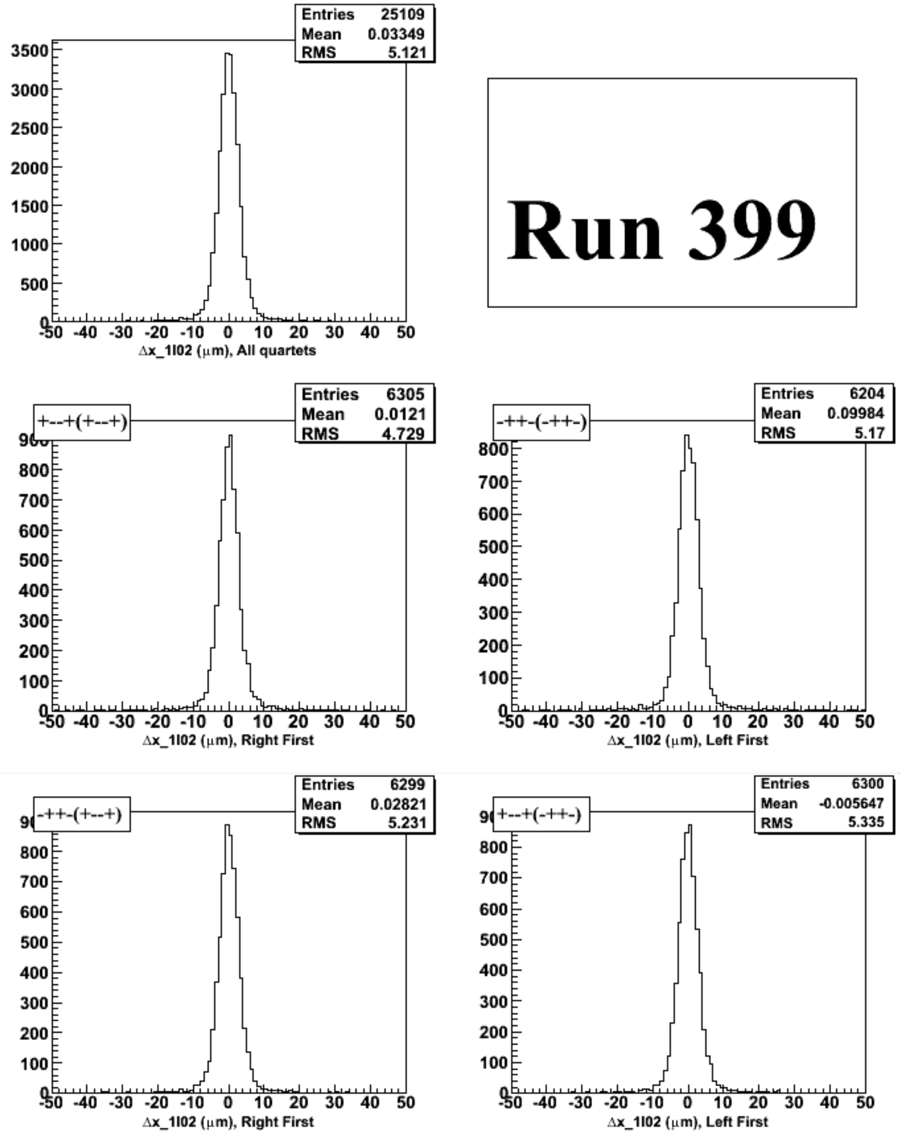
Charge Asymmetry

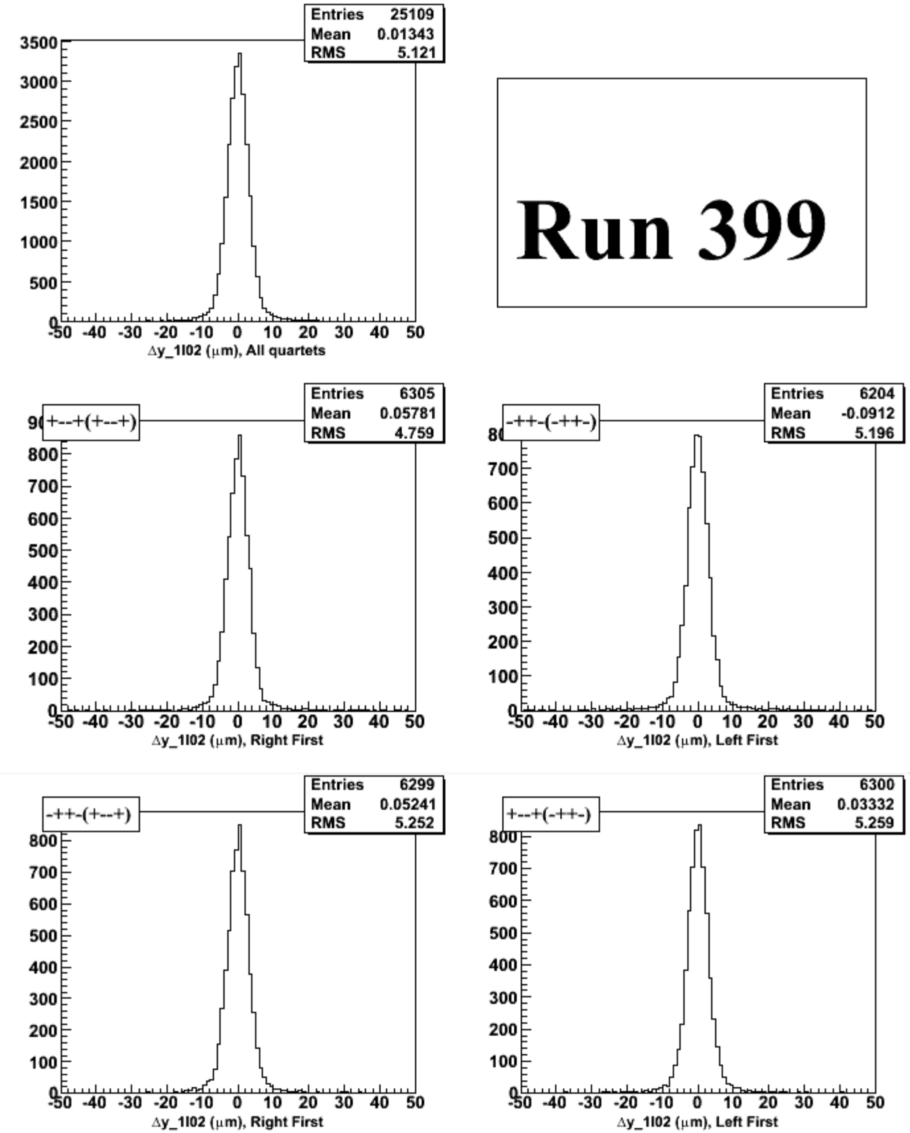


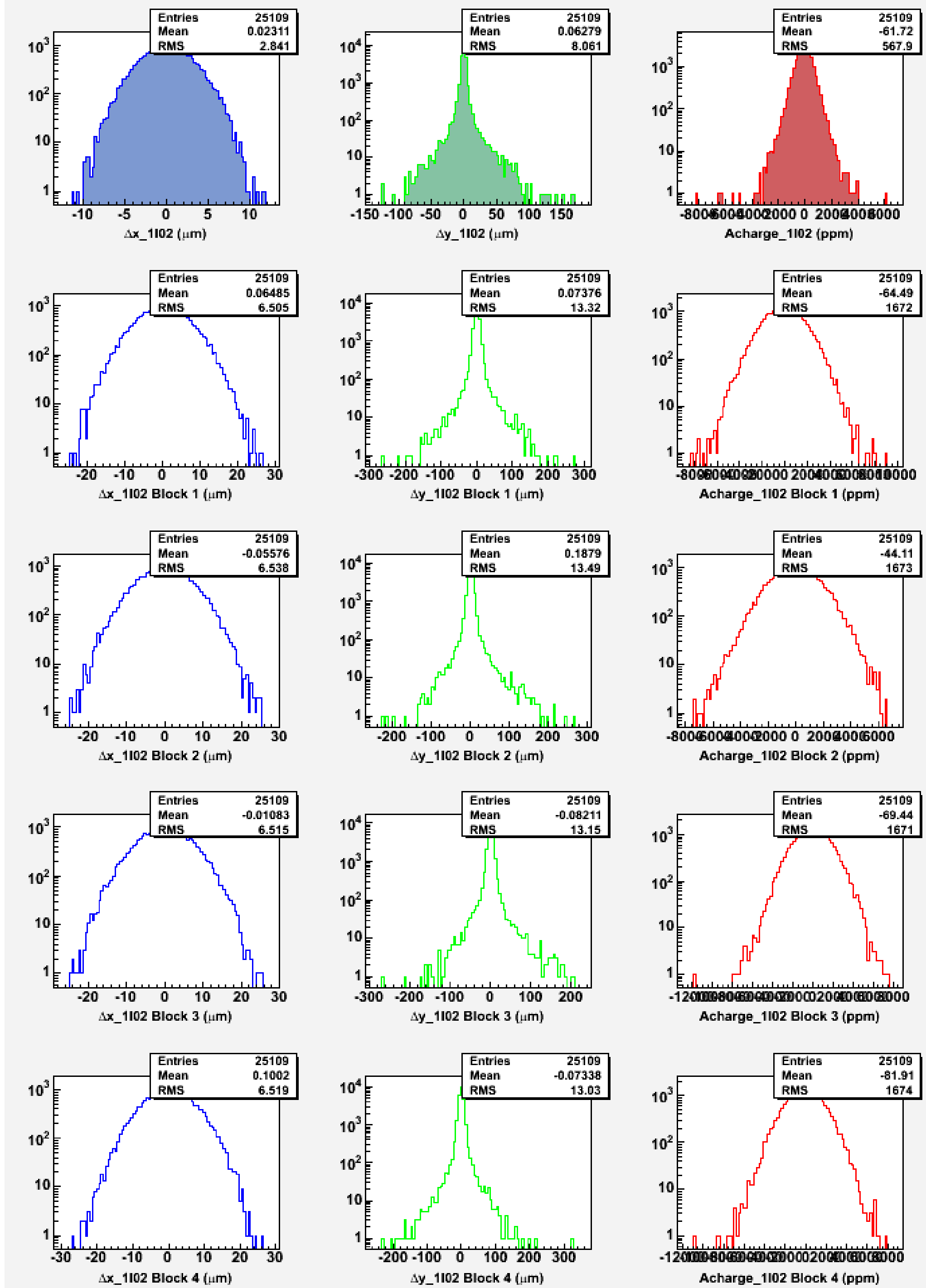


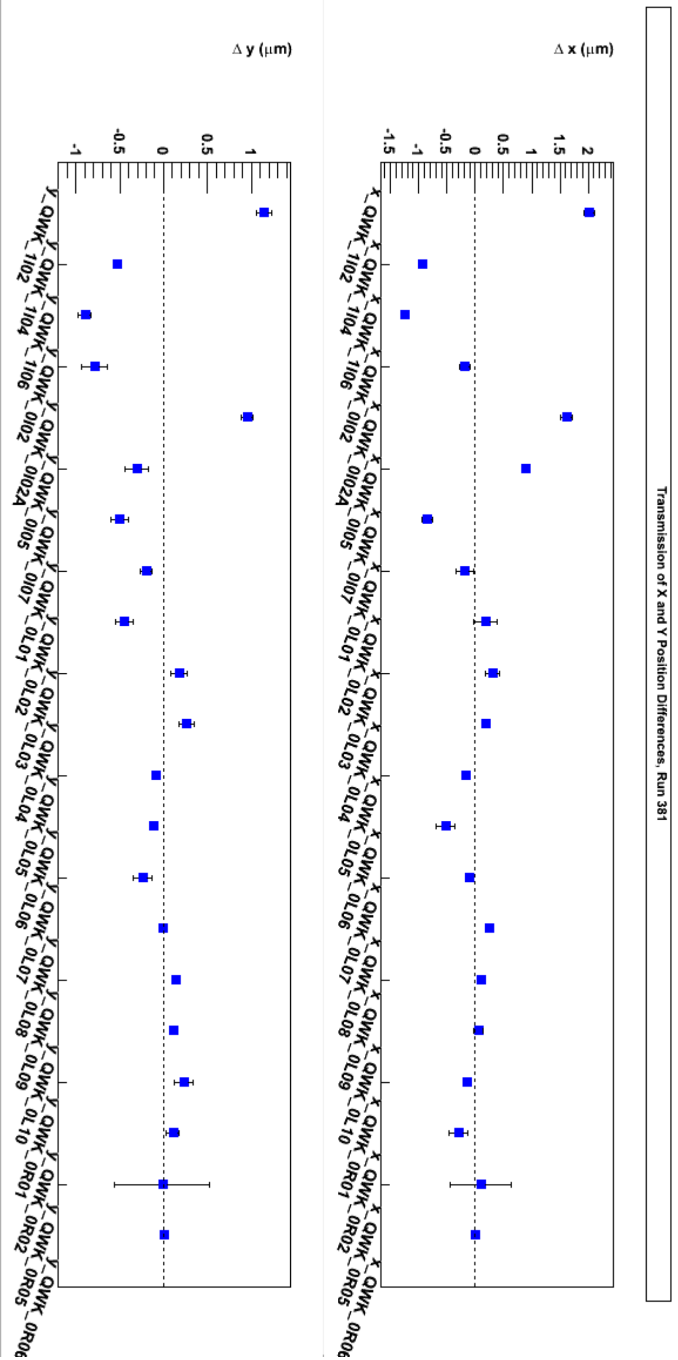


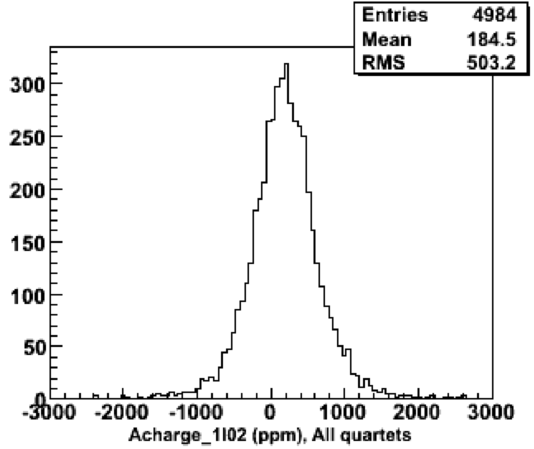



Run 399
Entries 25109
Mean 0.03349
RMS 5.121
Δx_1I02 (μm), All quartets
+--+(+--+)
Entries 6305
Mean 0.0121
RMS 4.729
Δx_1I02 (μm), Right First
-++-(-++-)
Entries 6204
Mean 0.09984
RMS 5.17
Δx_1I02 (μm), Left First
-++-(+--+)
Entries 6299
Mean 0.02821
RMS 5.231
Δx_1I02 (μm), Right First
+--+(-++-)
Entries 6300
Mean -0.005647
RMS 5.335
Δx_1I02 (μm), Left First


Run 399
Entries 25109
Mean 0.01343
RMS 5.121
Δy_1I02 (μm), All quartets
+--+(+--+)
Entries 6305
Mean 0.05781
RMS 4.759
Δy_1I02 (μm), Right First
-++-(-++-)
Entries 6204
Mean -0.0912
RMS 5.196
Δy_1I02 (μm), Left First
-++-(+--+)
Entries 6299
Mean 0.05241
RMS 5.252
Δy_1I02 (μm), Right First
+--+(-++-)
Entries 6300
Mean 0.03332
RMS 5.259
Δy_1I02 (μm), Left First

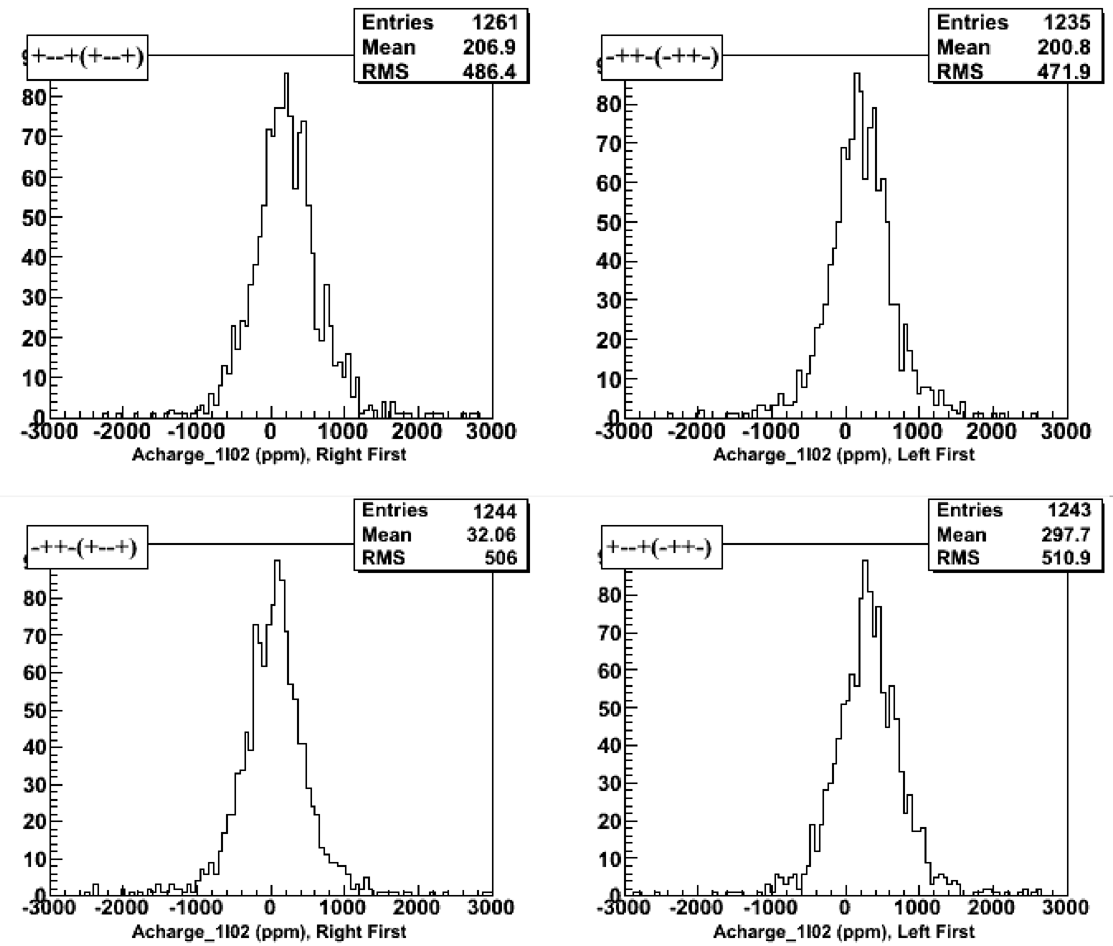

Entries 25109
Mean 0.02311
RMS 2.841
Δx_1I02 (μm)
Entries 25109
Mean 0.06279
RMS 8.061
Δy_1I02 (μm)
Entries 25109
Mean -61.72
RMS 567.9
Acharge_1I02 (ppm)
Entries 25109
Mean 0.06485
RMS 6.505
Δx_1I02 Block 1 (μm)
Entries 25109
Mean 0.07376
RMS 13.32
Δy_1I02 Block 1 (μm)
Entries 25109
Mean -64.49
RMS 1672
Acharge_1I02 Block 1 (ppm)
Entries 25109
Mean -0.05576
RMS 6.538
Δx_1I02 Block 2 (μm)
Entries 25109
Mean 0.1879
RMS 13.49
Δy_1I02 Block 2 (μm)
Entries 25109
Mean -44.11
RMS 1673
Acharge_1I02 Block 2 (ppm)
Entries 25109
Mean -0.01083
RMS 6.515
Δx_1I02 Block 3 (μm)
Entries 25109
Mean -0.08211
RMS 13.15
Δy_1I02 Block 3 (μm)
Entries 25109
Mean -69.44
RMS 1671
Acharge_1I02 Block 3 (ppm)
Entries 25109
Mean 0.1002
RMS 6.519
Δx_1I02 Block 4 (μm)
Entries 25109
Mean -0.07338
RMS 13.03
Δy_1I02 Block 4 (μm)
Entries 25109
Mean -81.91
RMS 1674
Acharge_1I02 Block 4 (ppm)

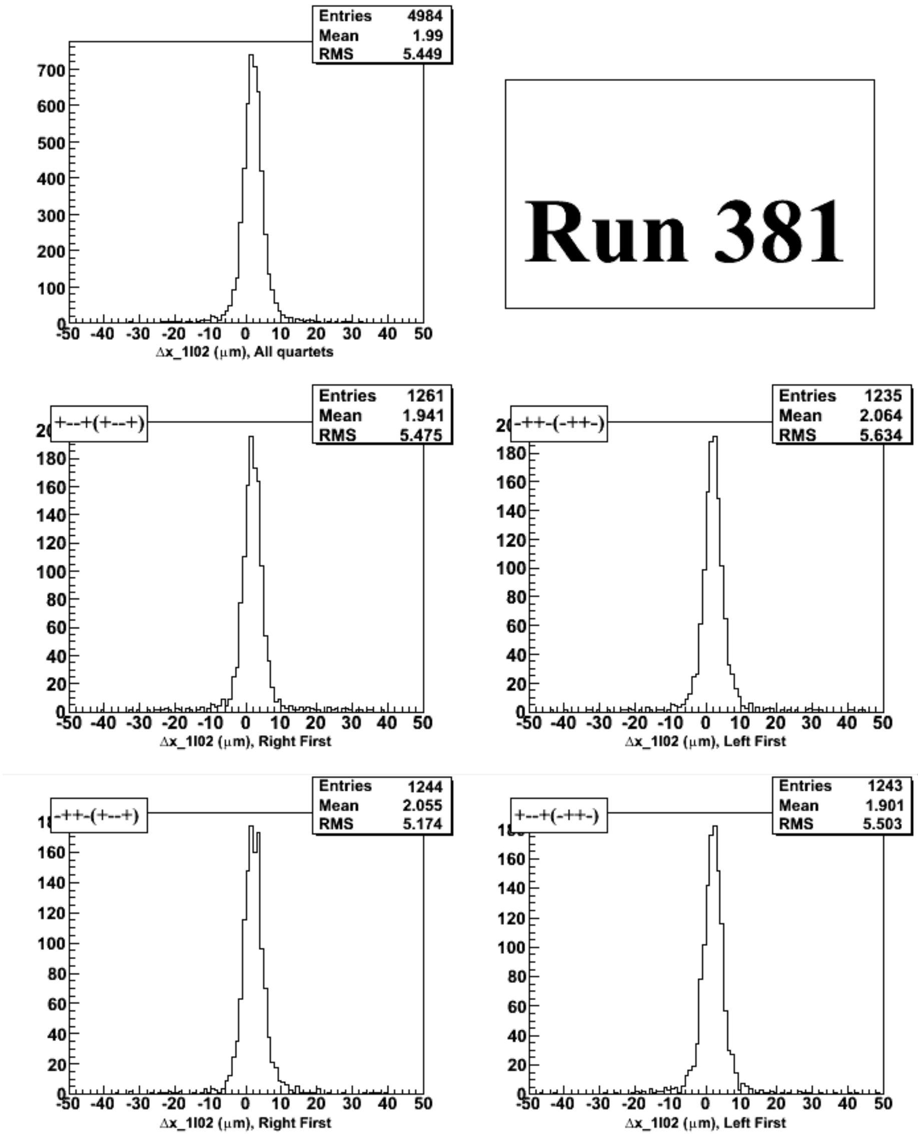


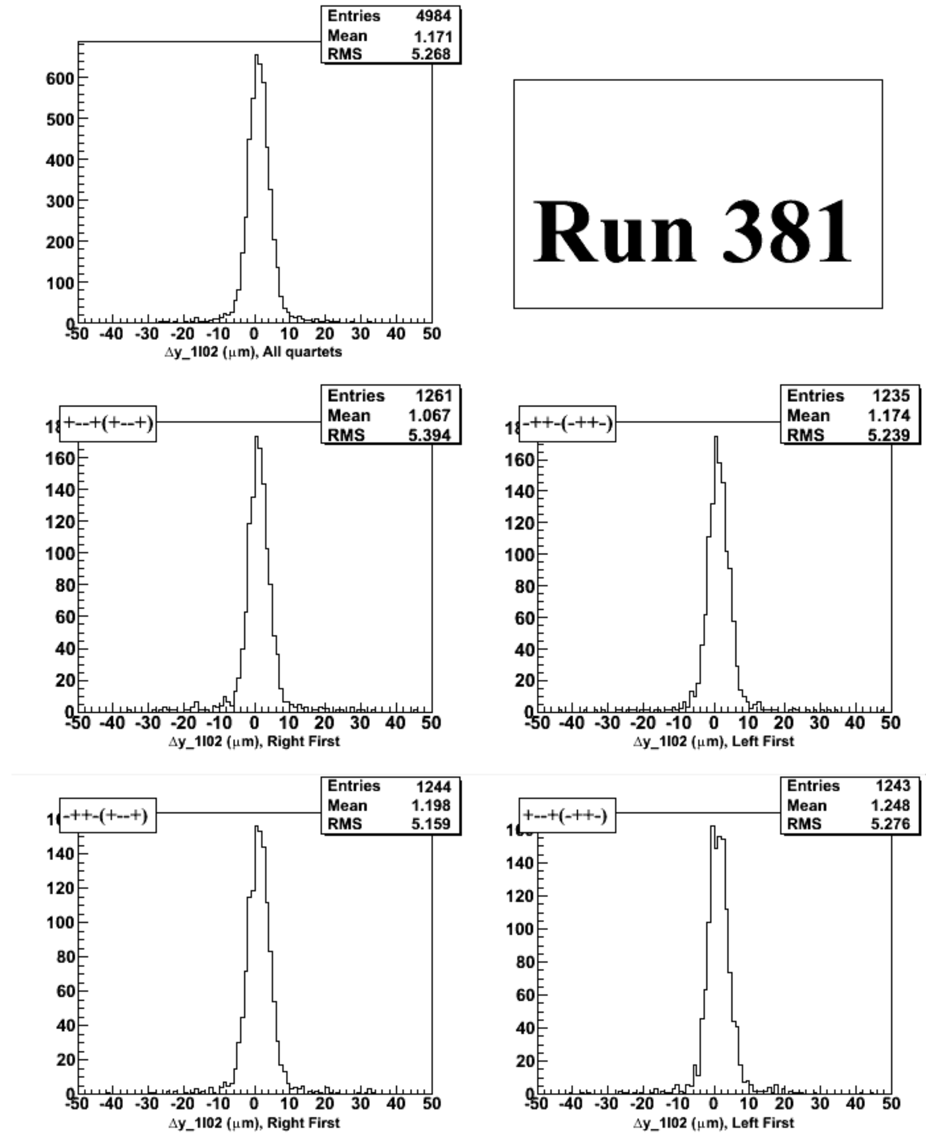


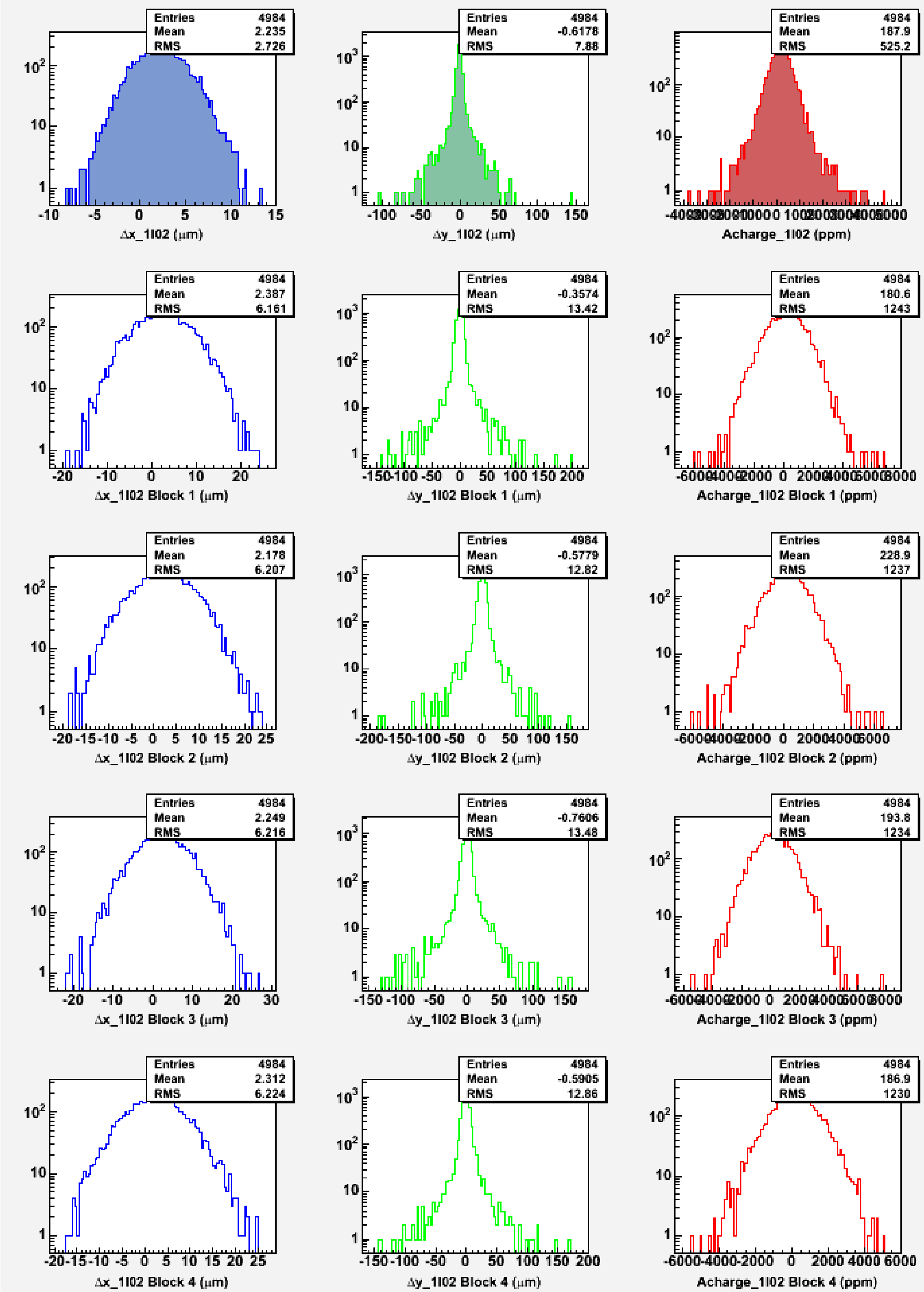
Run 381

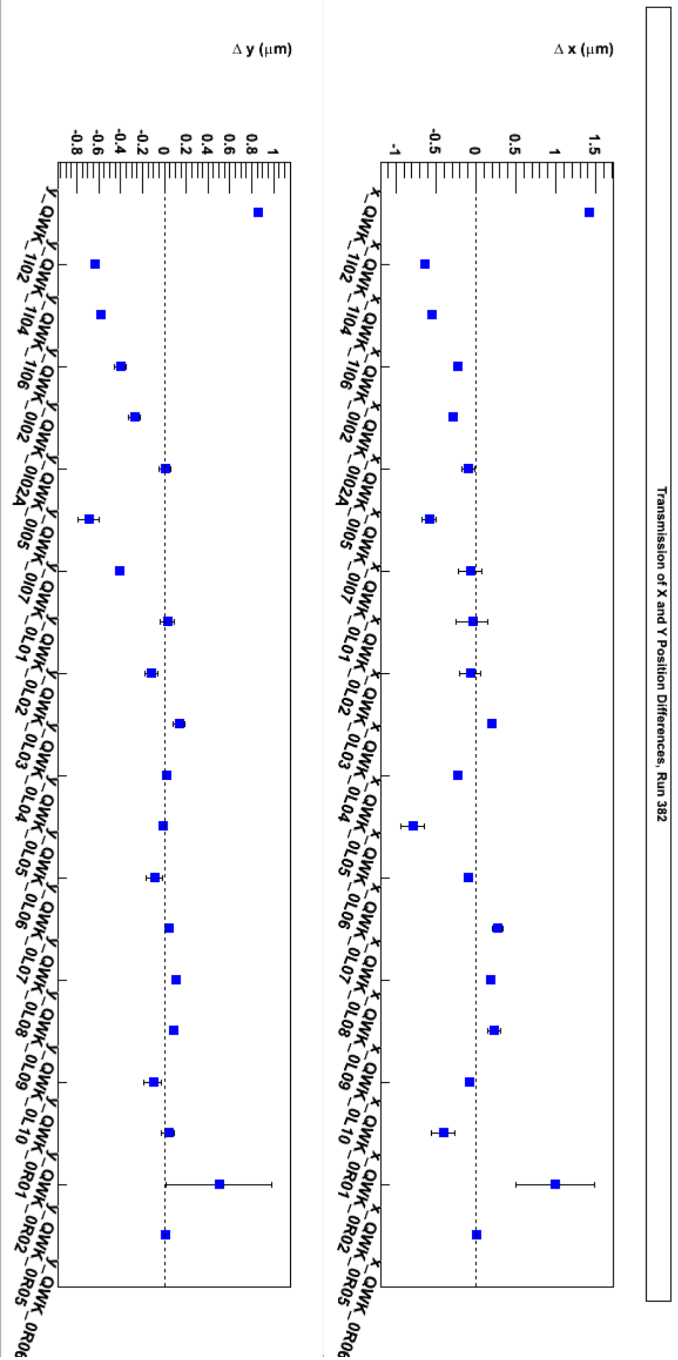
Charge Asymmetry

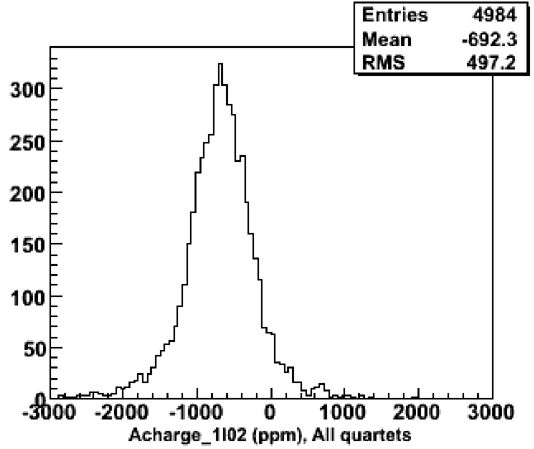



Run 381
Entries 4984
Mean 1.99
RMS 5.449
Δx_1l02 (μm), All quartets
+--+(+--+)
Entries 1261
Mean 1.941
RMS 5.475
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 1235
Mean 2.064
RMS 5.634
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 1244
Mean 2.055
RMS 5.174
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 1243
Mean 1.901
RMS 5.503
Δx_1l02 (μm), Left First


Run 381
Entries 4984
Mean 1.171
RMS 5.268
Δy_1l02 (μm), All quartets
+--+(+--+)
Entries 1261
Mean 1.067
RMS 5.394
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 1235
Mean 1.174
RMS 5.239
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 1244
Mean 1.198
RMS 5.159
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 1243
Mean 1.248
RMS 5.276
Δy_1l02 (μm), Left First

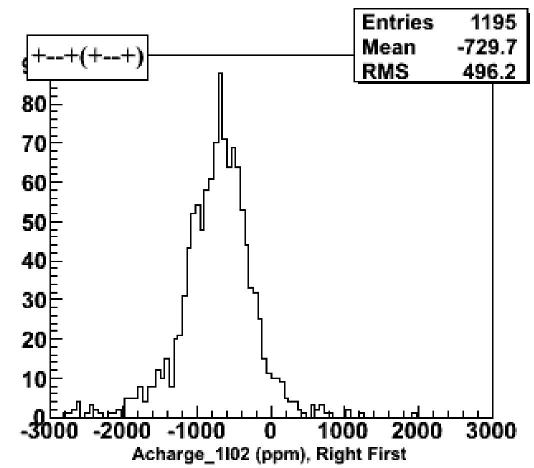

Entries 4984
Mean 2.235
RMS 2.726
Δx_1I02 (μm)
Entries 4984
Mean -0.6178
RMS 7.88
Δy_1I02 (μm)
Entries 4984
Mean 187.9
RMS 525.2
Acharge_1I02 (ppm)
Entries 4984
Mean 2.387
RMS 6.161
Δx_1I02 Block 1 (μm)
Entries 4984
Mean -0.3574
RMS 13.42
Δy_1I02 Block 1 (μm)
Entries 4984
Mean 180.6
RMS 1243
Acharge_1I02 Block 1 (ppm)
Entries 4984
Mean 2.178
RMS 6.207
Δx_1I02 Block 2 (μm)
Entries 4984
Mean -0.5779
RMS 12.82
Δy_1I02 Block 2 (μm)
Entries 4984
Mean 228.9
RMS 1237
Acharge_1I02 Block 2 (ppm)
Entries 4984
Mean 2.249
RMS 6.216
Δx_1I02 Block 3 (μm)
Entries 4984
Mean -0.7606
RMS 13.48
Δy_1I02 Block 3 (μm)
Entries 4984
Mean 193.8
RMS 1234
Acharge_1I02 Block 3 (ppm)
Entries 4984
Mean 2.312
RMS 6.224
Δx_1I02 Block 4 (μm)
Entries 4984
Mean -0.5905
RMS 12.86
Δy_1I02 Block 4 (μm)
Entries 4984
Mean 186.9
RMS 1230
Acharge_1I02 Block 4 (ppm)

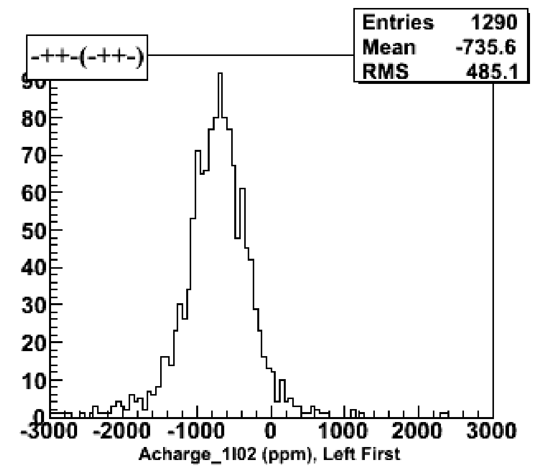


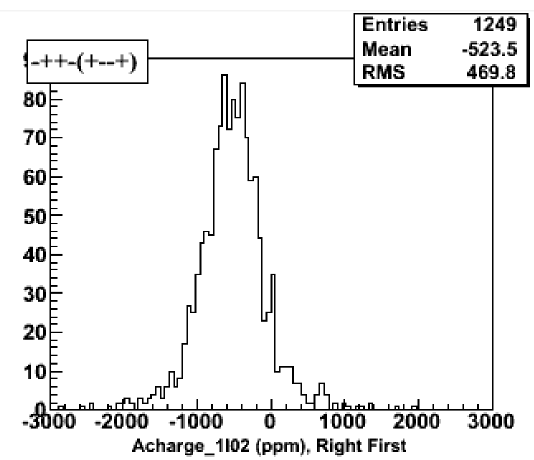


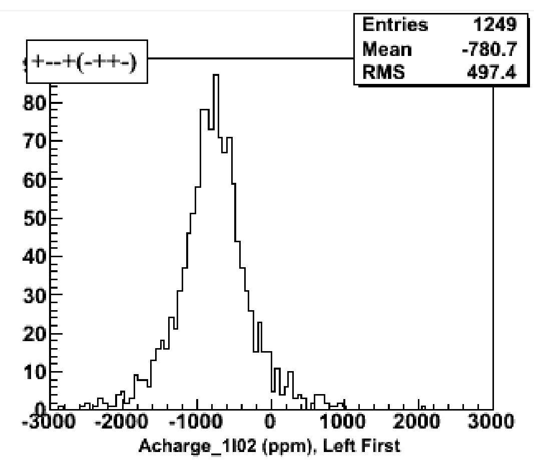
Run 382

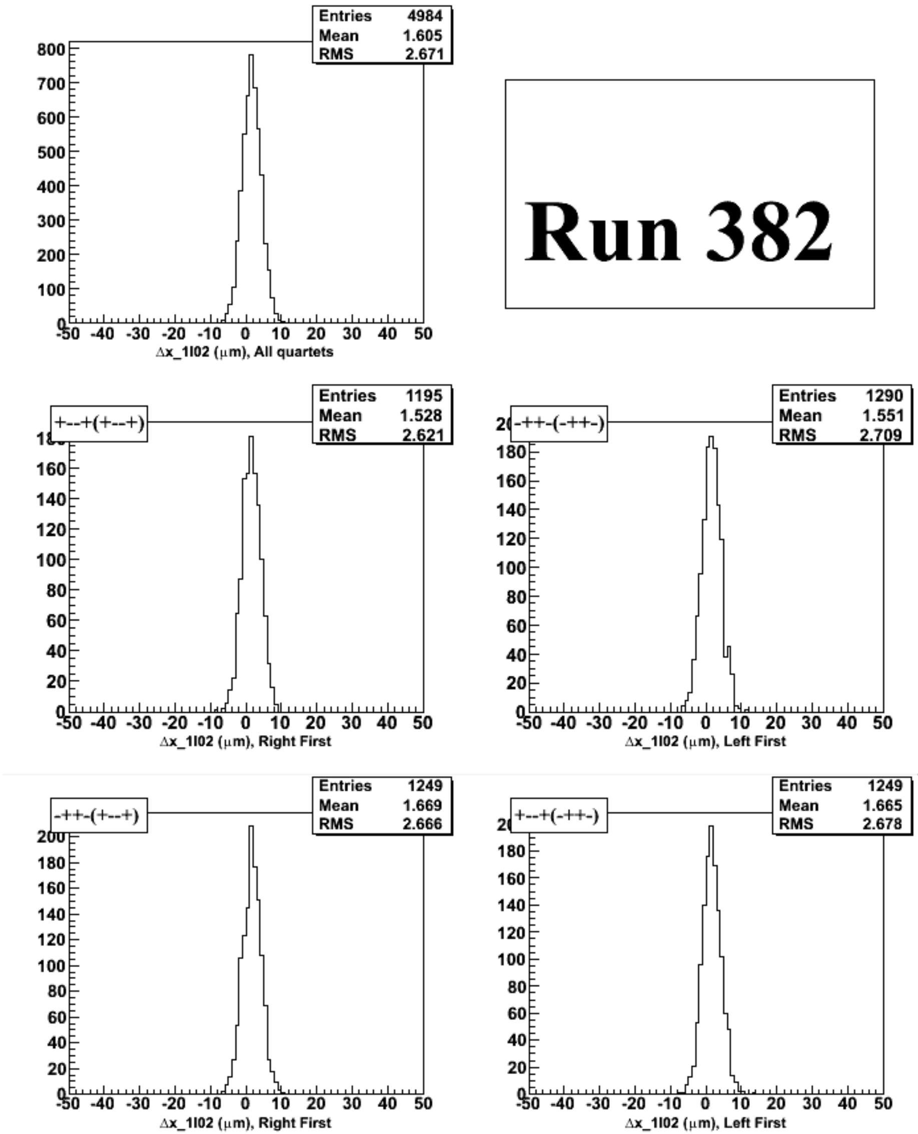
Charge Asymmetry

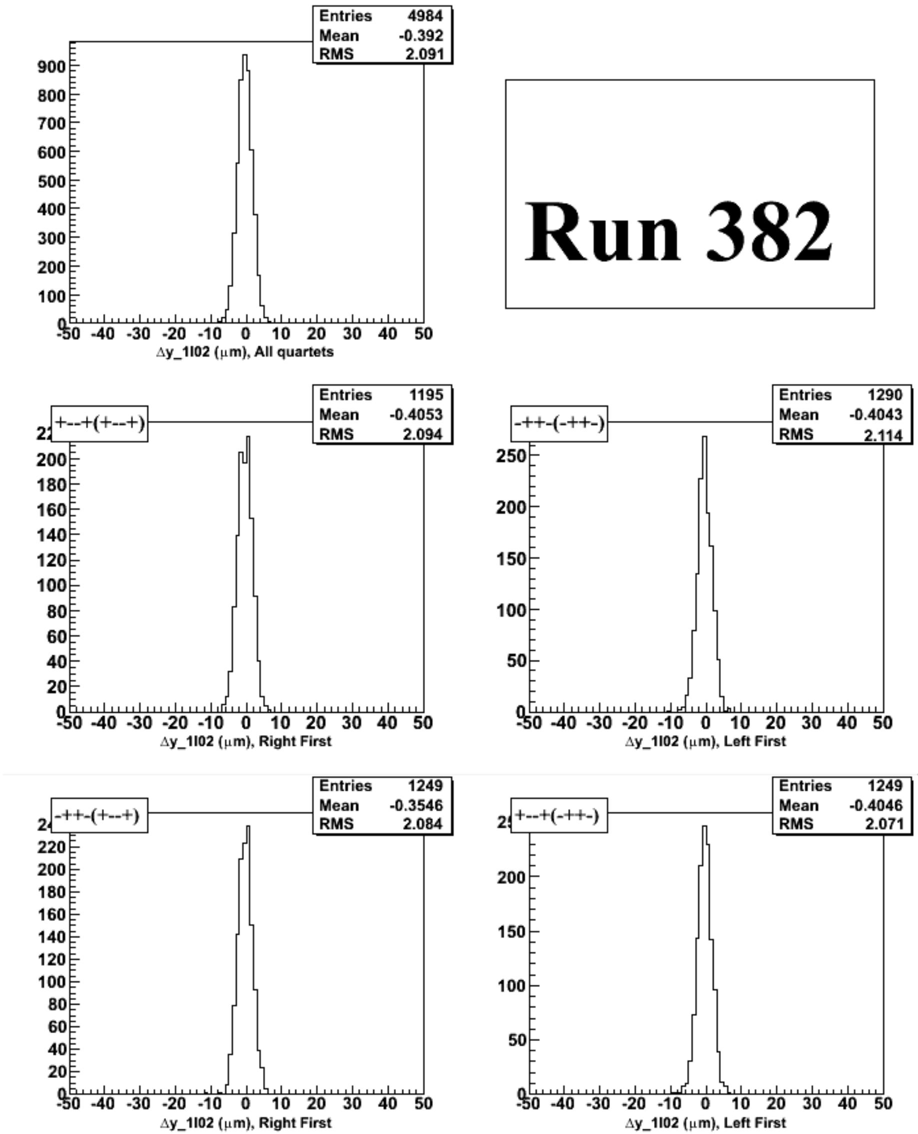


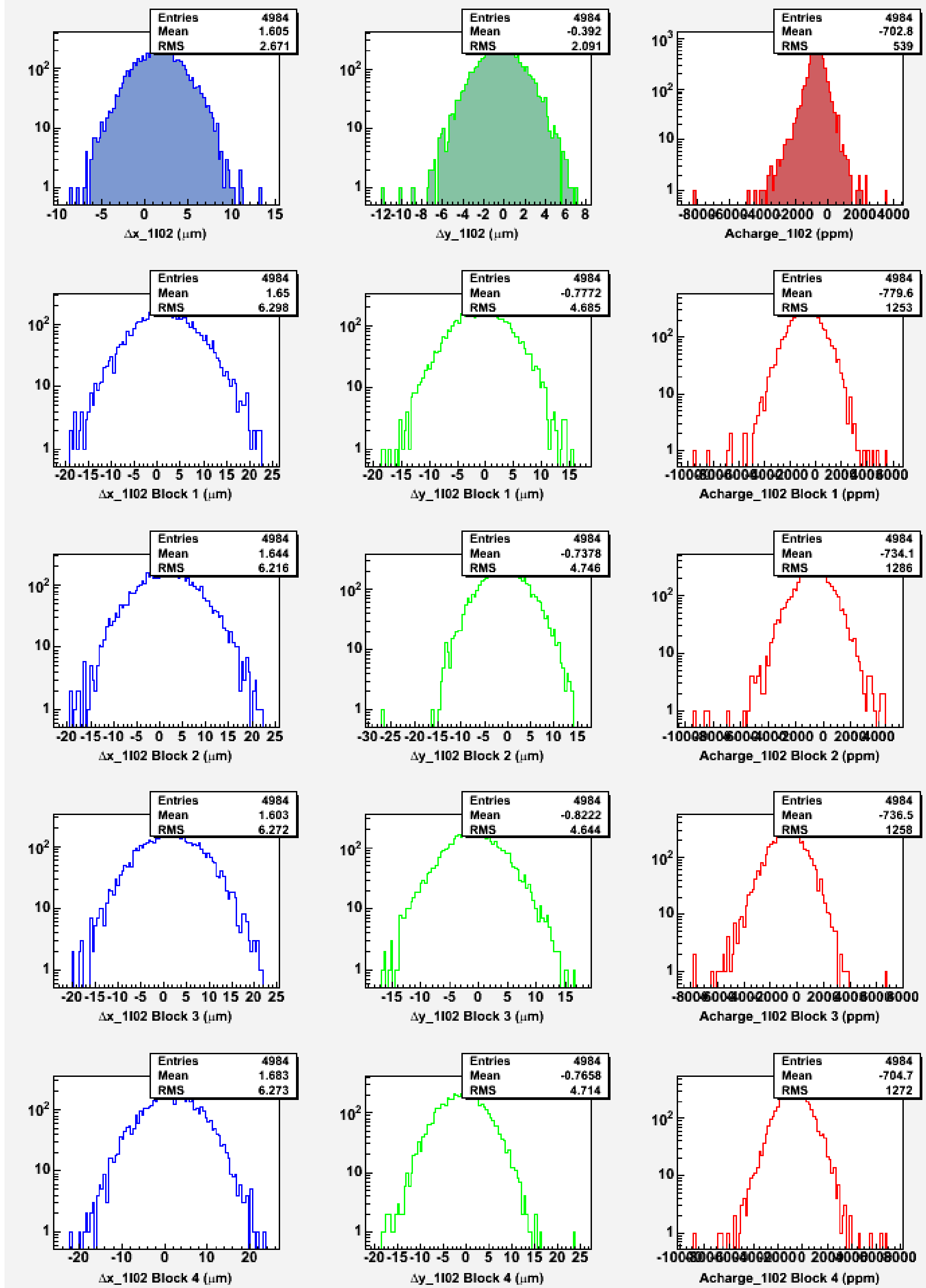


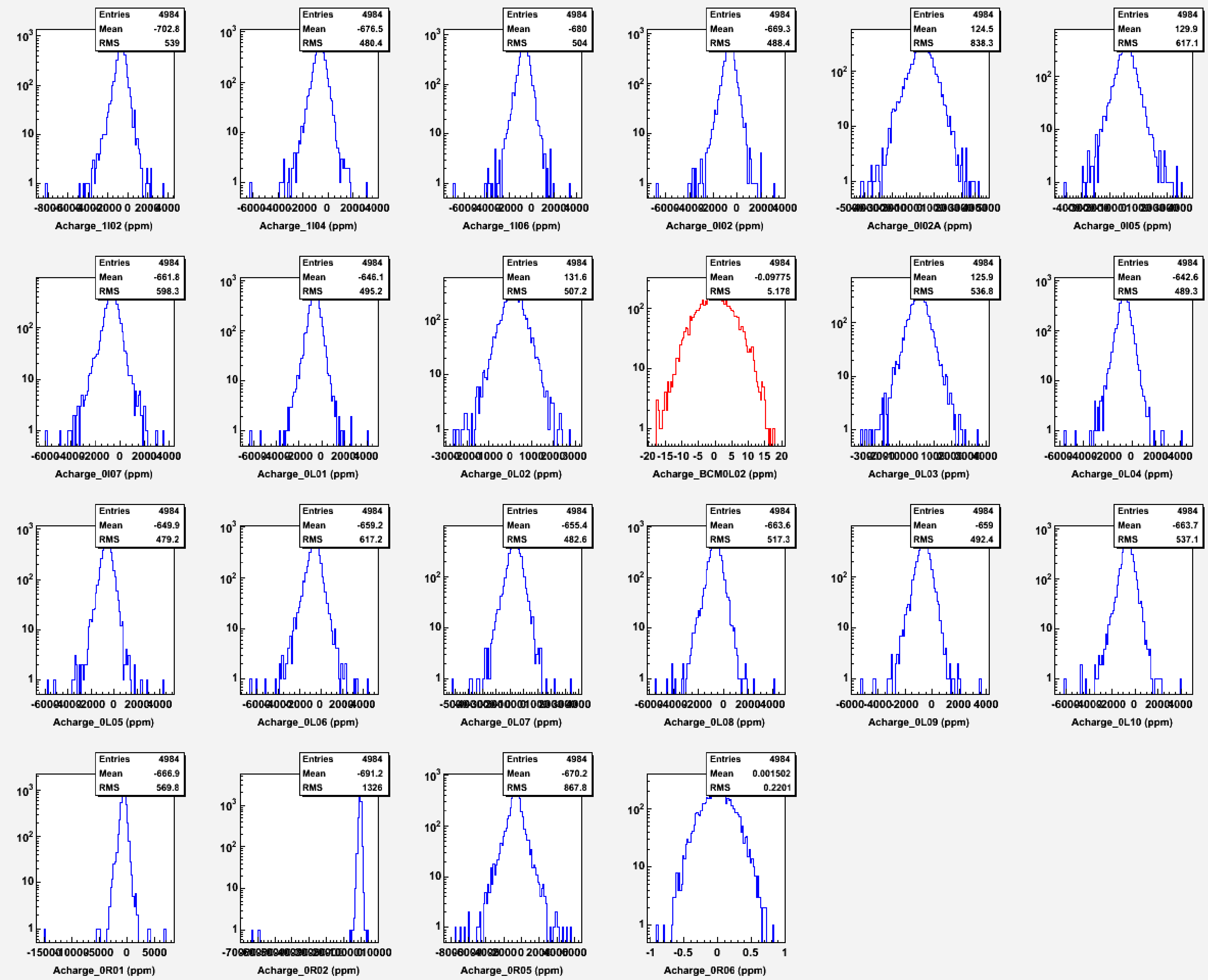


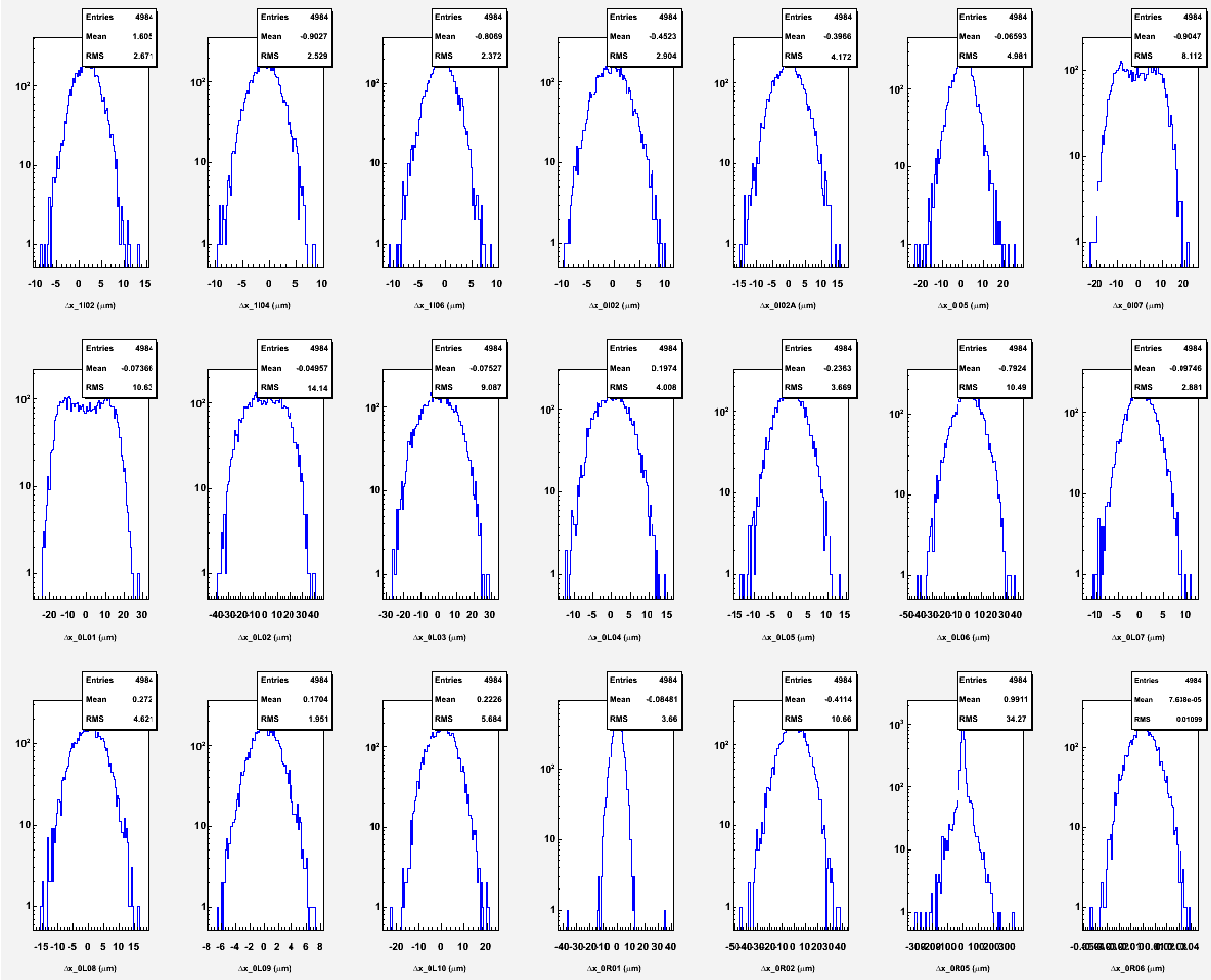


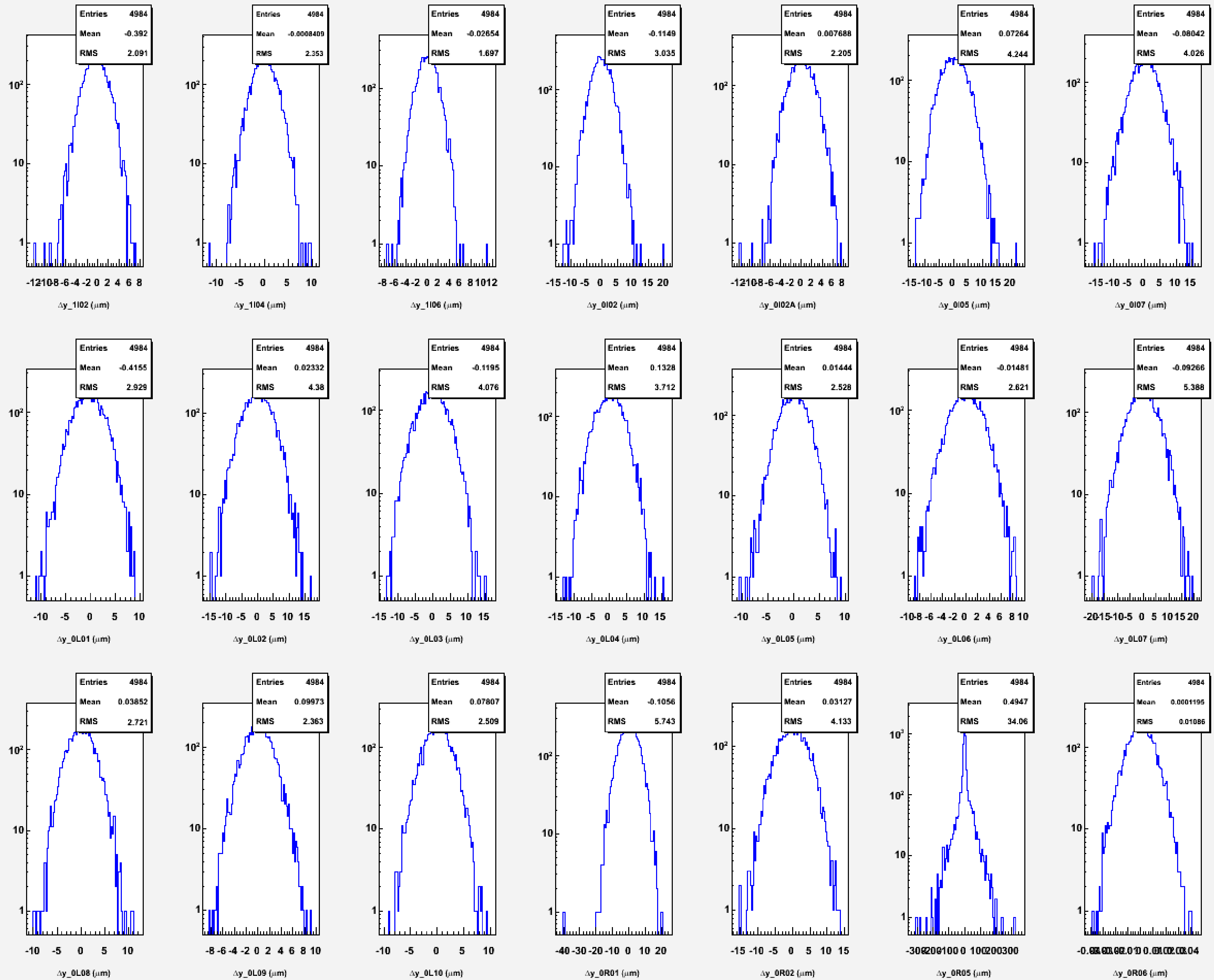

Entries 4984
Mean 1.605
RMS 2.671
Δx_1l02 (μm), All quartets
Run 382
+--+(+--+)
Entries 1195
Mean 1.528
RMS 2.621
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 1290
Mean 1.551
RMS 2.709
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 1249
Mean 1.669
RMS 2.666
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 1249
Mean 1.665
RMS 2.678
Δx_1l02 (μm), Left First

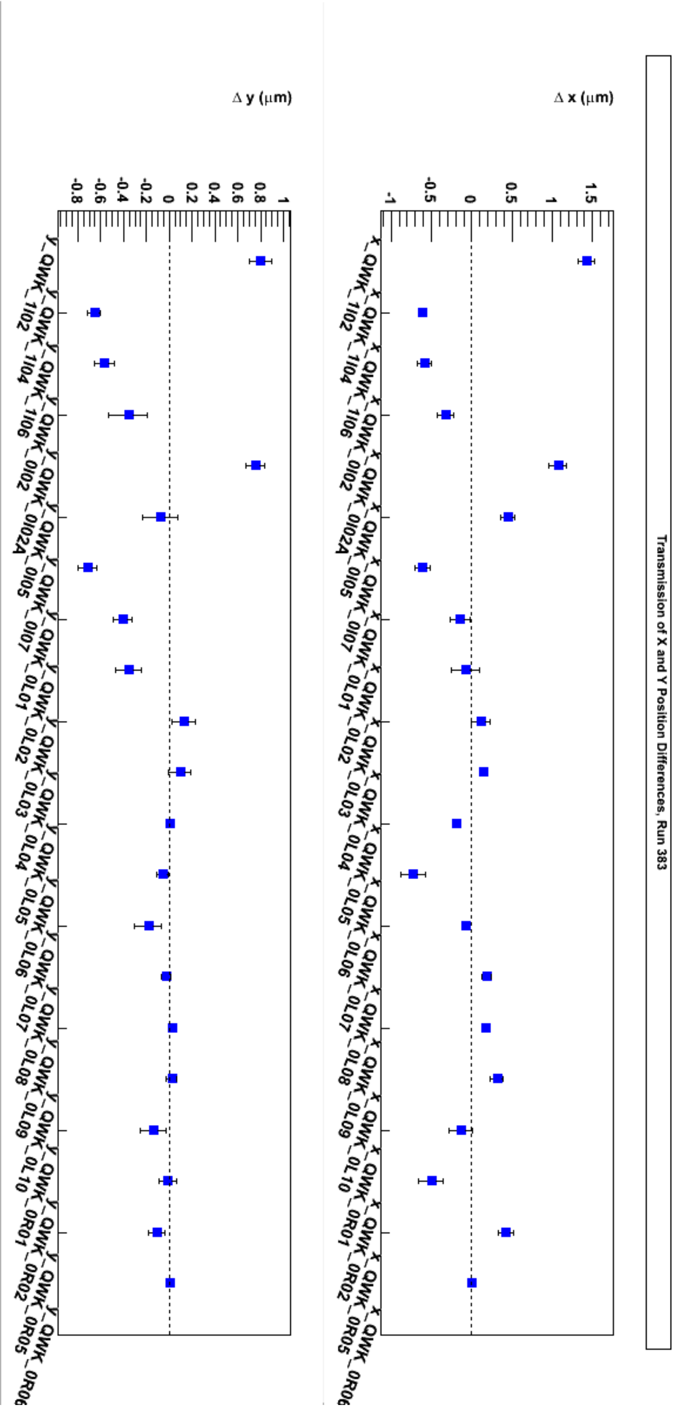

Entries 4984
Mean -0.392
RMS 2.091
Δy_1l02 (μm), All quartets
Run 382
+--+(+--+)
Entries 1195
Mean -0.4053
RMS 2.094
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 1290
Mean -0.4043
RMS 2.114
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 1249
Mean -0.3546
RMS 2.084
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 1249
Mean -0.4046
RMS 2.071
Δy_1l02 (μm), Left First

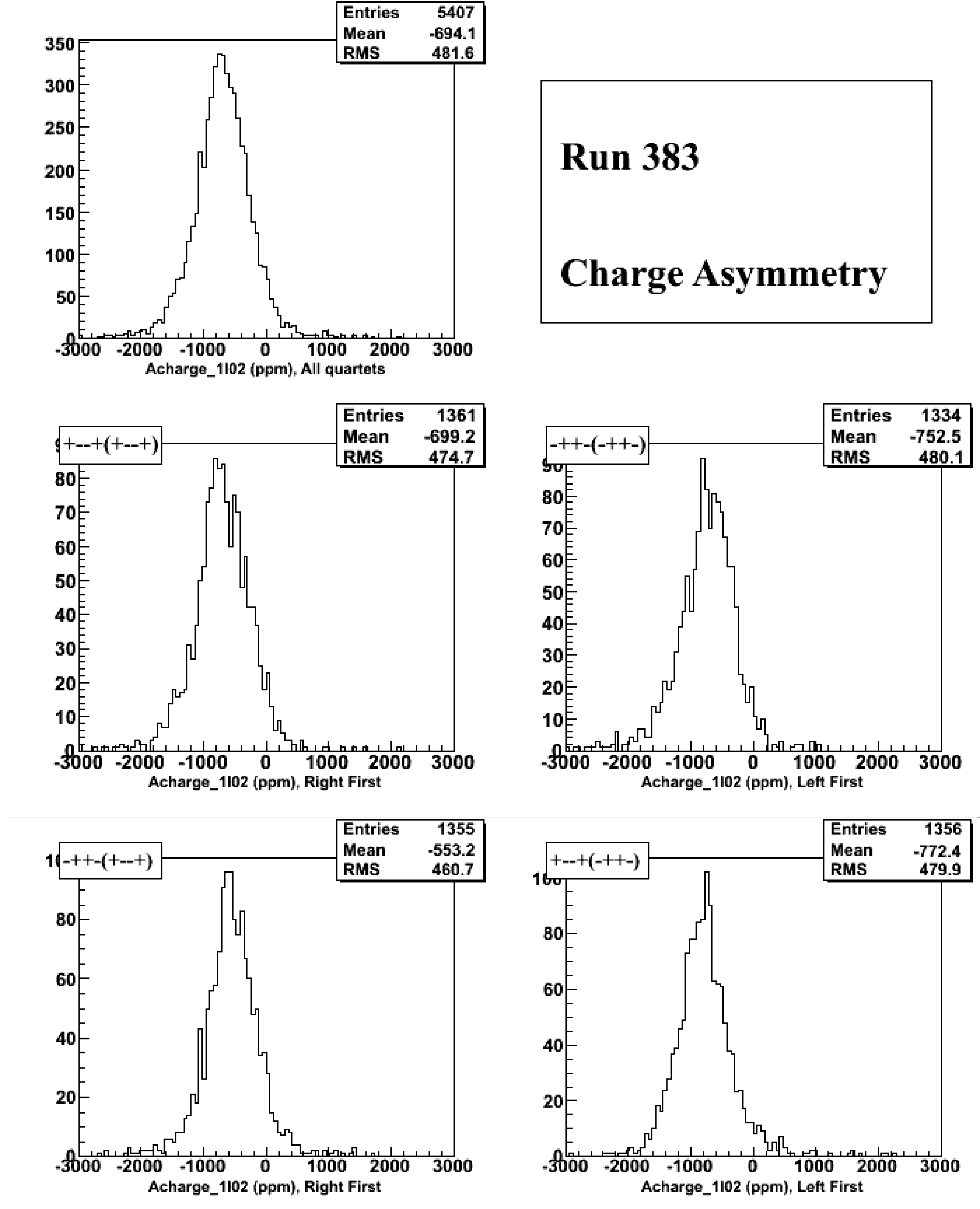

Entries 4984
Mean 1.605
RMS 2.671
Δx_1I02 (μm)
Entries 4984
Mean -0.392
RMS 2.091
Δy_1I02 (μm)
Entries 4984
Mean -702.8
RMS 539
Acharge_1I02 (ppm)
Entries 4984
Mean 1.65
RMS 6.298
Δx_1I02 Block 1 (μm)
Entries 4984
Mean -0.7772
RMS 4.685
Δy_1I02 Block 1 (μm)
Entries 4984
Mean -779.6
RMS 1253
Acharge_1I02 Block 1 (ppm)
Entries 4984
Mean 1.644
RMS 6.216
Δx_1I02 Block 2 (μm)
Entries 4984
Mean -0.7378
RMS 4.746
Δy_1I02 Block 2 (μm)
Entries 4984
Mean -734.1
RMS 1286
Acharge_1I02 Block 2 (ppm)
Entries 4984
Mean 1.603
RMS 6.272
Δx_1I02 Block 3 (μm)
Entries 4984
Mean -0.8222
RMS 4.644
Δy_1I02 Block 3 (μm)
Entries 4984
Mean -736.5
RMS 1258
Acharge_1I02 Block 3 (ppm)
Entries 4984
Mean 1.683
RMS 6.273
Δx_1I02 Block 4 (μm)
Entries 4984
Mean -0.7658
RMS 4.714
Δy_1I02 Block 4 (μm)
Entries 4984
Mean -704.7
RMS 1272
Acharge_1I02 Block 4 (ppm)

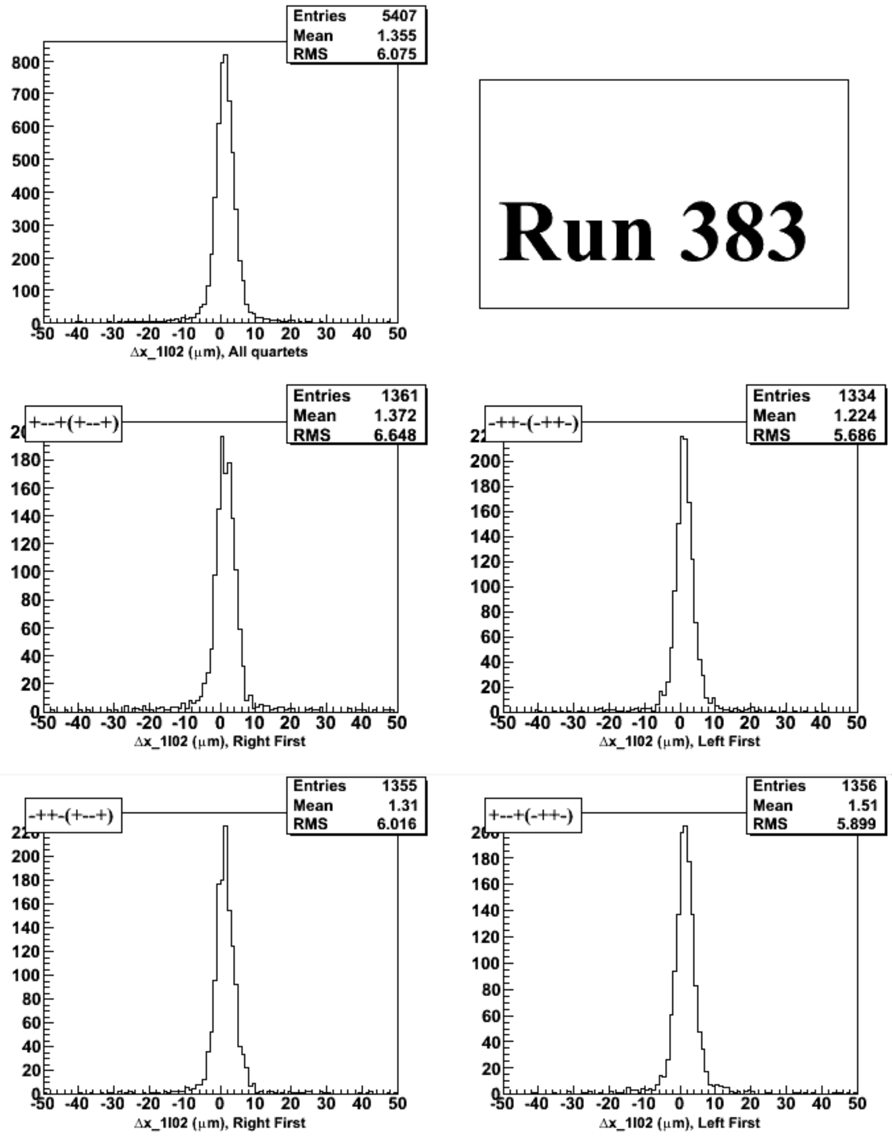

Entries 4984 Mean -702.8 RMS 539
Acharge_1I02 (ppm)
Entries 4984 Mean -676.5 RMS 480.4
Acharge_1I04 (ppm)
Entries 4984 Mean -680 RMS 504
Acharge_1I06 (ppm)
Entries 4984 Mean -669.3 RMS 488.4
Acharge_0I02 (ppm)
Entries 4984 Mean 124.5 RMS 838.3
Acharge_0I02A (ppm)
Entries 4984 Mean 129.9 RMS 617.1
Acharge_0I05 (ppm)
Entries 4984 Mean -661.8 RMS 598.3
Acharge_0I07 (ppm)
Entries 4984 Mean -646.1 RMS 495.2
Acharge_0L01 (ppm)
Entries 4984 Mean 131.6 RMS 507.2
Acharge_0L02 (ppm)
Entries 4984 Mean -0.09775 RMS 5.178
Acharge_BCM0L02 (ppm)
Entries 4984 Mean 125.9 RMS 536.8
Acharge_0L03 (ppm)
Entries 4984 Mean -642.6 RMS 489.3
Acharge_0L04 (ppm)
Entries 4984 Mean -649.9 RMS 479.2
Acharge_0L05 (ppm)
Entries 4984 Mean -659.2 RMS 617.2
Acharge_0L06 (ppm)
Entries 4984 Mean -655.4 RMS 482.6
Acharge_0L07 (ppm)
Entries 4984 Mean -663.6 RMS 517.3
Acharge_0L08 (ppm)
Entries 4984 Mean -659 RMS 492.4
Acharge_0L09 (ppm)
Entries 4984 Mean -663.7 RMS 537.1
Acharge_0L10 (ppm)
Entries 4984 Mean -666.9 RMS 569.8
Acharge_0R01 (ppm)
Entries 4984 Mean -691.2 RMS 1326
Acharge_0R02 (ppm)
Entries 4984 Mean -670.2 RMS 867.8
Acharge_0R05 (ppm)
Entries 4984 Mean 0.001502 RMS 0.2201
Acharge_0R06 (ppm)


Entries 4984
Mean 1.605
RMS 2.671
Δx_1I02 (μm)
Entries 4984
Mean -0.9027
RMS 2.529
Δx_1I04 (μm)
Entries 4984
Mean -0.8069
RMS 2.372
Δx_1I06 (μm)
Entries 4984
Mean -0.4523
RMS 2.904
Δx_0I02 (μm)
Entries 4984
Mean -0.3966
RMS 4.172
Δx_0I02A (μm)
Entries 4984
Mean -0.06593
RMS 4.981
Δx_0I05 (μm)
Entries 4984
Mean -0.9047
RMS 8.112
Δx_0I07 (μm)
Entries 4984
Mean -0.07366
RMS 10.63
Δx_0L01 (μm)
Entries 4984
Mean -0.04957
RMS 14.14
Δx_0L02 (μm)
Entries 4984
Mean -0.07527
RMS 9.087
Δx_0L03 (μm)
Entries 4984
Mean 0.1974
RMS 4.008
Δx_0L04 (μm)
Entries 4984
Mean -0.2363
RMS 3.669
Δx_0L05 (μm)
Entries 4984
Mean -0.7924
RMS 10.49
Δx_0L06 (μm)
Entries 4984
Mean -0.09746
RMS 2.881
Δx_0L07 (μm)
Entries 4984
Mean 0.272
RMS 4.621
Δx_0L08 (μm)
Entries 4984
Mean 0.1704
RMS 1.951
Δx_0L09 (μm)
Entries 4984
Mean 0.2226
RMS 5.684
Δx_0L10 (μm)
Entries 4984
Mean -0.08481
RMS 3.66
Δx_0R01 (μm)
Entries 4984
Mean -0.4114
RMS 10.66
Δx_0R02 (μm)
Entries 4984
Mean 0.9911
RMS 34.27
Δx_0R05 (μm)
Entries 4984
Mean 7.638e-05
RMS 0.01099
Δx_0R06 (μm)

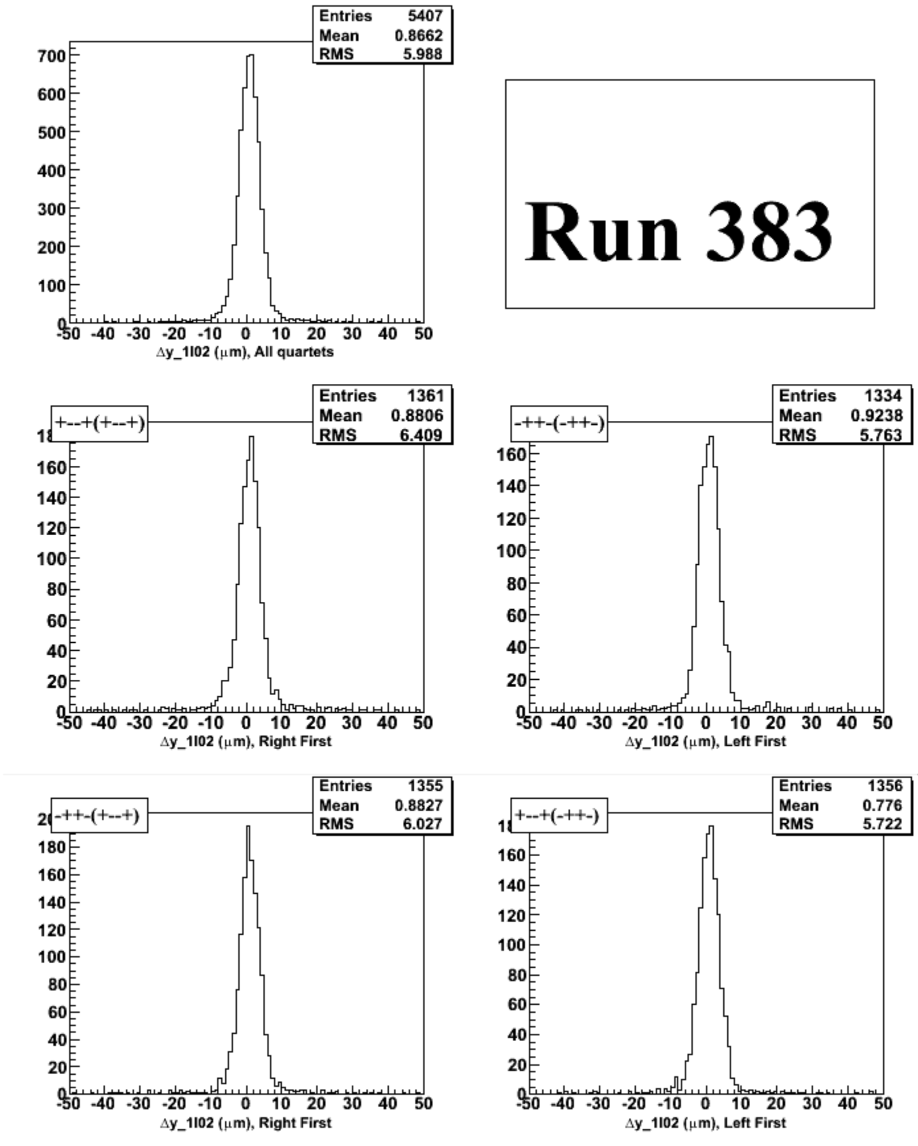

Entries 4984 Mean -0.392 RMS 2.091
Δy_1I02 (μm)
Entries 4984 Mean -0.0008409 RMS 2.353
Δy_1I04 (μm)
Entries 4984 Mean -0.02654 RMS 1.697
Δy_1I06 (μm)
Entries 4984 Mean -0.1149 RMS 3.035
Δy_0I02 (μm)
Entries 4984 Mean 0.007688 RMS 2.205
Δy_0I02A (μm)
Entries 4984 Mean 0.07264 RMS 4.244
Δy_0I05 (μm)
Entries 4984 Mean -0.08042 RMS 4.026
Δy_0I07 (μm)
Entries 4984 Mean -0.4155 RMS 2.929
Δy_0L01 (μm)
Entries 4984 Mean 0.02332 RMS 4.38
Δy_0L02 (μm)
Entries 4984 Mean -0.1195 RMS 4.076
Δy_0L03 (μm)
Entries 4984 Mean 0.1328 RMS 3.712
Δy_0L04 (μm)
Entries 4984 Mean 0.01444 RMS 2.528
Δy_0L05 (μm)
Entries 4984 Mean -0.01481 RMS 2.621
Δy_0L06 (μm)
Entries 4984 Mean -0.09266 RMS 5.388
Δy_0L07 (μm)
Entries 4984 Mean 0.03852 RMS 2.721
Δy_0L08 (μm)
Entries 4984 Mean 0.09973 RMS 2.363
Δy_0L09 (μm)
Entries 4984 Mean 0.07807 RMS 2.509
Δy_0L10 (μm)
Entries 4984 Mean -0.1056 RMS 5.743
Δy_0R01 (μm)
Entries 4984 Mean 0.03127 RMS 4.133
Δy_0R02 (μm)
Entries 4984 Mean 0.4947 RMS 34.06
Δy_0R05 (μm)
Entries 4984 Mean 0.0001195 RMS 0.01086
Δy_0R06 (μm)


Transmission of X and Y Position Differences, Run 383
Δ y (μm)
Δ x (μm)
Y_QWK_1I02 Y_QWK_1I04 Y_QWK_1I06 Y_QWK_0I02 Y_QWK_0I02A Y_QWK_0I05 Y_QWK_0I07 Y_QWK_0L01 Y_QWK_0L02 Y_QWK_0L03 Y_QWK_0L04 Y_QWK_0L05 Y_QWK_0L06 Y_QWK_0L07 Y_QWK_0L08 Y_QWK_0L09 Y_QWK_0L10 Y_QWK_0R01 Y_QWK_0R02 Y_QWK_0R05 Y_QWK_0R06
X_QWK_1I02 X_QWK_1I04 X_QWK_1I06 X_QWK_0I02 X_QWK_0I02A X_QWK_0I05 X_QWK_0I07 X_QWK_0L01 X_QWK_0L02 X_QWK_0L03 X_QWK_0L04 X_QWK_0L05 X_QWK_0L06 X_QWK_0L07 X_QWK_0L08 X_QWK_0L09 X_QWK_0L10 X_QWK_0R01 X_QWK_0R02 X_QWK_0R05 X_QWK_0R06

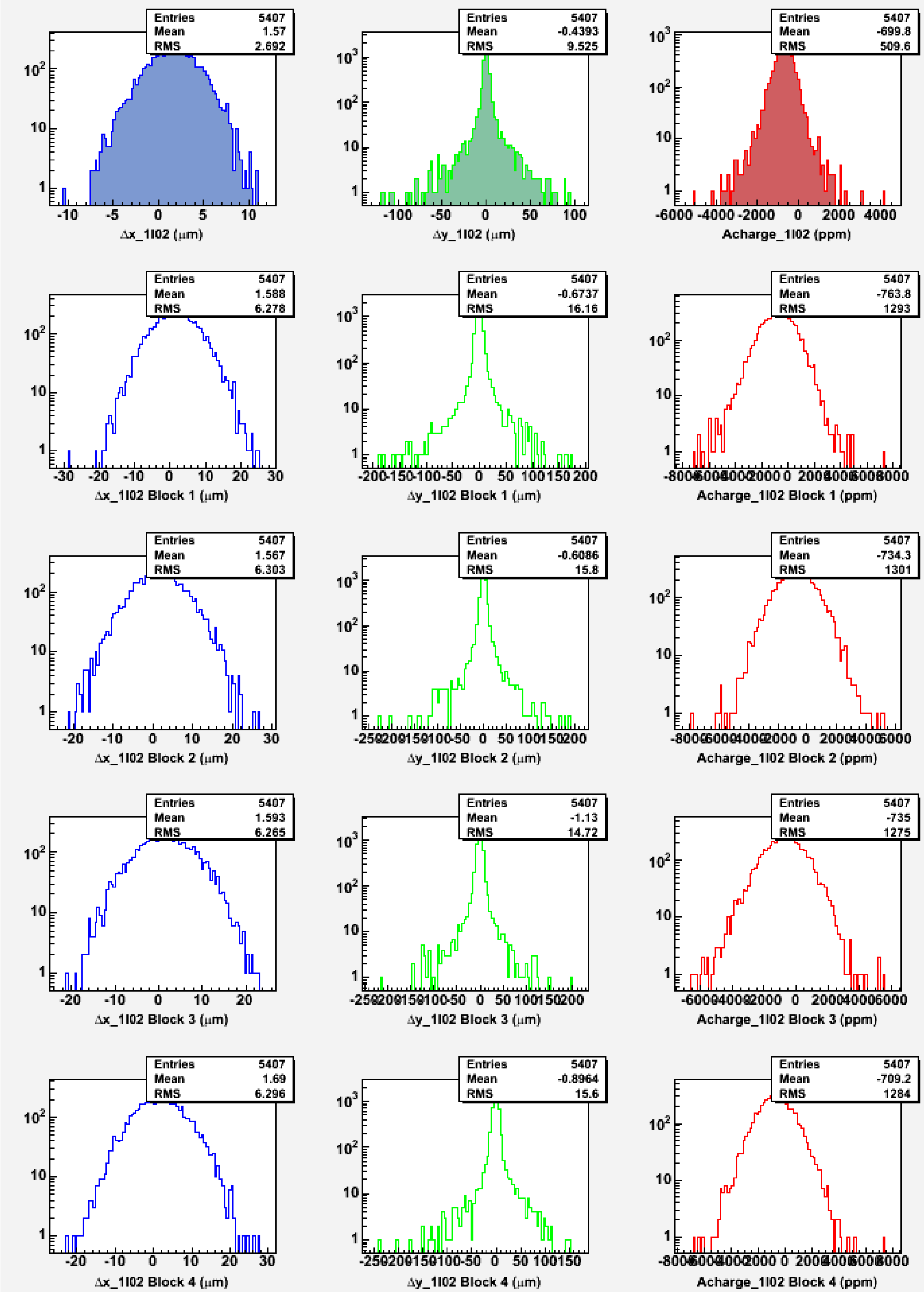

Run 383
Charge Asymmetry
Entries 5407
Mean -694.1
RMS 481.6
Acharge_1I02 (ppm), All quartets
+--+(+--+)
Entries 1361
Mean -699.2
RMS 474.7
Acharge_1I02 (ppm), Right First
-++-(-++-)
Entries 1334
Mean -752.5
RMS 480.1
Acharge_1I02 (ppm), Left First
-++-(+--+)
Entries 1355
Mean -553.2
RMS 460.7
Acharge_1I02 (ppm), Right First
+--+(-++-)
Entries 1356
Mean -772.4
RMS 479.9
Acharge_1I02 (ppm), Left First



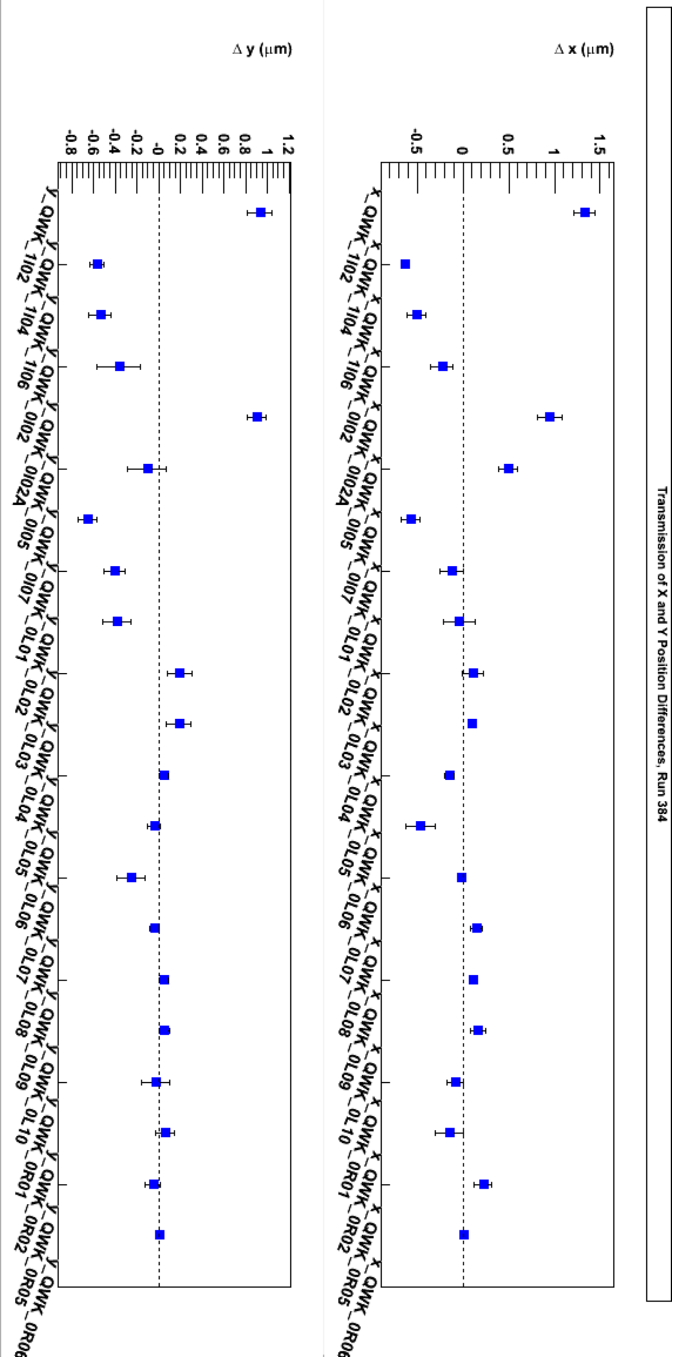
Run 383
Entries 5407
Mean 1.355
RMS 6.075
Δx_1I02 (μm), All quartets
+--+(+--+)
Entries 1361
Mean 1.372
RMS 6.648
Δx_1I02 (μm), Right First
-++-(-++-)
Entries 1334
Mean 1.224
RMS 5.686
Δx_1I02 (μm), Left First
-++-(+--+)
Entries 1355
Mean 1.31
RMS 6.016
Δx_1I02 (μm), Right First
+--+(-++-)
Entries 1356
Mean 1.51
RMS 5.899
Δx_1I02 (μm), Left First



Run 383
Entries 5407
Mean 0.8662
RMS 5.988
Δy_1I02 (μm), All quartets
+--+(+--+)
Entries 1361
Mean 0.8806
RMS 6.409
Δy_1I02 (μm), Right First
-++-(-++-)
Entries 1334
Mean 0.9238
RMS 5.763
Δy_1I02 (μm), Left First
-++-(+--+)
Entries 1355
Mean 0.8827
RMS 6.027
Δy_1I02 (μm), Right First
+--+(-++-)
Entries 1356
Mean 0.776
RMS 5.722
Δy_1I02 (μm), Left First

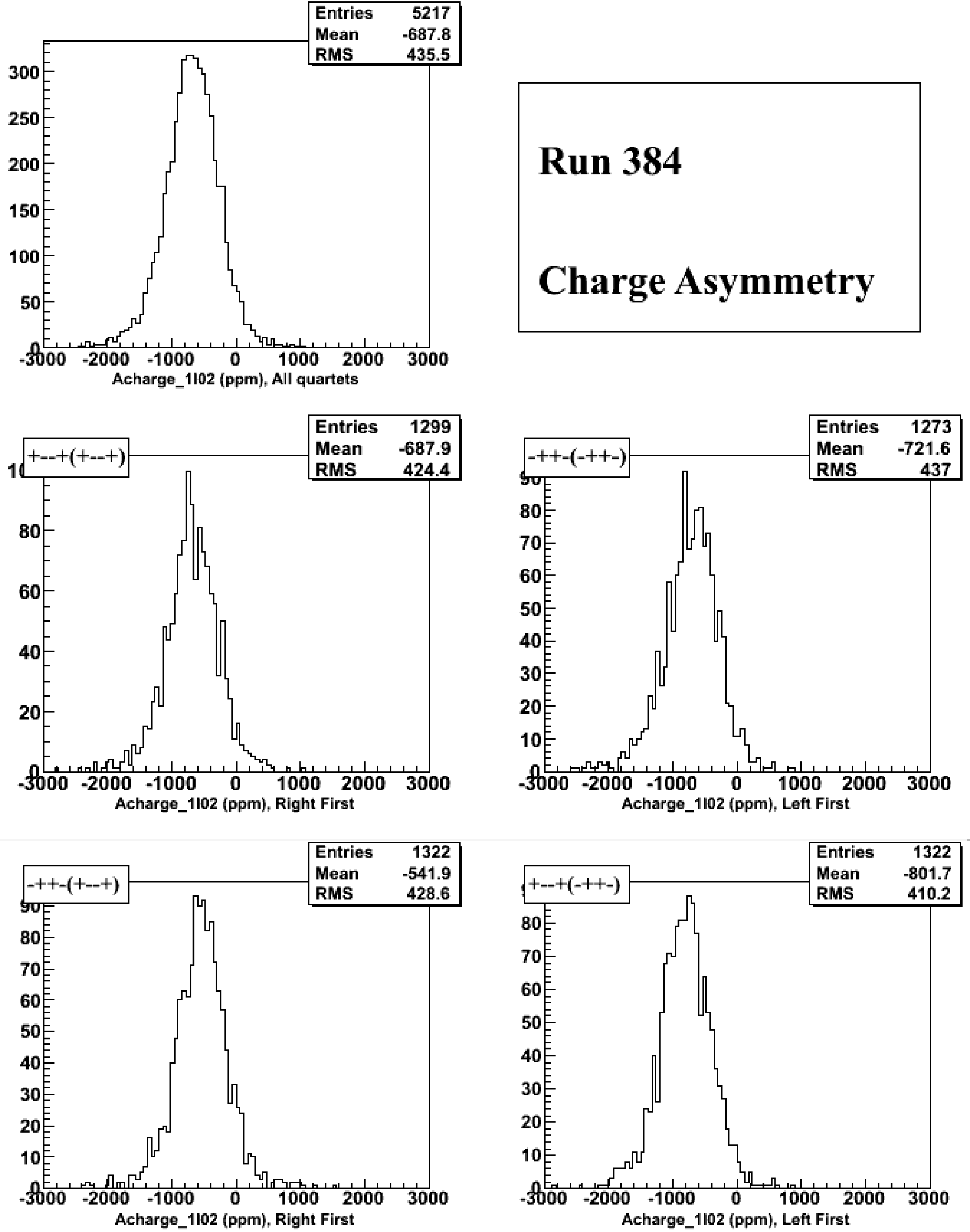


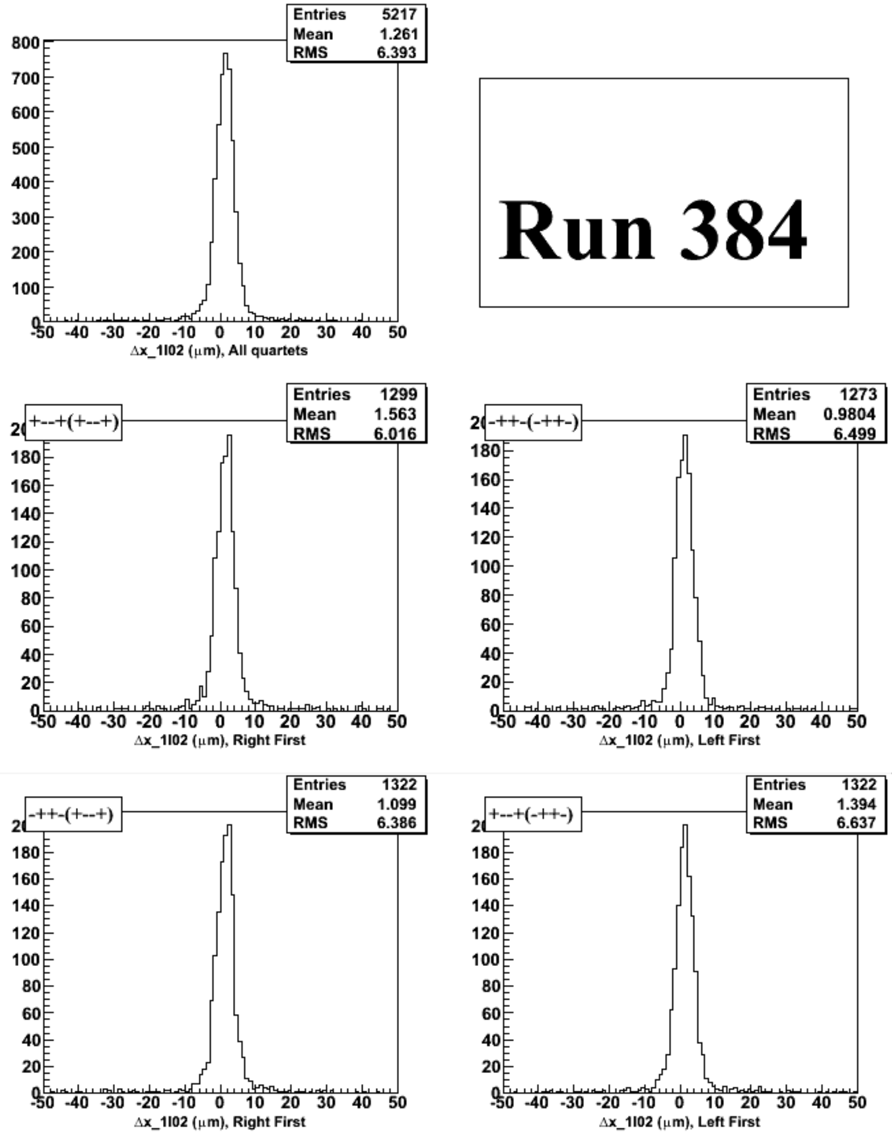
Entries 5407
Mean 1.57
RMS 2.692
Δx_1I02 (μm)
Entries 5407
Mean -0.4393
RMS 9.525
Δy_1I02 (μm)
Entries 5407
Mean -699.8
RMS 509.6
Acharge_1I02 (ppm)
Entries 5407
Mean 1.588
RMS 6.278
Δx_1I02 Block 1 (μm)
Entries 5407
Mean -0.6737
RMS 16.16
Δy_1I02 Block 1 (μm)
Entries 5407
Mean -763.8
RMS 1293
Acharge_1I02 Block 1 (ppm)
Entries 5407
Mean 1.567
RMS 6.303
Δx_1I02 Block 2 (μm)
Entries 5407
Mean -0.6086
RMS 15.8
Δy_1I02 Block 2 (μm)
Entries 5407
Mean -734.3
RMS 1301
Acharge_1I02 Block 2 (ppm)
Entries 5407
Mean 1.593
RMS 6.265
Δx_1I02 Block 3 (μm)
Entries 5407
Mean -1.13
RMS 14.72
Δy_1I02 Block 3 (μm)
Entries 5407
Mean -735
RMS 1275
Acharge_1I02 Block 3 (ppm)
Entries 5407
Mean 1.69
RMS 6.296
Δx_1I02 Block 4 (μm)
Entries 5407
Mean -0.8964
RMS 15.6
Δy_1I02 Block 4 (μm)
Entries 5407
Mean -709.2
RMS 1284
Acharge_1I02 Block 4 (ppm)

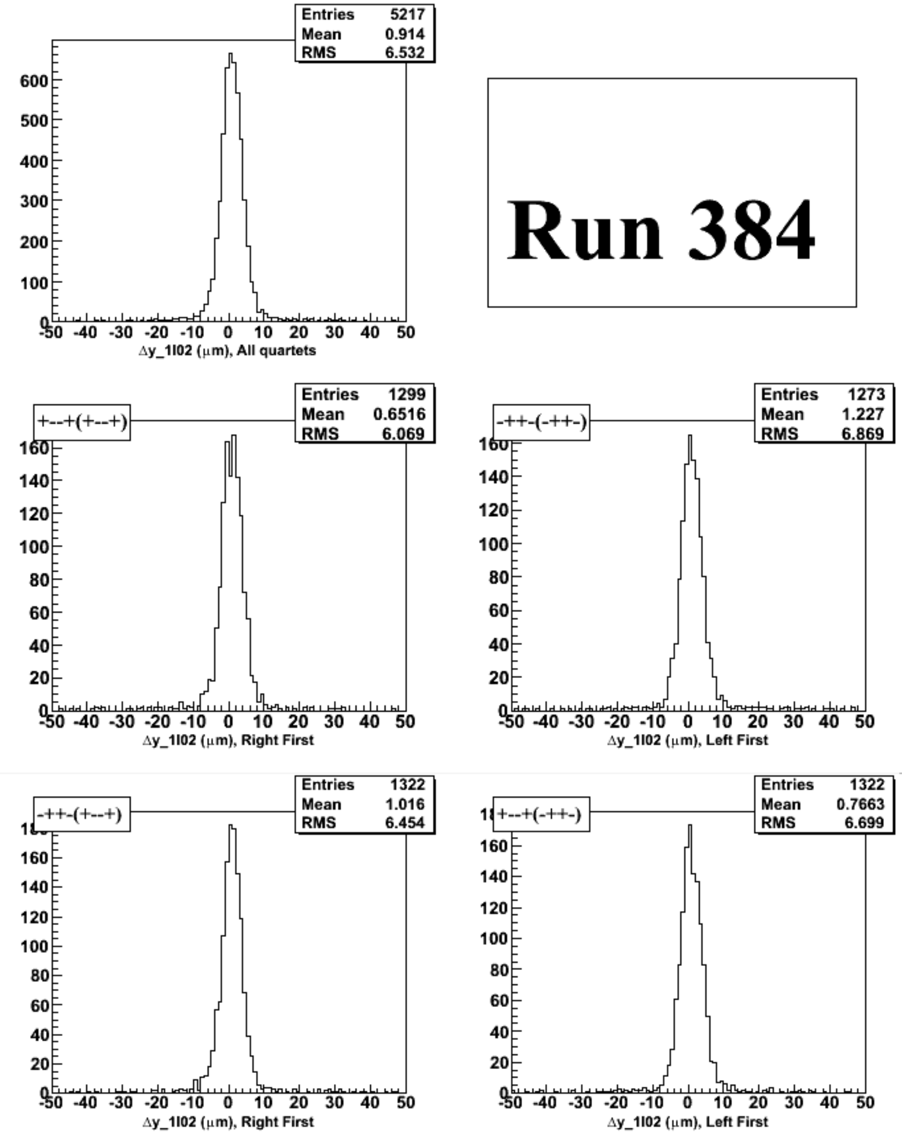


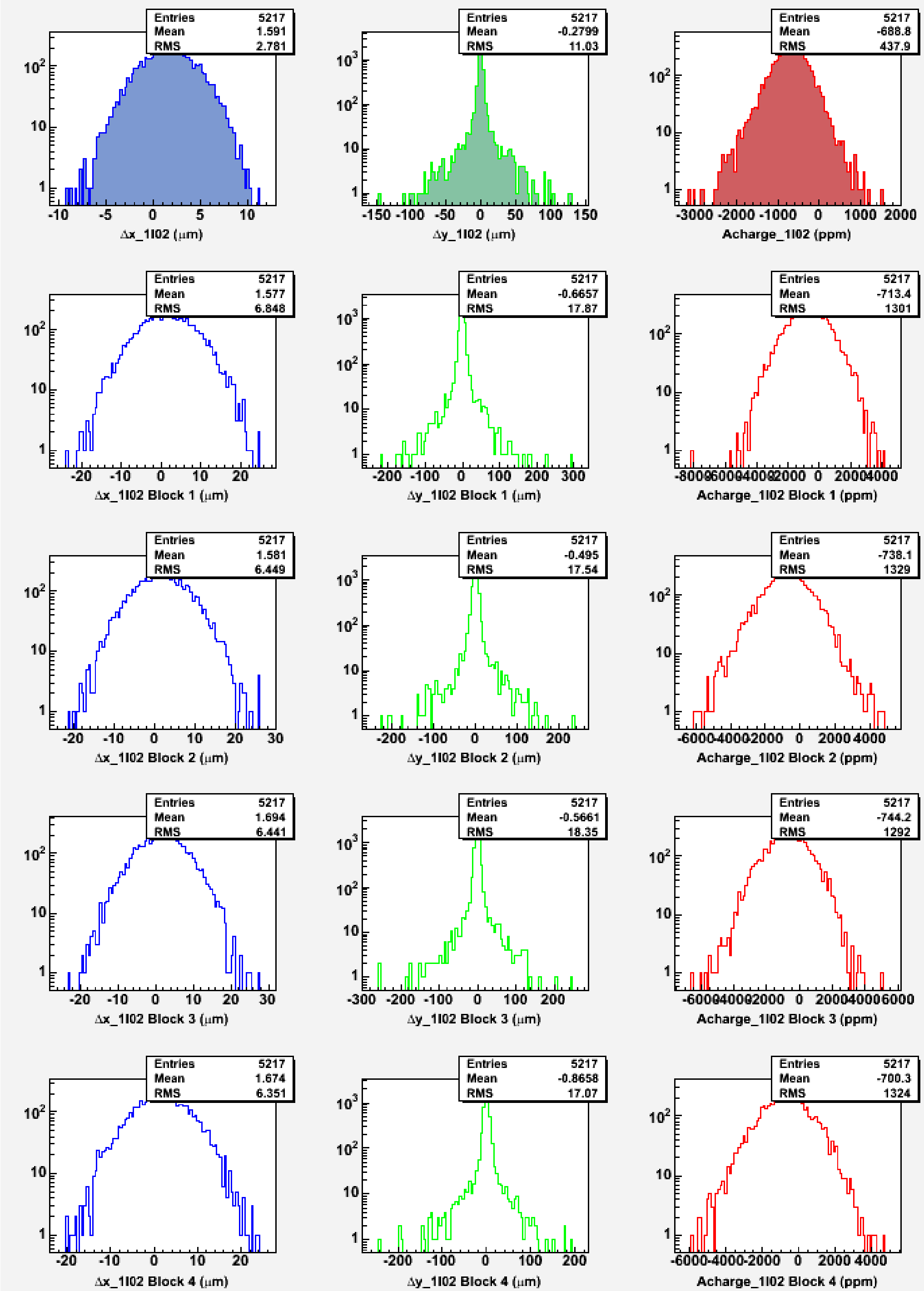
Run 384

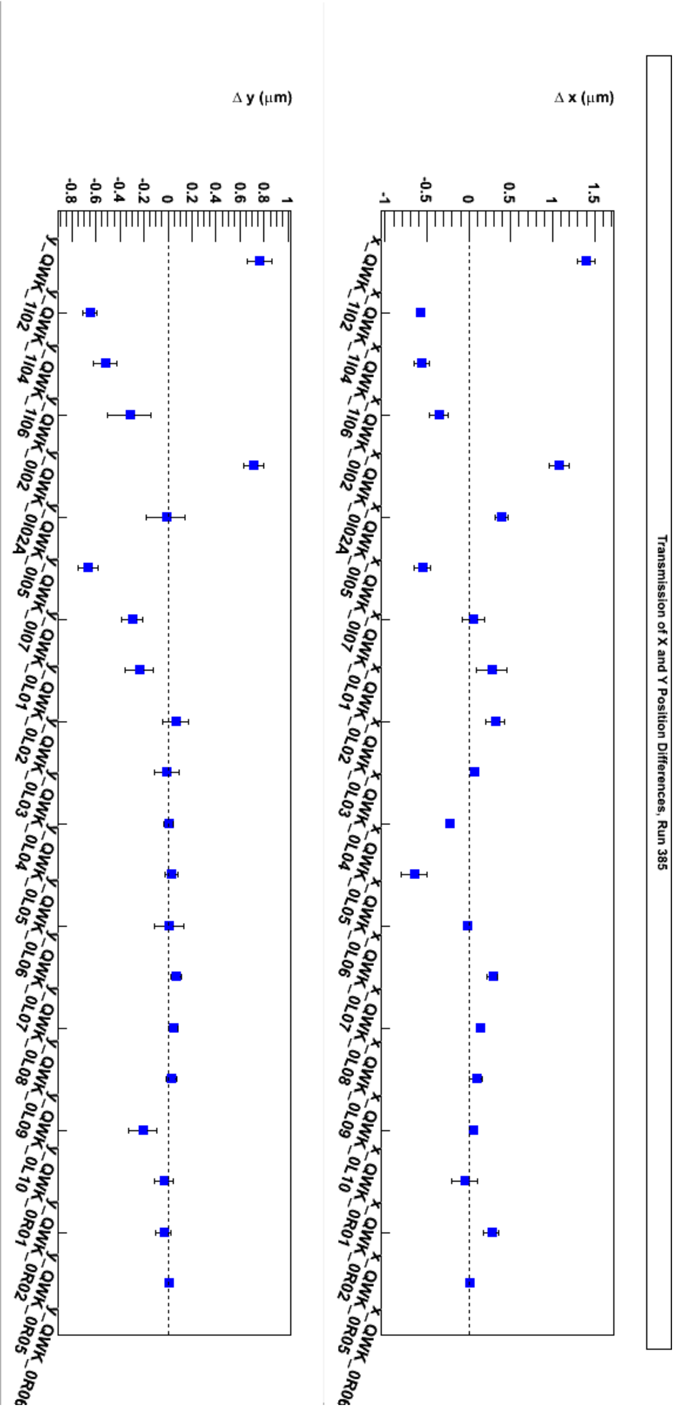
Charge Asymmetry

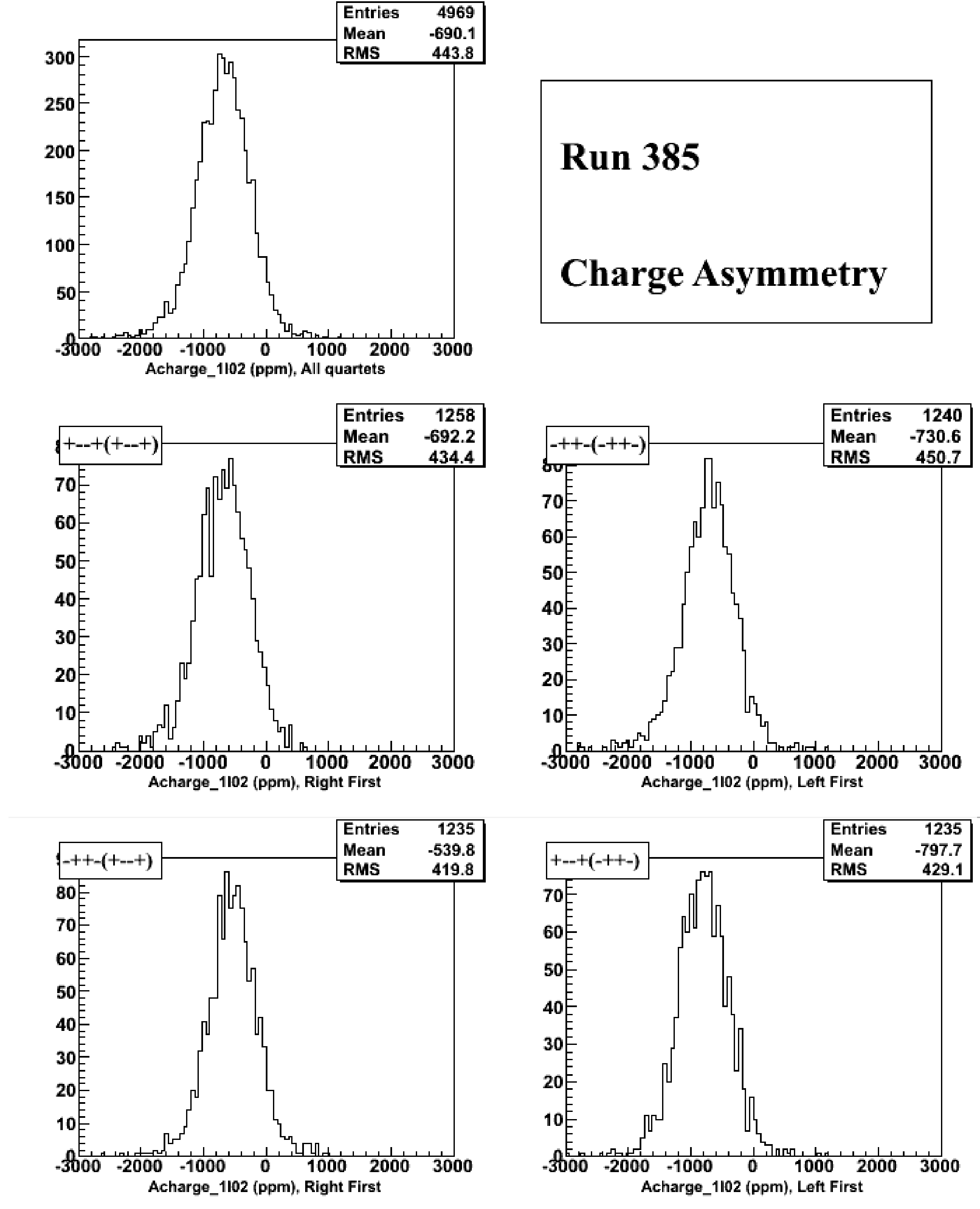


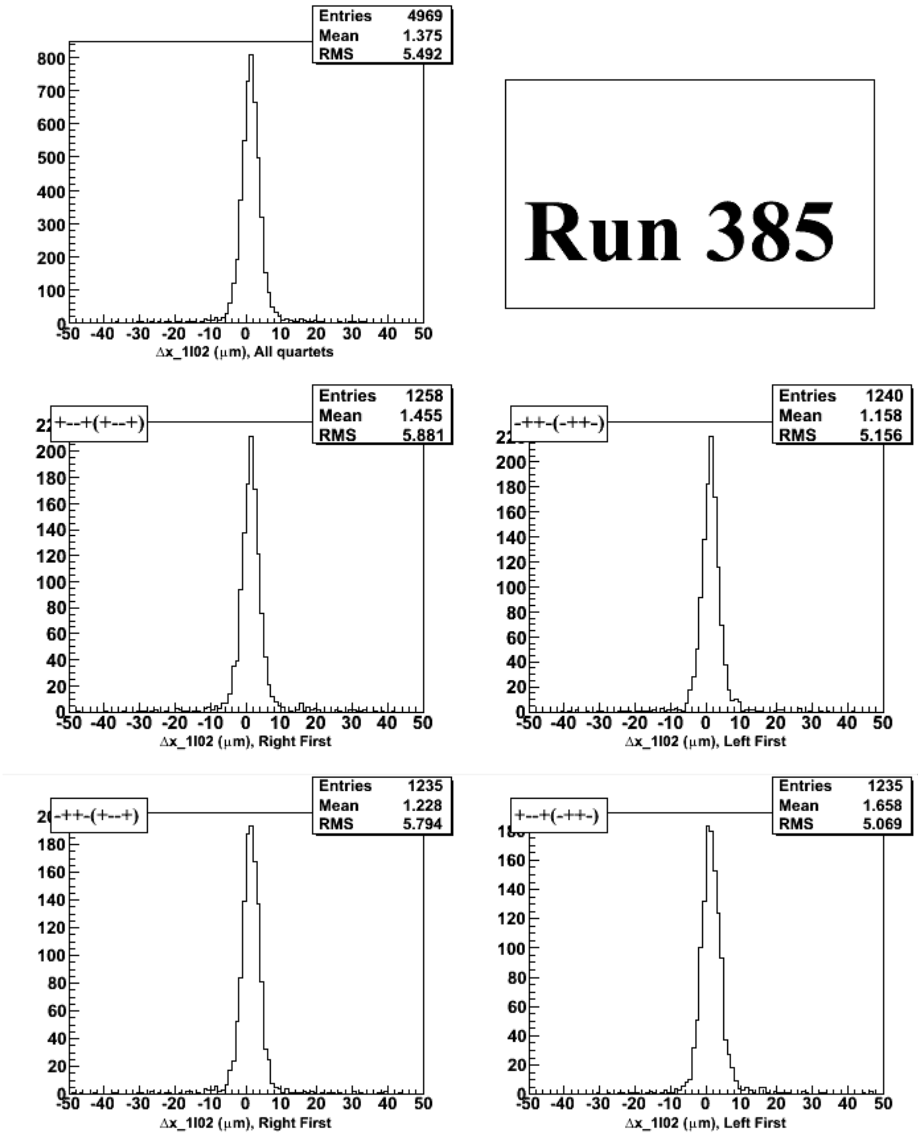

Entries 5217
Mean 1.261
RMS 6.393
Δx_1l02 (μm), All quartets
Run 384
+--+(+--+)
Entries 1299
Mean 1.563
RMS 6.016
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 1273
Mean 0.9804
RMS 6.499
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 1322
Mean 1.099
RMS 6.386
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 1322
Mean 1.394
RMS 6.637
Δx_1l02 (μm), Left First

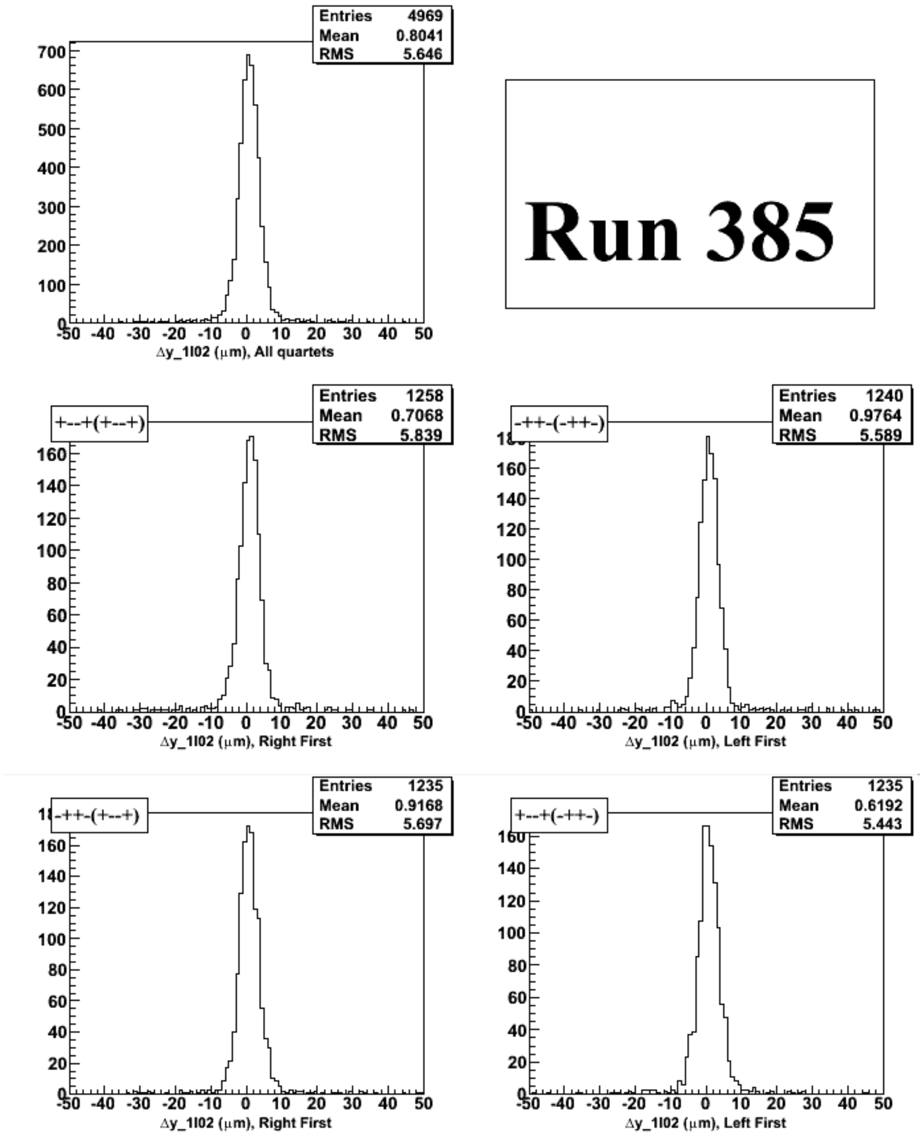

Entries 5217
Mean 0.914
RMS 6.532
Δy_1l02 (μm), All quartets
Run 384
+--+(+--+)
Entries 1299
Mean 0.6516
RMS 6.069
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 1273
Mean 1.227
RMS 6.869
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 1322
Mean 1.016
RMS 6.454
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 1322
Mean 0.7663
RMS 6.699
Δy_1l02 (μm), Left First

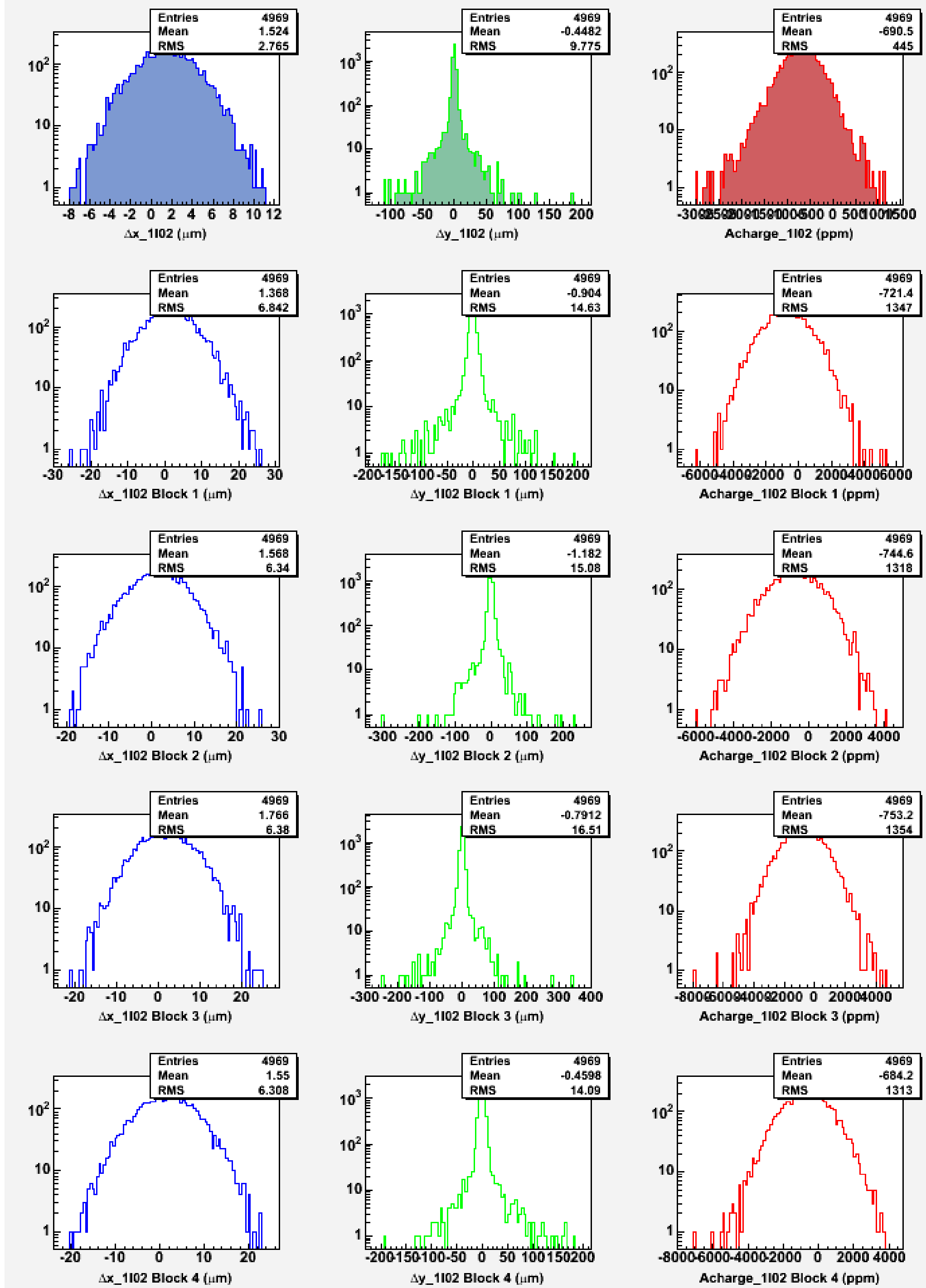

Entries 5217
Mean 1.591
RMS 2.781
Δx_1I02 (μm)
Entries 5217
Mean -0.2799
RMS 11.03
Δy_1I02 (μm)
Entries 5217
Mean -688.8
RMS 437.9
Acharge_1I02 (ppm)
Entries 5217
Mean 1.577
RMS 6.848
Δx_1I02 Block 1 (μm)
Entries 5217
Mean -0.6657
RMS 17.87
Δy_1I02 Block 1 (μm)
Entries 5217
Mean -713.4
RMS 1301
Acharge_1I02 Block 1 (ppm)
Entries 5217
Mean 1.581
RMS 6.449
Δx_1I02 Block 2 (μm)
Entries 5217
Mean -0.495
RMS 17.54
Δy_1I02 Block 2 (μm)
Entries 5217
Mean -738.1
RMS 1329
Acharge_1I02 Block 2 (ppm)
Entries 5217
Mean 1.694
RMS 6.441
Δx_1I02 Block 3 (μm)
Entries 5217
Mean -0.5661
RMS 18.35
Δy_1I02 Block 3 (μm)
Entries 5217
Mean -744.2
RMS 1292
Acharge_1I02 Block 3 (ppm)
Entries 5217
Mean 1.674
RMS 6.351
Δx_1I02 Block 4 (μm)
Entries 5217
Mean -0.8658
RMS 17.07
Δy_1I02 Block 4 (μm)
Entries 5217
Mean -700.3
RMS 1324
Acharge_1I02 Block 4 (ppm)


Transmission of X and Y Position Differences, Run 385
Δ y (μm)
Δ x (μm)
Y_QWK_1I02
Y_QWK_1I04
Y_QWK_1I06
Y_QWK_0I02
Y_QWK_0I02A
Y_QWK_0I05
Y_QWK_0I07
Y_QWK_0L01
Y_QWK_0L02
Y_QWK_0L03
Y_QWK_0L04
Y_QWK_0L05
Y_QWK_0L06
Y_QWK_0L07
Y_QWK_0L08
Y_QWK_0L09
Y_QWK_0L10
Y_QWK_0R01
Y_QWK_0R02
Y_QWK_0R05
Y_QWK_0R06
X_QWK_1I02
X_QWK_1I04
X_QWK_1I06
X_QWK_0I02
X_QWK_0I02A
X_QWK_0I05
X_QWK_0I07
X_QWK_0L01
X_QWK_0L02
X_QWK_0L03
X_QWK_0L04
X_QWK_0L05
X_QWK_0L06
X_QWK_0L07
X_QWK_0L08
X_QWK_0L09
X_QWK_0L10
X_QWK_0R01
X_QWK_0R02
X_QWK_0R05
X_QWK_0R06


Run 385
Charge Asymmetry
Entries 4969
Mean -690.1
RMS 443.8
Acharge_1I02 (ppm), All quartets
+--+(+--+)
Entries 1258
Mean -692.2
RMS 434.4
Acharge_1I02 (ppm), Right First
-++-(-++-)
Entries 1240
Mean -730.6
RMS 450.7
Acharge_1I02 (ppm), Left First
-++-(+--+)
Entries 1235
Mean -539.8
RMS 419.8
Acharge_1I02 (ppm), Right First
+--+(-++-)
Entries 1235
Mean -797.7
RMS 429.1
Acharge_1I02 (ppm), Left First


Entries 4969
Mean 1.375
RMS 5.492
Δx_1I02 (μm), All quartets
Run 385
+--+(+--+)
Entries 1258
Mean 1.455
RMS 5.881
Δx_1I02 (μm), Right First
-++-(-++-)
Entries 1240
Mean 1.158
RMS 5.156
Δx_1I02 (μm), Left First
-++-(+--+)
Entries 1235
Mean 1.228
RMS 5.794
Δx_1I02 (μm), Right First
+--+(-++-)
Entries 1235
Mean 1.658
RMS 5.069
Δx_1I02 (μm), Left First

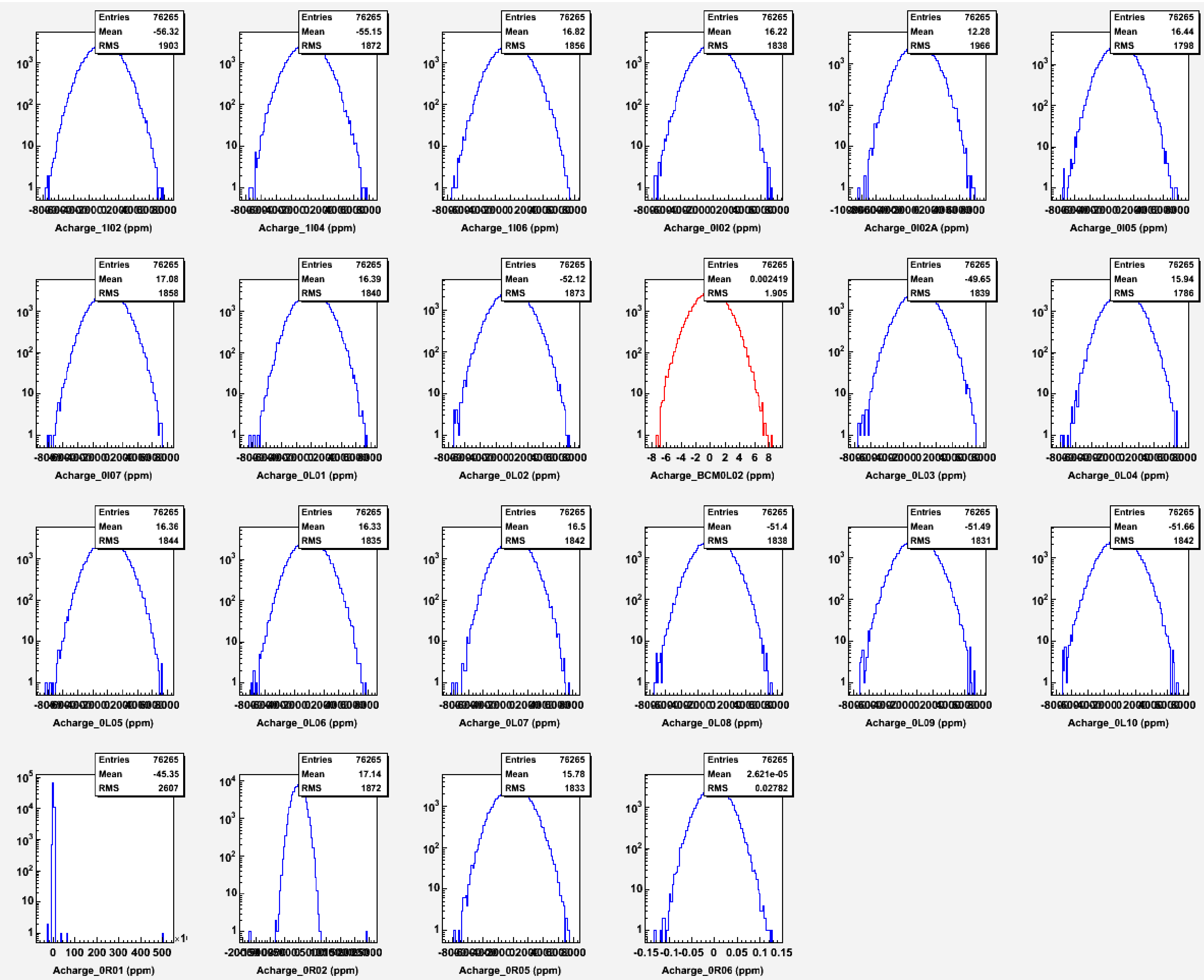

Entries 4969
Mean 0.8041
RMS 5.646
Δy_1I02 (μm), All quartets
Run 385
+--+(+--+)
Entries 1258
Mean 0.7068
RMS 5.839
Δy_1I02 (μm), Right First
-++-(-++-)
Entries 1240
Mean 0.9764
RMS 5.589
Δy_1I02 (μm), Left First
-++-(+--+)
Entries 1235
Mean 0.9168
RMS 5.697
Δy_1I02 (μm), Right First
+--+(-++-)
Entries 1235
Mean 0.6192
RMS 5.443
Δy_1I02 (μm), Left First



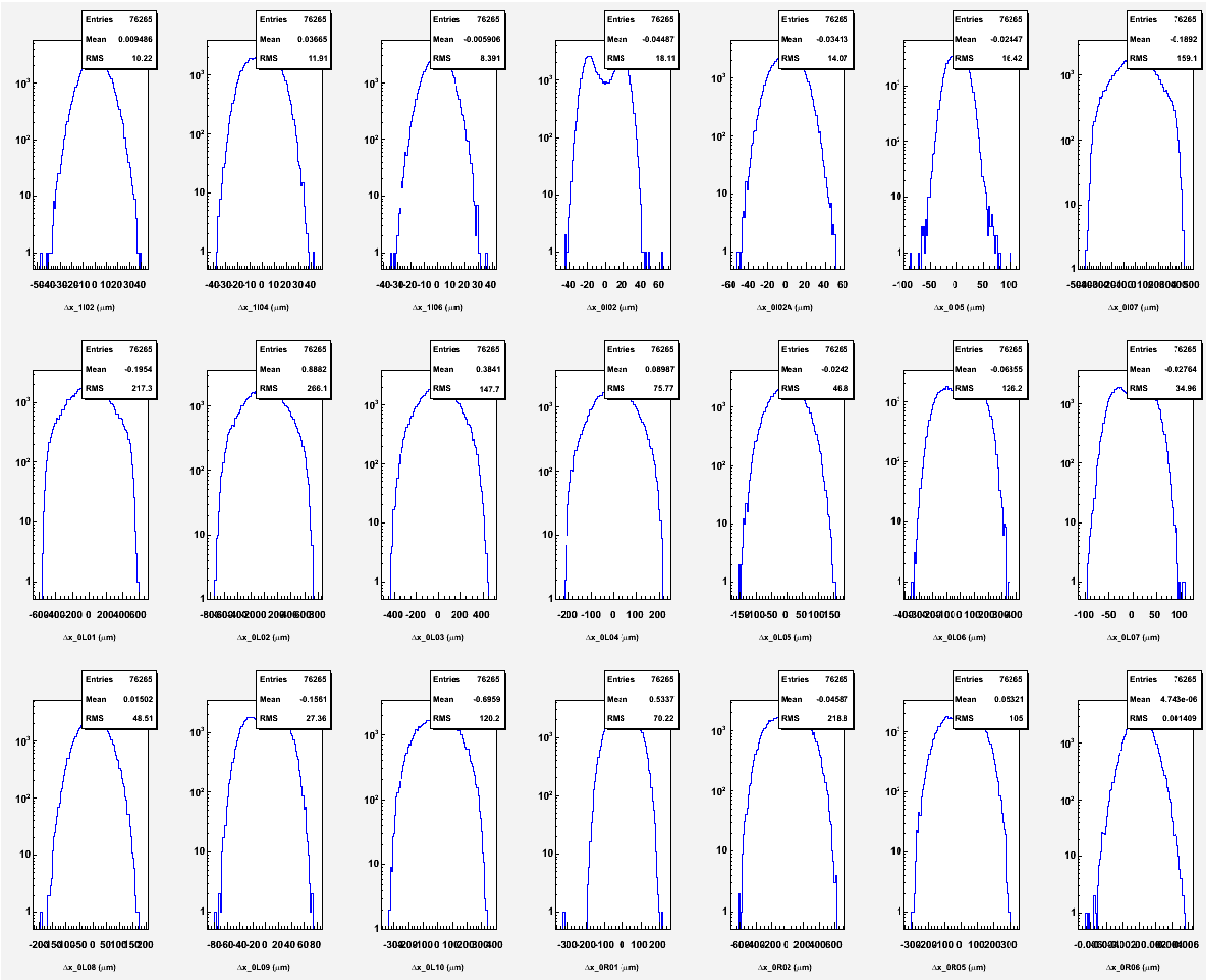
Entries 4969
Mean 1.524
RMS 2.765
Δx_1102 (μm)
Entries 4969
Mean -0.4482
RMS 9.775
Δy_1102 (μm)
Entries 4969
Mean -690.5
RMS 445
Acharge_1102 (ppm)
Entries 4969
Mean 1.368
RMS 6.842
Δx_1102 Block 1 (μm)
Entries 4969
Mean -0.904
RMS 14.63
Δy_1102 Block 1 (μm)
Entries 4969
Mean -721.4
RMS 1347
Acharge_1102 Block 1 (ppm)
Entries 4969
Mean 1.568
RMS 6.34
Δx_1102 Block 2 (μm)
Entries 4969
Mean -1.182
RMS 15.08
Δy_1102 Block 2 (μm)
Entries 4969
Mean -744.6
RMS 1318
Acharge_1102 Block 2 (ppm)
Entries 4969
Mean 1.766
RMS 6.38
Δx_1102 Block 3 (μm)
Entries 4969
Mean -0.7912
RMS 16.51
Δy_1102 Block 3 (μm)
Entries 4969
Mean -753.2
RMS 1354
Acharge_1102 Block 3 (ppm)
Entries 4969
Mean 1.55
RMS 6.308
Δx_1102 Block 4 (μm)
Entries 4969
Mean -0.4598
RMS 14.09
Δy_1102 Block 4 (μm)
Entries 4969
Mean -684.2
RMS 1313
Acharge_1102 Block 4 (ppm)

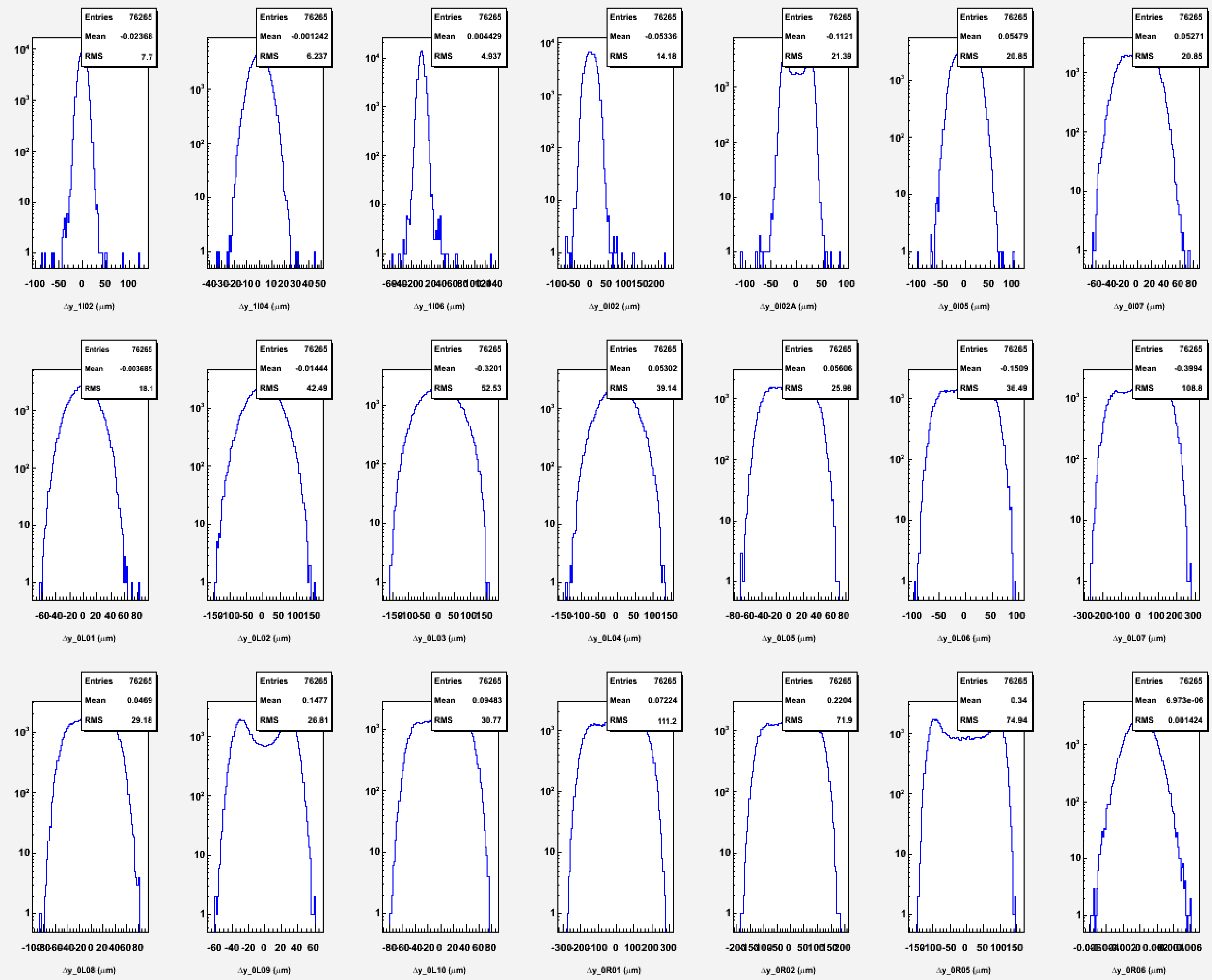
T-Settle Study (500, 200, 100, 60 µs)

- 250 Hz
  1. Run 391: PC OFF, IHWP IN, 500 µs
  2. Run 394: IHWP OUT, 500 µs
  3. Run 392: IHWP IN, 500 µs
  4. Run 395: IHWP IN, 200 µs
  5. Run 396: IHWP IN, 100 µs
  6. Run 397: IHWP IN, 60 µs

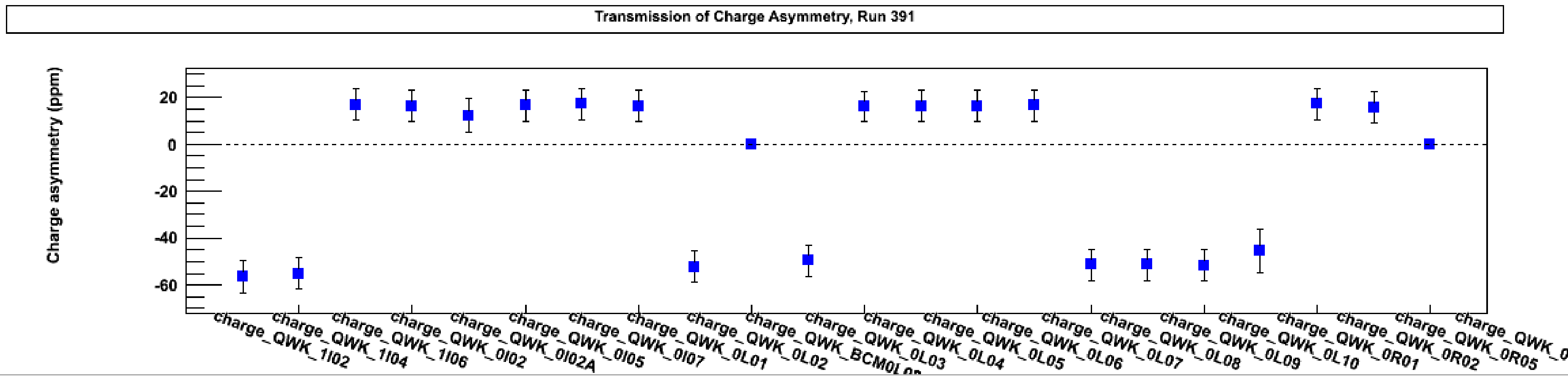


Entries 76265
Mean -56.32
RMS 1903
Acharge_1I02 (ppm)
Entries 76265
Mean -55.15
RMS 1872
Acharge_1I04 (ppm)
Entries 76265
Mean 16.82
RMS 1856
Acharge_1I06 (ppm)
Entries 76265
Mean 16.22
RMS 1838
Acharge_0I02 (ppm)
Entries 76265
Mean 12.28
RMS 1966
Acharge_0I02A (ppm)
Entries 76265
Mean 16.44
RMS 1798
Acharge_0I05 (ppm)
Entries 76265
Mean 17.08
RMS 1858
Acharge_0I07 (ppm)
Entries 76265
Mean 16.39
RMS 1840
Acharge_0L01 (ppm)
Entries 76265
Mean -52.12
RMS 1873
Acharge_0L02 (ppm)
Entries 76265
Mean 0.002419
RMS 1.905
-8 -6 -4 -2 0 2 4 6 8
Acharge_BCM0L02 (ppm)
Entries 76265
Mean -49.65
RMS 1839
Acharge_0L03 (ppm)
Entries 76265
Mean 15.94
RMS 1786
Acharge_0L04 (ppm)
Entries 76265
Mean 16.36
RMS 1844
Acharge_0L05 (ppm)
Entries 76265
Mean 16.33
RMS 1835
Acharge_0L06 (ppm)
Entries 76265
Mean 16.5
RMS 1842
Acharge_0L07 (ppm)
Entries 76265
Mean -51.4
RMS 1838
Acharge_0L08 (ppm)
Entries 76265
Mean -51.49
RMS 1831
Acharge_0L09 (ppm)
Entries 76265
Mean -51.66
RMS 1842
Acharge_0L10 (ppm)
Entries 76265
Mean -45.35
RMS 2607
0 100 200 300 400 500
Acharge_0R01 (ppm)
Entries 76265
Mean 17.14
RMS 1872
Acharge_0R02 (ppm)
Entries 76265
Mean 15.78
RMS 1833
Acharge_0R05 (ppm)
Entries 76265
Mean 2.621e-05
RMS 0.02782
-0.15 -0.1 -0.05 0 0.05 0.1 0.15
Acharge_0R06 (ppm)

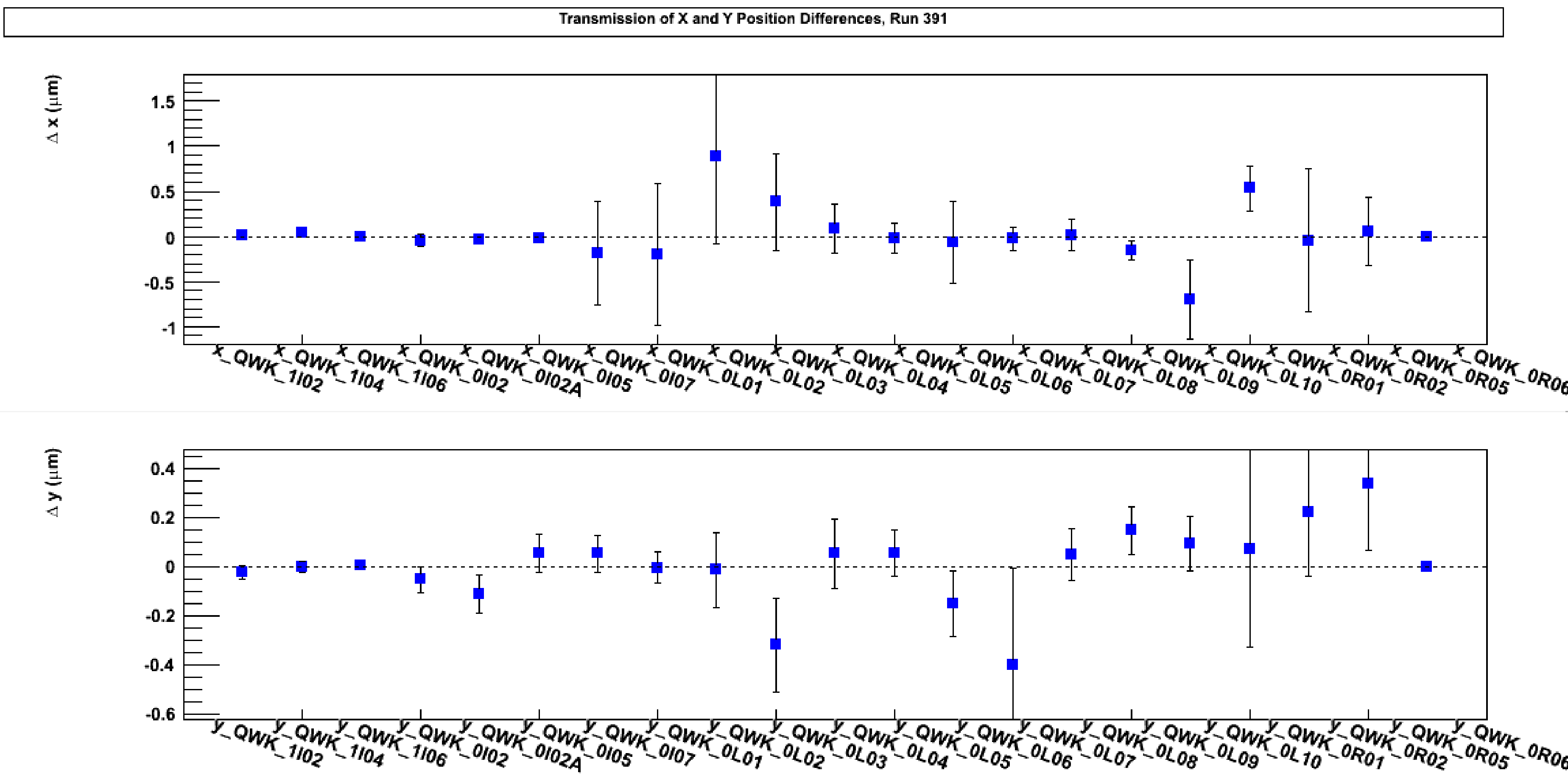

Entries 76265
Mean 0.009486
RMS 10.22
Δx_1I02 (μm)
Entries 76265
Mean 0.03665
RMS 11.91
Δx_1I04 (μm)
Entries 76265
Mean -0.005906
RMS 8.391
Δx_1I06 (μm)
Entries 76265
Mean -0.04487
RMS 18.11
Δx_0I02 (μm)
Entries 76265
Mean -0.03413
RMS 14.07
Δx_0I02A (μm)
Entries 76265
Mean -0.02447
RMS 16.42
Δx_0I05 (μm)
Entries 76265
Mean -0.1892
RMS 159.1
Δx_0I07 (μm)
Entries 76265
Mean -0.1954
RMS 217.3
Δx_0L01 (μm)
Entries 76265
Mean 0.8882
RMS 266.1
Δx_0L02 (μm)
Entries 76265
Mean 0.3841
RMS 147.7
Δx_0L03 (μm)
Entries 76265
Mean 0.08987
RMS 75.77
Δx_0L04 (μm)
Entries 76265
Mean -0.0242
RMS 46.8
Δx_0L05 (μm)
Entries 76265
Mean -0.06855
RMS 126.2
Δx_0L06 (μm)
Entries 76265
Mean -0.02764
RMS 34.96
Δx_0L07 (μm)
Entries 76265
Mean 0.01502
RMS 48.51
Δx_0L08 (μm)
Entries 76265
Mean -0.1561
RMS 27.36
Δx_0L09 (μm)
Entries 76265
Mean -0.6959
RMS 120.2
Δx_0L10 (μm)
Entries 76265
Mean 0.5337
RMS 70.22
Δx_0R01 (μm)
Entries 76265
Mean -0.04587
RMS 218.8
Δx_0R02 (μm)
Entries 76265
Mean 0.05321
RMS 105
Δx_0R05 (μm)
Entries 76265
Mean 4.743e-06
RMS 0.001409
Δx_0R06 (μm)



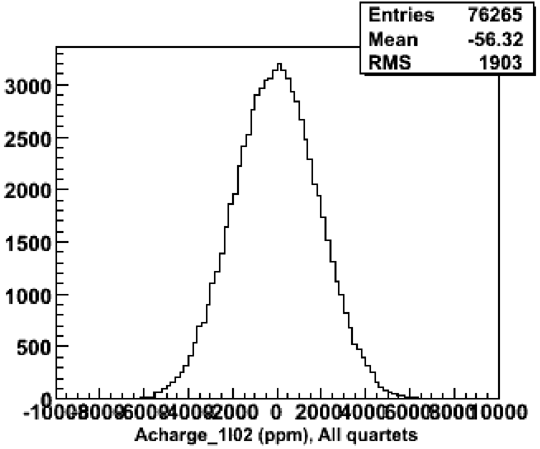
Entries 76265 Mean -0.02368 RMS 7.7
Δy_1I02 (μm)
Entries 76265 Mean -0.001242 RMS 6.237
Δy_1I04 (μm)
Entries 76265 Mean 0.004429 RMS 4.937
Δy_1I06 (μm)
Entries 76265 Mean -0.05336 RMS 14.18
Δy_0I02 (μm)
Entries 76265 Mean -0.1121 RMS 21.39
Δy_0I02A (μm)
Entries 76265 Mean 0.05479 RMS 20.85
Δy_0I05 (μm)
Entries 76265 Mean 0.05271 RMS 20.85
Δy_0I07 (μm)
Entries 76265 Mean -0.003685 RMS 18.1
Δy_0L01 (μm)
Entries 76265 Mean -0.01444 RMS 42.49
Δy_0L02 (μm)
Entries 76265 Mean -0.3201 RMS 52.53
Δy_0L03 (μm)
Entries 76265 Mean 0.05302 RMS 39.14
Δy_0L04 (μm)
Entries 76265 Mean 0.05606 RMS 25.98
Δy_0L05 (μm)
Entries 76265 Mean -0.1509 RMS 36.49
Δy_0L06 (μm)
Entries 76265 Mean -0.3994 RMS 108.8
Δy_0L07 (μm)
Entries 76265 Mean 0.0469 RMS 29.18
Δy_0L08 (μm)
Entries 76265 Mean 0.1477 RMS 26.81
Δy_0L09 (μm)
Entries 76265 Mean 0.09483 RMS 30.77
Δy_0L10 (μm)
Entries 76265 Mean 0.07224 RMS 111.2
Δy_0R01 (μm)
Entries 76265 Mean 0.2204 RMS 71.9
Δy_0R02 (μm)
Entries 76265 Mean 0.34 RMS 74.94
Δy_0R05 (μm)
Entries 76265 Mean 6.973e-06 RMS 0.001424
Δy_0R06 (μm)



Transmission of Charge Asymmetry, Run 391
Charge asymmetry (ppm)
20
0
-20
-40
-60
charge_QWK_1I02
charge_QWK_1I04
charge_QWK_1I06
charge_QWK_0I02
charge_QWK_0I02A
charge_QWK_0I05
charge_QWK_0I07
charge_QWK_0L01
charge_QWK_0L02
charge_QWK_0L03
charge_QWK_0L04
charge_QWK_0L05
charge_QWK_0L06
charge_QWK_0L07
charge_QWK_0L08
charge_QWK_0L09
charge_QWK_0L10
charge_QWK_0R01
charge_QWK_0R02
charge_QWK_0R05

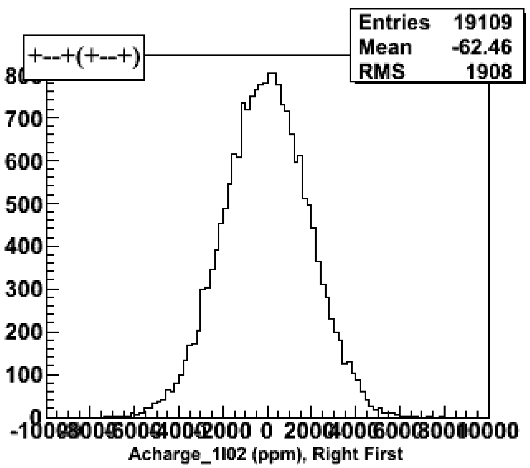


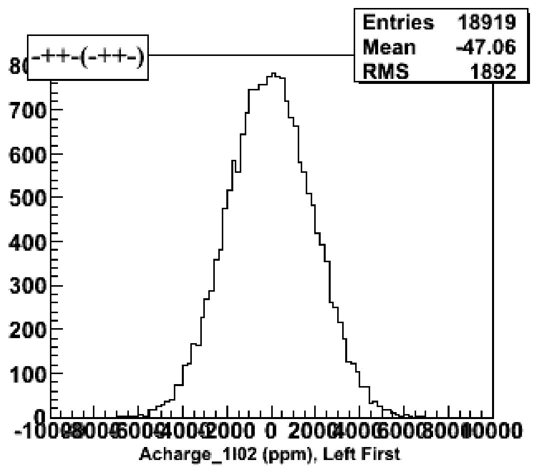
Transmission of X and Y Position Differences, Run 391
Δ x (μm)
1.5
1
0.5
0
-0.5
-1
x_QWK_1I02
x_QWK_1I04
x_QWK_1I06
x_QWK_0I02
x_QWK_0I02A
x_QWK_0I05
x_QWK_0I07
x_QWK_0L01
x_QWK_0L02
x_QWK_0L03
x_QWK_0L04
x_QWK_0L05
x_QWK_0L06
x_QWK_0L07
x_QWK_0L08
x_QWK_0L09
x_QWK_0L10
x_QWK_0R01
x_QWK_0R02
x_QWK_0R05
Δ y (μm)
0.4
0.2
0
-0.2
-0.4
-0.6
y_QWK_1I02
y_QWK_1I04
y_QWK_1I06
y_QWK_0I02
y_QWK_0I02A
y_QWK_0I05
y_QWK_0I07
y_QWK_0L01
y_QWK_0L02
y_QWK_0L03
y_QWK_0L04
y_QWK_0L05
y_QWK_0L06
y_QWK_0L07
y_QWK_0L08
y_QWK_0L09
y_QWK_0L10
y_QWK_0R01
y_QWK_0R02
y_QWK_0R05

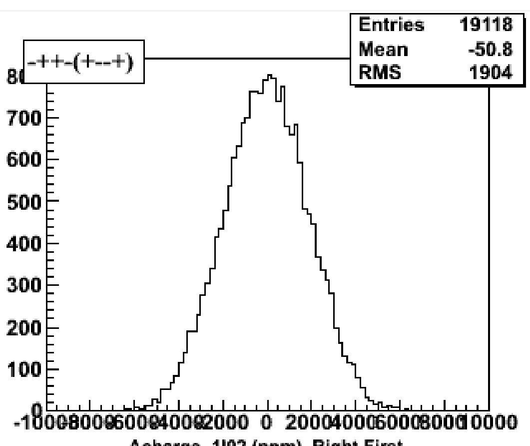


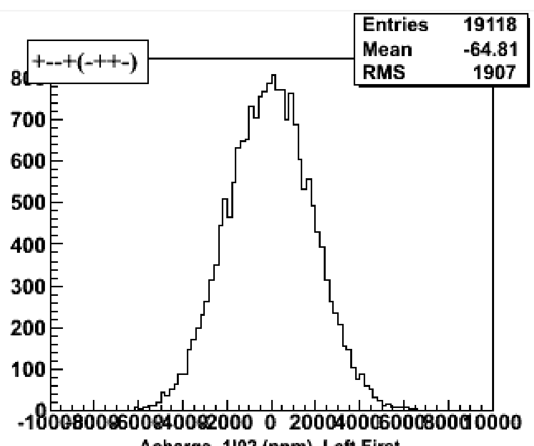
Run 391

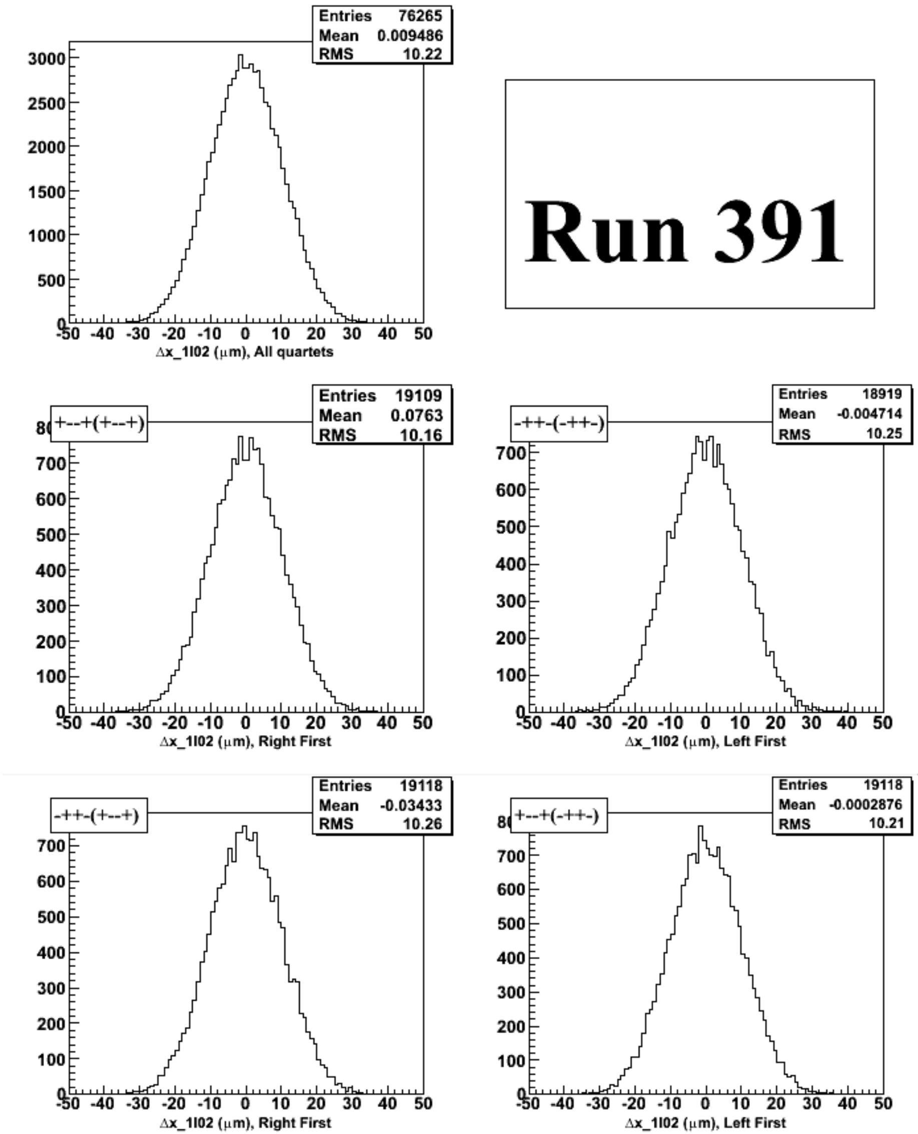
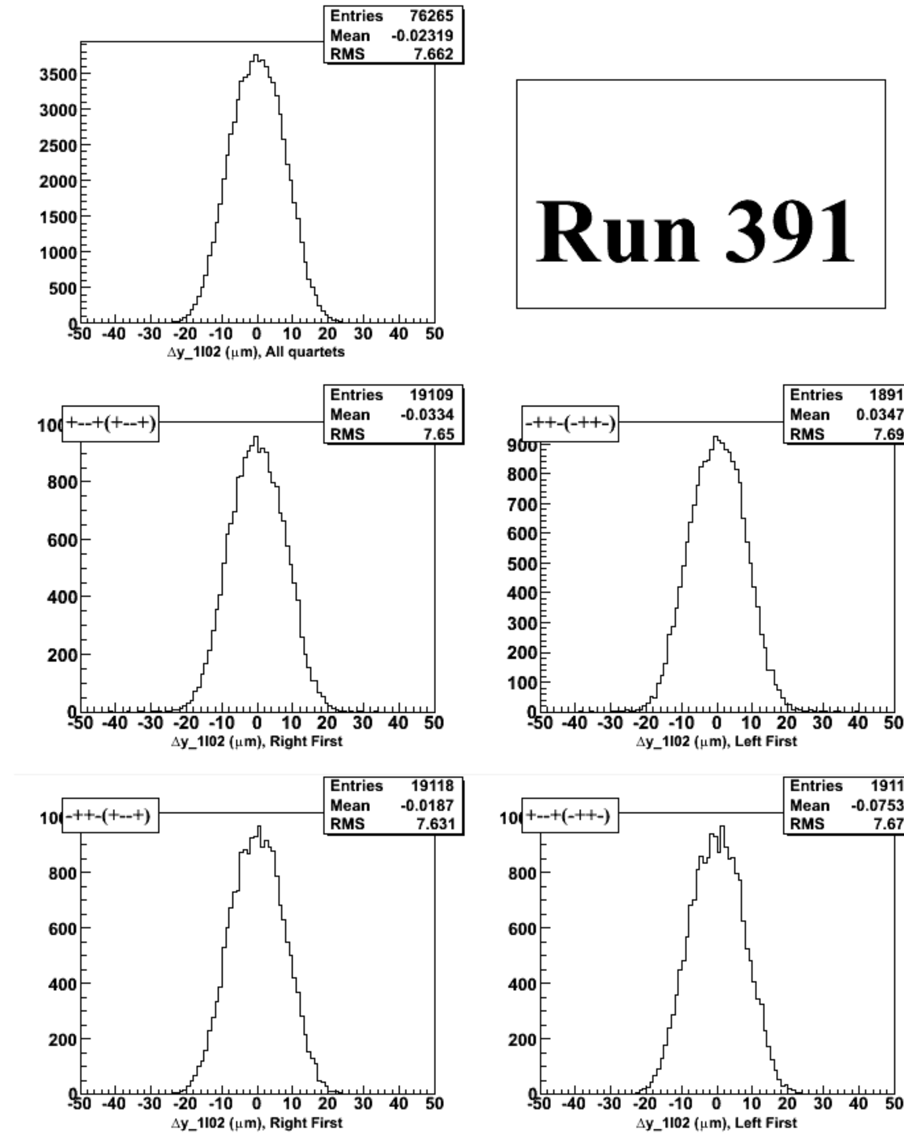
Charge Asymmetry

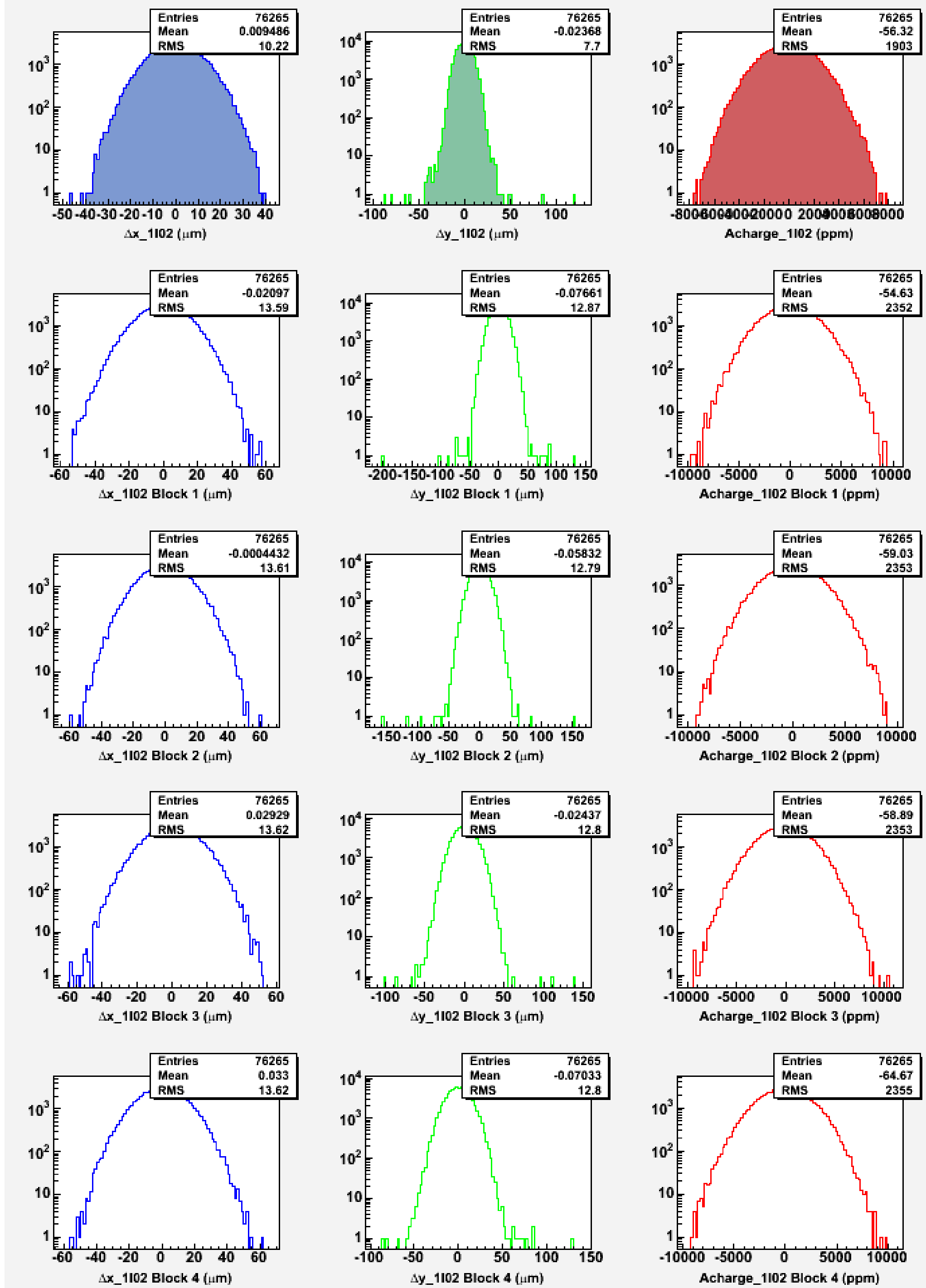


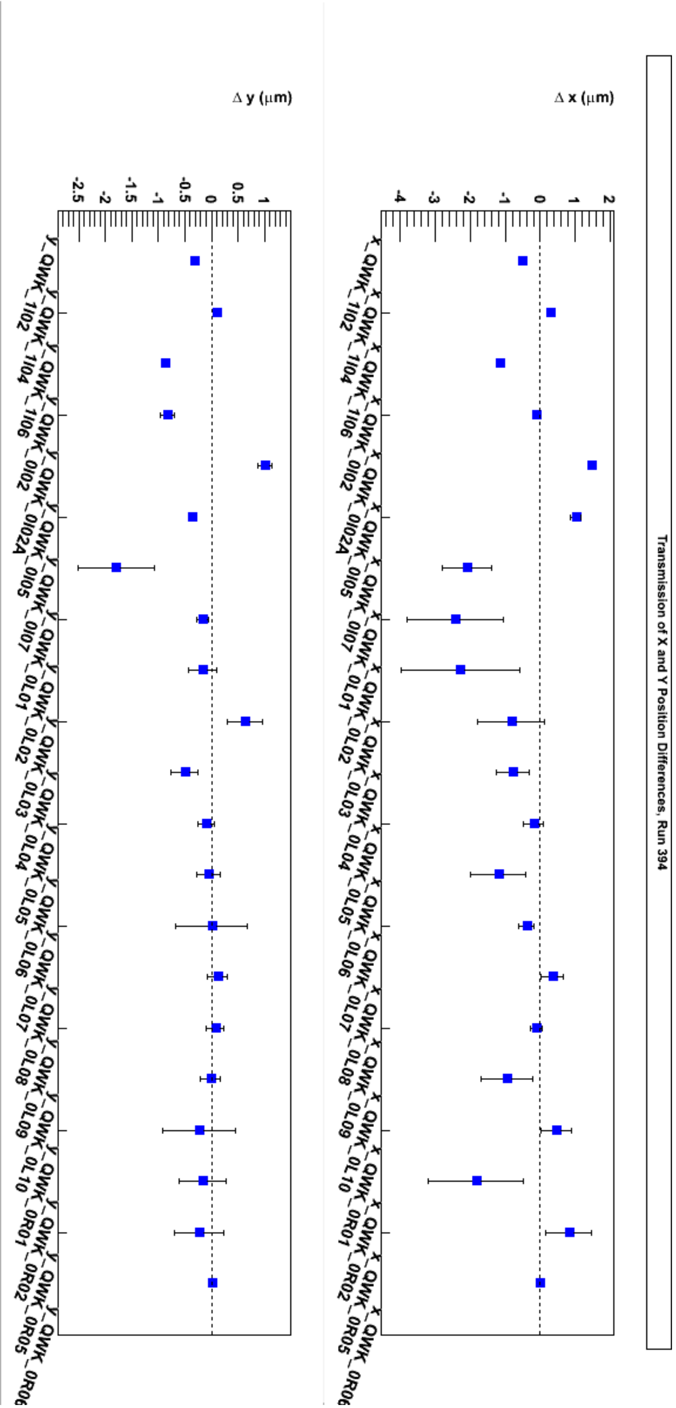


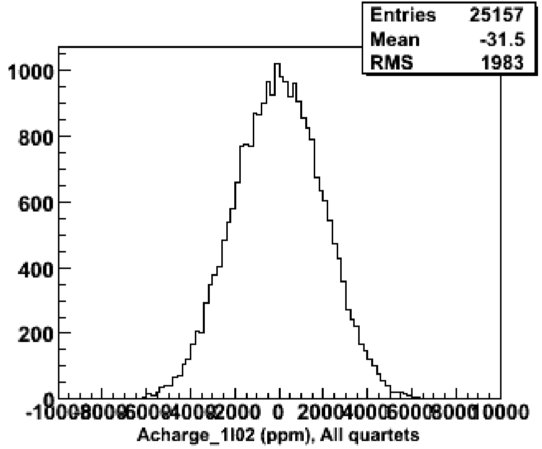





Entries 76265
Mean 0.009486
RMS 10.22
Δx_1l02 (μm), All quartets
Run 391
+--+(+--+)
Entries 19109
Mean 0.0763
RMS 10.16
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 18919
Mean -0.004714
RMS 10.25
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 19118
Mean -0.03433
RMS 10.26
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 19118
Mean -0.0002876
RMS 10.21
Δx_1l02 (μm), Left First

Entries 76265
Mean -0.02319
RMS 7.662
Δy_1l02 (μm), All quartets
Run 391
+--+(+--+)
Entries 19109
Mean -0.0334
RMS 7.65
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 18919
Mean 0.03478
RMS 7.692
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 19118
Mean -0.0187
RMS 7.631
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 19118
Mean -0.07537
RMS 7.673
Δy_1l02 (μm), Left First

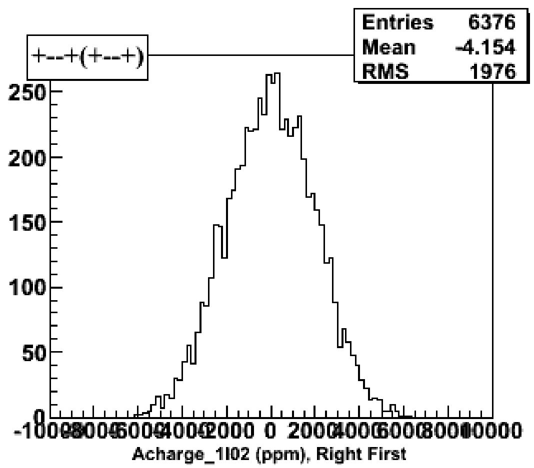

Entries 76265
Mean 0.009486
RMS 10.22
Δx_1l02 (μm)
Entries 76265
Mean -0.02368
RMS 7.7
Δy_1l02 (μm)
Entries 76265
Mean -56.32
RMS 1903
Acharge_1l02 (ppm)
Entries 76265
Mean -0.02097
RMS 13.59
Δx_1l02 Block 1 (μm)
Entries 76265
Mean -0.07661
RMS 12.87
Δy_1l02 Block 1 (μm)
Entries 76265
Mean -54.63
RMS 2352
Acharge_1l02 Block 1 (ppm)
Entries 76265
Mean -0.0004432
RMS 13.61
Δx_1l02 Block 2 (μm)
Entries 76265
Mean -0.05832
RMS 12.79
Δy_1l02 Block 2 (μm)
Entries 76265
Mean -59.03
RMS 2353
Acharge_1l02 Block 2 (ppm)
Entries 76265
Mean 0.02929
RMS 13.62
Δx_1l02 Block 3 (μm)
Entries 76265
Mean -0.02437
RMS 12.8
Δy_1l02 Block 3 (μm)
Entries 76265
Mean -58.89
RMS 2353
Acharge_1l02 Block 3 (ppm)
Entries 76265
Mean 0.033
RMS 13.62
Δx_1l02 Block 4 (μm)
Entries 76265
Mean -0.07033
RMS 12.8
Δy_1l02 Block 4 (μm)
Entries 76265
Mean -64.67
RMS 2355
Acharge_1l02 Block 4 (ppm)

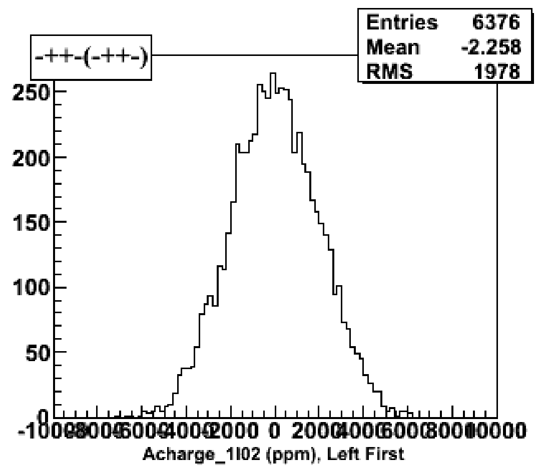


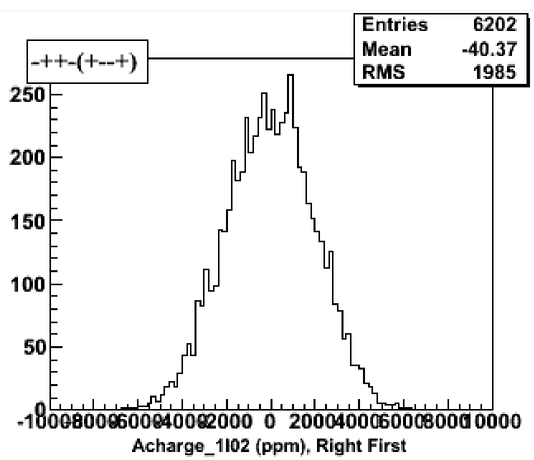


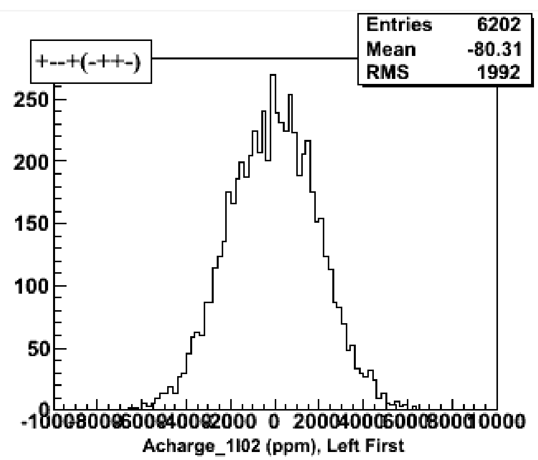
Run 394

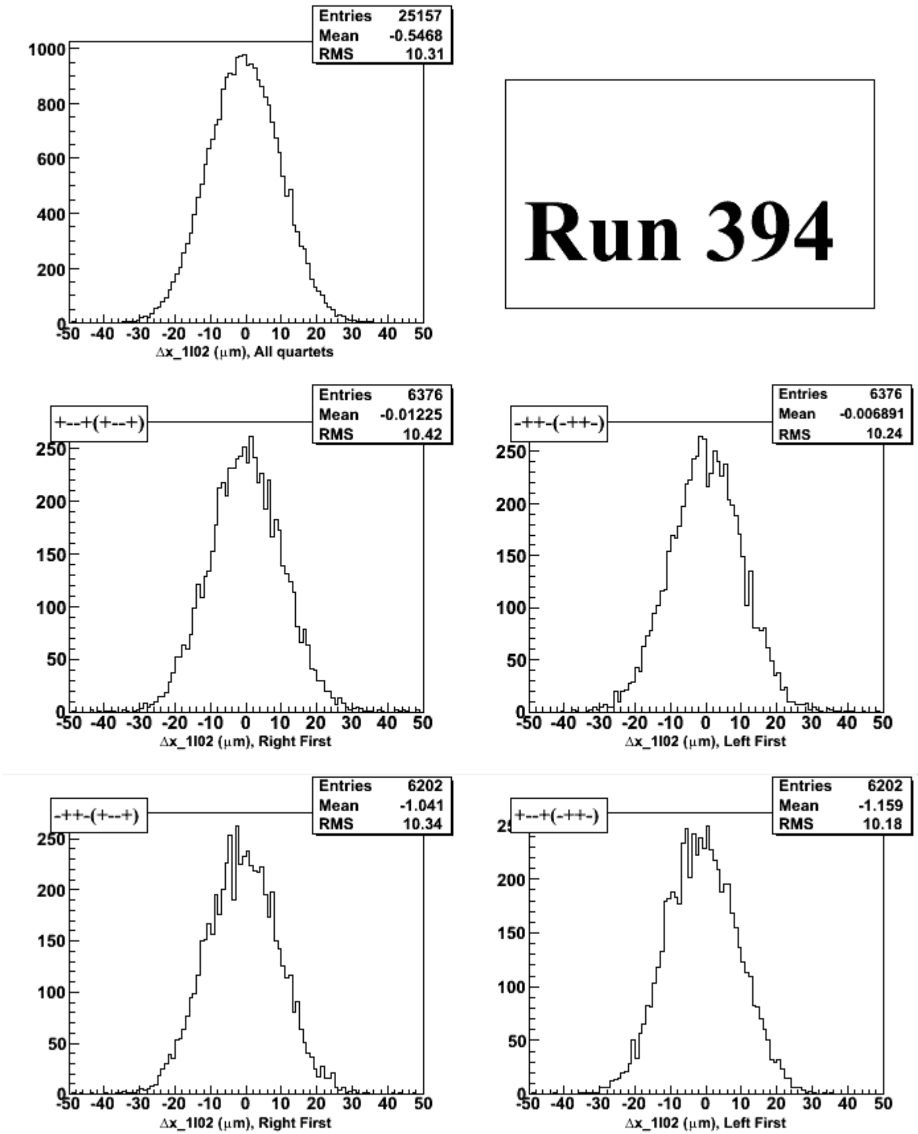
Charge Asymmetry

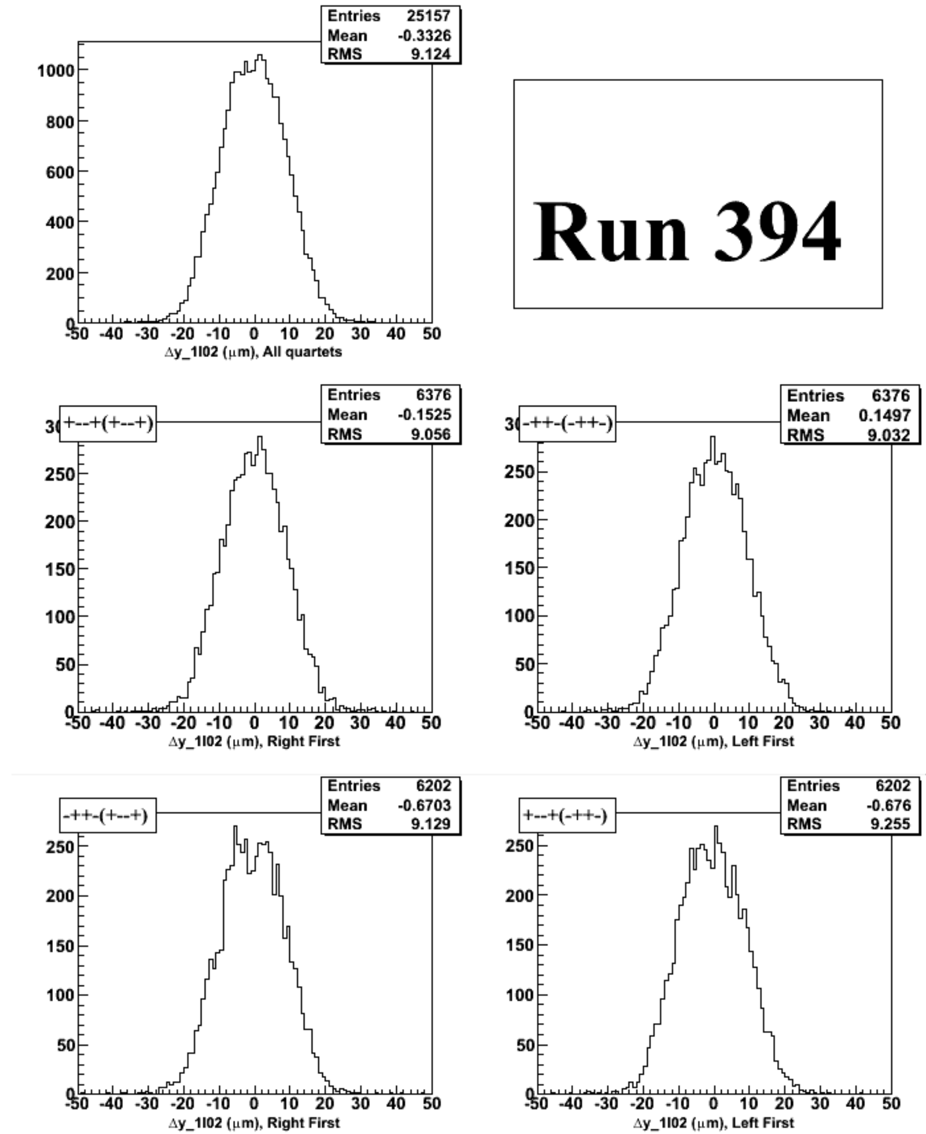


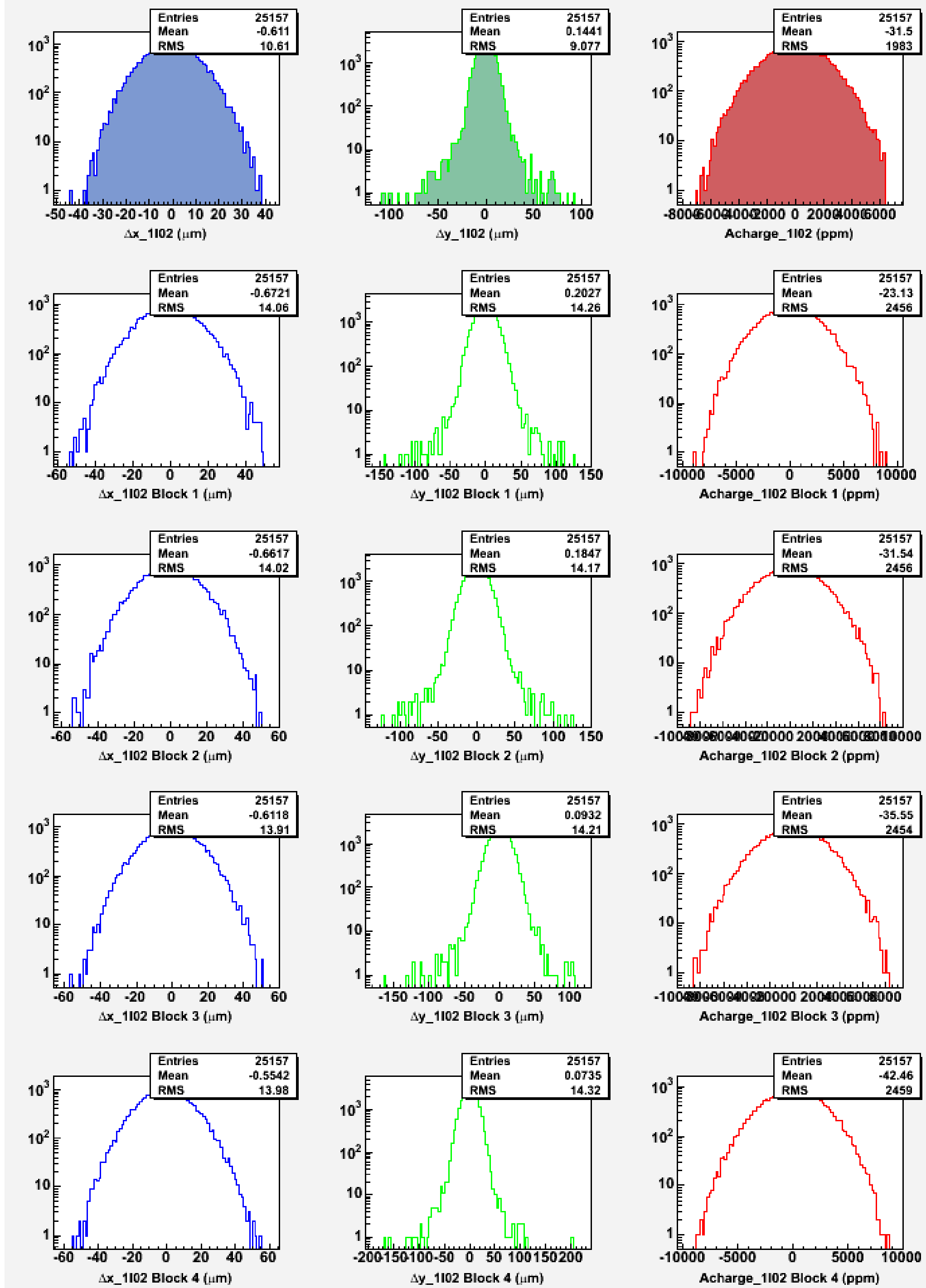


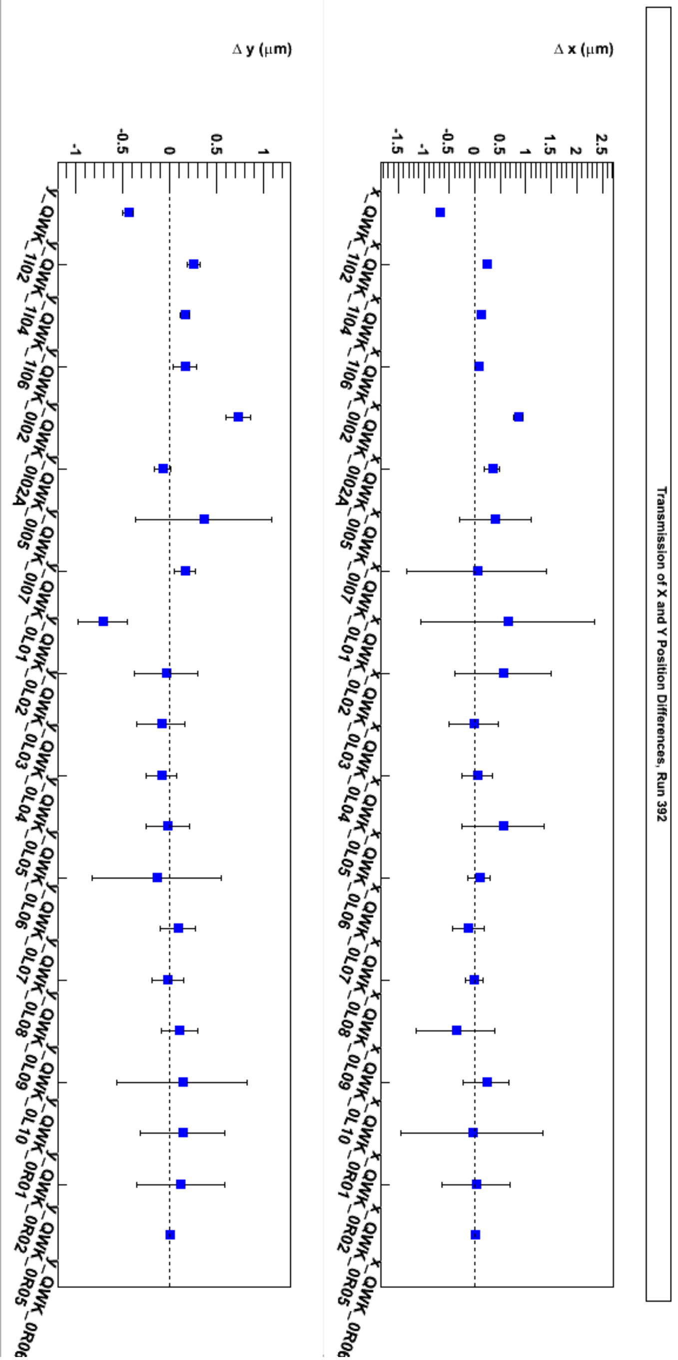


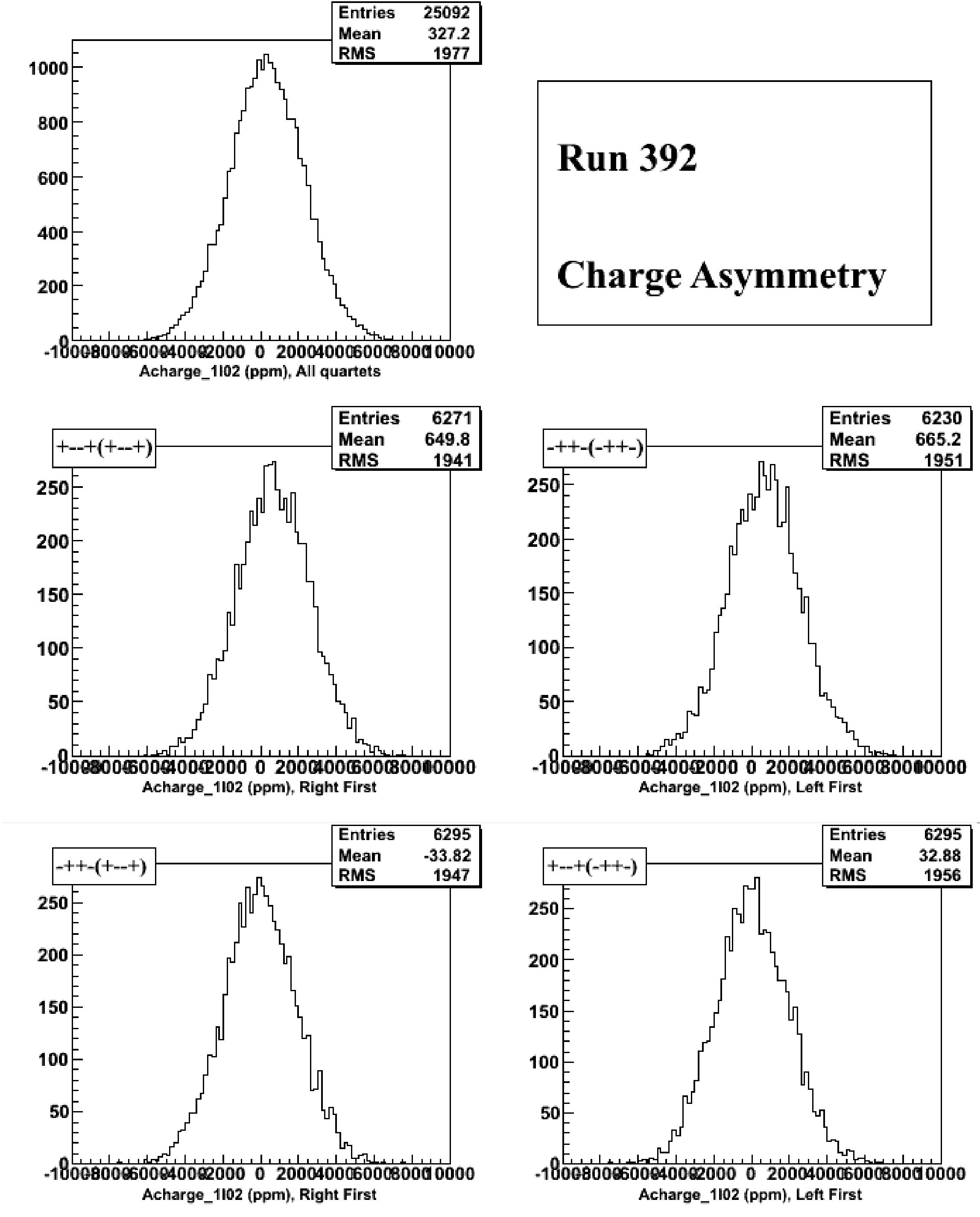


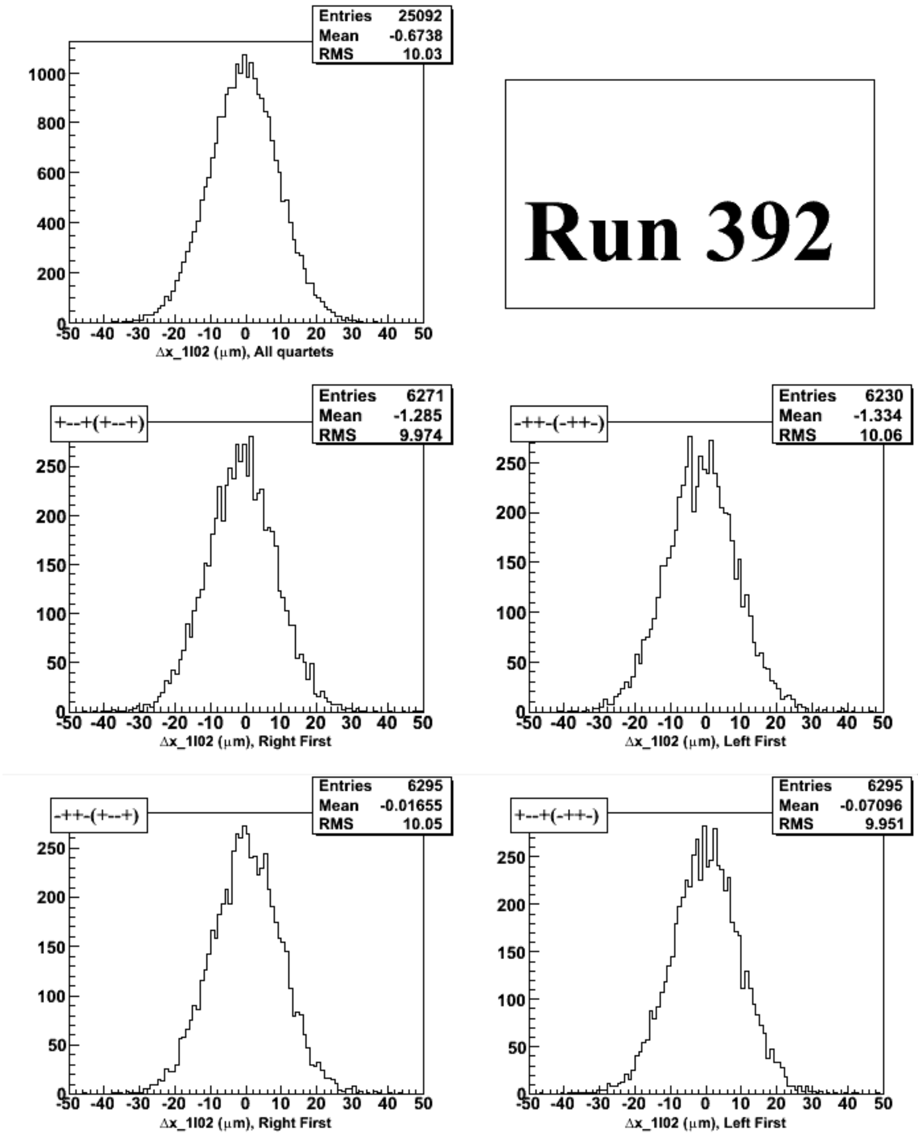

Run 394
Entries 25157
Mean -0.5468
RMS 10.31
Δx_1l02 (μm), All quartets
+--+(+--+)
Entries 6376
Mean -0.01225
RMS 10.42
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 6376
Mean -0.006891
RMS 10.24
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 6202
Mean -1.041
RMS 10.34
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 6202
Mean -1.159
RMS 10.18
Δx_1l02 (μm), Left First

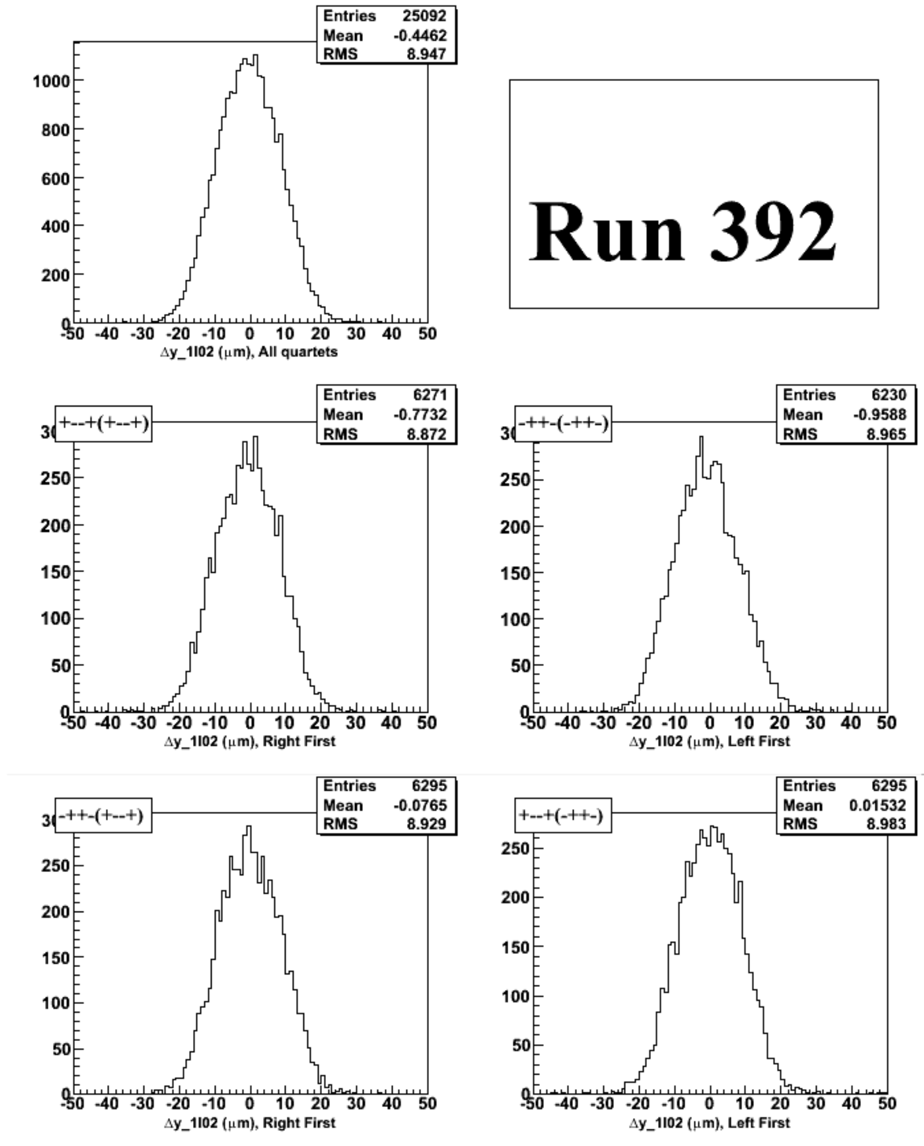

Run 394
Entries 25157
Mean -0.3326
RMS 9.124
Δy_1l02 (μm), All quartets
+--+(+--+)
Entries 6376
Mean -0.1525
RMS 9.056
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 6376
Mean 0.1497
RMS 9.032
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 6202
Mean -0.6703
RMS 9.129
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 6202
Mean -0.676
RMS 9.255
Δy_1l02 (μm), Left First

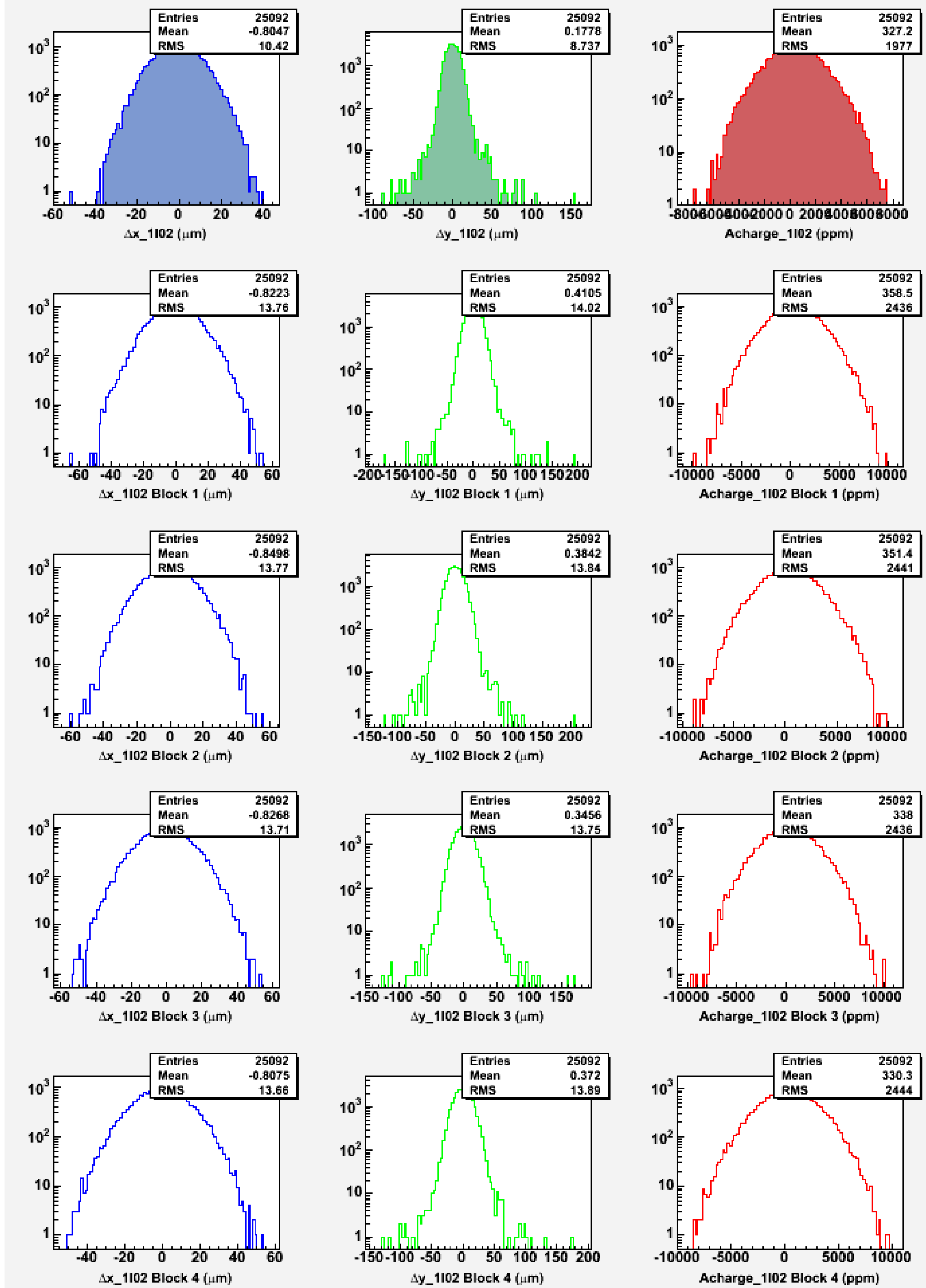

Entries 25157
Mean -0.611
RMS 10.61
Δx_1I02 (μm)
Entries 25157
Mean 0.1441
RMS 9.077
Δy_1I02 (μm)
Entries 25157
Mean -31.5
RMS 1983
Acharge_1I02 (ppm)
Entries 25157
Mean -0.6721
RMS 14.06
Δx_1I02 Block 1 (μm)
Entries 25157
Mean 0.2027
RMS 14.26
Δy_1I02 Block 1 (μm)
Entries 25157
Mean -23.13
RMS 2456
Acharge_1I02 Block 1 (ppm)
Entries 25157
Mean -0.6617
RMS 14.02
Δx_1I02 Block 2 (μm)
Entries 25157
Mean 0.1847
RMS 14.17
Δy_1I02 Block 2 (μm)
Entries 25157
Mean -31.54
RMS 2456
Acharge_1I02 Block 2 (ppm)
Entries 25157
Mean -0.6118
RMS 13.91
Δx_1I02 Block 3 (μm)
Entries 25157
Mean 0.0932
RMS 14.21
Δy_1I02 Block 3 (μm)
Entries 25157
Mean -35.55
RMS 2454
Acharge_1I02 Block 3 (ppm)
Entries 25157
Mean -0.5542
RMS 13.98
Δx_1I02 Block 4 (μm)
Entries 25157
Mean 0.0735
RMS 14.32
Δy_1I02 Block 4 (μm)
Entries 25157
Mean -42.46
RMS 2459
Acharge_1I02 Block 4 (ppm)


Transmission of X and Y Position Differences, Run 392
Δ y (μm)
Δ x (μm)

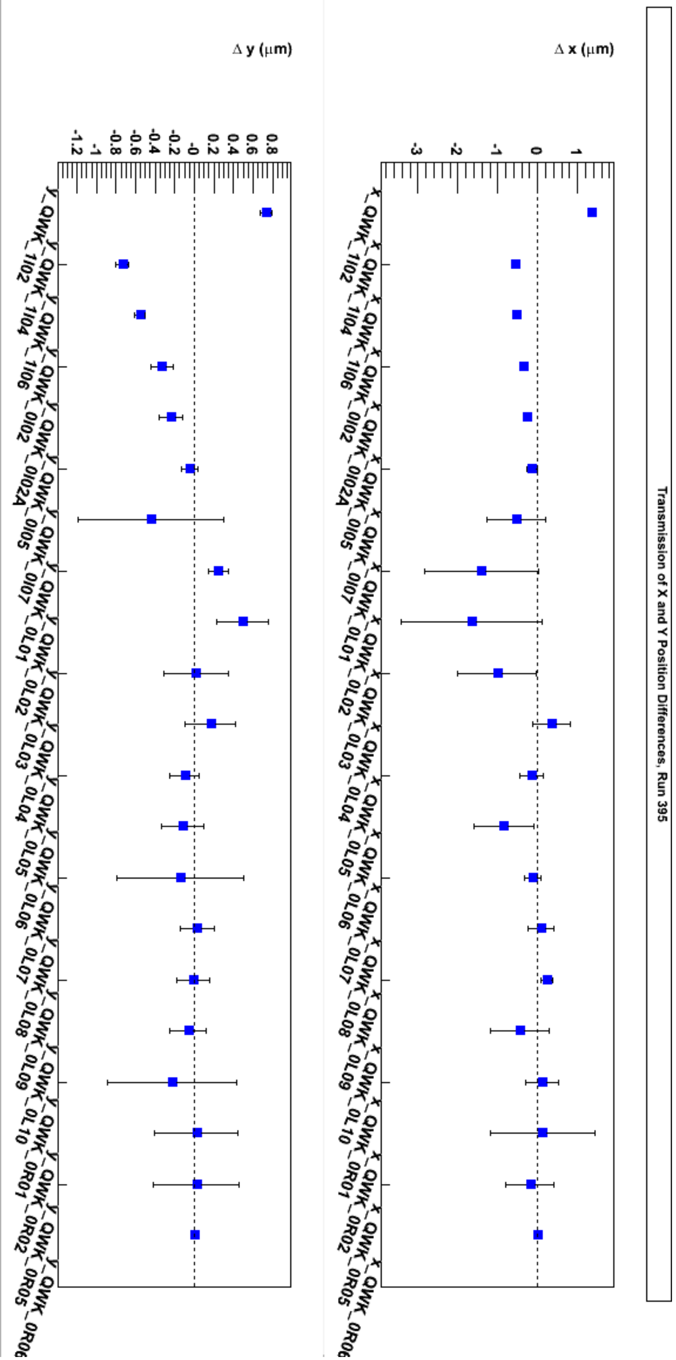

Run 392
Charge Asymmetry
Entries 25092
Mean 327.2
RMS 1977
Acharge_1I02 (ppm), All quartets
+--+(+--+)
Entries 6271
Mean 649.8
RMS 1941
Acharge_1I02 (ppm), Right First
-++-(-++-)
Entries 6230
Mean 665.2
RMS 1951
Acharge_1I02 (ppm), Left First
-++-(+--+)
Entries 6295
Mean -33.82
RMS 1947
Acharge_1I02 (ppm), Right First
+--+(-++-)
Entries 6295
Mean 32.88
RMS 1956
Acharge_1I02 (ppm), Left First

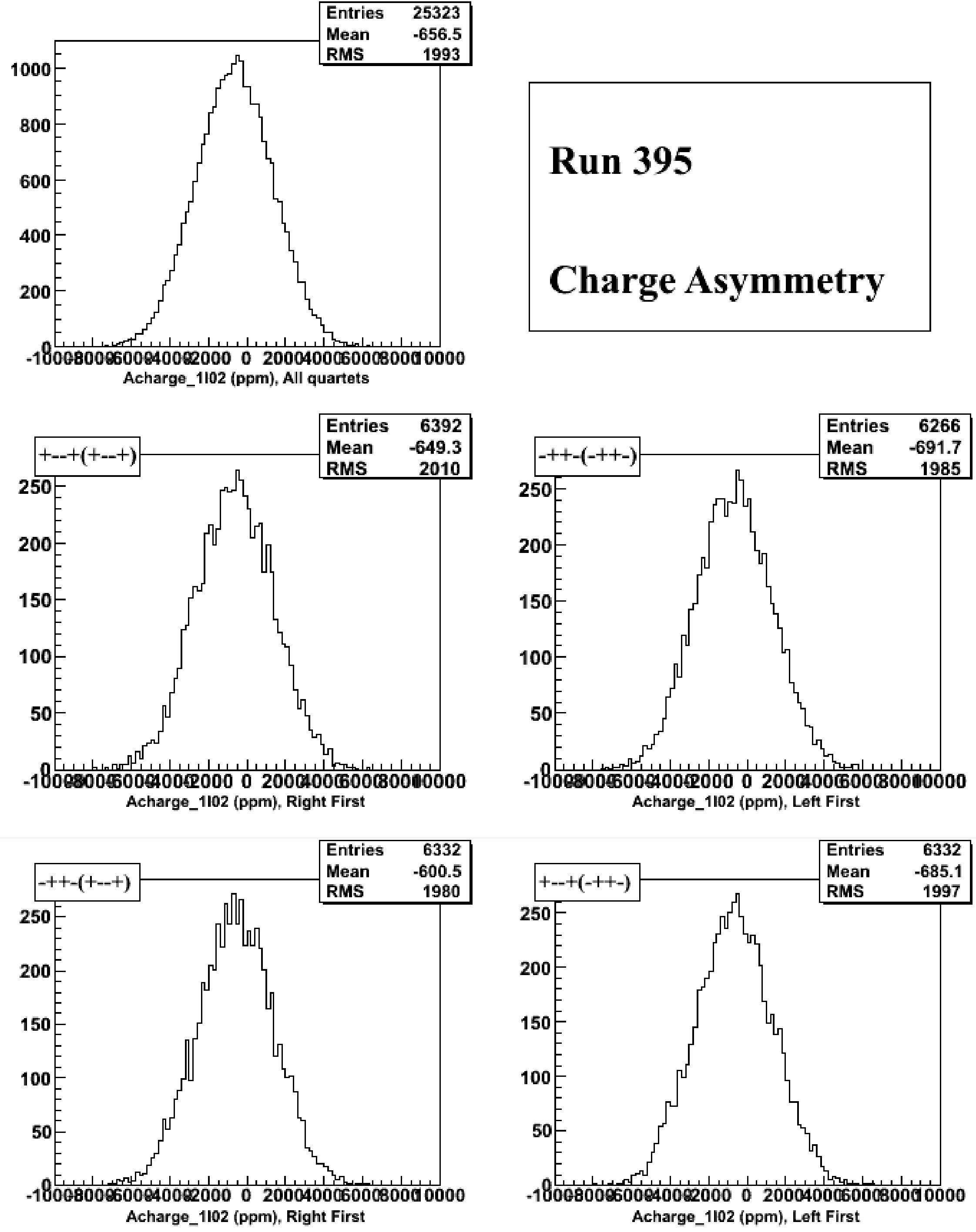

Entries 25092
Mean -0.6738
RMS 10.03
Δx_1l02 (μm), All quartets
Run 392
+--+(+--+)
Entries 6271
Mean -1.285
RMS 9.974
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 6230
Mean -1.334
RMS 10.06
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 6295
Mean -0.01655
RMS 10.05
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 6295
Mean -0.07096
RMS 9.951
Δx_1l02 (μm), Left First


Entries 25092
Mean -0.4462
RMS 8.947
Δy_1l02 (μm), All quartets
Run 392
+--+(+--+)
Entries 6271
Mean -0.7732
RMS 8.872
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 6230
Mean -0.9588
RMS 8.965
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 6295
Mean -0.0765
RMS 8.929
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 6295
Mean 0.01532
RMS 8.983
Δy_1l02 (μm), Left First



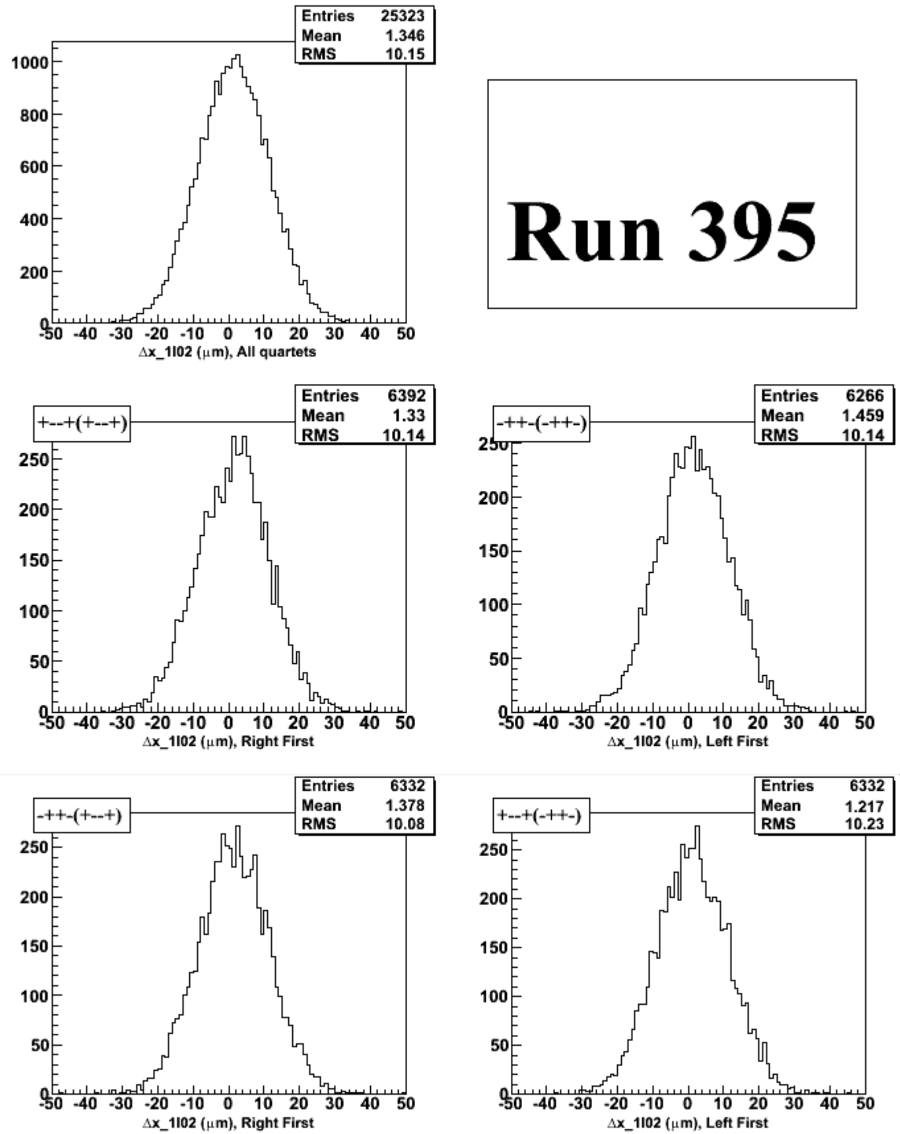
Entries 25092
Mean -0.8047
RMS 10.42
Δx_1I02 (μm)
Entries 25092
Mean 0.1778
RMS 8.737
Δy_1I02 (μm)
Entries 25092
Mean 327.2
RMS 1977
Acharge_1I02 (ppm)
Entries 25092
Mean -0.8223
RMS 13.76
Δx_1I02 Block 1 (μm)
Entries 25092
Mean 0.4105
RMS 14.02
Δy_1I02 Block 1 (μm)
Entries 25092
Mean 358.5
RMS 2436
Acharge_1I02 Block 1 (ppm)
Entries 25092
Mean -0.8498
RMS 13.77
Δx_1I02 Block 2 (μm)
Entries 25092
Mean 0.3842
RMS 13.84
Δy_1I02 Block 2 (μm)
Entries 25092
Mean 351.4
RMS 2441
Acharge_1I02 Block 2 (ppm)
Entries 25092
Mean -0.8268
RMS 13.71
Δx_1I02 Block 3 (μm)
Entries 25092
Mean 0.3456
RMS 13.75
Δy_1I02 Block 3 (μm)
Entries 25092
Mean 338
RMS 2436
Acharge_1I02 Block 3 (ppm)
Entries 25092
Mean -0.8075
RMS 13.66
Δx_1I02 Block 4 (μm)
Entries 25092
Mean 0.372
RMS 13.89
Δy_1I02 Block 4 (μm)
Entries 25092
Mean 330.3
RMS 2444
Acharge_1I02 Block 4 (ppm)

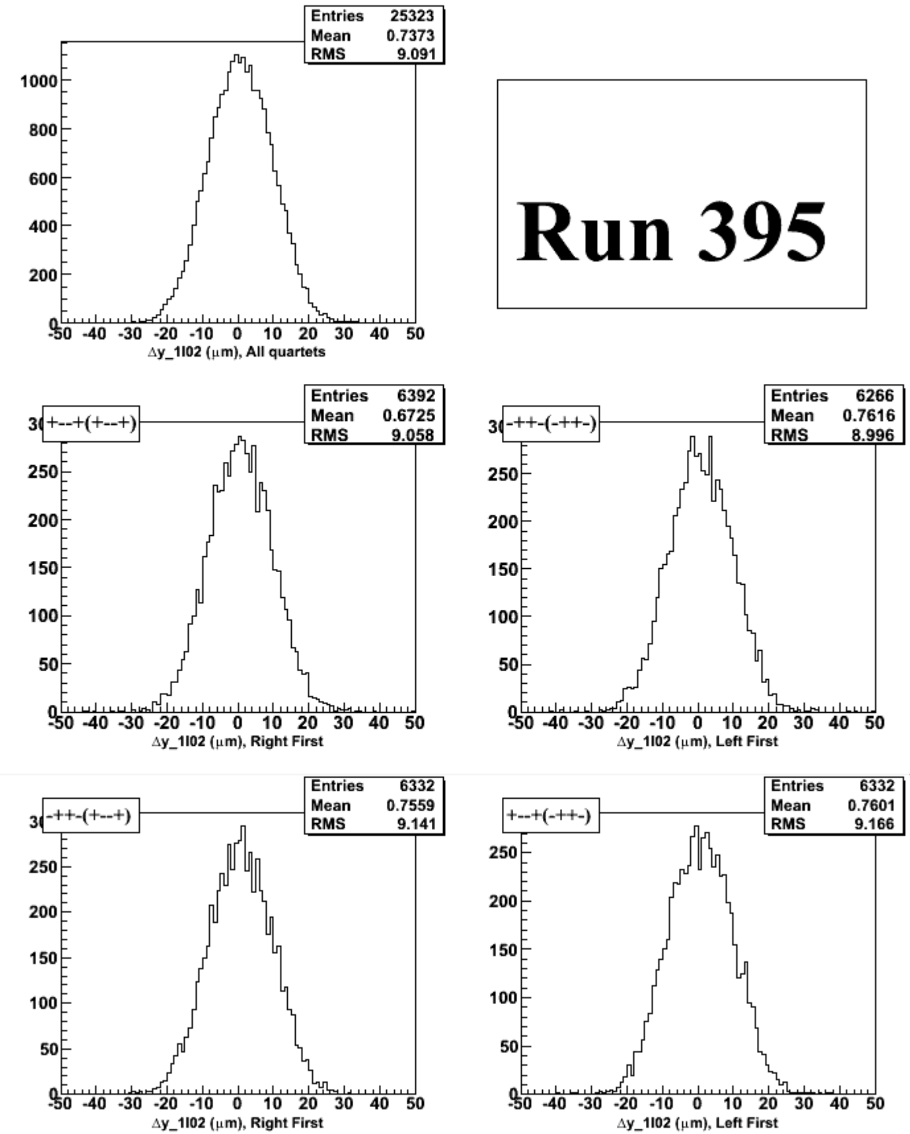


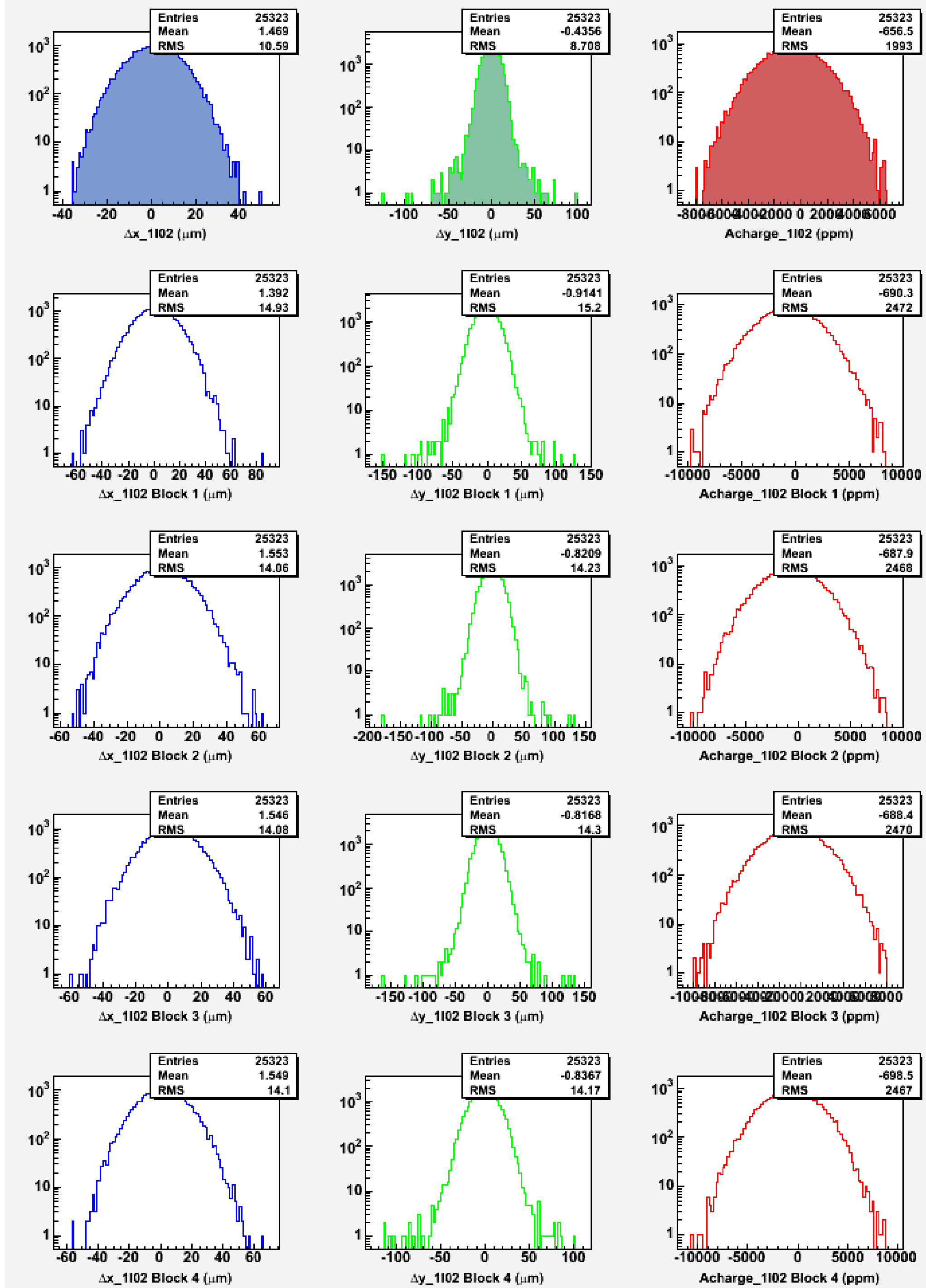


Run 395

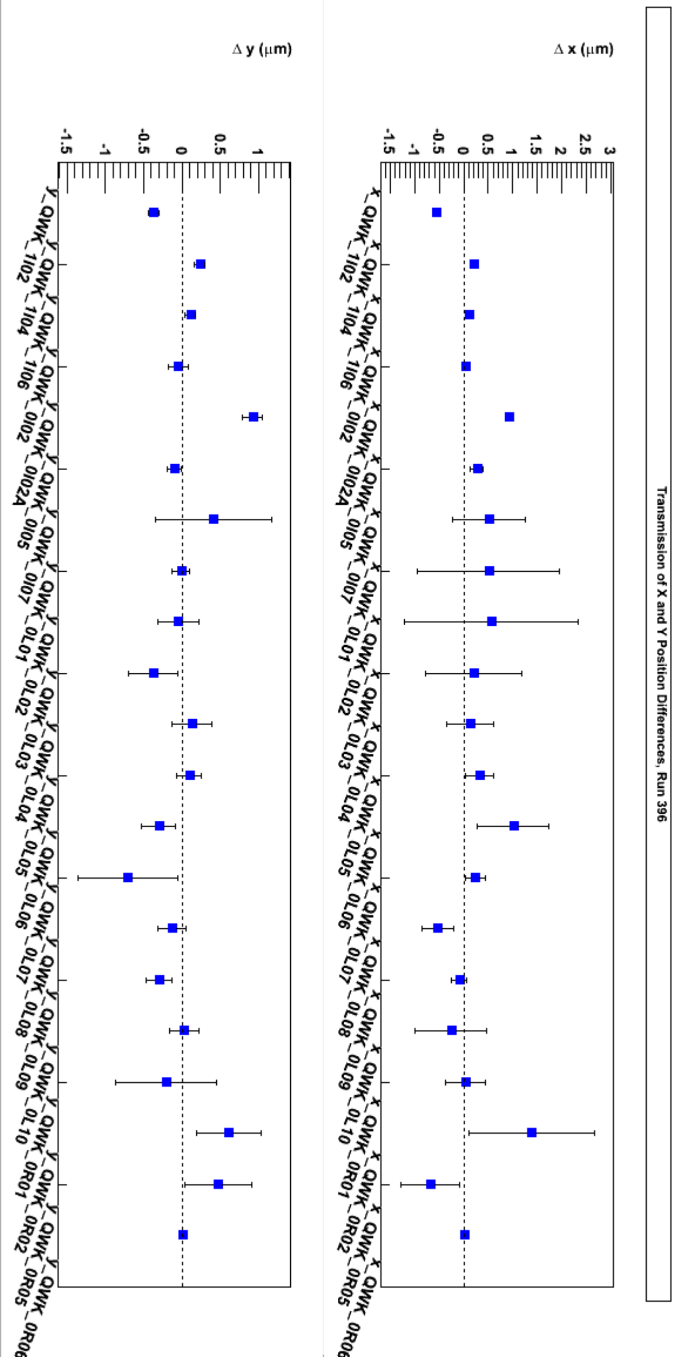
Charge Asymmetry

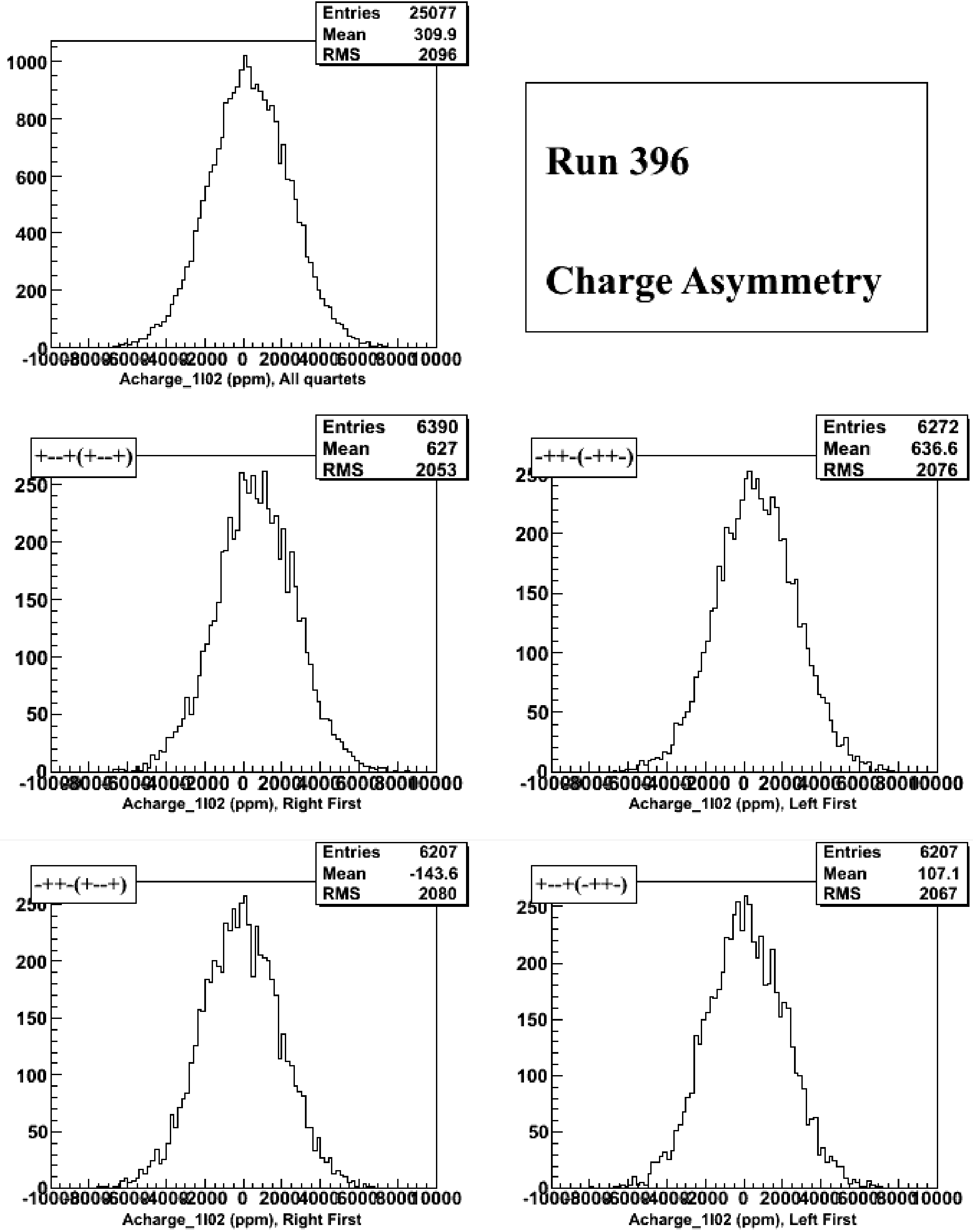

Run 395
Entries 25323
Mean 1.346
RMS 10.15
Δx_1l02 (μm), All quartets
+--+(+--+)
Entries 6392
Mean 1.33
RMS 10.14
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 6266
Mean 1.459
RMS 10.14
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 6332
Mean 1.378
RMS 10.08
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 6332
Mean 1.217
RMS 10.23
Δx_1l02 (μm), Left First

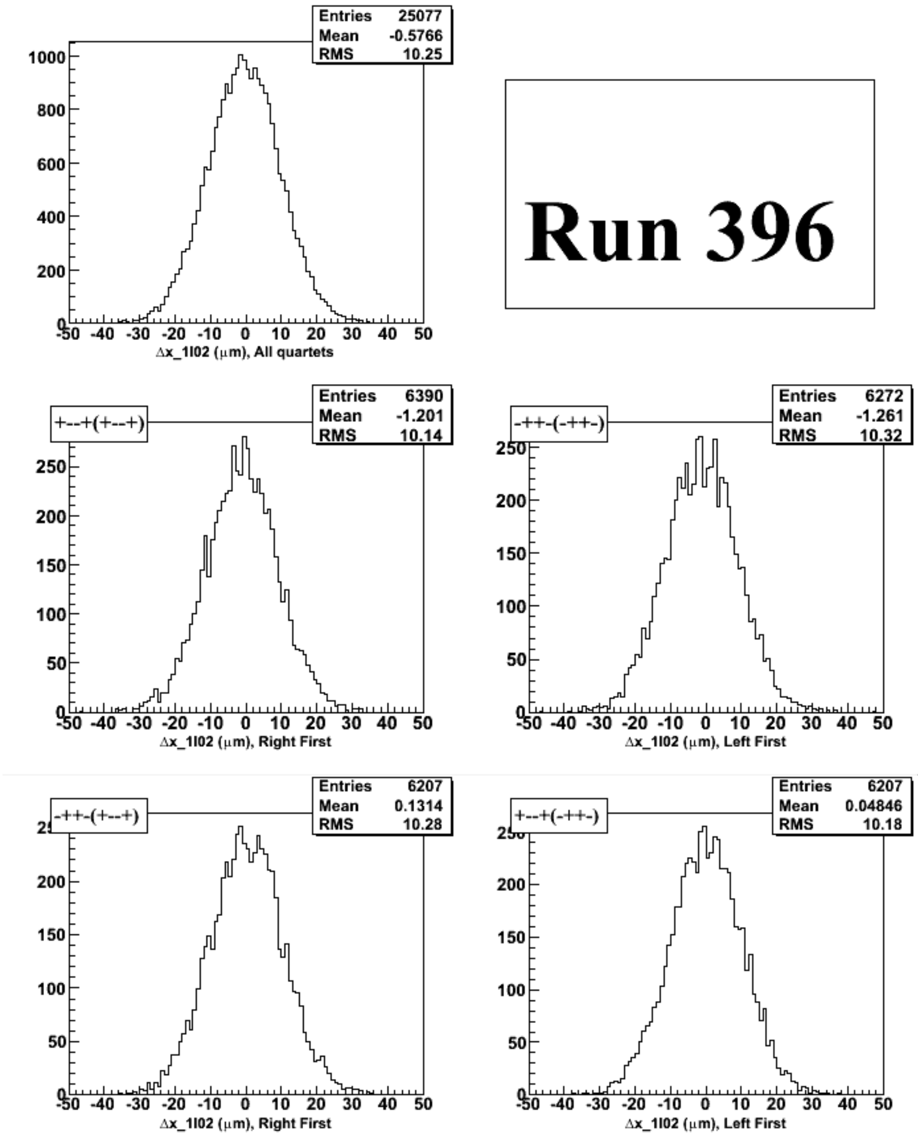

Run 395
Entries 25323
Mean 0.7373
RMS 9.091
Δy_1l02 (μm), All quartets
+--+(+--+)
Entries 6392
Mean 0.6725
RMS 9.058
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 6266
Mean 0.7616
RMS 8.996
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 6332
Mean 0.7559
RMS 9.141
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 6332
Mean 0.7601
RMS 9.166
Δy_1l02 (μm), Left First

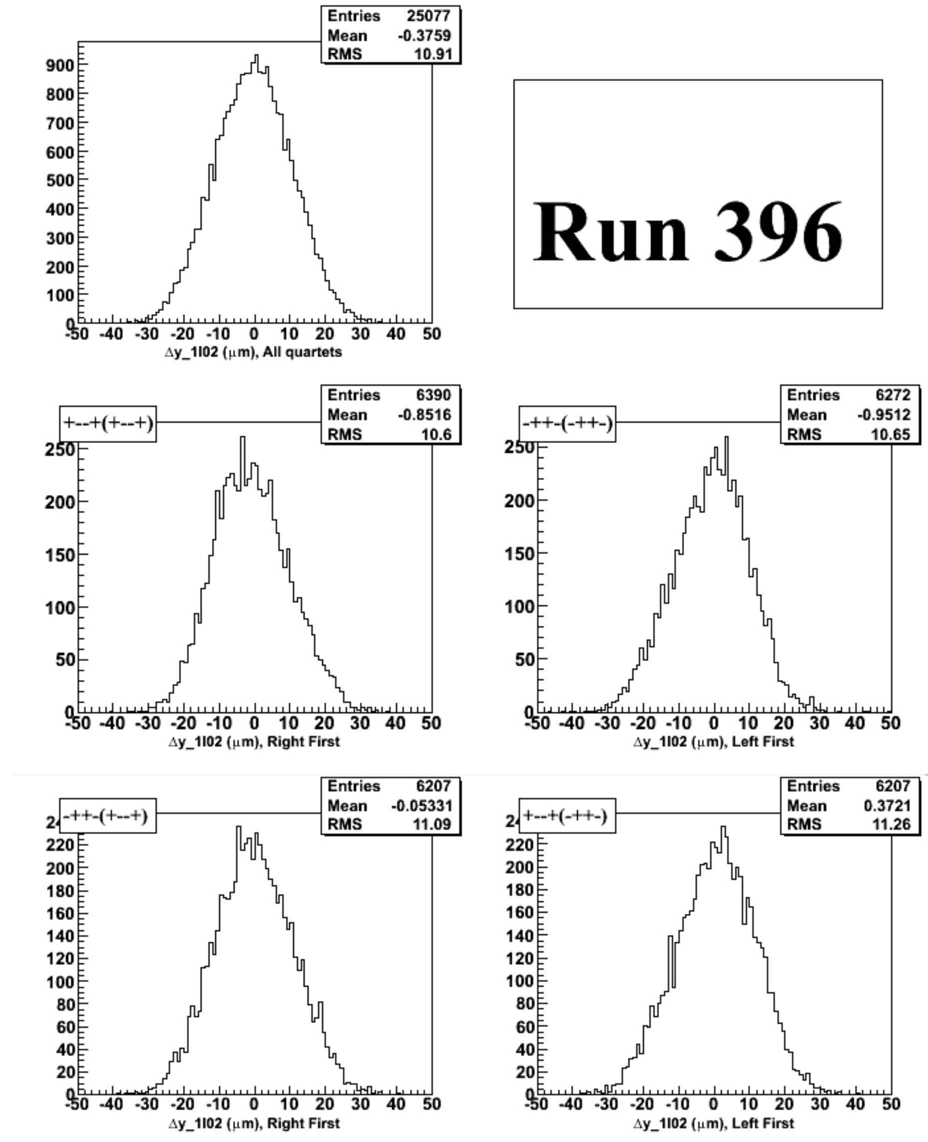


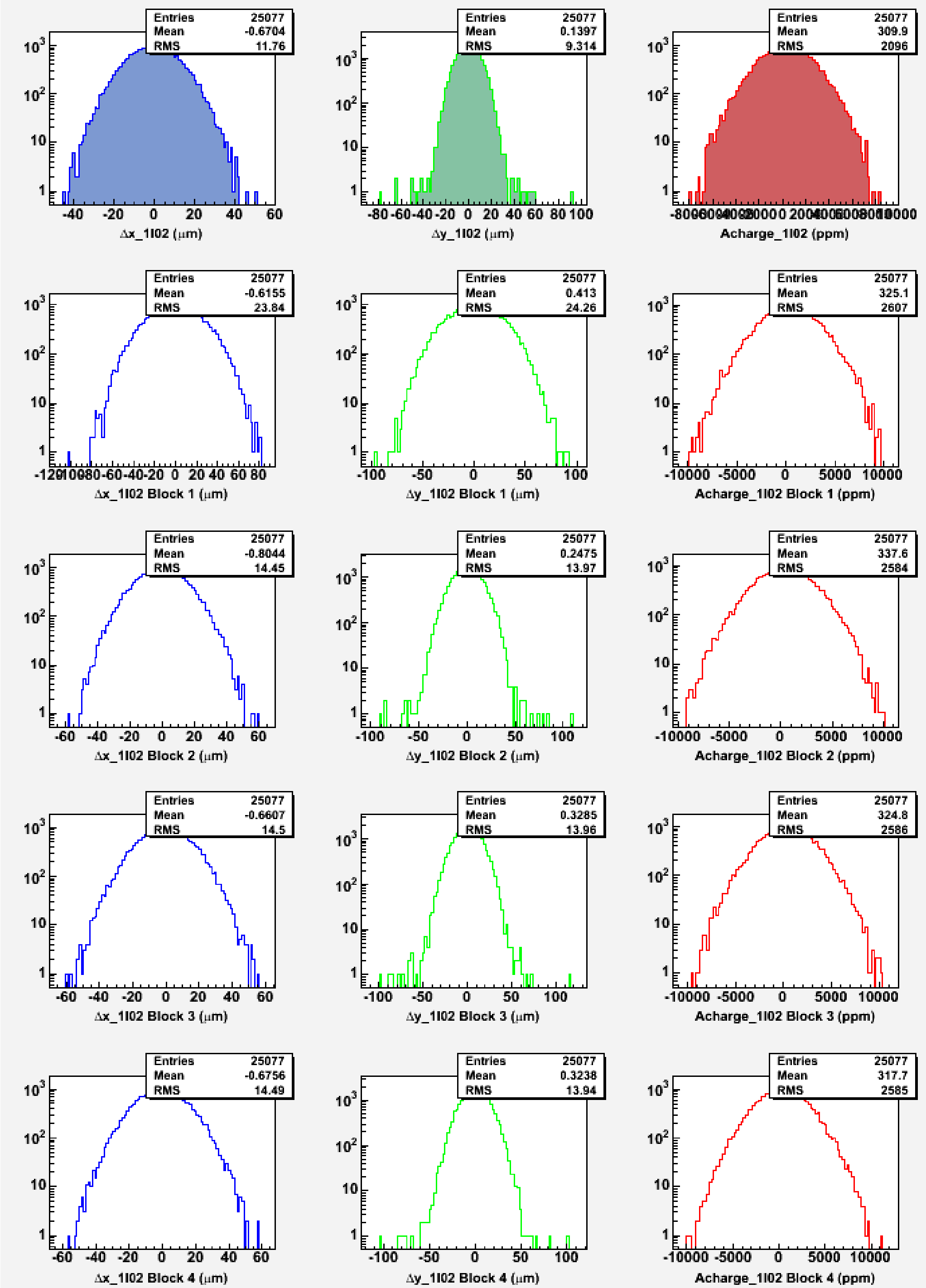
Entries 25323
Mean 1.469
RMS 10.59
Δx_1I02 (μm)
Entries 25323
Mean -0.4356
RMS 8.708
Δy_1I02 (μm)
Entries 25323
Mean -656.5
RMS 1993
Acharge_1I02 (ppm)
Entries 25323
Mean 1.392
RMS 14.93
Δx_1I02 Block 1 (μm)
Entries 25323
Mean -0.9141
RMS 15.2
Δy_1I02 Block 1 (μm)
Entries 25323
Mean -690.3
RMS 2472
Acharge_1I02 Block 1 (ppm)
Entries 25323
Mean 1.553
RMS 14.06
Δx_1I02 Block 2 (μm)
Entries 25323
Mean -0.8209
RMS 14.23
Δy_1I02 Block 2 (μm)
Entries 25323
Mean -687.9
RMS 2468
Acharge_1I02 Block 2 (ppm)
Entries 25323
Mean 1.546
RMS 14.08
Δx_1I02 Block 3 (μm)
Entries 25323
Mean -0.8168
RMS 14.3
Δy_1I02 Block 3 (μm)
Entries 25323
Mean -688.4
RMS 2470
Acharge_1I02 Block 3 (ppm)
Entries 25323
Mean 1.549
RMS 14.1
Δx_1I02 Block 4 (μm)
Entries 25323
Mean -0.8367
RMS 14.17
Δy_1I02 Block 4 (μm)
Entries 25323
Mean -698.5
RMS 2467
Acharge_1I02 Block 4 (ppm)


Δ y (μm)
Δ x (μm)
Transmission of X and Y Position Differences, Run 396

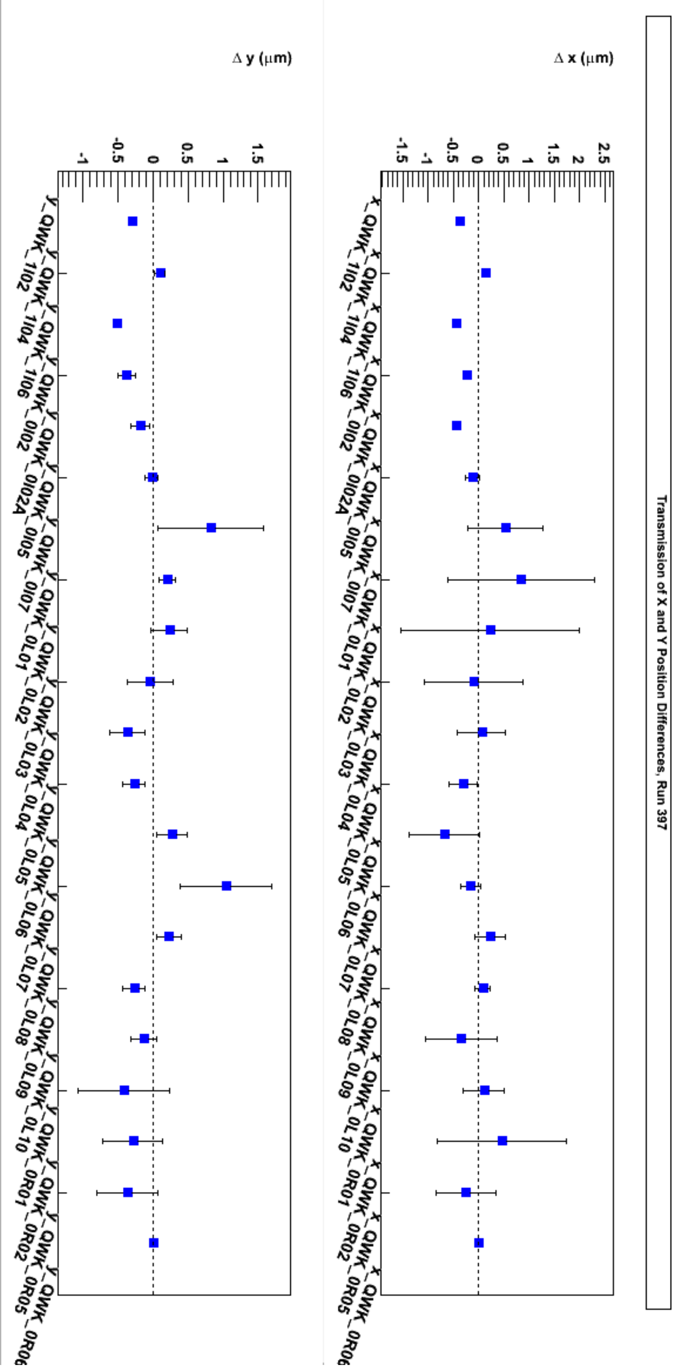

Run 396
Charge Asymmetry
Entries 25077
Mean 309.9
RMS 2096
Acharge_1I02 (ppm), All quartets
+--+(+--+)
Entries 6390
Mean 627
RMS 2053
Acharge_1I02 (ppm), Right First
-++-(-++-)
Entries 6272
Mean 636.6
RMS 2076
Acharge_1I02 (ppm), Left First
-++-(+--+)
Entries 6207
Mean -143.6
RMS 2080
Acharge_1I02 (ppm), Right First
+--+(-++-)
Entries 6207
Mean 107.1
RMS 2067
Acharge_1I02 (ppm), Left First


Run 396
Entries 25077
Mean -0.5766
RMS 10.25
Δx_1l02 (μm), All quartets
+--+(+--+)
Entries 6390
Mean -1.201
RMS 10.14
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 6272
Mean -1.261
RMS 10.32
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 6207
Mean 0.1314
RMS 10.28
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 6207
Mean 0.04846
RMS 10.18
Δx_1l02 (μm), Left First

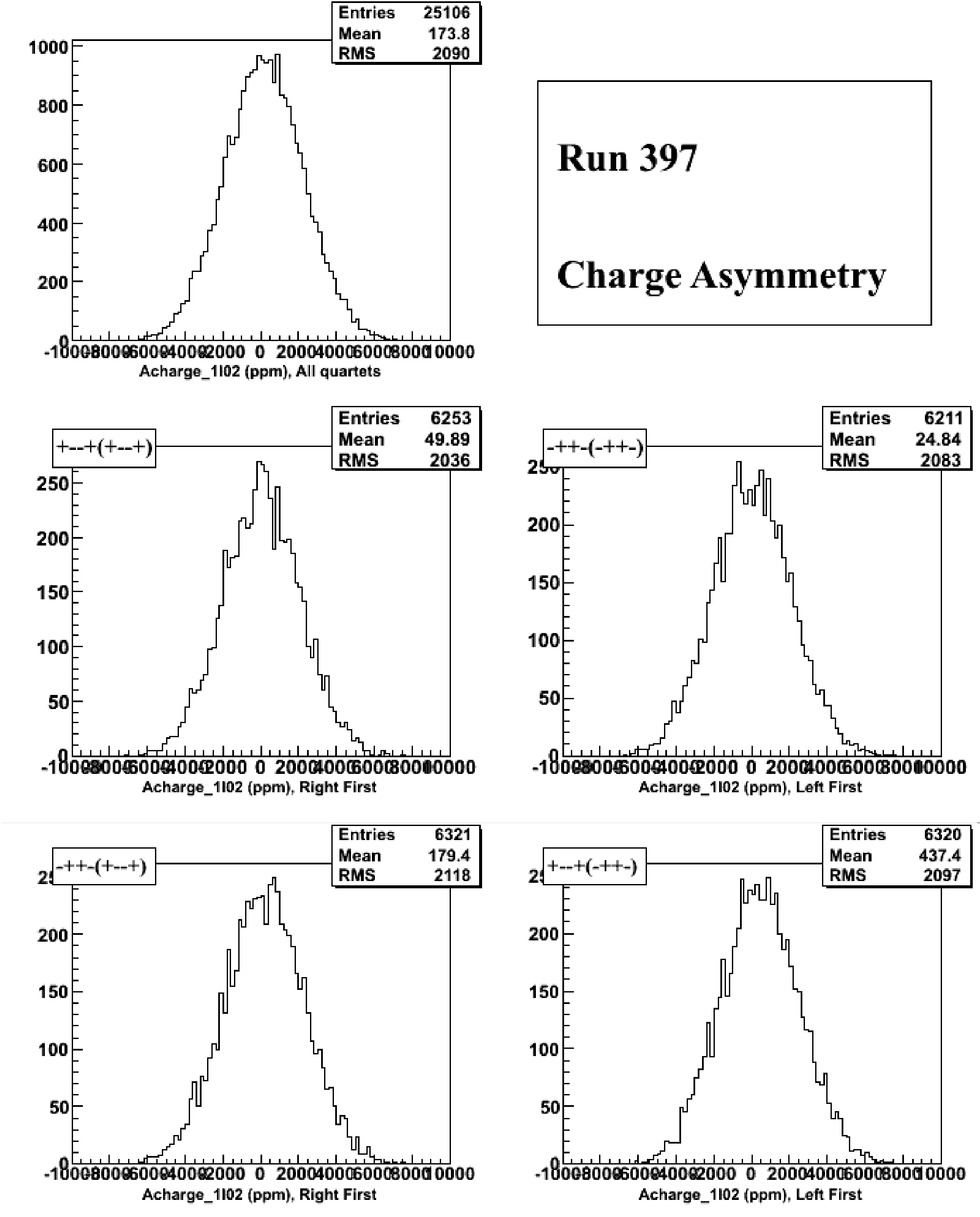

Run 396
Entries 25077
Mean -0.3759
RMS 10.91
Δy_1l02 (μm), All quartets
+--+(+--+)
Entries 6390
Mean -0.8516
RMS 10.6
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 6272
Mean -0.9512
RMS 10.65
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 6207
Mean -0.05331
RMS 11.09
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 6207
Mean 0.3721
RMS 11.26
Δy_1l02 (μm), Left First



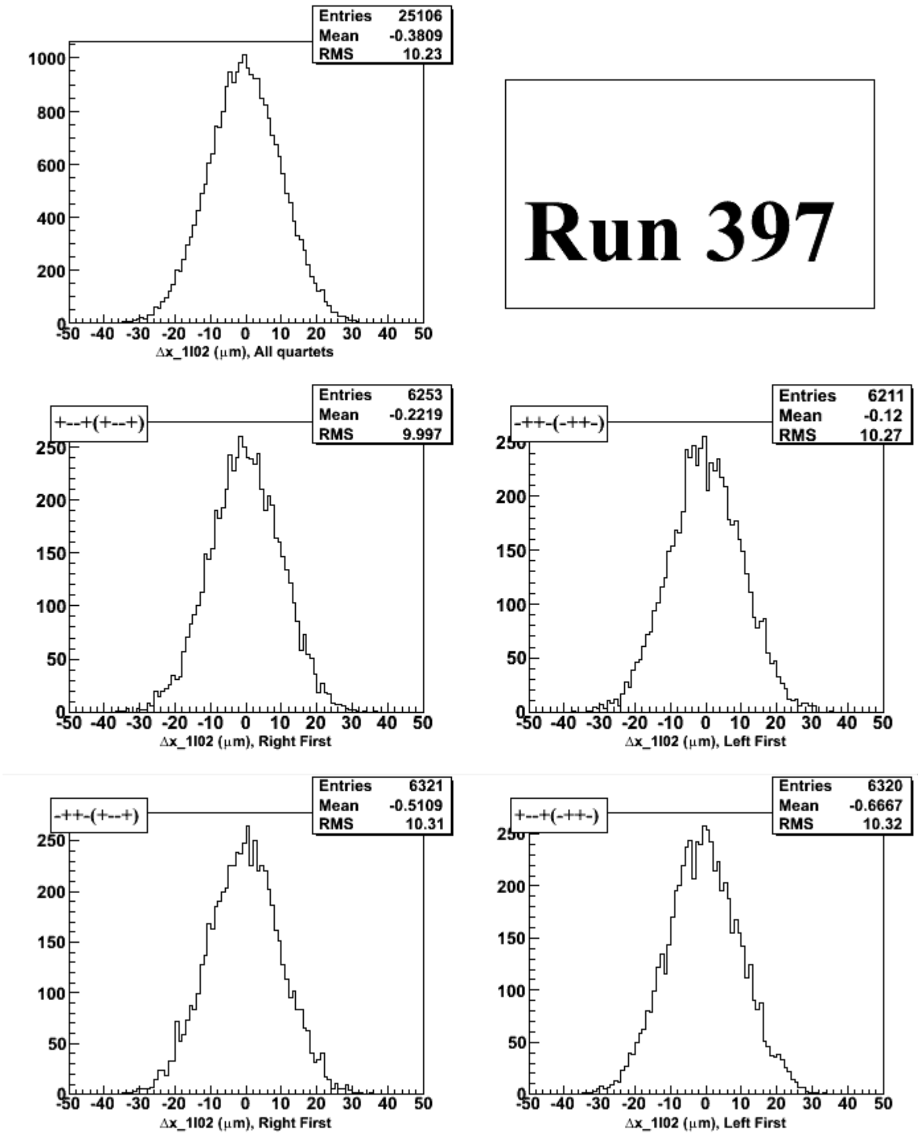
Entries 25077 Mean -0.6704 RMS 11.76
Δx_1I02 (μm)
Entries 25077 Mean 0.1397 RMS 9.314
Δy_1I02 (μm)
Entries 25077 Mean 309.9 RMS 2096
Acharge_1I02 (ppm)
Entries 25077 Mean -0.6155 RMS 23.84
Δx_1I02 Block 1 (μm)
Entries 25077 Mean 0.413 RMS 24.26
Δy_1I02 Block 1 (μm)
Entries 25077 Mean 325.1 RMS 2607
Acharge_1I02 Block 1 (ppm)
Entries 25077 Mean -0.8044 RMS 14.45
Δx_1I02 Block 2 (μm)
Entries 25077 Mean 0.2475 RMS 13.97
Δy_1I02 Block 2 (μm)
Entries 25077 Mean 337.6 RMS 2584
Acharge_1I02 Block 2 (ppm)
Entries 25077 Mean -0.6607 RMS 14.5
Δx_1I02 Block 3 (μm)
Entries 25077 Mean 0.3285 RMS 13.96
Δy_1I02 Block 3 (μm)
Entries 25077 Mean 324.8 RMS 2586
Acharge_1I02 Block 3 (ppm)
Entries 25077 Mean -0.6756 RMS 14.49
Δx_1I02 Block 4 (μm)
Entries 25077 Mean 0.3238 RMS 13.94
Δy_1I02 Block 4 (μm)
Entries 25077 Mean 317.7 RMS 2585
Acharge_1I02 Block 4 (ppm)

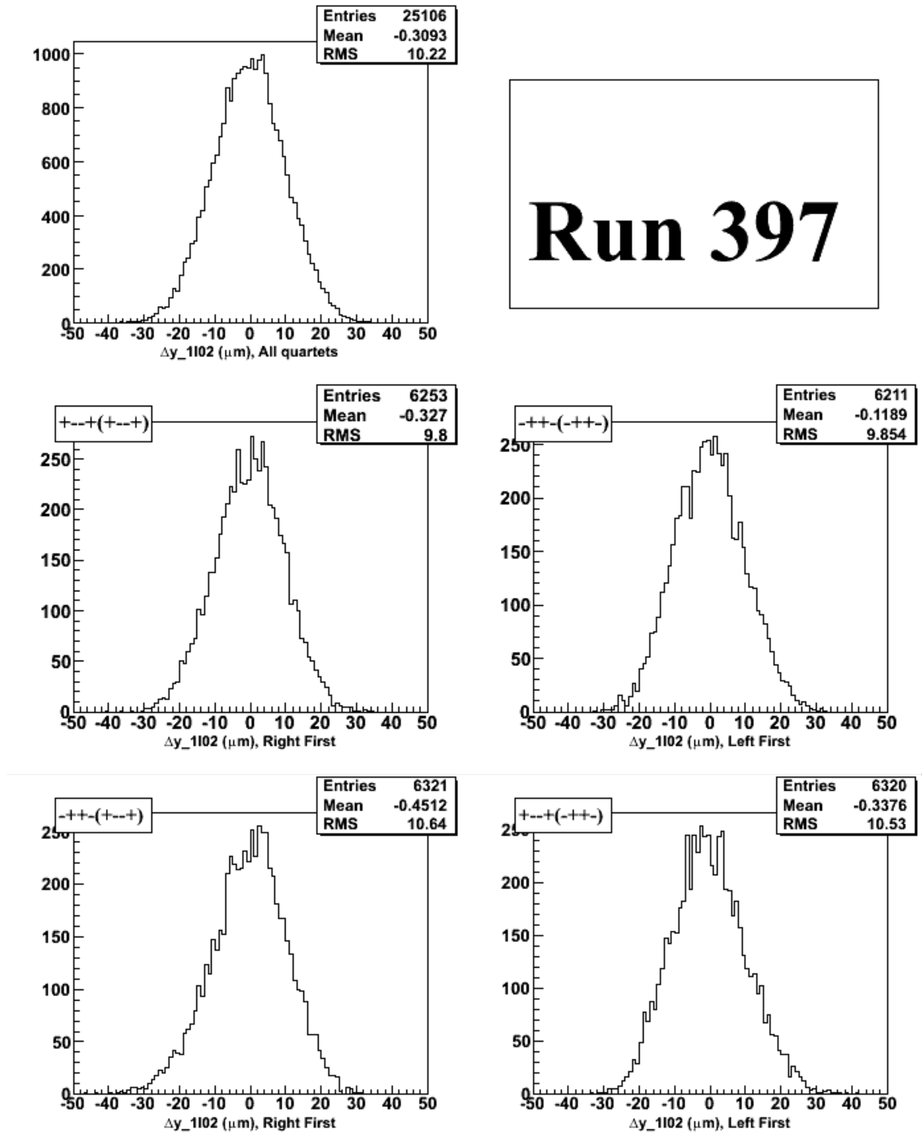


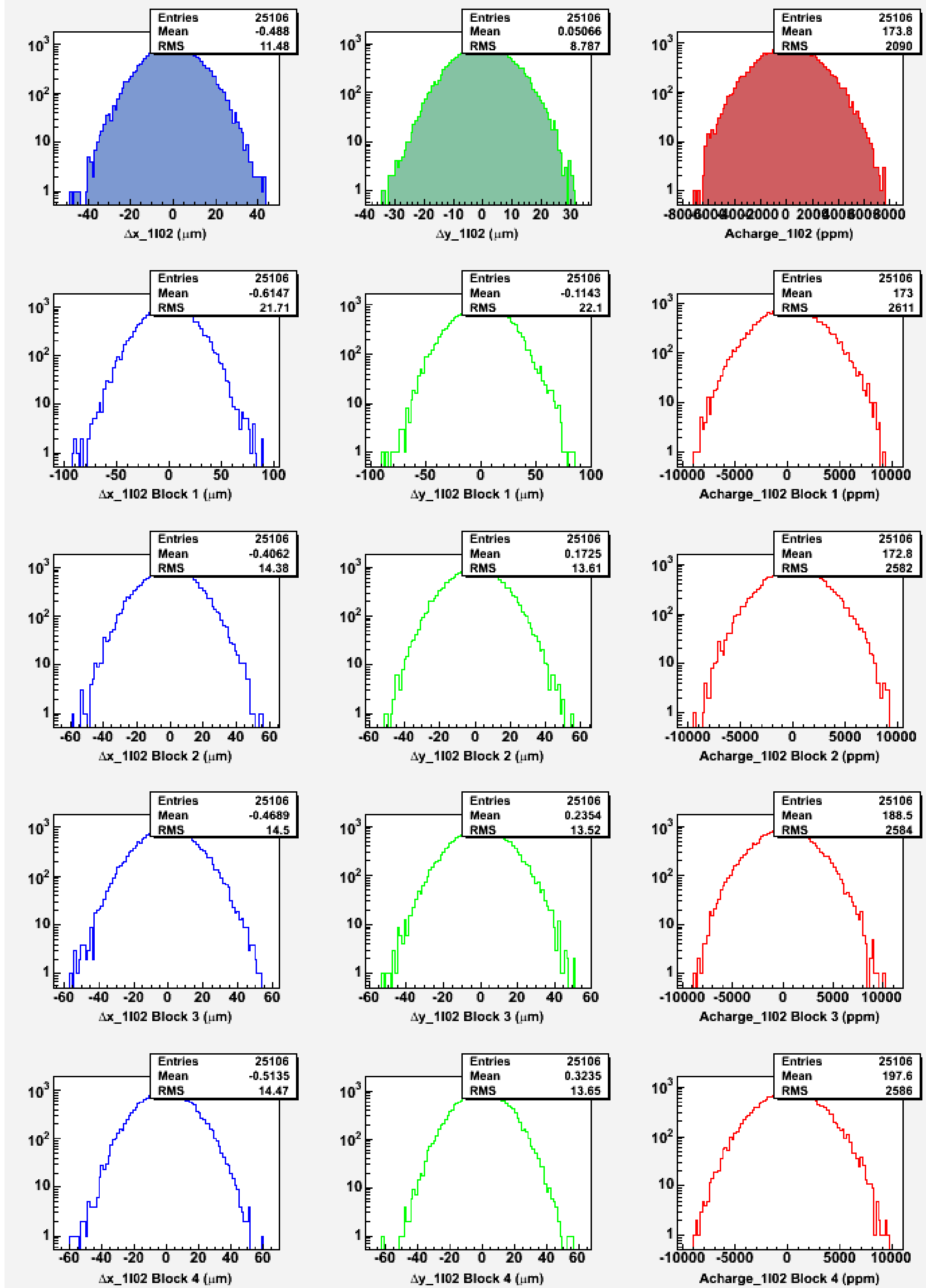
Transmission of X and Y Position Differences, Run 397
Δ y (μm)
Δ x (μm)



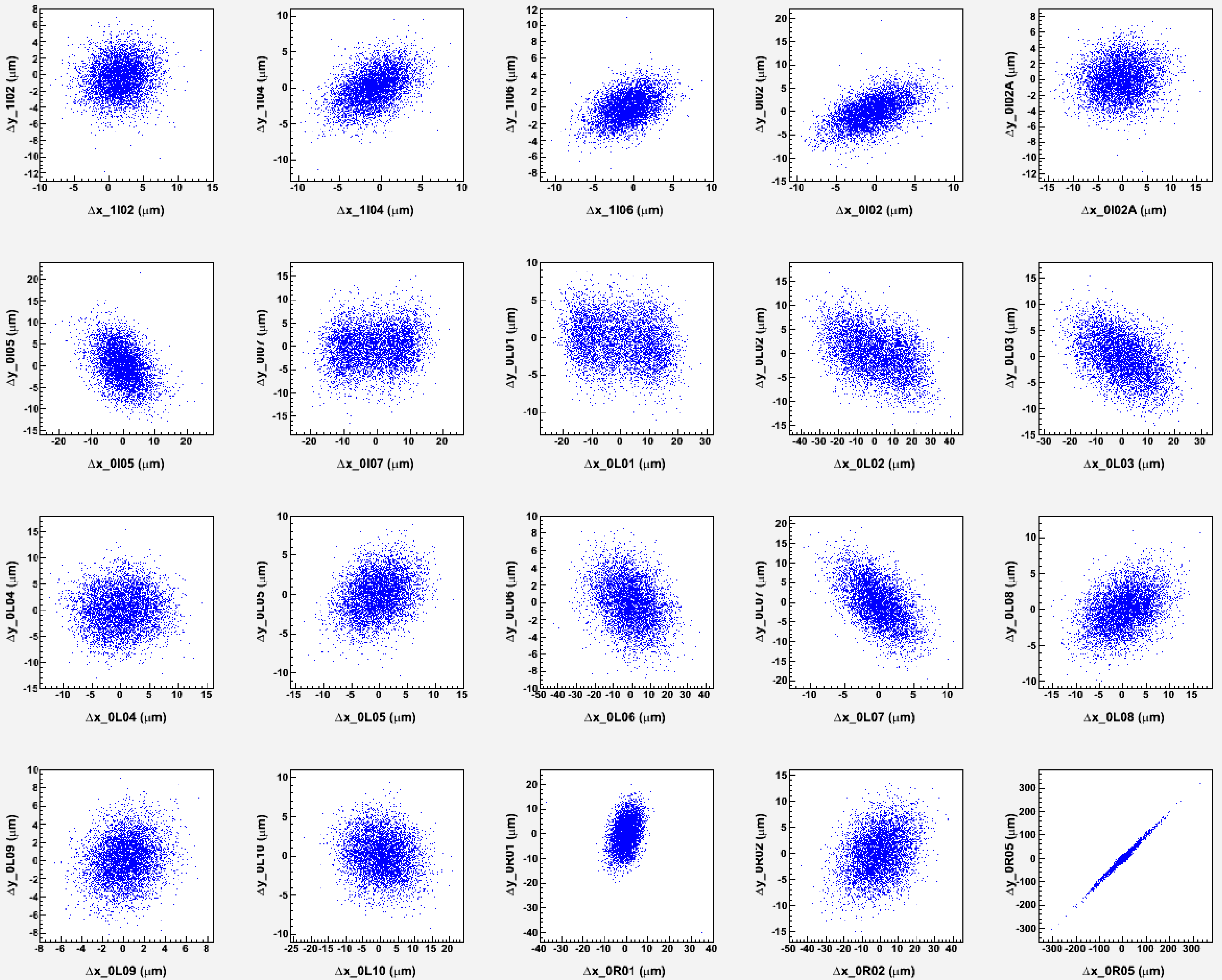
Run 397
Charge Asymmetry
Entries 25106
Mean 173.8
RMS 2090
Acharge_1I02 (ppm), All quartets
+--+(+--+)
Entries 6253
Mean 49.89
RMS 2036
Acharge_1I02 (ppm), Right First
-++-(-++-)
Entries 6211
Mean 24.84
RMS 2083
Acharge_1I02 (ppm), Left First
-++-(+--+)
Entries 6321
Mean 179.4
RMS 2118
Acharge_1I02 (ppm), Right First
+--+(-++-)
Entries 6320
Mean 437.4
RMS 2097
Acharge_1I02 (ppm), Left First

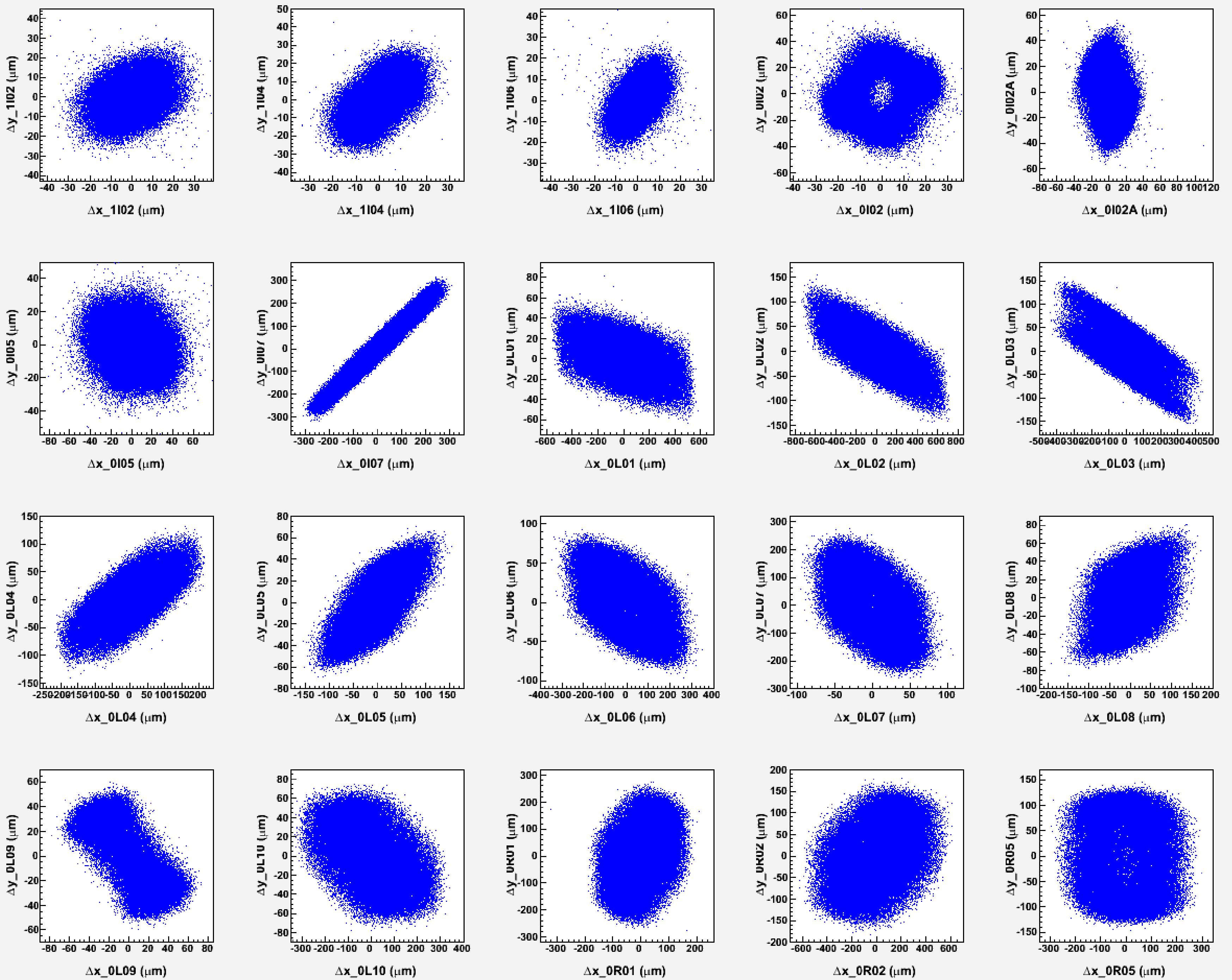

Entries 25106
Mean -0.3809
RMS 10.23
Δx_1l02 (μm), All quartets
Run 397
+--+(+--+)
Entries 6253
Mean -0.2219
RMS 9.997
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 6211
Mean -0.12
RMS 10.27
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 6321
Mean -0.5109
RMS 10.31
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 6320
Mean -0.6667
RMS 10.32
Δx_1l02 (μm), Left First


Entries 25106
Mean -0.3093
RMS 10.22
Δy_1l02 (μm), All quartets
Run 397
+--+(+--+)
Entries 6253
Mean -0.327
RMS 9.8
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 6211
Mean -0.1189
RMS 9.854
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 6321
Mean -0.4512
RMS 10.64
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 6320
Mean -0.3376
RMS 10.53
Δy_1l02 (μm), Left First



60 Hz Noise and Line Phase Monitor


Δy_1I02 (μm)
Δx_1I02 (μm)
Δy_1I04 (μm)
Δx_1I04 (μm)
Δy_1I06 (μm)
Δx_1I06 (μm)
Δy_0I02 (μm)
Δx_0I02 (μm)
Δy_0I02A (μm)
Δx_0I02A (μm)
Δy_0I05 (μm)
Δx_0I05 (μm)
Δx_0I07 (μm)
Δy_0L01 (μm)
Δx_0L01 (μm)
Δy_0L02 (μm)
Δx_0L02 (μm)
Δy_0L03 (μm)
Δx_0L03 (μm)
Δy_0L04 (μm)
Δx_0L04 (μm)
Δx_0L05 (μm)
Δy_0L06 (μm)
Δx_0L06 (μm)
Δx_0L07 (μm)
Δy_0L08 (μm)
Δx_0L08 (μm)
Δy_0L09 (μm)
Δx_0L09 (μm)
Δx_0L10 (μm)
Δx_0R01 (μm)
Δx_0R02 (μm)
Δy_0R05 (μm)
Δx_0R05 (μm)

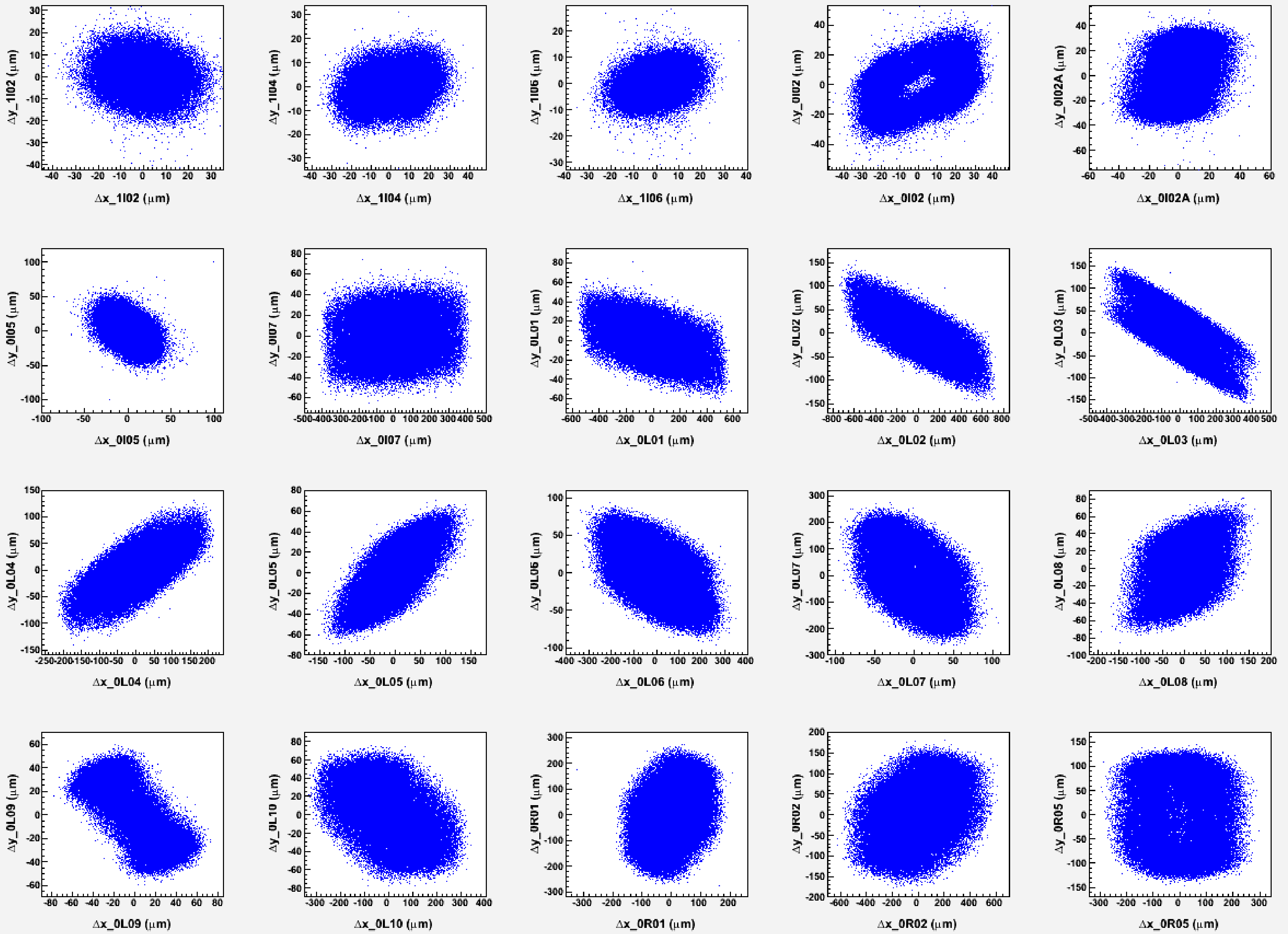


Δy_1I02 (μm)
Δx_1I02 (μm)
Δy_1I04 (μm)
Δx_1I04 (μm)
Δy_1I06 (μm)
Δx_1I06 (μm)
Δy_0I02 (μm)
Δx_0I02 (μm)
Δy_0I02A (μm)
Δx_0I02A (μm)
Δy_0I05 (μm)
Δx_0I05 (μm)
Δx_0I07 (μm)
Δx_0L01 (μm)
Δx_0L02 (μm)
Δy_0L03 (μm)
Δx_0L03 (μm)
Δy_0L04 (μm)
Δx_0L04 (μm)
Δx_0L05 (μm)
Δx_0L06 (μm)
Δx_0L07 (μm)
Δy_0L08 (μm)
Δx_0L08 (μm)
Δy_0L09 (μm)
Δx_0L09 (μm)
Δx_0L10 (μm)
Δx_0R01 (μm)
Δx_0R02 (μm)
Δy_0R05 (μm)
Δx_0R05 (μm)

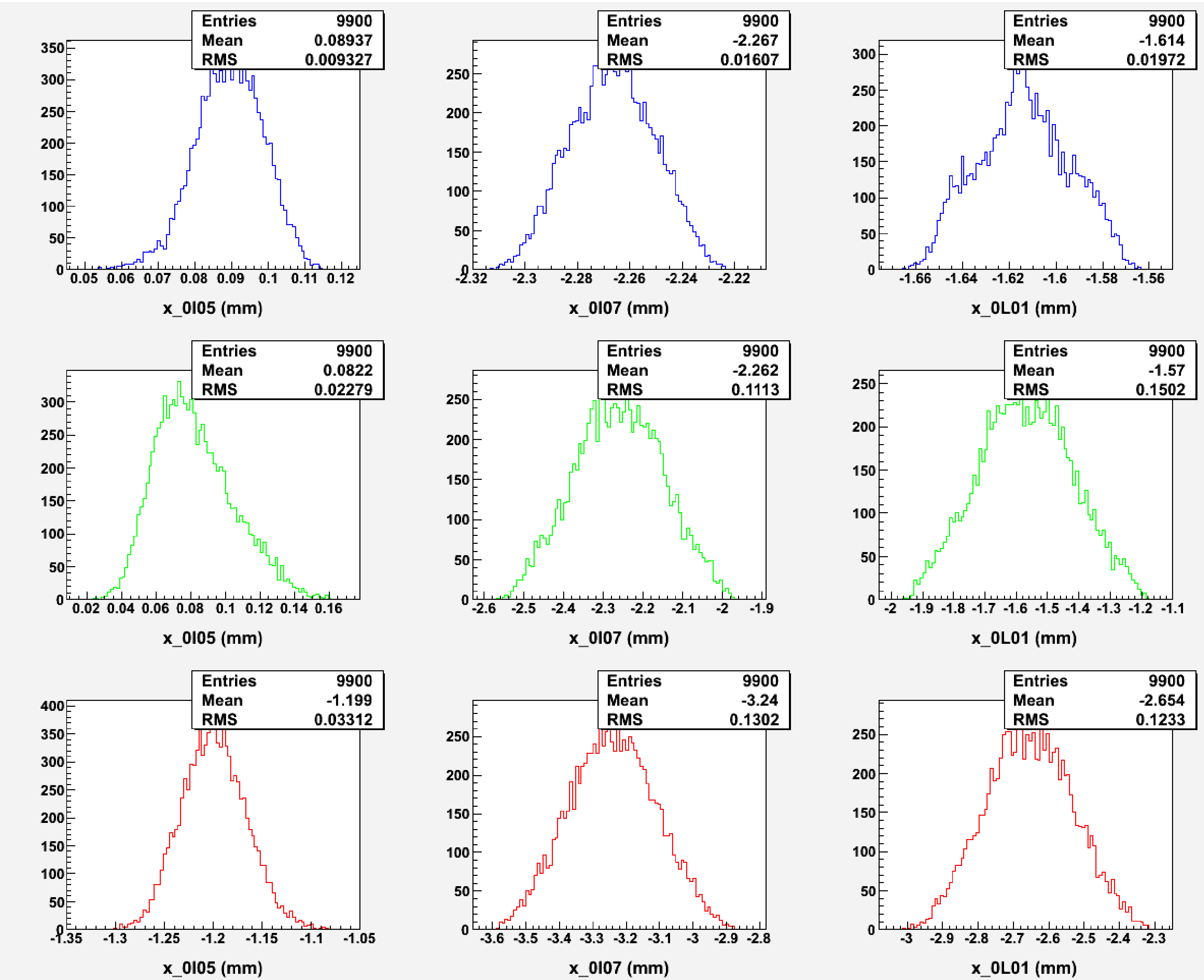
60 Hz Noise Search with Extech 480824 EMF Adapter and a Fluke 87

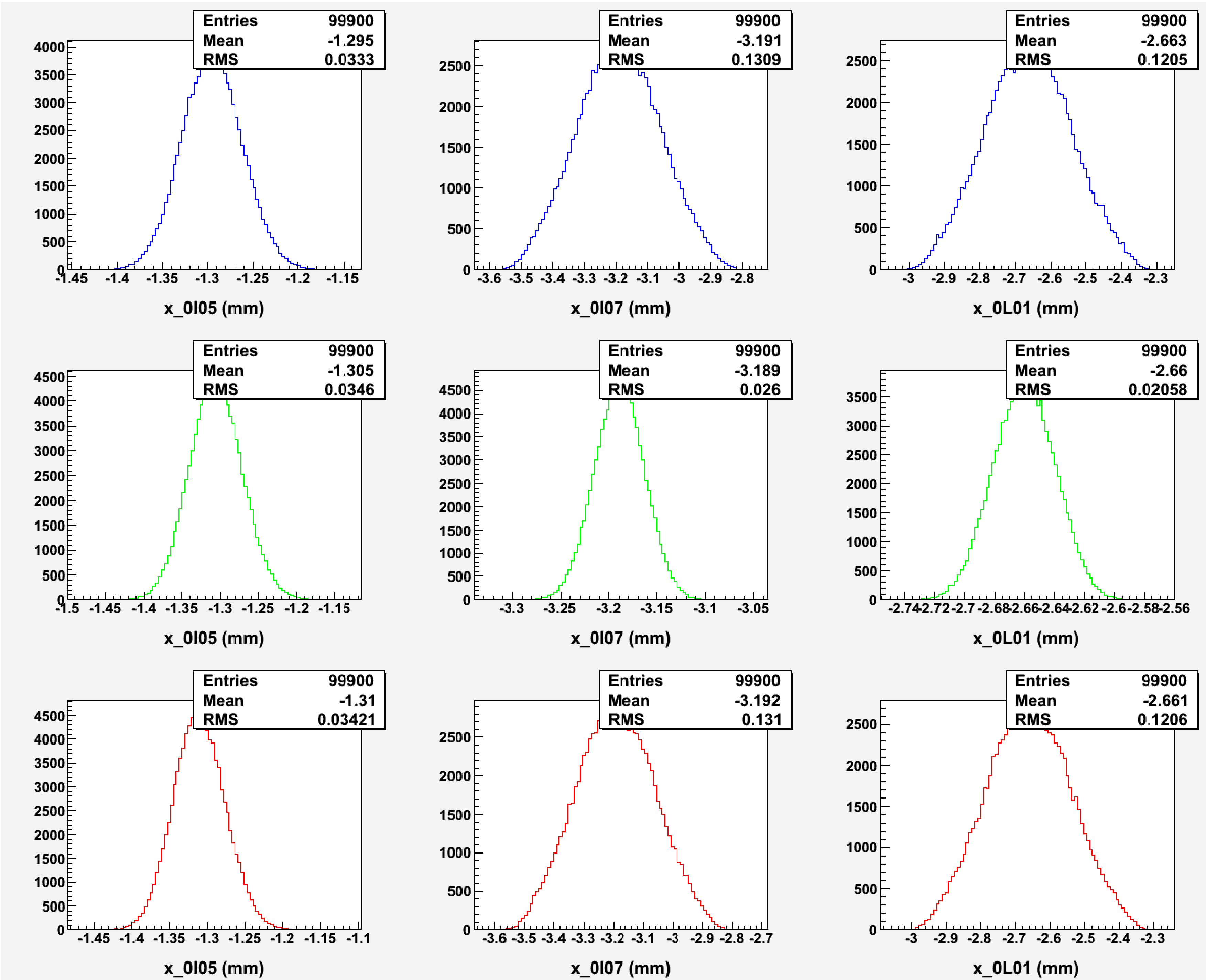
Three high reading areas:

1. PSS 500 keV MBO0I06 Dipole current sensor
2. VIP0L02 ion pump and its power supply
3. VIP0L03 ion pump and its power supply

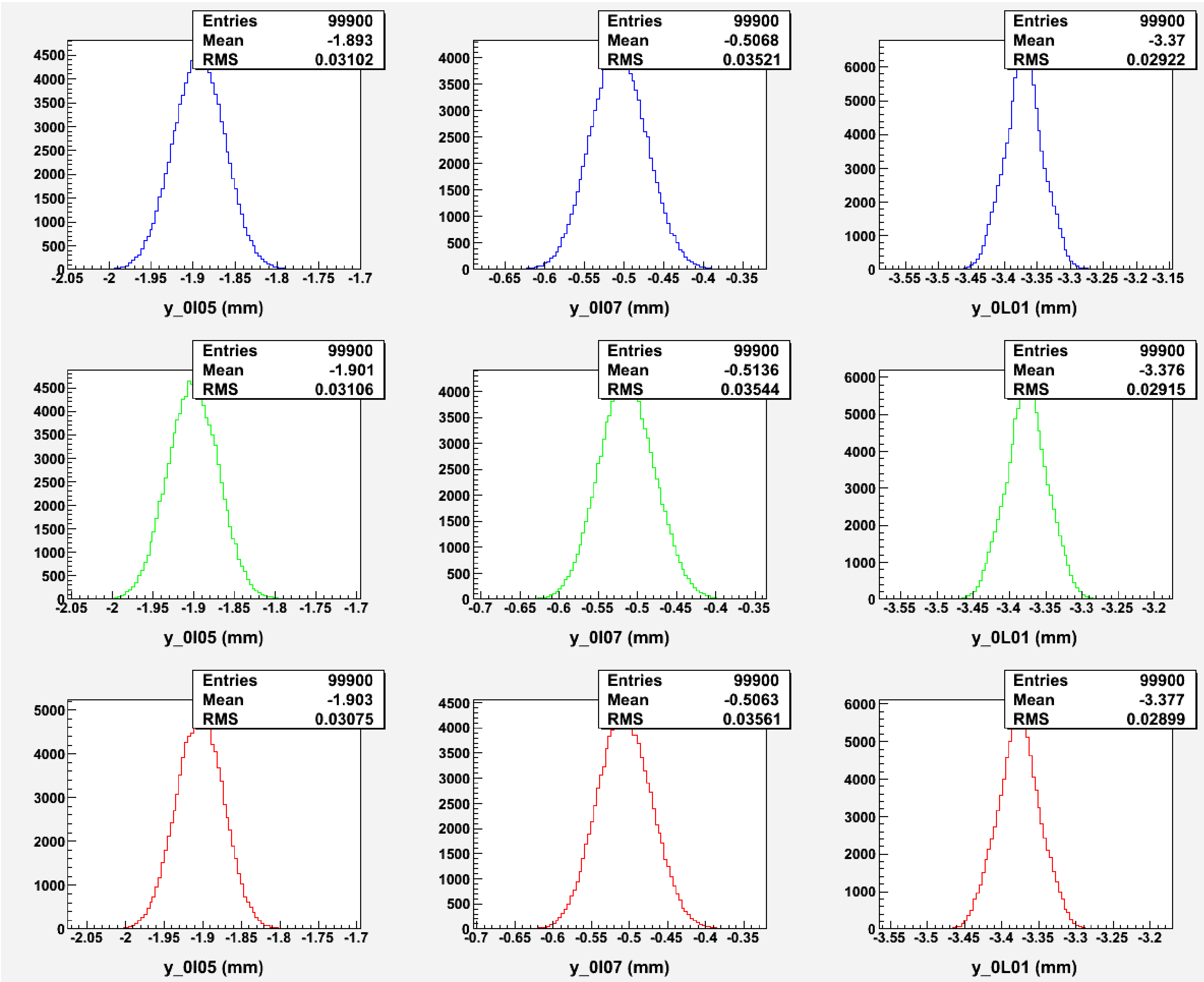


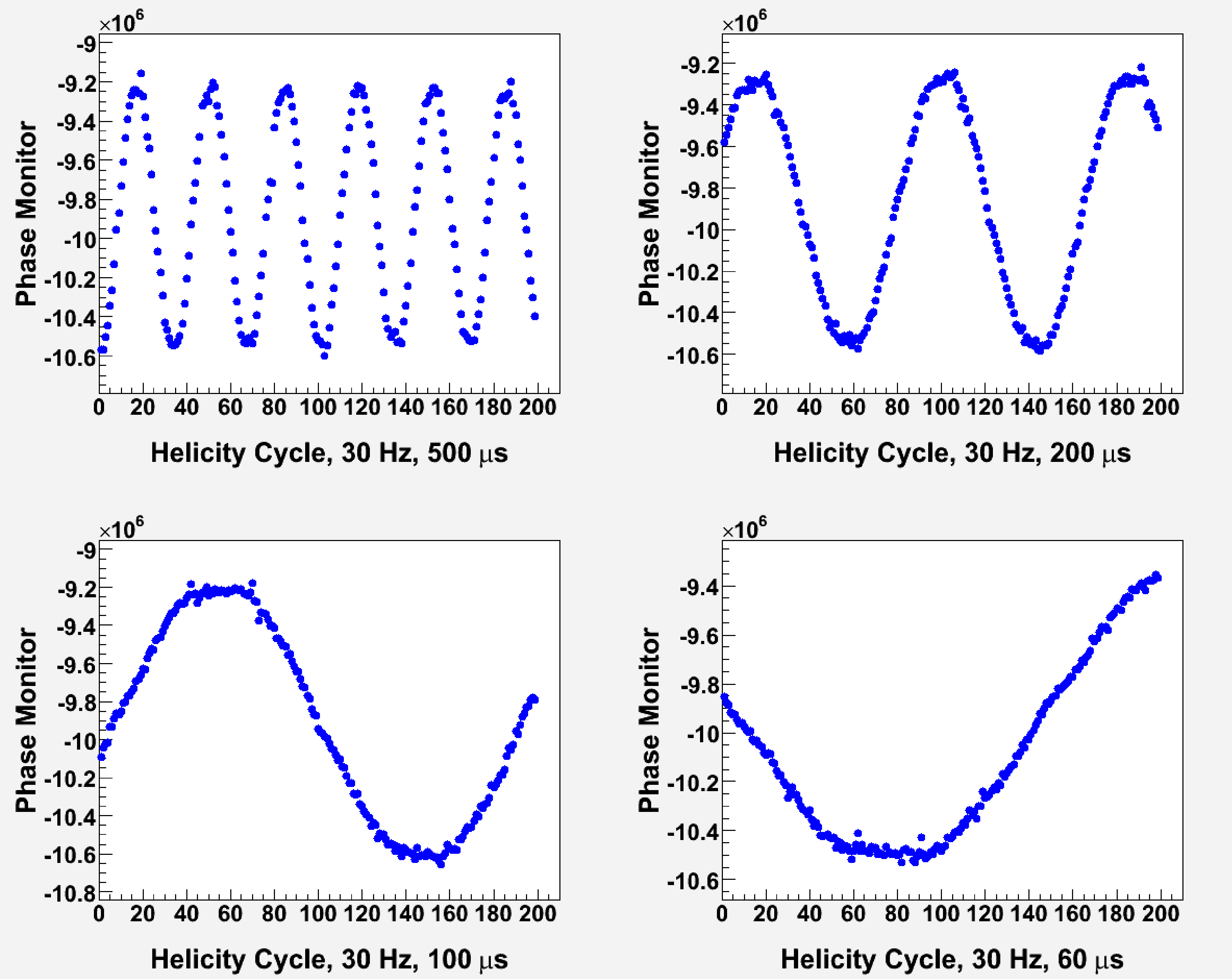
Δy_1I02 (μm)
Δx_1I02 (μm)
Δy_1I04 (μm)
Δx_1I04 (μm)
Δy_1I06 (μm)
Δx_1I06 (μm)
Δy_0I02 (μm)
Δx_0I02 (μm)
Δy_0I02A (μm)
Δx_0I02A (μm)
Δy_0I05 (μm)
Δx_0I05 (μm)
Δy_0I07 (μm)
Δx_0I07 (μm)
Δy_0L01 (μm)
Δx_0L01 (μm)
Δy_0L02 (μm)
Δx_0L02 (μm)
Δy_0L03 (μm)
Δx_0L03 (μm)
Δy_0L04 (μm)
Δx_0L04 (μm)
Δy_0L05 (μm)
Δx_0L05 (μm)
Δy_0L06 (μm)
Δx_0L06 (μm)
Δy_0L07 (μm)
Δx_0L07 (μm)
Δy_0L08 (μm)
Δx_0L08 (μm)
Δy_0L09 (μm)
Δx_0L09 (μm)
Δy_0L10 (μm)
Δx_0L10 (μm)
Δy_0R01 (μm)
Δx_0R01 (μm)
Δy_0R02 (μm)
Δx_0R02 (μm)
Δy_0R05 (μm)
Δx_0R05 (μm)

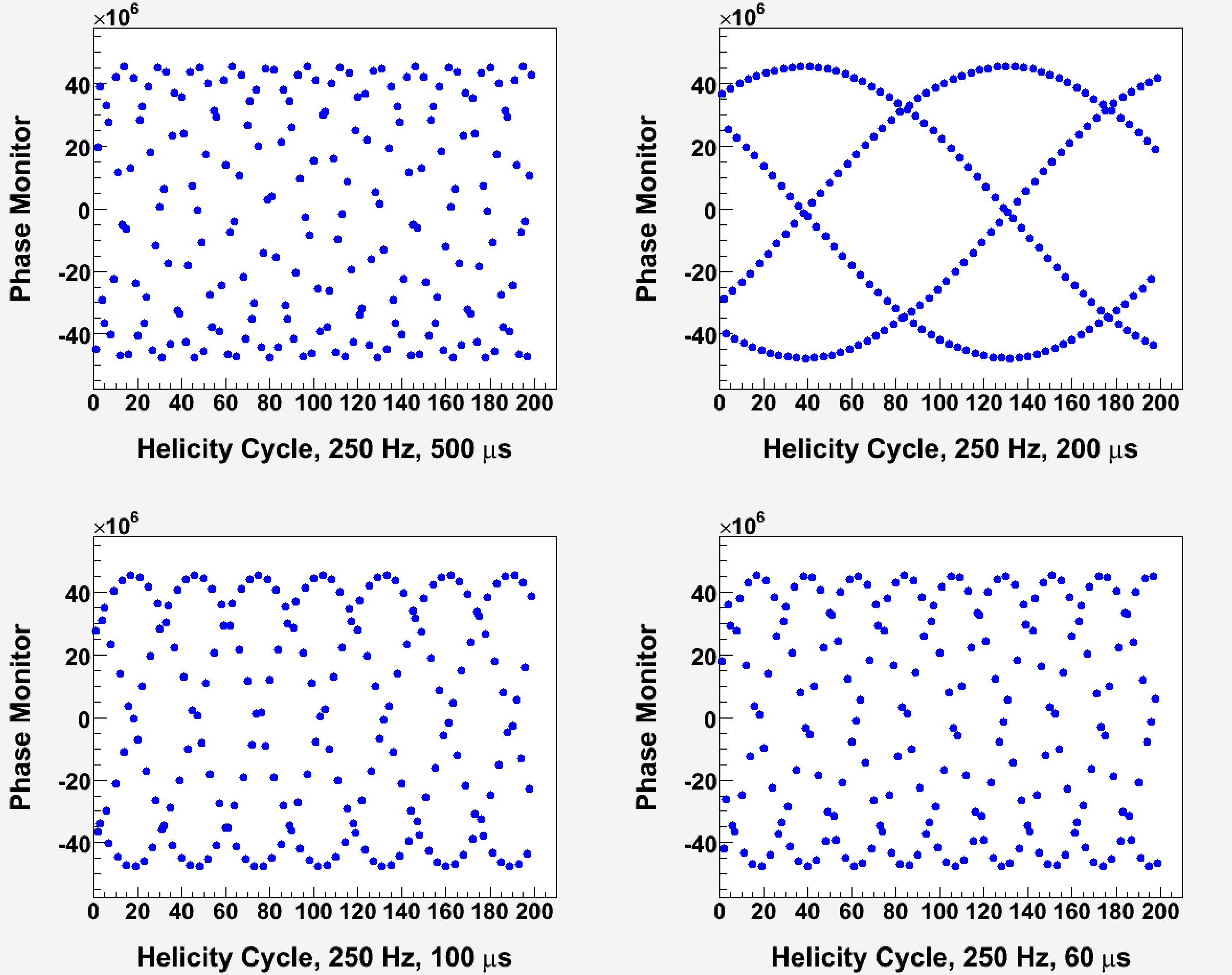

Entries 9900
Mean 0.08937
RMS 0.009327
x_0I05 (mm)
Entries 9900
Mean -2.267
RMS 0.01607
x_0I07 (mm)
Entries 9900
Mean -1.614
RMS 0.01972
x_0L01 (mm)
Entries 9900
Mean 0.0822
RMS 0.02279
x_0I05 (mm)
Entries 9900
Mean -2.262
RMS 0.1113
x_0I07 (mm)
Entries 9900
Mean -1.57
RMS 0.1502
x_0L01 (mm)
Entries 9900
Mean -1.199
RMS 0.03312
x_0I05 (mm)
Entries 9900
Mean -3.24
RMS 0.1302
x_0I07 (mm)
Entries 9900
Mean -2.654
RMS 0.1233
x_0L01 (mm)



Entries 99900
Mean -1.295
RMS 0.0333
x_0I05 (mm)
Entries 99900
Mean -3.191
RMS 0.1309
x_0I07 (mm)
Entries 99900
Mean -2.663
RMS 0.1205
x_0L01 (mm)
Entries 99900
Mean -1.305
RMS 0.0346
x_0I05 (mm)
Entries 99900
Mean -3.189
RMS 0.026
x_0I07 (mm)
Entries 99900
Mean -2.66
RMS 0.02058
x_0L01 (mm)
Entries 99900
Mean -1.31
RMS 0.03421
x_0I05 (mm)
Entries 99900
Mean -3.192
RMS 0.131
x_0I07 (mm)
Entries 99900
Mean -2.661
RMS 0.1206
x_0L01 (mm)


Entries 99900
Mean -1.893
RMS 0.03102
y_0I05 (mm)
Entries 99900
Mean -0.5068
RMS 0.03521
y_0I07 (mm)
Entries 99900
Mean -3.37
RMS 0.02922
y_0L01 (mm)
Entries 99900
Mean -1.901
RMS 0.03106
y_0I05 (mm)
Entries 99900
Mean -0.5136
RMS 0.03544
y_0I07 (mm)
Entries 99900
Mean -3.376
RMS 0.02915
y_0L01 (mm)
Entries 99900
Mean -1.903
RMS 0.03075
y_0I05 (mm)
Entries 99900
Mean -0.5063
RMS 0.03561
y_0I07 (mm)
Entries 99900
Mean -3.377
RMS 0.02899
y_0L01 (mm)


×10^6
Phase Monitor
Helicity Cycle, 30 Hz, 500 μs
Helicity Cycle, 30 Hz, 200 μs
Helicity Cycle, 30 Hz, 100 μs
Helicity Cycle, 30 Hz, 60 μs

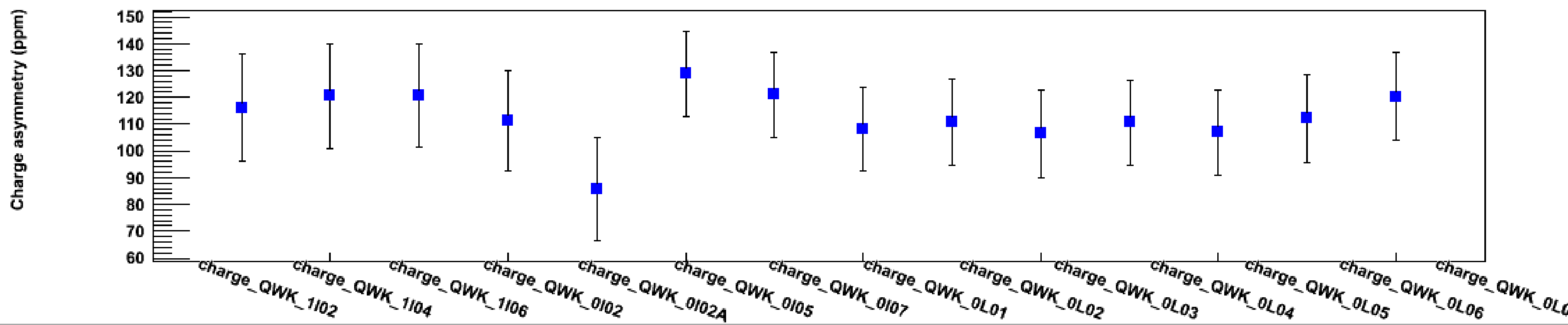


×10^6
Phase Monitor
Helicity Cycle, 250 Hz, 500 μs
×10^6
Phase Monitor
Helicity Cycle, 250 Hz, 200 μs
×10^6
Phase Monitor
Helicity Cycle, 250 Hz, 100 μs
×10^6
Phase Monitor
Helicity Cycle, 250 Hz, 60 μs

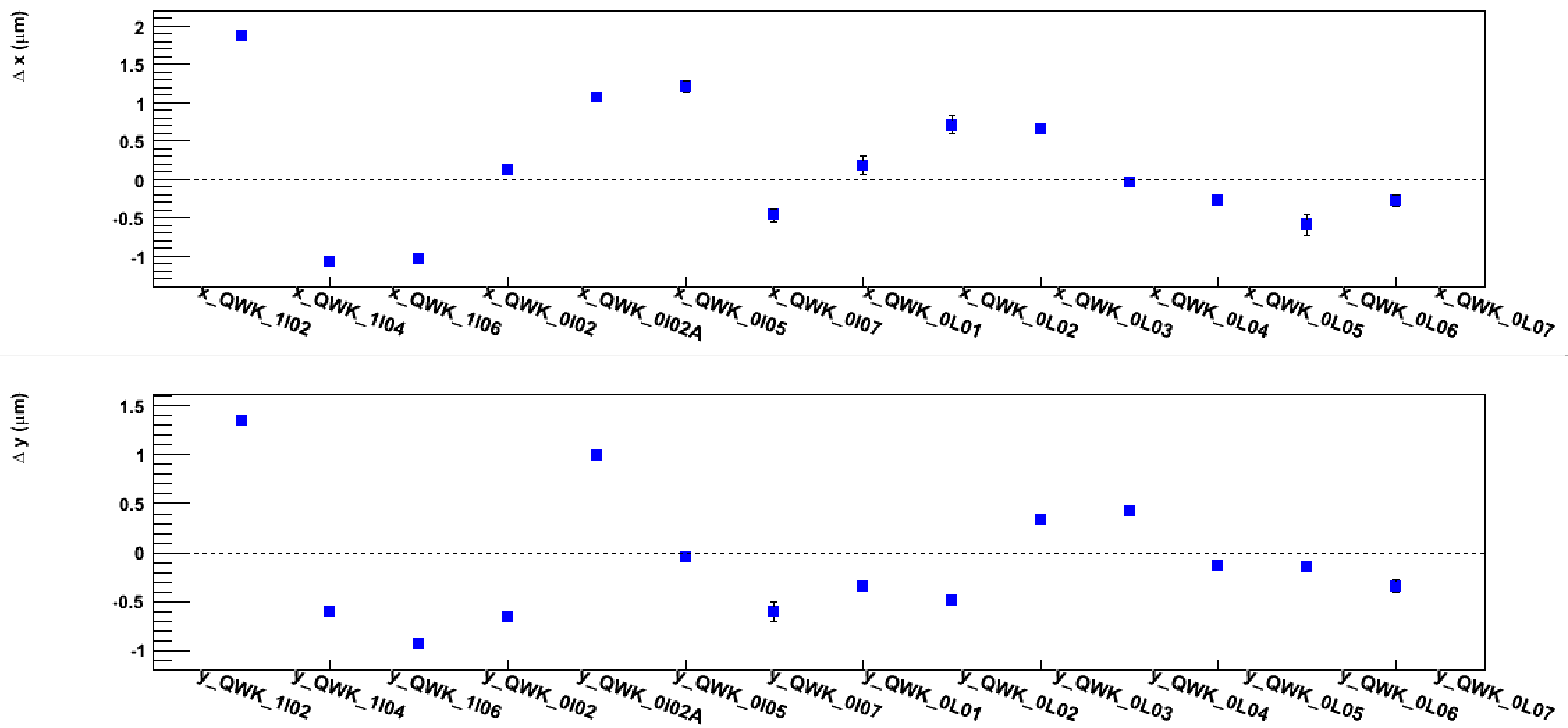
Beams Crosstalk

- Run 410: Hall A 120 µA, Hall C 0 µA
- Run 412: Hall A 0 µA, Hall C 110 µA
- Run 413: Hall A 120 µA, Hall C 0 -110 µA, Hall C laser phase 55 degree
- Run 414: Hall A 120 µA, Hall C 110 µA, changed Hall C laser phase

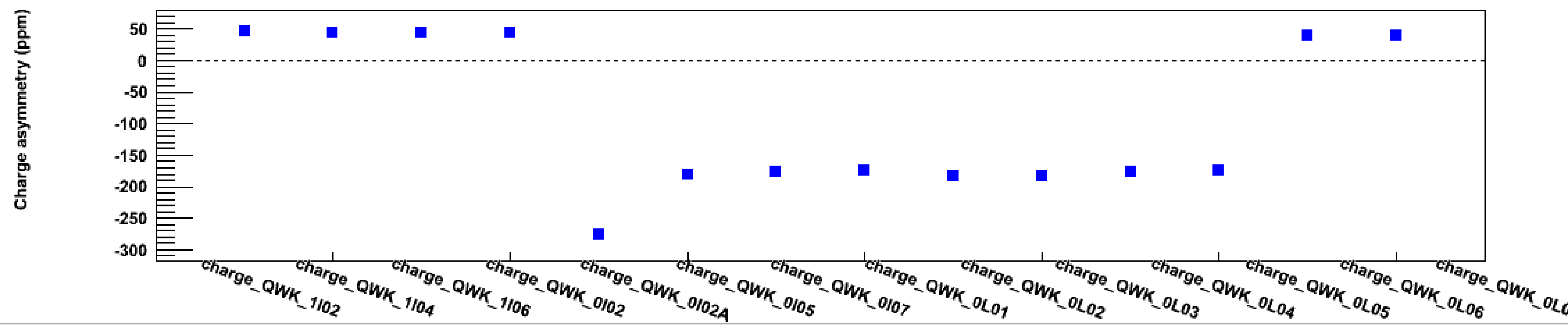
Transmission of Charge Asymmetry, Run 410



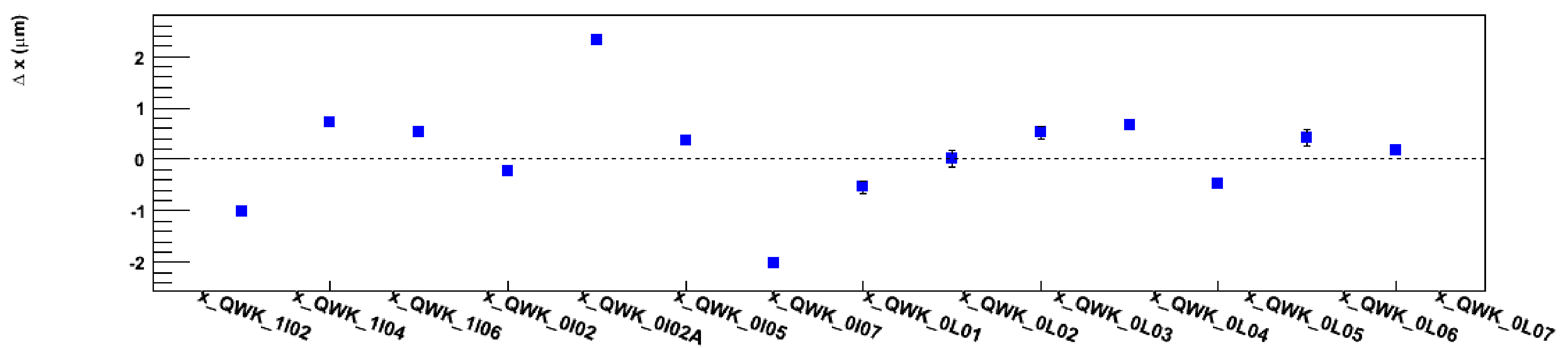
Transmission of X and Y Position Differences, Run 410

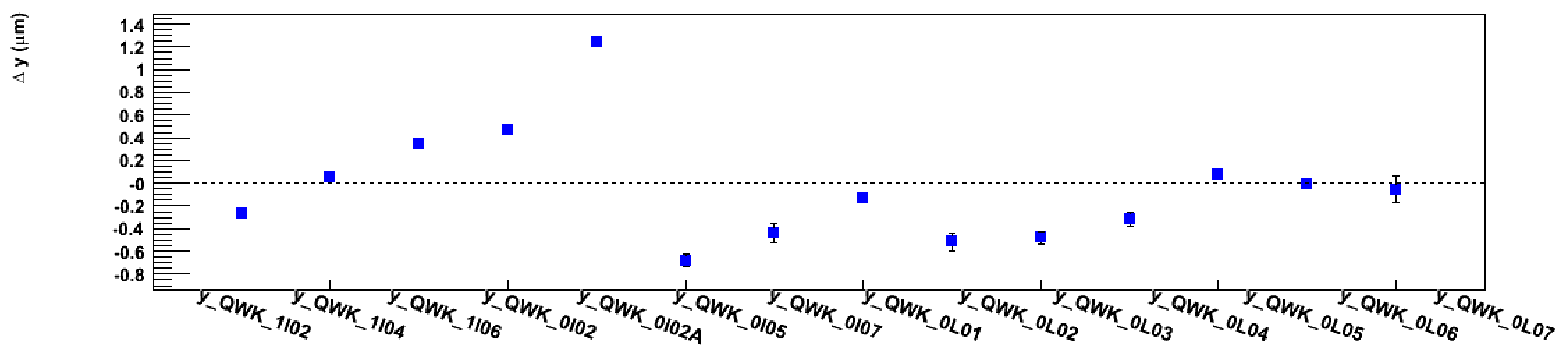


Transmission of Charge Asymmetry, Run 412

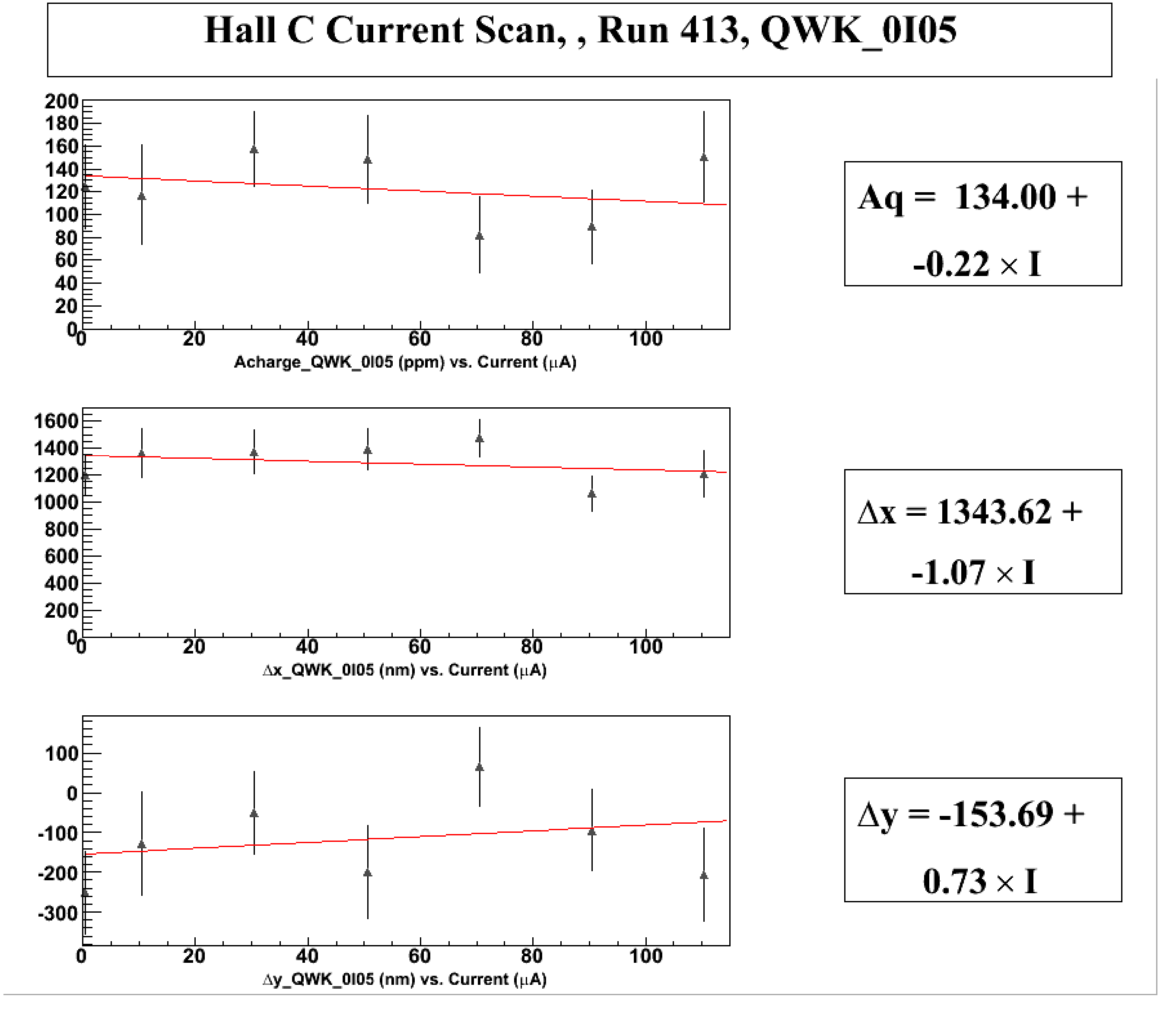


Transmission of X and Y Position Differences, Run 412

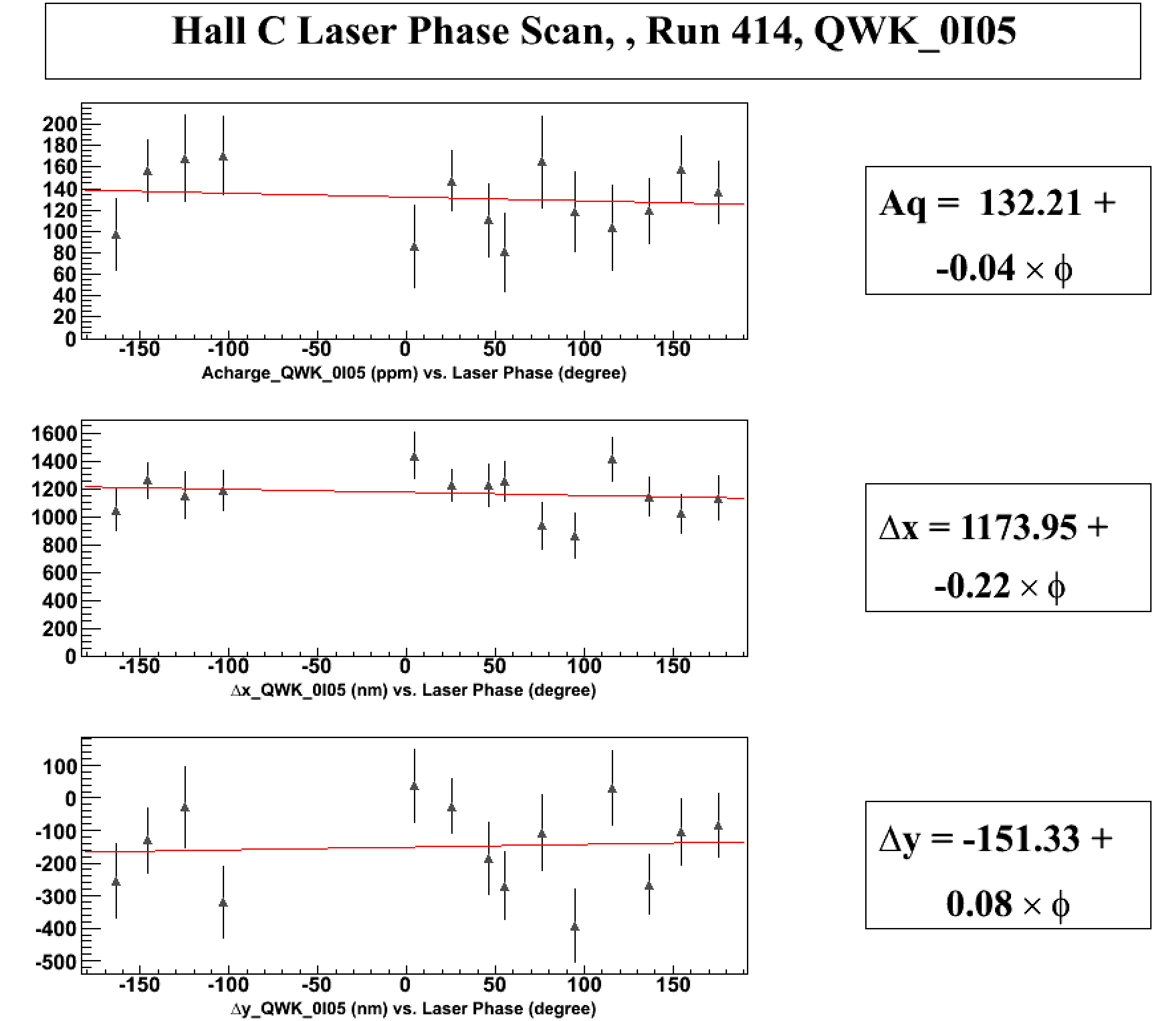




Hall C Current Scan



Hall C Laser Phase Scan



1 kHz Helicity Reversal

Cycle Rae (HZ)	MPS (µs)	MPS (Hz)	QRT (Hz)	Helicity (ms)	Helicity (Hz)
30	500	29.58	7.386	33.83	14.78
30	100	29.90	7.474	33.43	14.96
30	60	29.94	7.485	33.39	14.97
30	10	29.99	7.496	33.34	14.99
1000	500	675.7	168.9	1.480	337.8
1000	100	925.9	231.5	1.080	463.0
1000	60	961.5	240.4	1.040	480.8
1000	10	1010	252.5	0.9900	505.1

Notes:

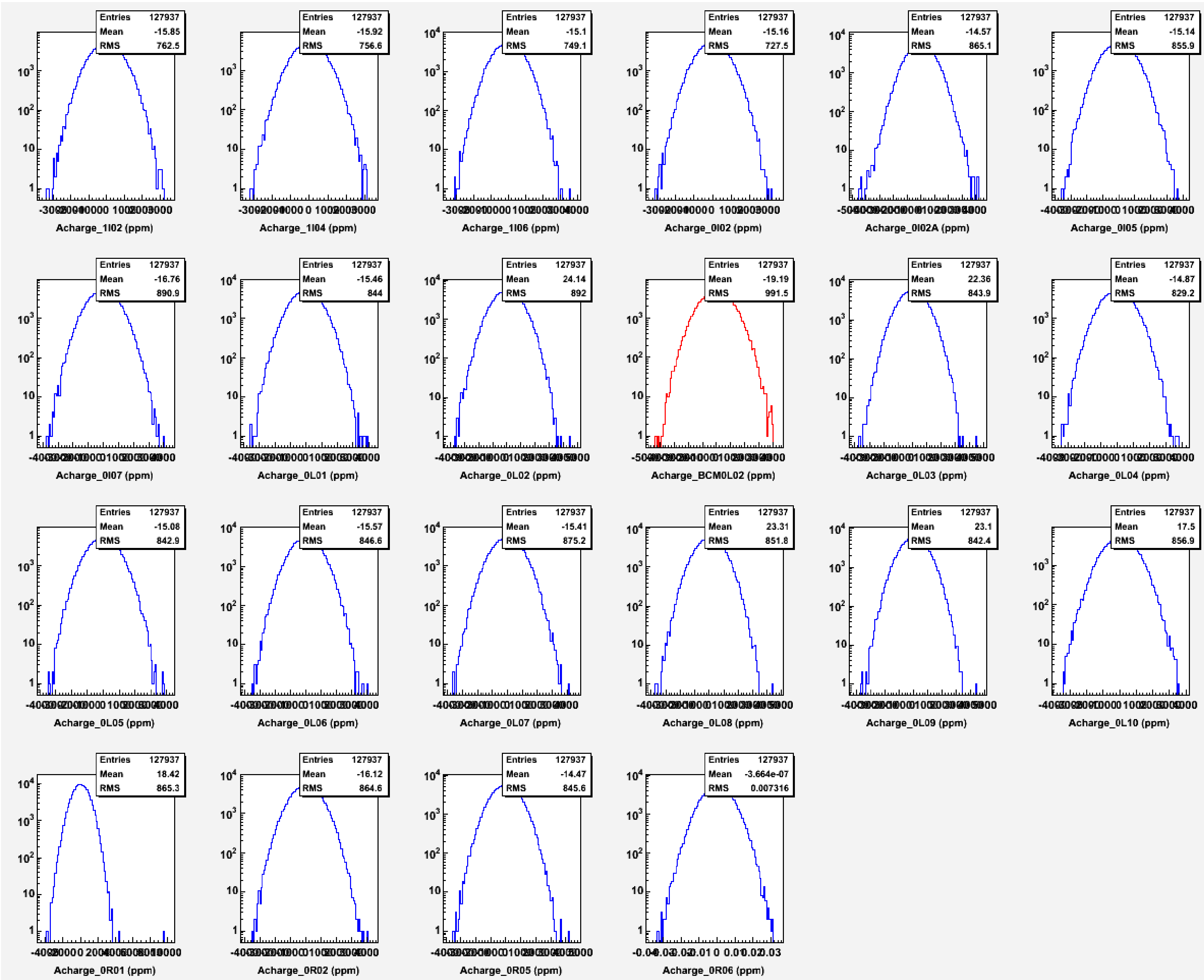
1. These values as measured by a scope
2. The integration window for 1 kHz is 0.980 ms

T-Settle Study
(500, 100, 60, 10 μs)

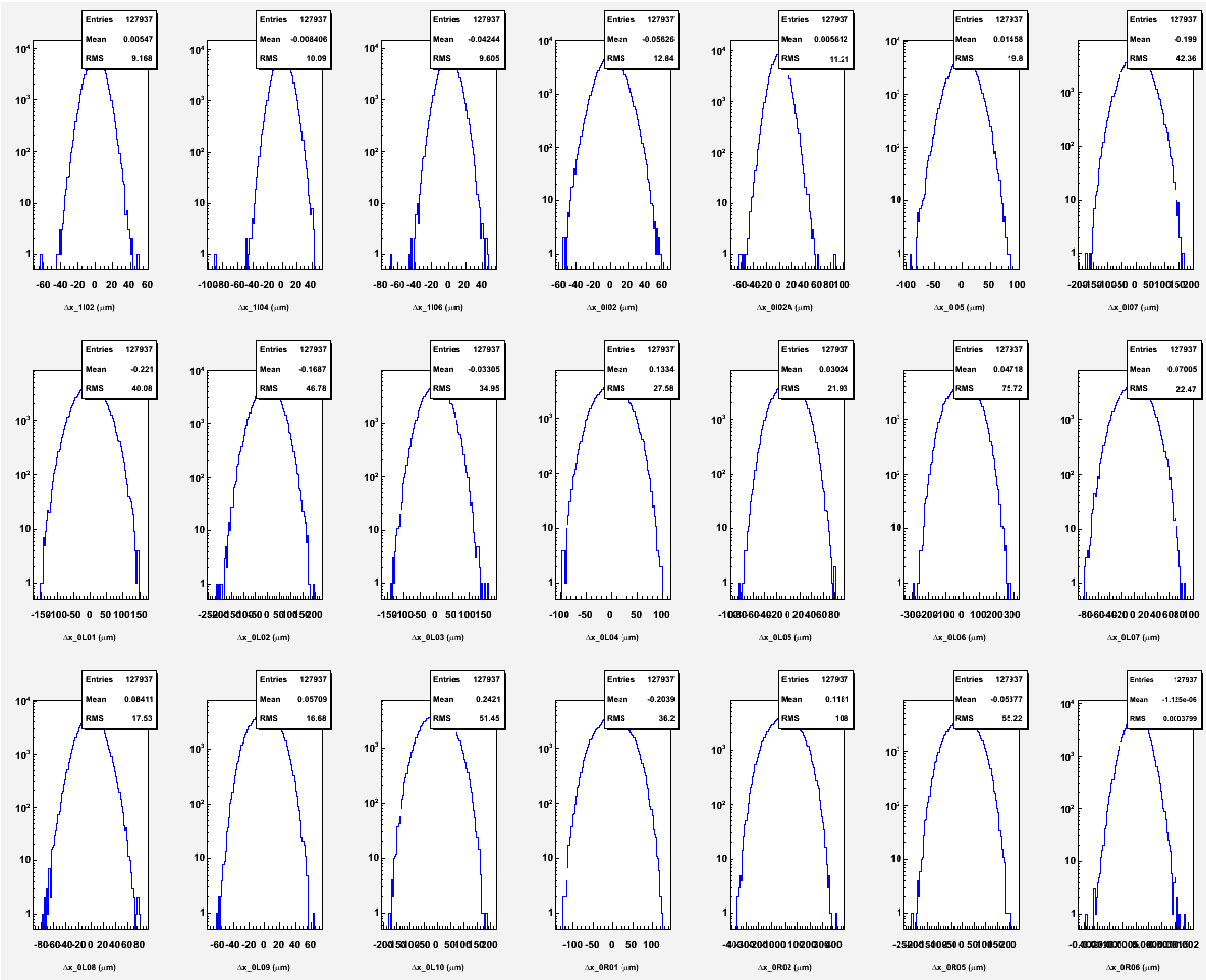
- 1 kHz
  1. Run 477: PC OFF, IHWP OUT, 100 μs
  2. Run 470: IHWP IN, 100 μs
  3. Run 471: IHWP OUT, 100 μs

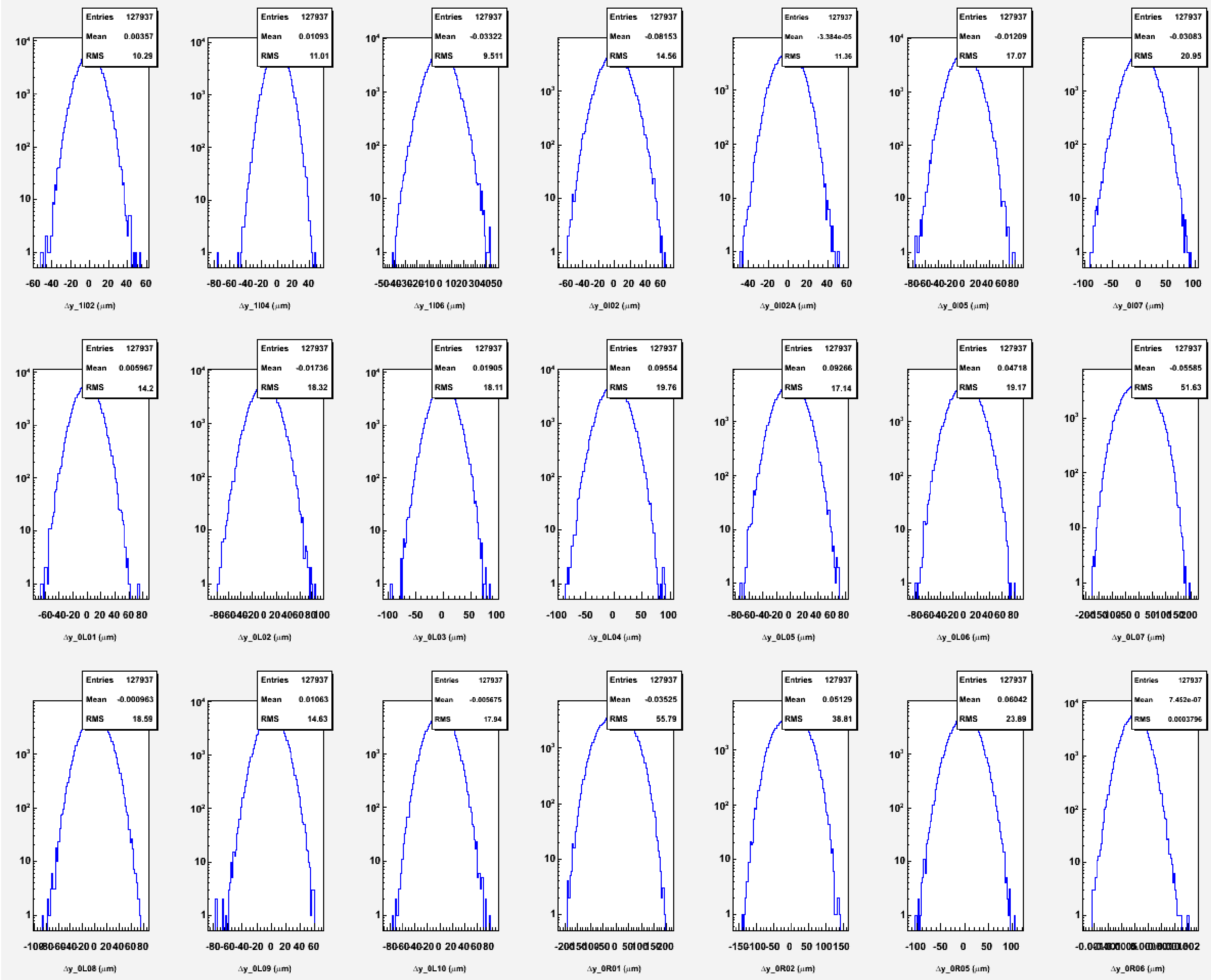
  4. Run 472: IHWP OUT, 100 μs, Toggle, No Delay (not analyzed yet)
  5. Run 479: IHWP IN, 100 μs, Toggle, No Delay (not analyzed yet)

- Notes:
  1. CODA gave error messages with the other T_Settle choices

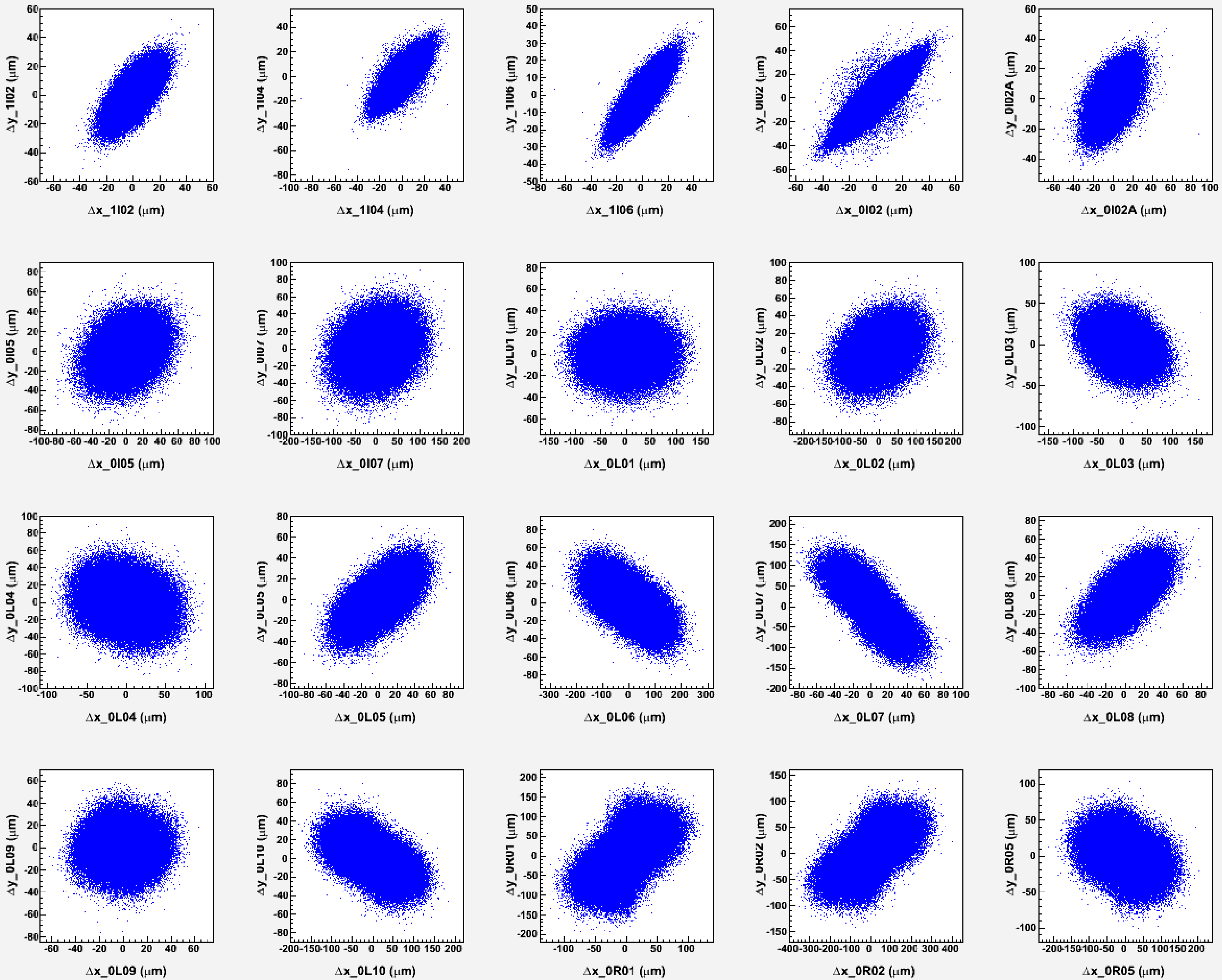


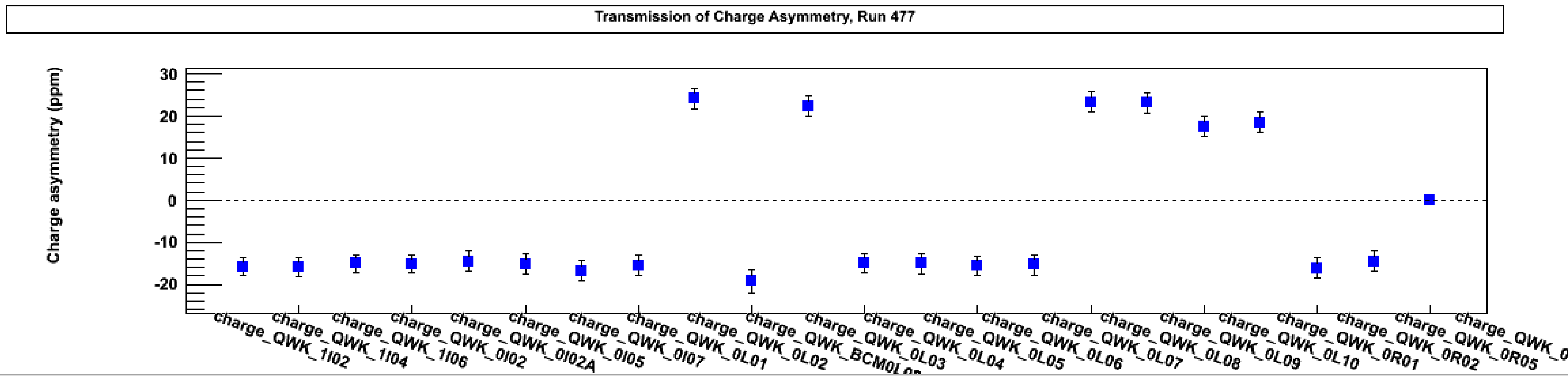
Entries 127937
Mean -15.85
RMS 762.5
Acharge_1I02 (ppm)
Entries 127937
Mean -15.92
RMS 756.6
Acharge_1I04 (ppm)
Entries 127937
Mean -15.1
RMS 749.1
Acharge_1I06 (ppm)
Entries 127937
Mean -15.16
RMS 727.5
Acharge_0I02 (ppm)
Entries 127937
Mean -14.57
RMS 865.1
Acharge_0I02A (ppm)
Entries 127937
Mean -15.14
RMS 855.9
Acharge_0I05 (ppm)
Entries 127937
Mean -16.76
RMS 890.9
Acharge_0I07 (ppm)
Entries 127937
Mean -15.46
RMS 844
Acharge_0L01 (ppm)
Entries 127937
Mean 24.14
RMS 892
Acharge_0L02 (ppm)
Entries 127937
Mean -19.19
RMS 991.5
Acharge_BCM0L02 (ppm)
Entries 127937
Mean 22.36
RMS 843.9
Acharge_0L03 (ppm)
Entries 127937
Mean -14.87
RMS 829.2
Acharge_0L04 (ppm)
Entries 127937
Mean -15.08
RMS 842.9
Acharge_0L05 (ppm)
Entries 127937
Mean -15.57
RMS 846.6
Acharge_0L06 (ppm)
Entries 127937
Mean -15.41
RMS 875.2
Acharge_0L07 (ppm)
Entries 127937
Mean 23.31
RMS 851.8
Acharge_0L08 (ppm)
Entries 127937
Mean 23.1
RMS 842.4
Acharge_0L09 (ppm)
Entries 127937
Mean 17.5
RMS 856.9
Acharge_0L10 (ppm)
Entries 127937
Mean 18.42
RMS 865.3
Acharge_0R01 (ppm)
Entries 127937
Mean -16.12
RMS 864.6
Acharge_0R02 (ppm)
Entries 127937
Mean -14.47
RMS 845.6
Acharge_0R05 (ppm)
Entries 127937
Mean -3.664e-07
RMS 0.007316
Acharge_0R06 (ppm)

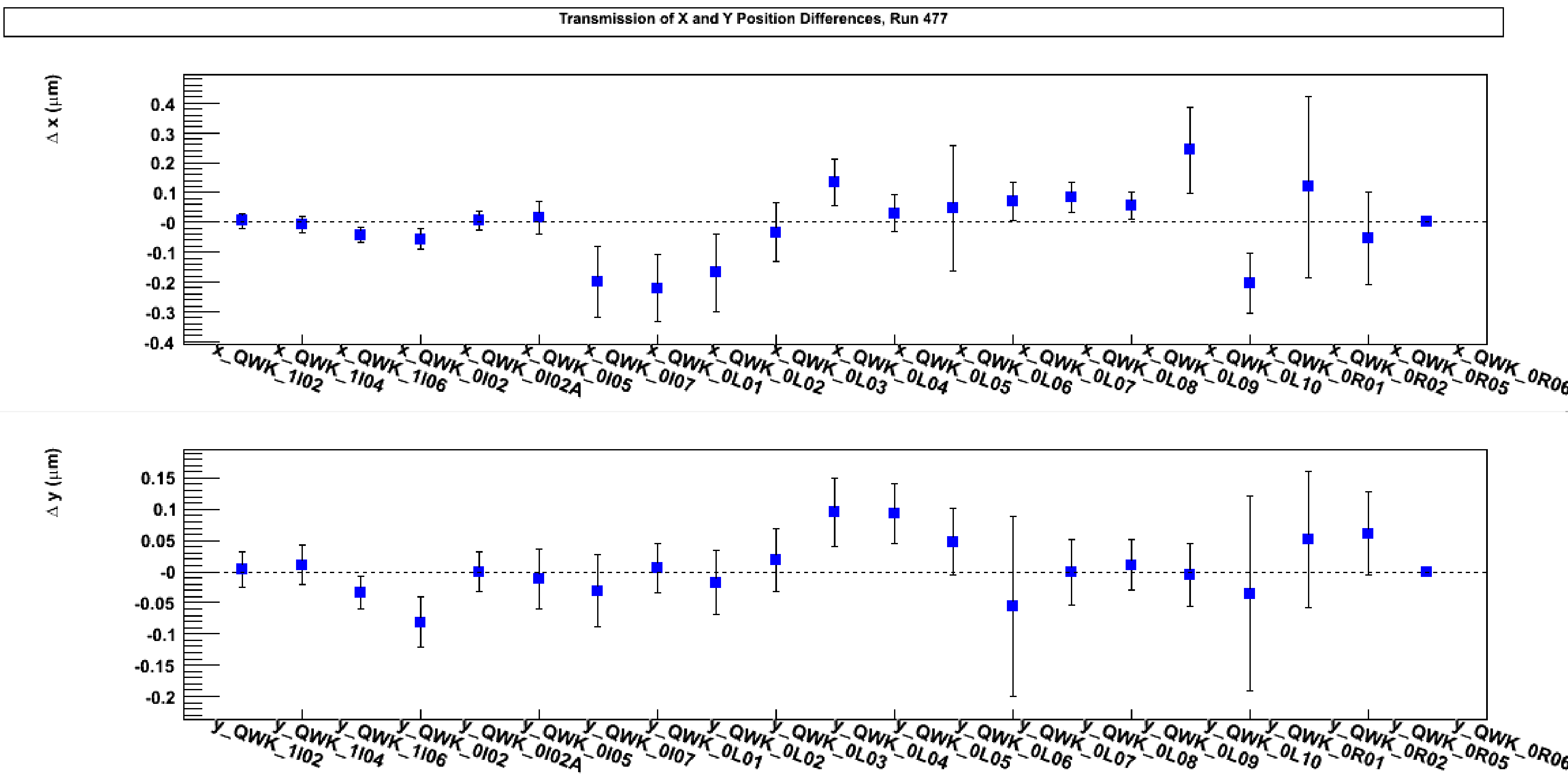

Entries 127937
Mean 0.00547
RMS 9.168
Δx_1I02 (μm)
Entries 127937
Mean -0.008406
RMS 10.09
Δx_1I04 (μm)
Entries 127937
Mean -0.04244
RMS 9.605
Δx_1I06 (μm)
Entries 127937
Mean -0.05626
RMS 12.84
Δx_0I02 (μm)
Entries 127937
Mean 0.005612
RMS 11.21
Δx_0I02A (μm)
Entries 127937
Mean 0.01458
RMS 19.8
Δx_0I05 (μm)
Entries 127937
Mean -0.199
RMS 42.36
Δx_0I07 (μm)
Entries 127937
Mean -0.221
RMS 40.08
Δx_0L01 (μm)
Entries 127937
Mean -0.1687
RMS 46.78
Δx_0L02 (μm)
Entries 127937
Mean -0.03305
RMS 34.95
Δx_0L03 (μm)
Entries 127937
Mean 0.1334
RMS 27.58
Δx_0L04 (μm)
Entries 127937
Mean 0.03024
RMS 21.93
Δx_0L05 (μm)
Entries 127937
Mean 0.04718
RMS 75.72
Δx_0L06 (μm)
Entries 127937
Mean 0.07005
RMS 22.47
Δx_0L07 (μm)
Entries 127937
Mean 0.08411
RMS 17.53
Δx_0L08 (μm)
Entries 127937
Mean 0.05709
RMS 16.68
Δx_0L09 (μm)
Entries 127937
Mean 0.2421
RMS 51.45
Δx_0L10 (μm)
Entries 127937
Mean -0.2039
RMS 36.2
Δx_0R01 (μm)
Entries 127937
Mean 0.1181
RMS 108
Δx_0R02 (μm)
Entries 127937
Mean -0.05377
RMS 55.22
Δx_0R05 (μm)
Entries 127937
Mean -1.125e-06
RMS 0.0003799
Δx_0R06 (μm)

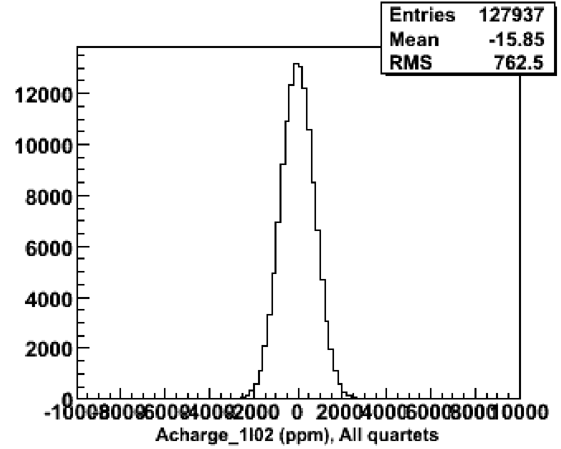


Entries 127937 Mean 0.00357 RMS 10.29
Δy_1I02 (μm)
Entries 127937 Mean 0.01093 RMS 11.01
Δy_1I04 (μm)
Entries 127937 Mean -0.03322 RMS 9.511
Δy_1I06 (μm)
Entries 127937 Mean -0.08153 RMS 14.56
Δy_0I02 (μm)
Entries 127937 Mean -3.384e-05 RMS 11.36
Δy_0I02A (μm)
Entries 127937 Mean -0.01209 RMS 17.07
Δy_0I05 (μm)
Entries 127937 Mean -0.03083 RMS 20.95
Δy_0I07 (μm)
Entries 127937 Mean 0.005967 RMS 14.2
Δy_0L01 (μm)
Entries 127937 Mean -0.01736 RMS 18.32
Δy_0L02 (μm)
Entries 127937 Mean 0.01905 RMS 18.11
Δy_0L03 (μm)
Entries 127937 Mean 0.09554 RMS 19.76
Δy_0L04 (μm)
Entries 127937 Mean 0.09266 RMS 17.14
Δy_0L05 (μm)
Entries 127937 Mean 0.04718 RMS 19.17
Δy_0L06 (μm)
Entries 127937 Mean -0.05585 RMS 51.63
Δy_0L07 (μm)
Entries 127937 Mean -0.000963 RMS 18.59
Δy_0L08 (μm)
Entries 127937 Mean 0.01063 RMS 14.63
Δy_0L09 (μm)
Entries 127937 Mean -0.005675 RMS 17.94
Δy_0L10 (μm)
Entries 127937 Mean -0.03525 RMS 55.79
Δy_0R01 (μm)
Entries 127937 Mean 0.05129 RMS 38.81
Δy_0R02 (μm)
Entries 127937 Mean 0.06042 RMS 23.89
Δy_0R05 (μm)
Entries 127937 Mean 7.452e-07 RMS 0.0003796
Δy_0R06 (μm)


Δy_1I02 (μm)
Δx_1I02 (μm)
Δx_1I04 (μm)
Δx_1I06 (μm)
Δx_0I02 (μm)
Δy_0I02A (μm)
Δx_0I02A (μm)
Δy_0I05 (μm)
Δx_0I05 (μm)
Δx_0I07 (μm)
Δx_0L01 (μm)
Δx_0L02 (μm)
Δy_0L03 (μm)
Δx_0L03 (μm)
Δy_0L04 (μm)
Δx_0L04 (μm)
Δx_0L05 (μm)
Δx_0L06 (μm)
Δx_0L07 (μm)
Δy_0L08 (μm)
Δx_0L08 (μm)
Δy_0L09 (μm)
Δx_0L09 (μm)
Δx_0L10 (μm)
Δx_0R01 (μm)
Δx_0R02 (μm)
Δy_0R05 (μm)
Δx_0R05 (μm)

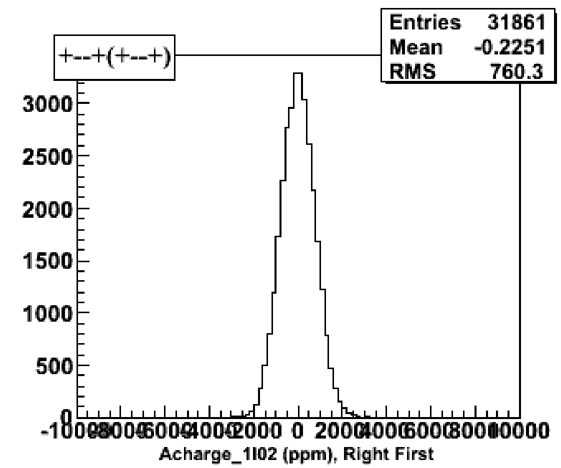

Transmission of Charge Asymmetry, Run 477
Charge asymmetry (ppm)
30
20
10
0
-10
-20
charge_QWK_1I02
charge_QWK_1I04
charge_QWK_1I06
charge_QWK_0I02
charge_QWK_0I02A
charge_QWK_0I05
charge_QWK_0I07
charge_QWK_0L01
charge_QWK_0L02
charge_QWK_BCM0L0
charge_QWK_0L03
charge_QWK_0L04
charge_QWK_0L05
charge_QWK_0L06
charge_QWK_0L07
charge_QWK_0L08
charge_QWK_0L09
charge_QWK_0L10
charge_QWK_0R01
charge_QWK_0R02
charge_QWK_0R05

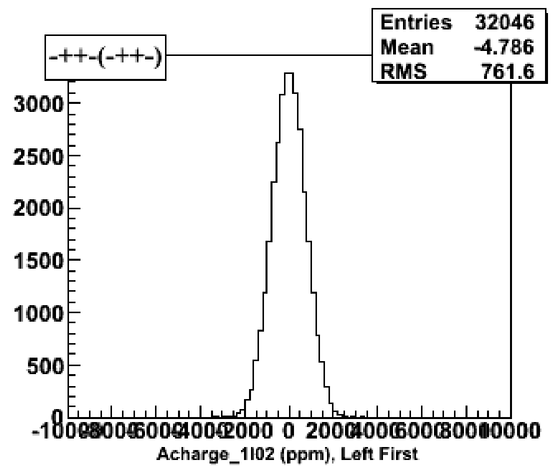

Transmission of X and Y Position Differences, Run 477
Δ x (μm)
0.4
0.3
0.2
0.1
-0
-0.1
-0.2
-0.3
-0.4
x_QWK_1I02
x_QWK_1I04
x_QWK_1I06
x_QWK_0I02
x_QWK_0I02A
x_QWK_0I05
x_QWK_0I07
x_QWK_0L01
x_QWK_0L02
x_QWK_0L03
x_QWK_0L04
x_QWK_0L05
x_QWK_0L06
x_QWK_0L07
x_QWK_0L08
x_QWK_0L09
x_QWK_0L10
x_QWK_0R01
x_QWK_0R02
x_QWK_0R05
x_QWK_0R06
Δ y (μm)
0.15
0.1
0.05
-0
-0.05
-0.1
-0.15
-0.2
y_QWK_1I02
y_QWK_1I04
y_QWK_1I06
y_QWK_0I02
y_QWK_0I02A
y_QWK_0I05
y_QWK_0I07
y_QWK_0L01
y_QWK_0L02
y_QWK_0L03
y_QWK_0L04
y_QWK_0L05
y_QWK_0L06
y_QWK_0L07
y_QWK_0L08
y_QWK_0L09
y_QWK_0L10
y_QWK_0R01
y_QWK_0R02
y_QWK_0R05
y_QWK_0R06

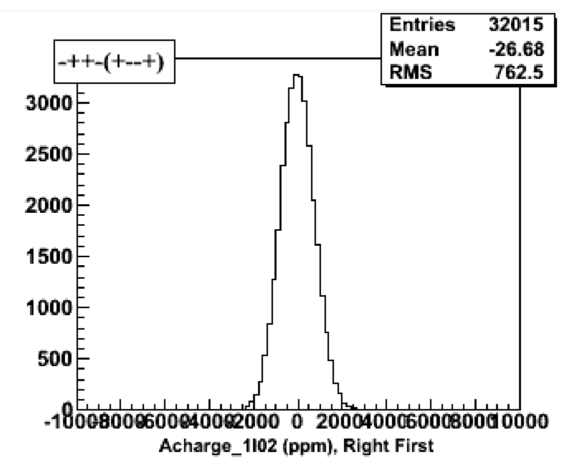


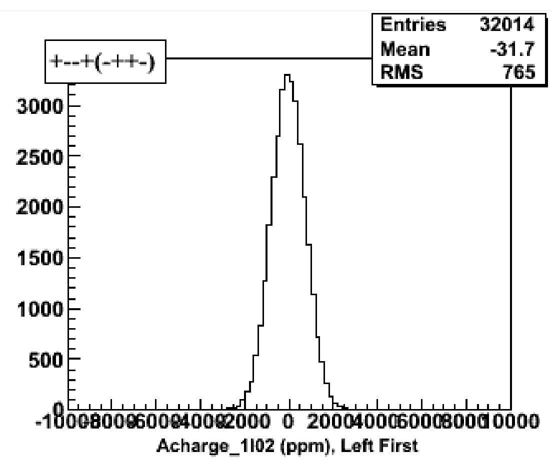
Run 477

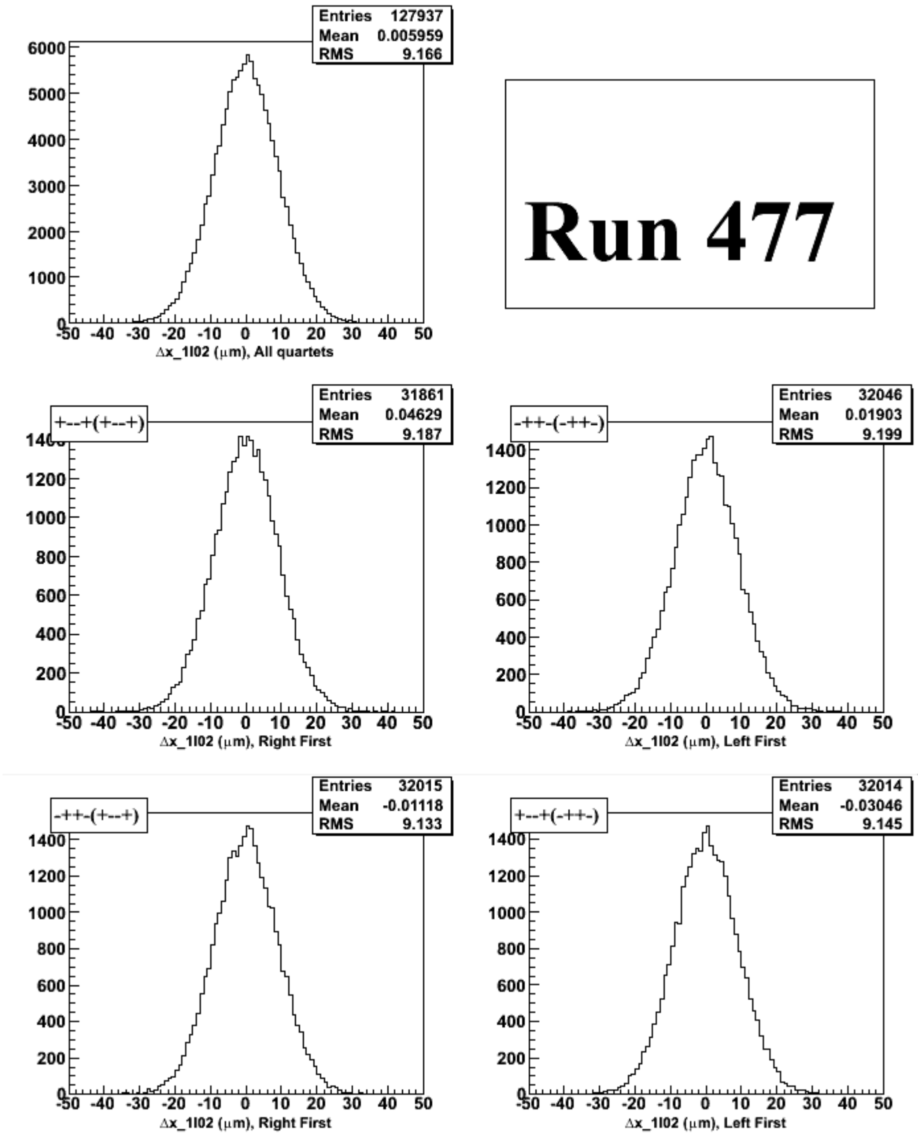
Charge Asymmetry

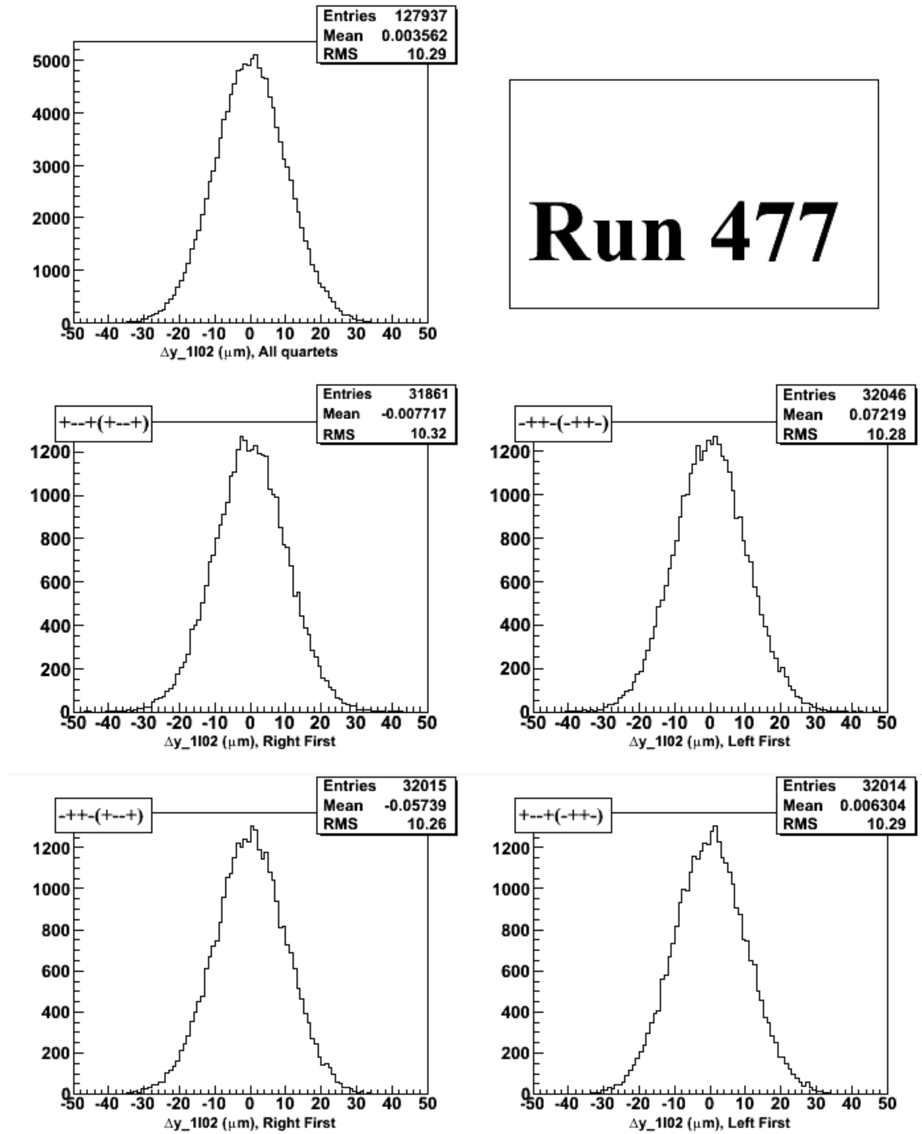


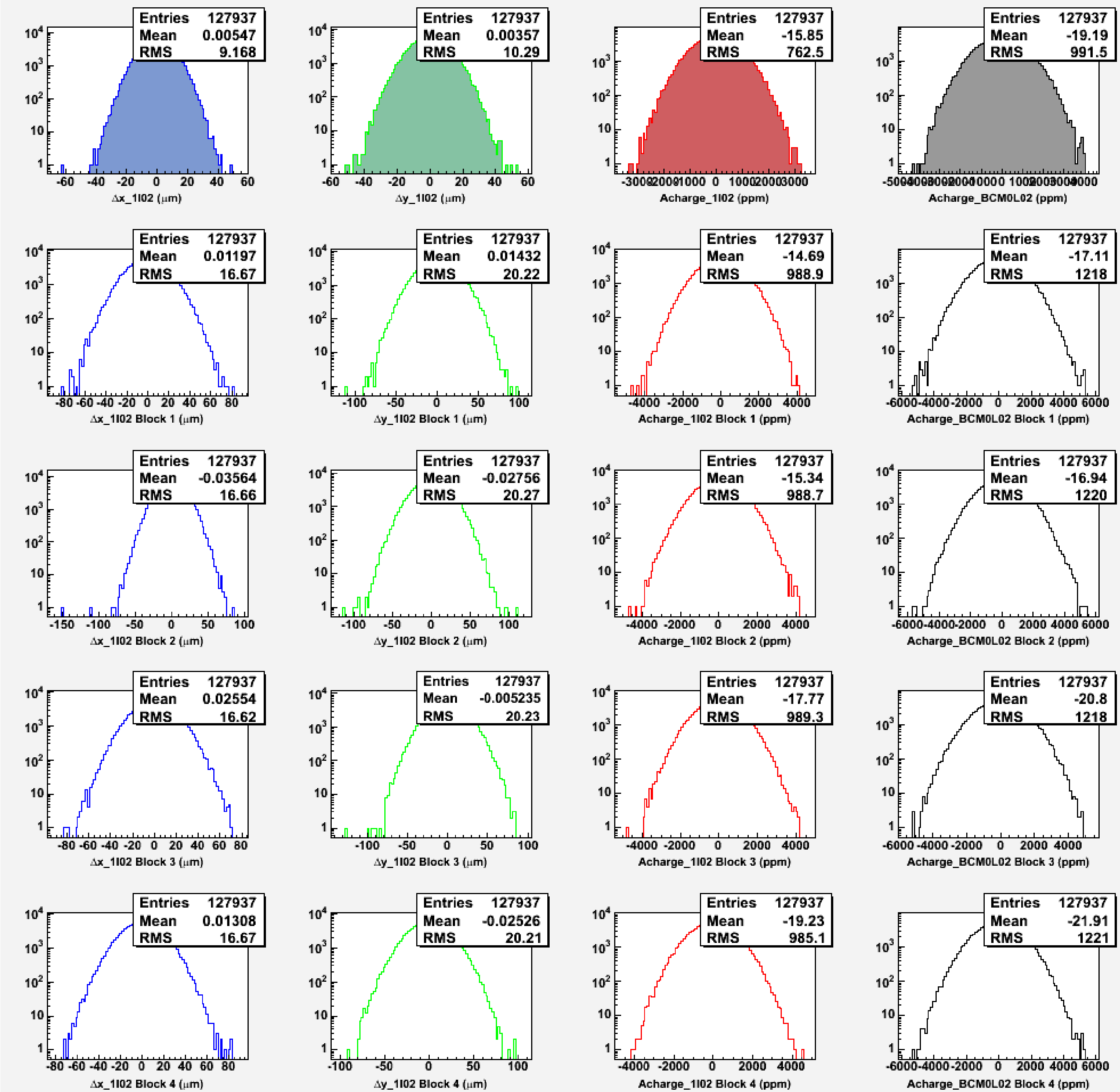


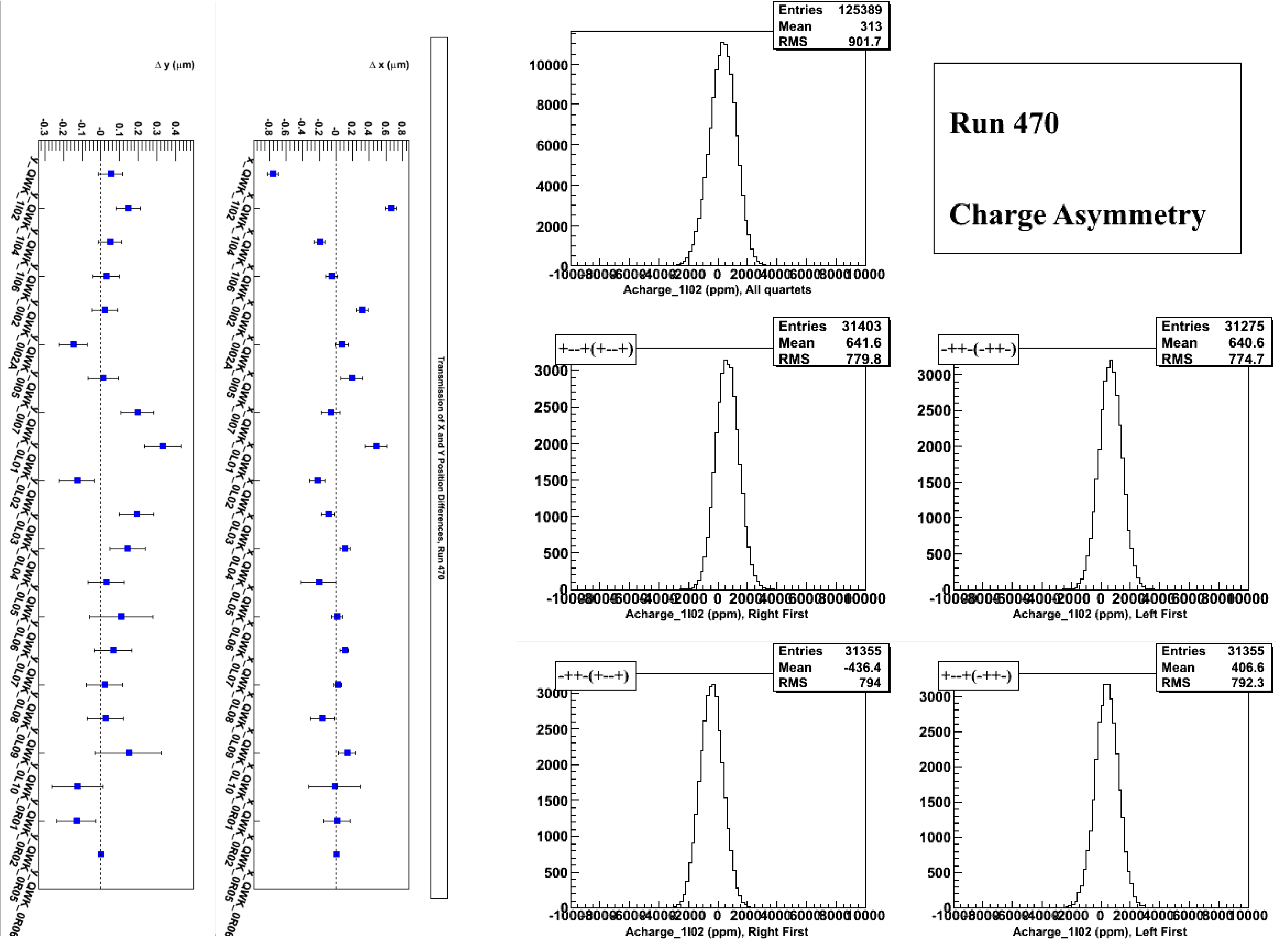


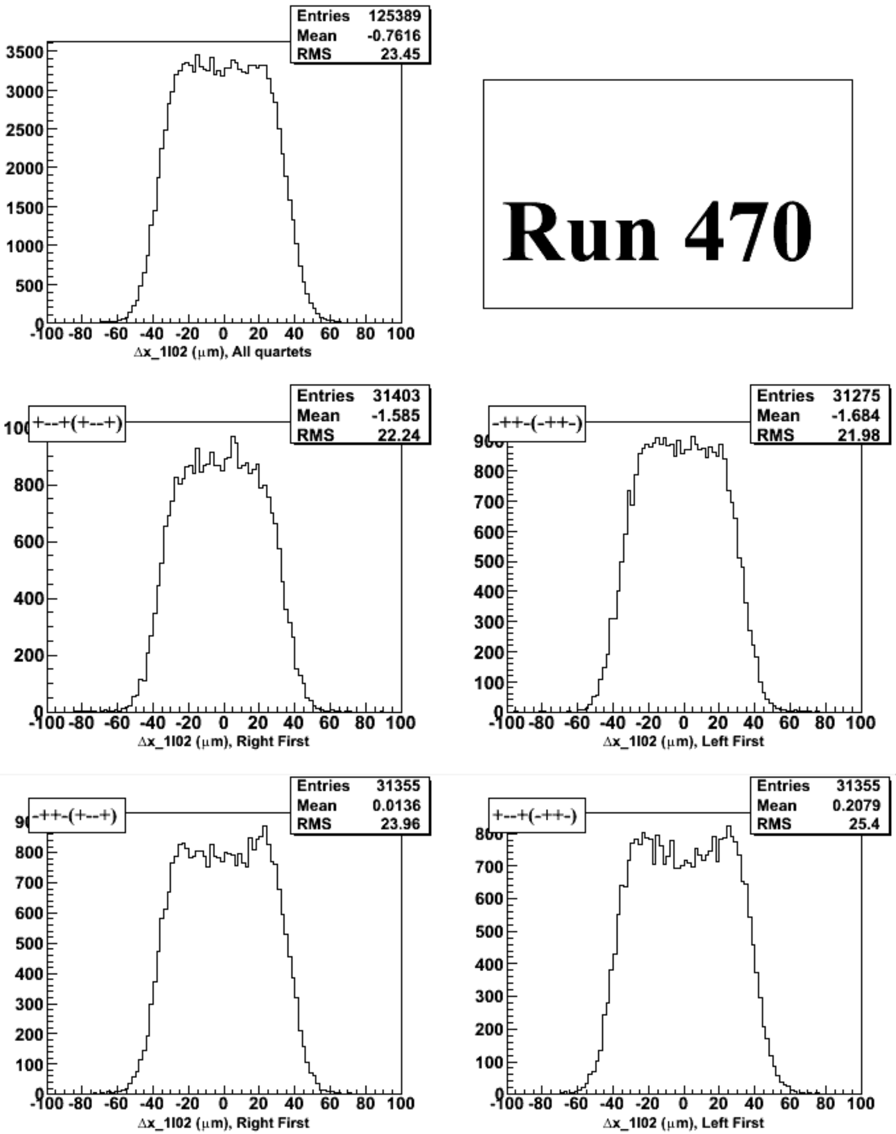


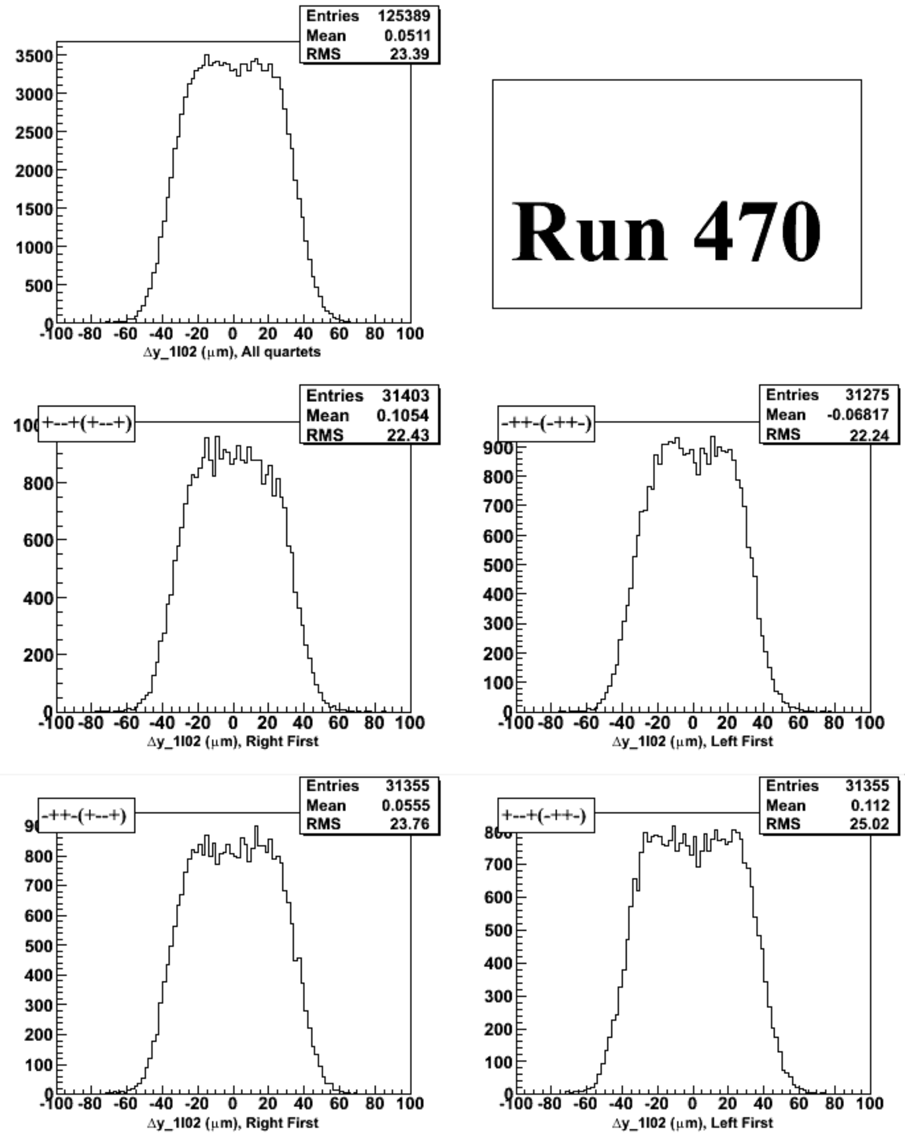

Entries 127937
Mean 0.005959
RMS 9.166
Δx_1l02 (μm), All quartets
Run 477
+--+(+--+)
Entries 31861
Mean 0.04629
RMS 9.187
Δx_1l02 (μm), Right First
-++-(-++-)
Entries 32046
Mean 0.01903
RMS 9.199
Δx_1l02 (μm), Left First
-++-(+--+)
Entries 32015
Mean -0.01118
RMS 9.133
Δx_1l02 (μm), Right First
+--+(-++-)
Entries 32014
Mean -0.03046
RMS 9.145
Δx_1l02 (μm), Left First

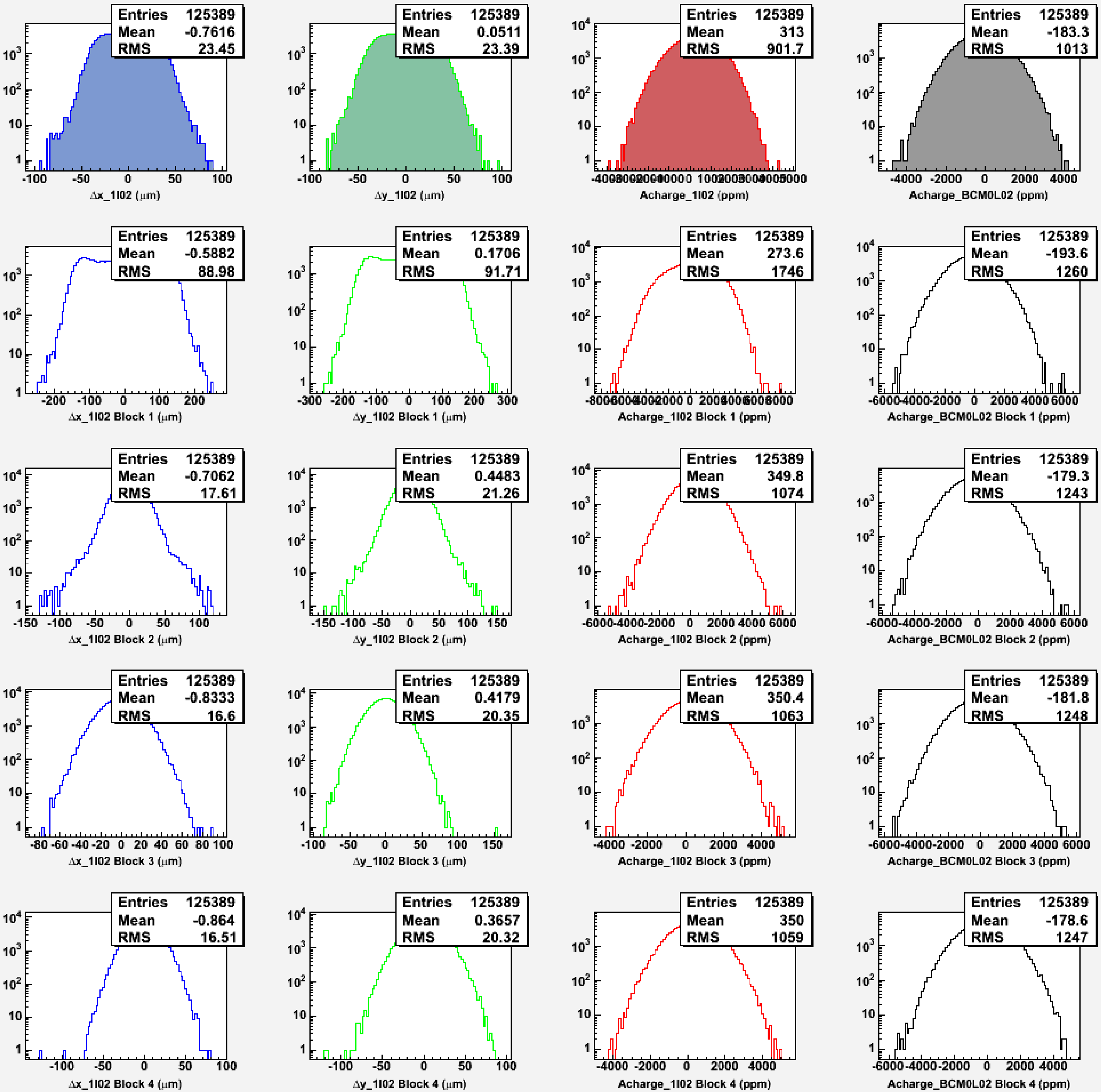

Entries 127937
Mean 0.003562
RMS 10.29
Δy_1l02 (μm), All quartets
Run 477
+--+(+--+)
Entries 31861
Mean -0.007717
RMS 10.32
Δy_1l02 (μm), Right First
-++-(-++-)
Entries 32046
Mean 0.07219
RMS 10.28
Δy_1l02 (μm), Left First
-++-(+--+)
Entries 32015
Mean -0.05739
RMS 10.26
Δy_1l02 (μm), Right First
+--+(-++-)
Entries 32014
Mean 0.006304
RMS 10.29
Δy_1l02 (μm), Left First


Entries 127937
Mean 0.00547
RMS 9.168
Δx_1I02 (μm)
Entries 127937
Mean 0.00357
RMS 10.29
Δy_1I02 (μm)
Entries 127937
Mean -15.85
RMS 762.5
Acharge_1I02 (ppm)
Entries 127937
Mean -19.19
RMS 991.5
Acharge_BCM0L02 (ppm)
Entries 127937
Mean 0.01197
RMS 16.67
Δx_1I02 Block 1 (μm)
Entries 127937
Mean 0.01432
RMS 20.22
Δy_1I02 Block 1 (μm)
Entries 127937
Mean -14.69
RMS 988.9
Acharge_1I02 Block 1 (ppm)
Entries 127937
Mean -17.11
RMS 1218
Acharge_BCM0L02 Block 1 (ppm)
Entries 127937
Mean -0.03564
RMS 16.66
Δx_1I02 Block 2 (μm)
Entries 127937
Mean -0.02756
RMS 20.27
Δy_1I02 Block 2 (μm)
Entries 127937
Mean -15.34
RMS 988.7
Acharge_1I02 Block 2 (ppm)
Entries 127937
Mean -16.94
RMS 1220
Acharge_BCM0L02 Block 2 (ppm)
Entries 127937
Mean 0.02554
RMS 16.62
Δx_1I02 Block 3 (μm)
Entries 127937
Mean -0.005235
RMS 20.23
Δy_1I02 Block 3 (μm)
Entries 127937
Mean -17.77
RMS 989.3
Acharge_1I02 Block 3 (ppm)
Entries 127937
Mean -20.8
RMS 1218
Acharge_BCM0L02 Block 3 (ppm)
Entries 127937
Mean 0.01308
RMS 16.67
Δx_1I02 Block 4 (μm)
Entries 127937
Mean -0.02526
RMS 20.21
Δy_1I02 Block 4 (μm)
Entries 127937
Mean -19.23
RMS 985.1
Acharge_1I02 Block 4 (ppm)
Entries 127937
Mean -21.91
RMS 1221
Acharge_BCM0L02 Block 4 (ppm)

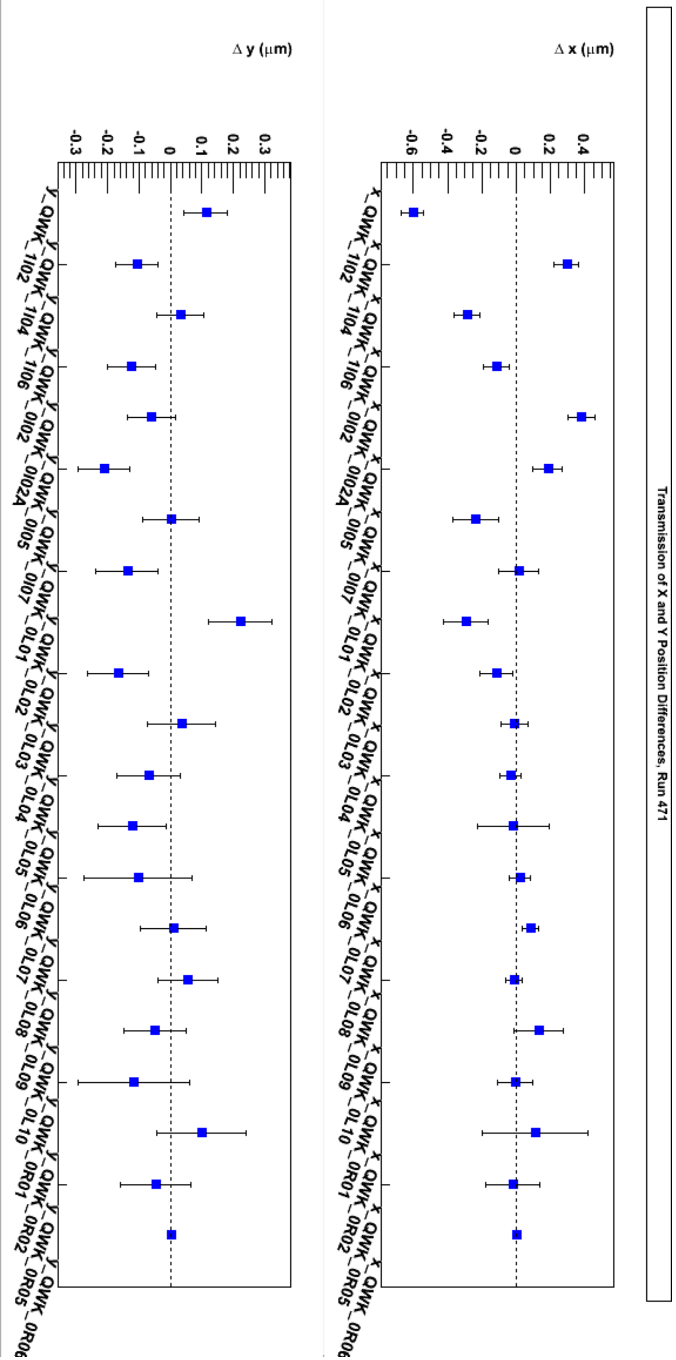

Run 470
Charge Asymmetry
Transmission of X and Y Position Differences, Run 470
Δ y (μm)
Δ x (μm)
Entries 125389
Mean 313
RMS 901.7
Acharge_1I02 (ppm), All quartets
+--+(+--+)
Entries 31403
Mean 641.6
RMS 779.8
Acharge_1I02 (ppm), Right First
-++-(-++-)
Entries 31275
Mean 640.6
RMS 774.7
Acharge_1I02 (ppm), Left First
-++-(+--+)
Entries 31355
Mean -436.4
RMS 794
Acharge_1I02 (ppm), Right First
+--+(-++-)
Entries 31355
Mean 406.6
RMS 792.3
Acharge_1I02 (ppm), Left First

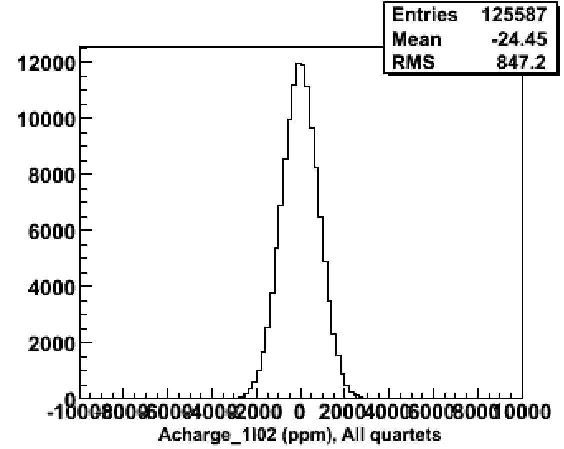

Entries 125389
Mean -0.7616
RMS 23.45
Δx_1I02 (μm), All quartets
Run 470
+--+(+--+)
Entries 31403
Mean -1.585
RMS 22.24
Δx_1I02 (μm), Right First
-++-(-++-)
Entries 31275
Mean -1.684
RMS 21.98
Δx_1I02 (μm), Left First
-++-(+--+)
Entries 31355
Mean 0.0136
RMS 23.96
Δx_1I02 (μm), Right First
+--+(-++-)
Entries 31355
Mean 0.2079
RMS 25.4
Δx_1I02 (μm), Left First


Entries 125389
Mean 0.0511
RMS 23.39
Δy_1I02 (μm), All quartets
Run 470
+--+(+--+)
Entries 31403
Mean 0.1054
RMS 22.43
Δy_1I02 (μm), Right First
-++-(-++-)
Entries 31275
Mean -0.06817
RMS 22.24
Δy_1I02 (μm), Left First
-++-(+--+)
Entries 31355
Mean 0.0555
RMS 23.76
Δy_1I02 (μm), Right First
+--+(-++-)
Entries 31355
Mean 0.112
RMS 25.02
Δy_1I02 (μm), Left First



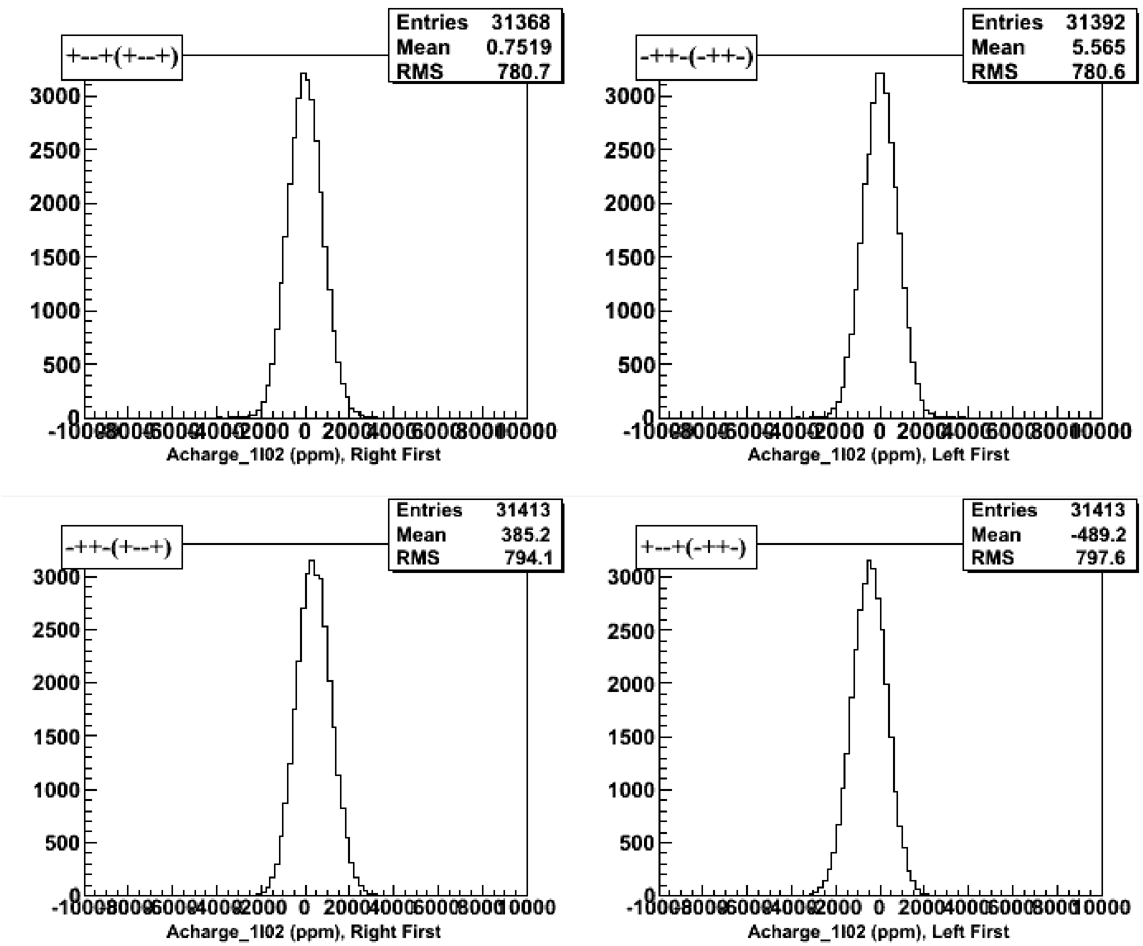
Entries 125389 Mean -0.7616 RMS 23.45
Δx_1I02 (μm)
Entries 125389 Mean 0.0511 RMS 23.39
Δy_1I02 (μm)
Entries 125389 Mean 313 RMS 901.7
Acharge_1I02 (ppm)
Entries 125389 Mean -183.3 RMS 1013
Acharge_BCM0L02 (ppm)
Entries 125389 Mean -0.5882 RMS 88.98
Δx_1I02 Block 1 (μm)
Entries 125389 Mean 0.1706 RMS 91.71
Δy_1I02 Block 1 (μm)
Entries 125389 Mean 273.6 RMS 1746
Acharge_1I02 Block 1 (ppm)
Entries 125389 Mean -193.6 RMS 1260
Acharge_BCM0L02 Block 1 (ppm)
Entries 125389 Mean -0.7062 RMS 17.61
Δx_1I02 Block 2 (μm)
Entries 125389 Mean 0.4483 RMS 21.26
Δy_1I02 Block 2 (μm)
Entries 125389 Mean 349.8 RMS 1074
Acharge_1I02 Block 2 (ppm)
Entries 125389 Mean -179.3 RMS 1243
Acharge_BCM0L02 Block 2 (ppm)
Entries 125389 Mean -0.8333 RMS 16.6
Δx_1I02 Block 3 (μm)
Entries 125389 Mean 0.4179 RMS 20.35
Δy_1I02 Block 3 (μm)
Entries 125389 Mean 350.4 RMS 1063
Acharge_1I02 Block 3 (ppm)
Entries 125389 Mean -181.8 RMS 1248
Acharge_BCM0L02 Block 3 (ppm)
Entries 125389 Mean -0.864 RMS 16.51
Δx_1I02 Block 4 (μm)
Entries 125389 Mean 0.3657 RMS 20.32
Δy_1I02 Block 4 (μm)
Entries 125389 Mean 350 RMS 1059
Acharge_1I02 Block 4 (ppm)
Entries 125389 Mean -178.6 RMS 1247
Acharge_BCM0L02 Block 4 (ppm)

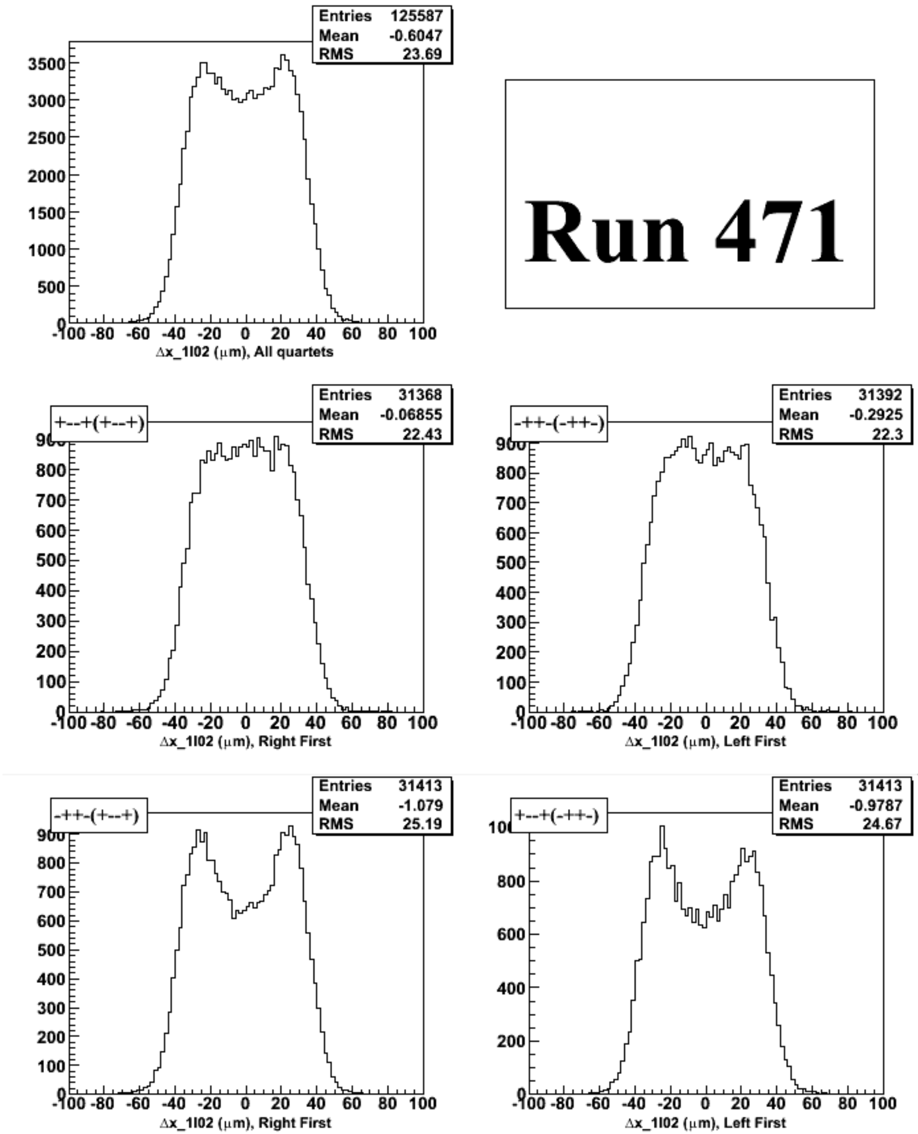


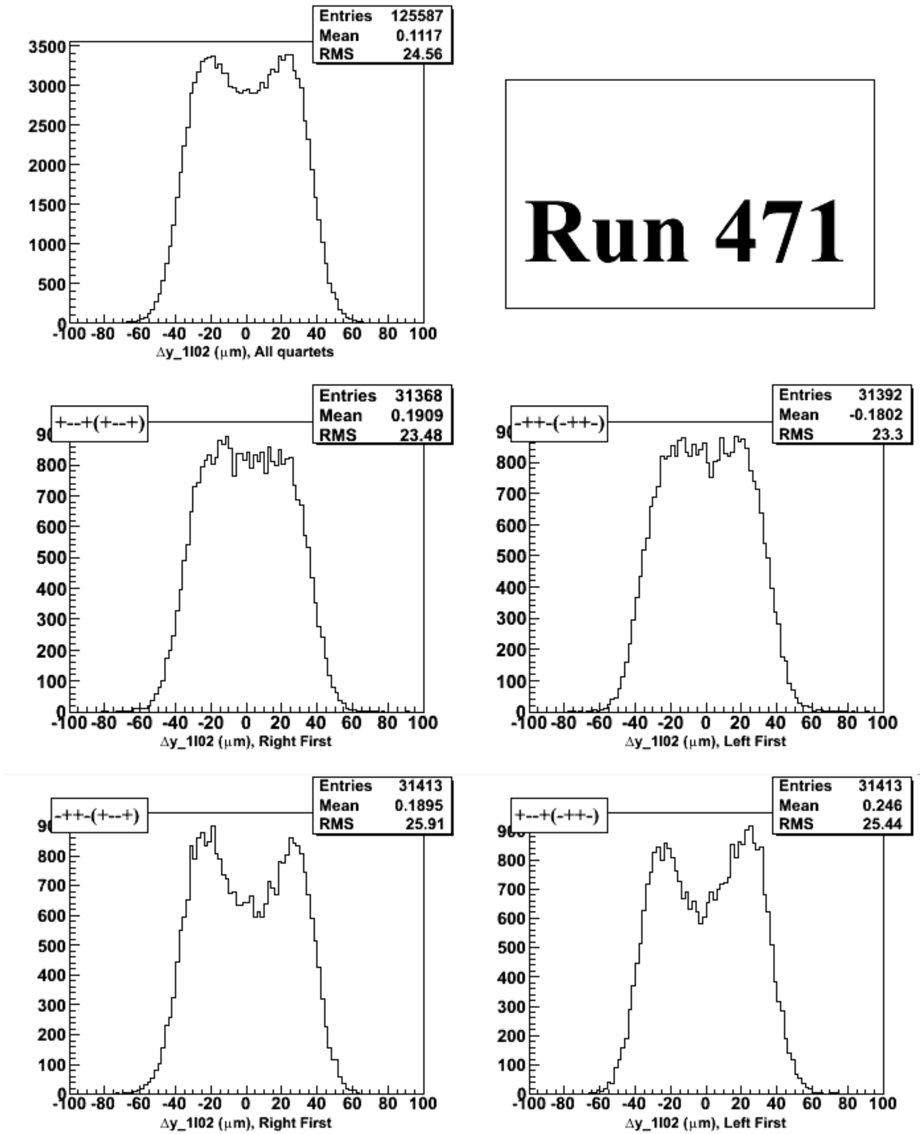


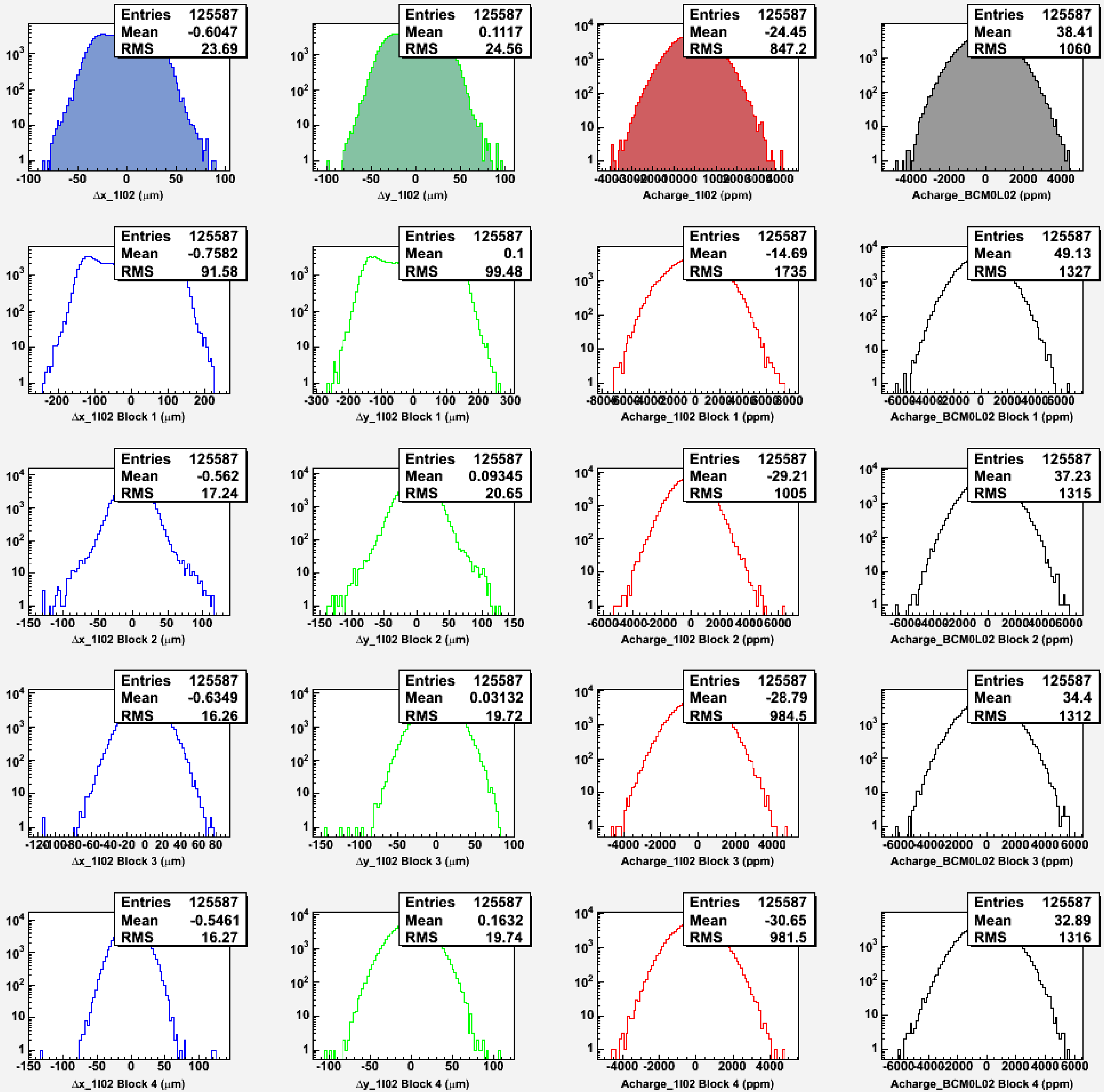
Run 471

Charge Asymmetry




Run 471
Entries 125587
Mean -0.6047
RMS 23.69
Δx_1I02 (μm), All quartets
+--+(+--+)
Entries 31368
Mean -0.06855
RMS 22.43
Δx_1I02 (μm), Right First
-++-(-++-)
Entries 31392
Mean -0.2925
RMS 22.3
Δx_1I02 (μm), Left First
-++-(+--+)
Entries 31413
Mean -1.079
RMS 25.19
Δx_1I02 (μm), Right First
+--+(-++-)
Entries 31413
Mean -0.9787
RMS 24.67
Δx_1I02 (μm), Left First


Run 471
Entries 125587
Mean 0.1117
RMS 24.56
Δy_1I02 (μm), All quartets
+--+(+--+)
Entries 31368
Mean 0.1909
RMS 23.48
Δy_1I02 (μm), Right First
-++-(-++-)
Entries 31392
Mean -0.1802
RMS 23.3
Δy_1I02 (μm), Left First
-++-(+--+)
Entries 31413
Mean 0.1895
RMS 25.91
Δy_1I02 (μm), Right First
+--+(-++-)
Entries 31413
Mean 0.246
RMS 25.44
Δy_1I02 (μm), Left First



Entries 125587 Mean -0.6047 RMS 23.69
Δx_1I02 (μm)
Entries 125587 Mean 0.1117 RMS 24.56
Δy_1I02 (μm)
Entries 125587 Mean -24.45 RMS 847.2
Acharge_1I02 (ppm)
Entries 125587 Mean 38.41 RMS 1060
Acharge_BCM0L02 (ppm)
Entries 125587 Mean -0.7582 RMS 91.58
Δx_1I02 Block 1 (μm)
Entries 125587 Mean 0.1 RMS 99.48
Δy_1I02 Block 1 (μm)
Entries 125587 Mean -14.69 RMS 1735
Acharge_1I02 Block 1 (ppm)
Entries 125587 Mean 49.13 RMS 1327
Acharge_BCM0L02 Block 1 (ppm)
Entries 125587 Mean -0.562 RMS 17.24
Δx_1I02 Block 2 (μm)
Entries 125587 Mean 0.09345 RMS 20.65
Δy_1I02 Block 2 (μm)
Entries 125587 Mean -29.21 RMS 1005
Acharge_1I02 Block 2 (ppm)
Entries 125587 Mean 37.23 RMS 1315
Acharge_BCM0L02 Block 2 (ppm)
Entries 125587 Mean -0.6349 RMS 16.26
Δx_1I02 Block 3 (μm)
Entries 125587 Mean 0.03132 RMS 19.72
Δy_1I02 Block 3 (μm)
Entries 125587 Mean -28.79 RMS 984.5
Acharge_1I02 Block 3 (ppm)
Entries 125587 Mean 34.4 RMS 1312
Acharge_BCM0L02 Block 3 (ppm)
Entries 125587 Mean -0.5461 RMS 16.27
Δx_1I02 Block 4 (μm)
Entries 125587 Mean 0.1632 RMS 19.74
Δy_1I02 Block 4 (μm)
Entries 125587 Mean -30.65 RMS 981.5
Acharge_1I02 Block 4 (ppm)
Entries 125587 Mean 32.89 RMS 1316
Acharge_BCM0L02 Block 4 (ppm)

Summary

- The parity DAQ, BPMs, and Analysis are working fine
- 30 Hz:
  1. The standard PQB at 30 Hz was achieved
- 250 Hz:
  1. The PQB at 250 Hz very similar to 30 Hz otherwise for the 60 Hz noise
- 1 kHz:
  1. The PQB at 1 kHz very similar to 30 Hz, again issues with 60 Hz noise (less sensitive than at 250 Hz)
- What's next?
  1. Finish analysis: 4 blocks, Phase Monitor, Batteries, …
  2. Study 1 kHz for all T_Settle choices
  3. Photocathode rotation
  4. Check Helicity Magnets, Mott Polarimeters at 1 kHz helicity reversal