

# Parity Quality Beam (PQB) Study

Injector Group

September 2008

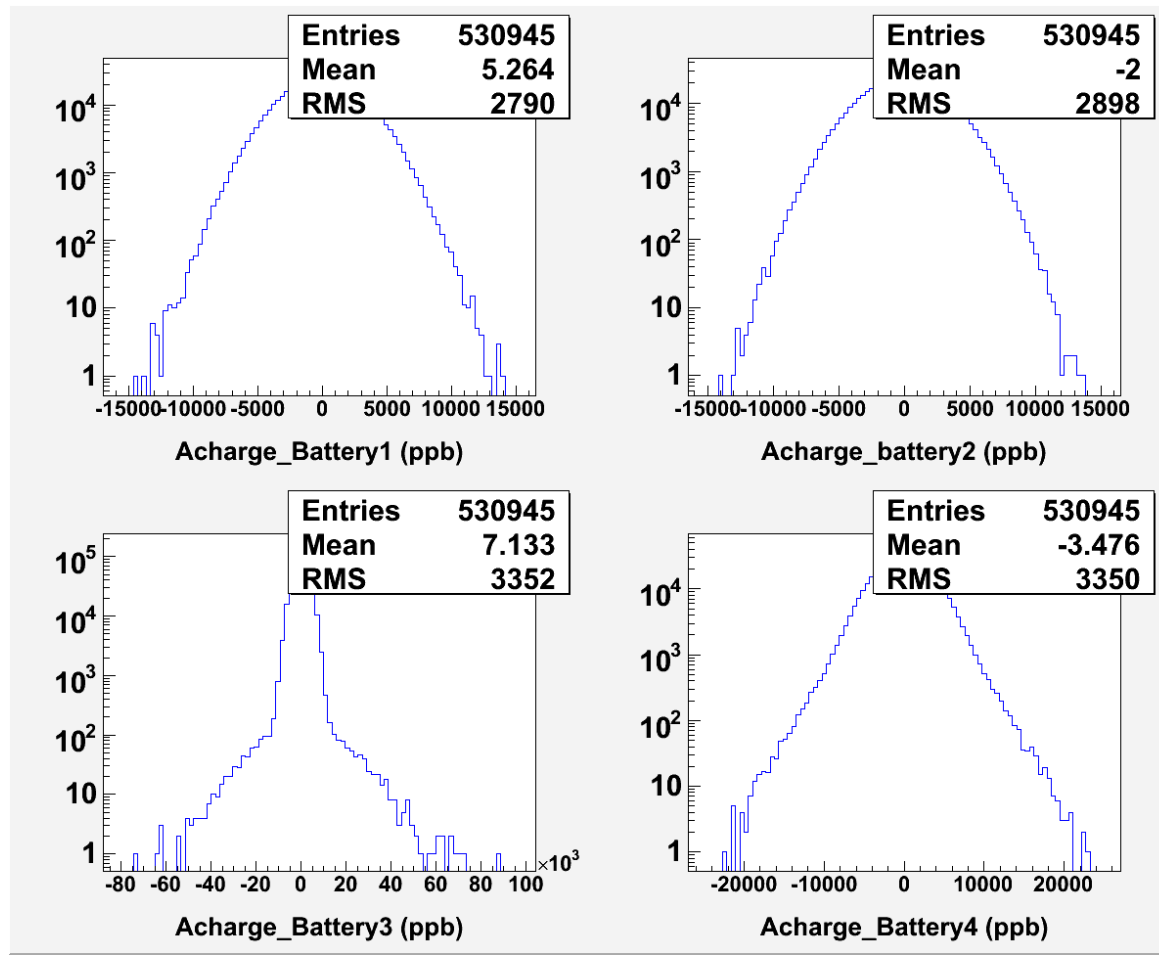
Cycle Rate (Hz)	MPS ( $\mu$ s)	MPS (Hz)	QRT (Hz)	Helicity (ms)	Helicity (Hz)
30	500	29.58	7.386	33.83	14.78
30	200	29.76	7.451	33.53	14.91
30	100	29.90	7.474	33.43	14.96
30	60	29.94	7.485	33.39	14.97
250	500	226.3	56.56	4.420	113.1
250	200	242.7	60.68	4.120	121.4
250	100	248.8	62.68	4.020	124.4
250	60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

Notes:

1. Signals to Parity DAQ: MPS (T-Settle), QRT, Helicity (delayed), and Pair-Sync
2. The length and frequency of Pair-Sync are identical to Helicity
3. The length of QRT is identical to Helicity
4. The integration window for 30 Hz is 33.33 ms and for 250 Hz is 3.92 ms

# 1- Battery Signals (3 V)

## Random, 8-window delay, Run 361



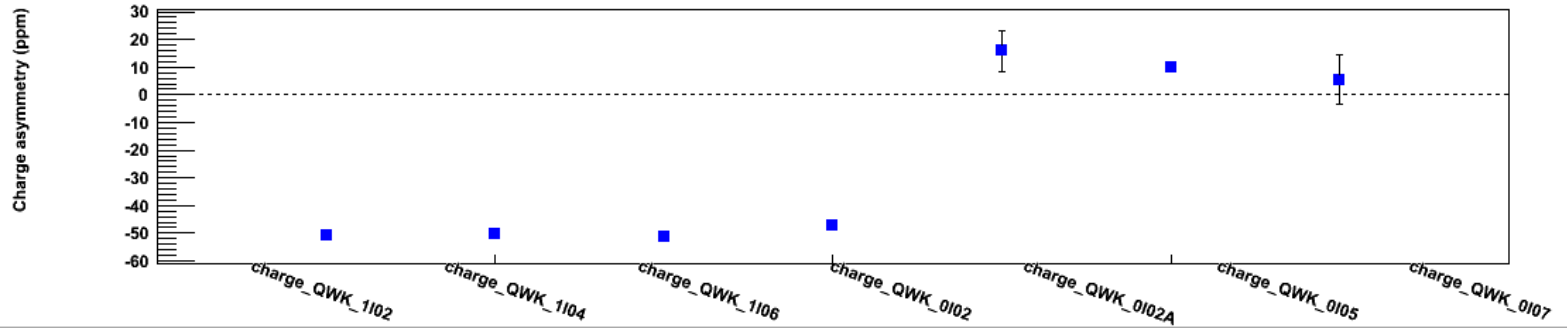
# 2- T-Settle Study

## (500, 200, 100, 60 $\mu$ s)

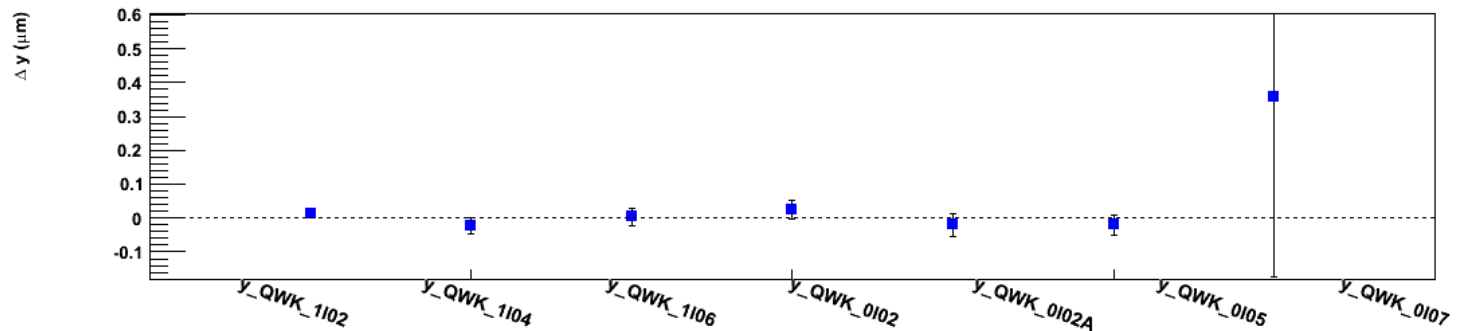
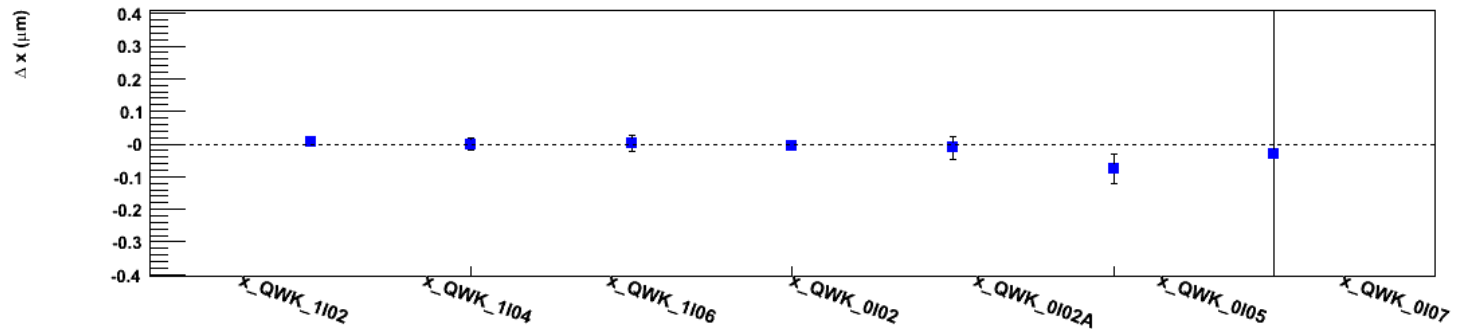
- 30 Hz
  1. Run 340: PC OFF, IHWP OUT, 500  $\mu$ s
  2. Run 341: IHWP OUT, 500  $\mu$ s
  3. Run 342: IHWP IN, 500  $\mu$ s
  4. Run 343: IHWP IN, 200  $\mu$ s
  5. Run 344: IHWP IN, 100  $\mu$ s
  6. Run 345: IHWP IN, 60  $\mu$ s
  
- 250 Hz
  1. Run 347: PC OFF, IHWP OUT, 500  $\mu$ s
  2. Run 348: IHWP OUT, 500  $\mu$ s
  3. Run 349: IHWP IN, 500  $\mu$ s
  4. Run 350: IHWP IN, 200  $\mu$ s
  5. Run 351: IHWP IN, 100  $\mu$ s
  6. Run 352: IHWP IN, 60  $\mu$ s

# PC OFF, 30 Hz, 500 $\mu$ s

Transmission of Charge Asymmetry, Run 340

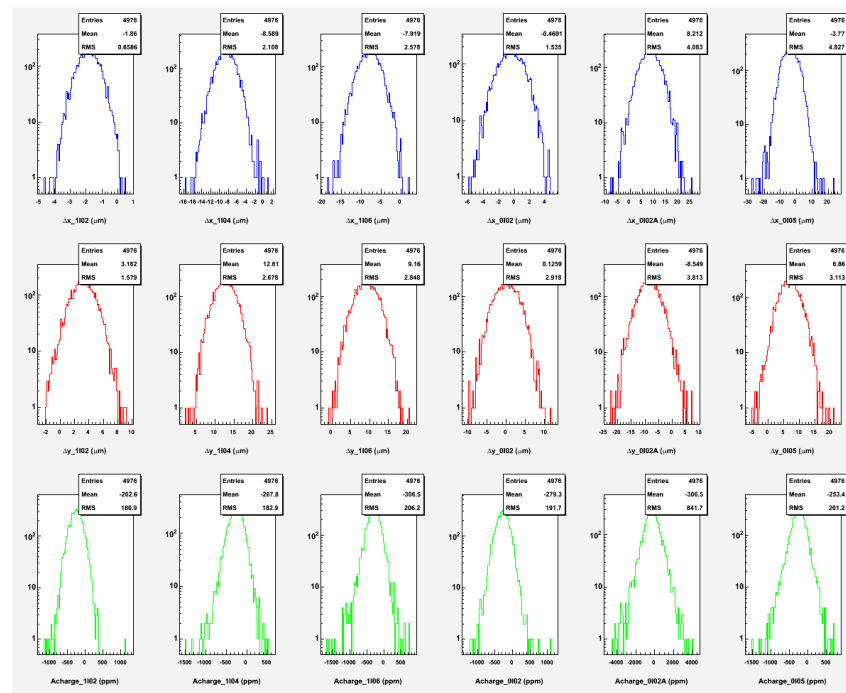
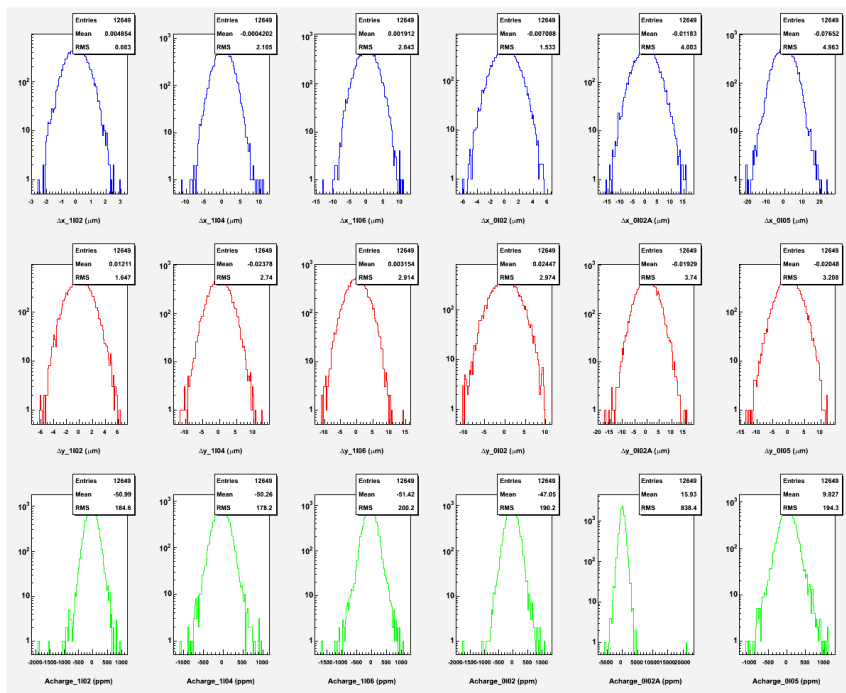


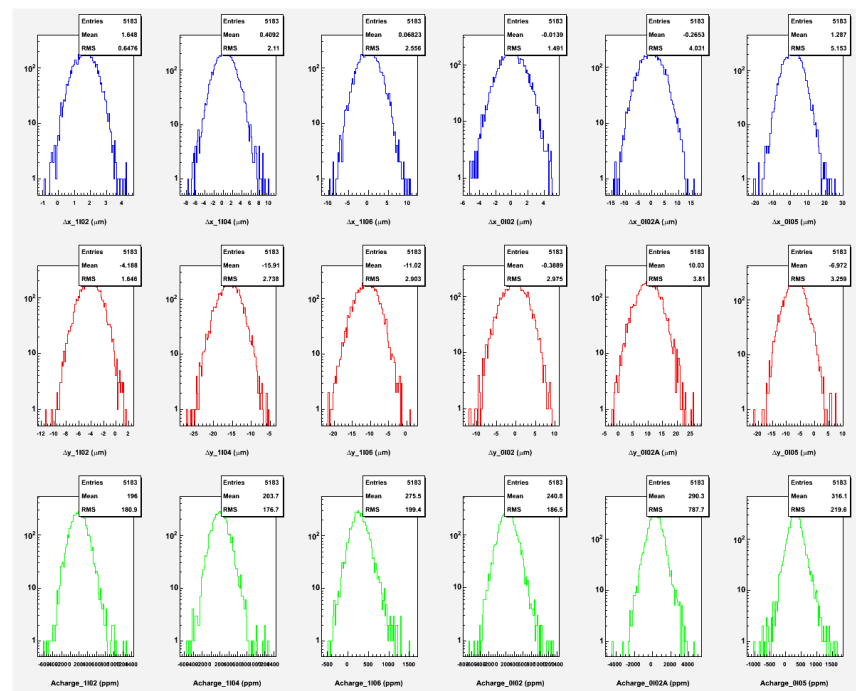
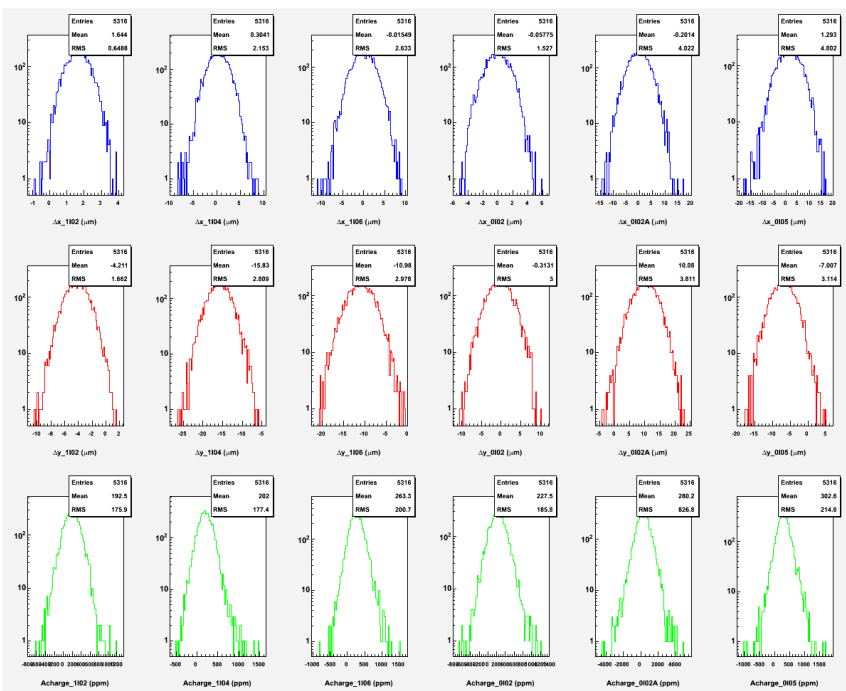
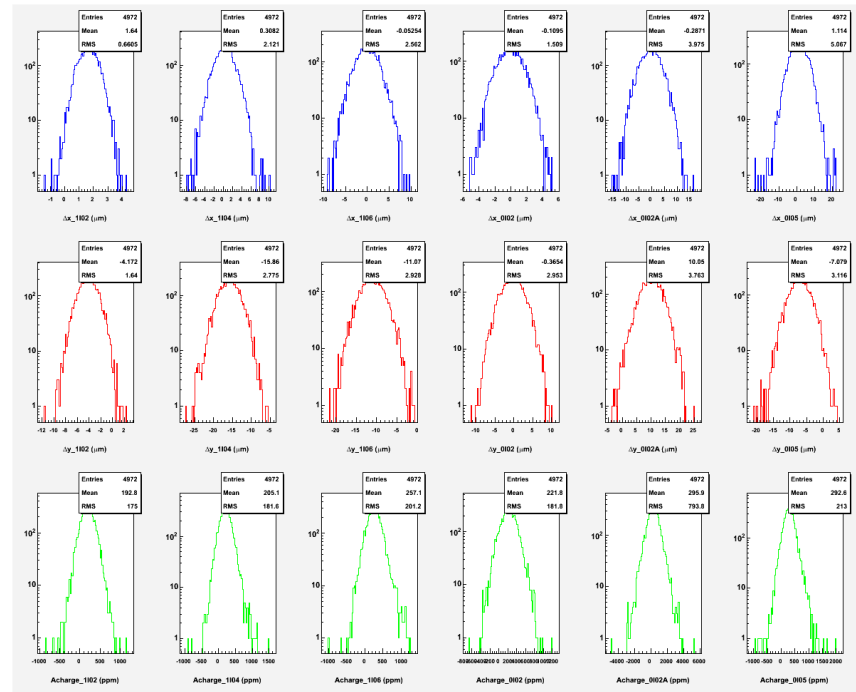
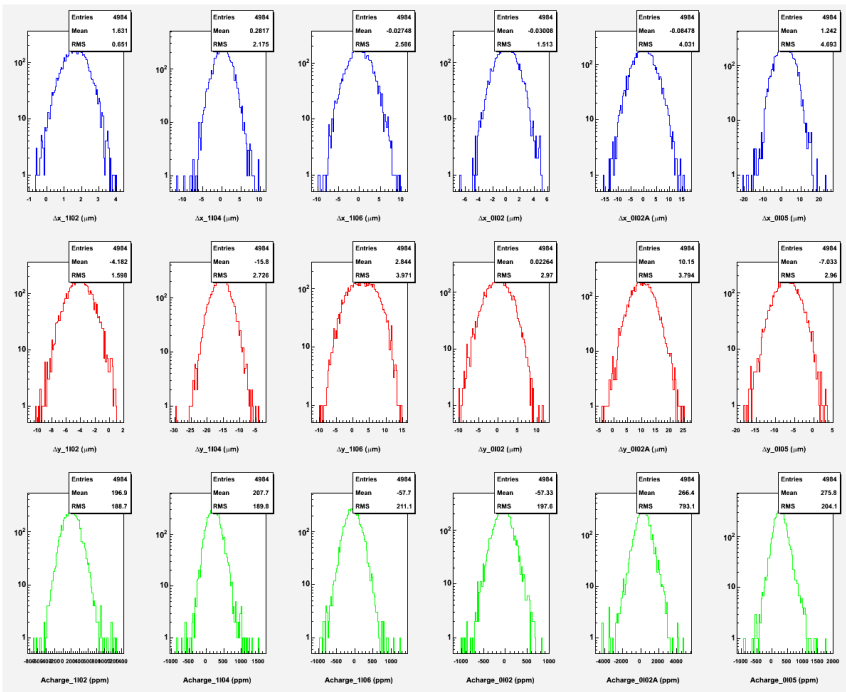
Transmission of X and Y Position Differences, Run 340



# PC OFF, 30 Hz, 500 $\mu$ s

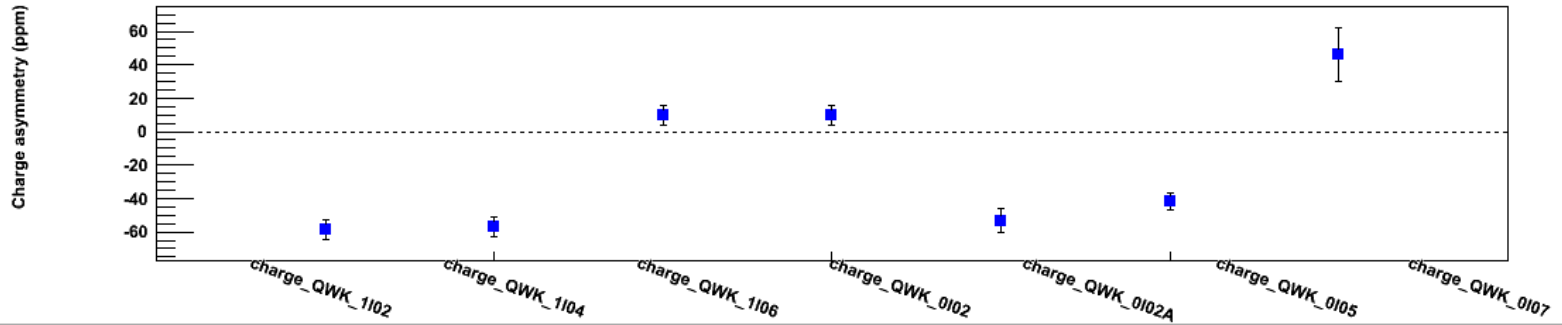
# IHWP=OUT, 30 Hz, 500 $\mu$ s



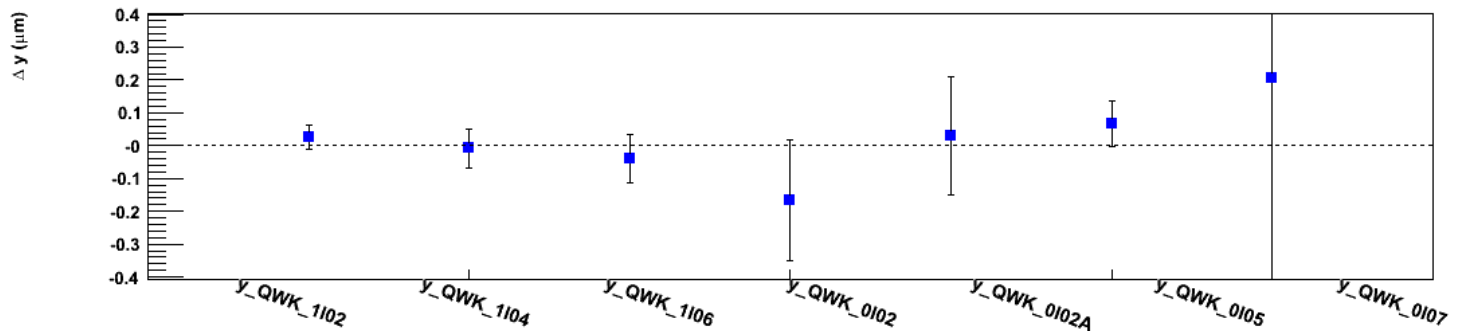
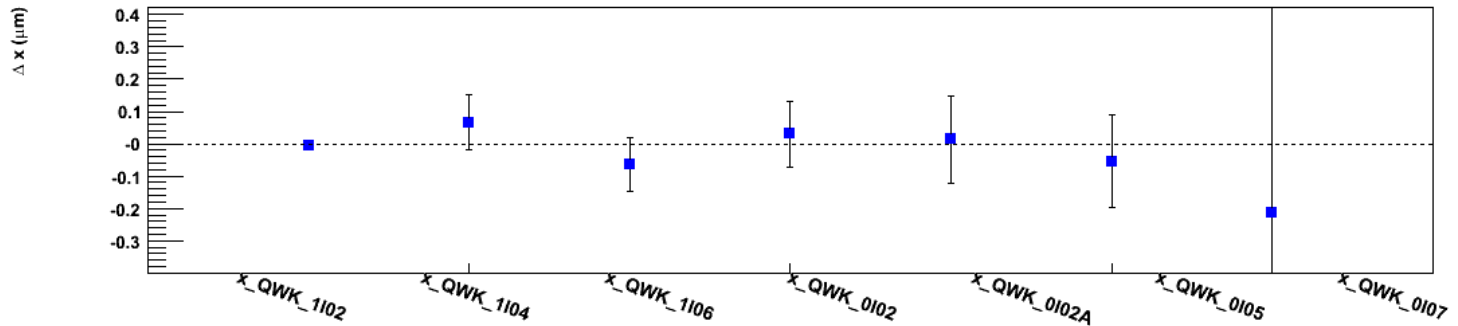


# PC OFF, 250 Hz, 500 $\mu$ s

Transmission of Charge Asymmetry, Run 347



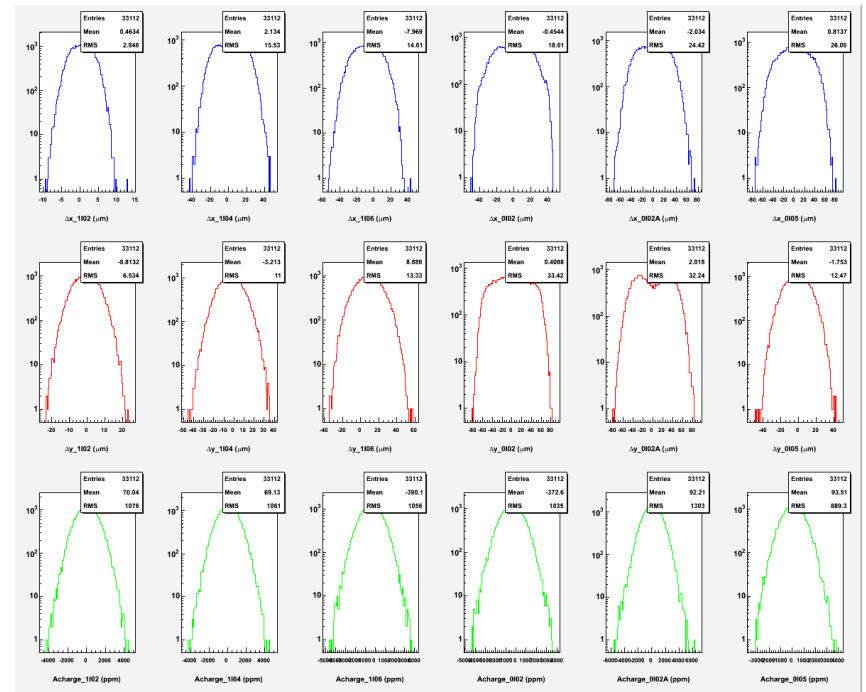
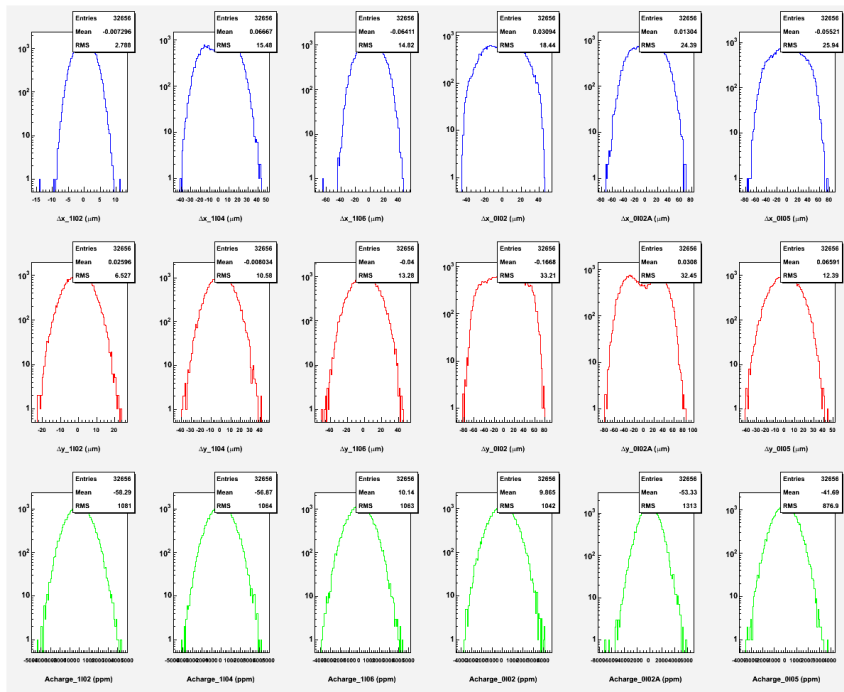
Transmission of X and Y Position Differences, Run 347

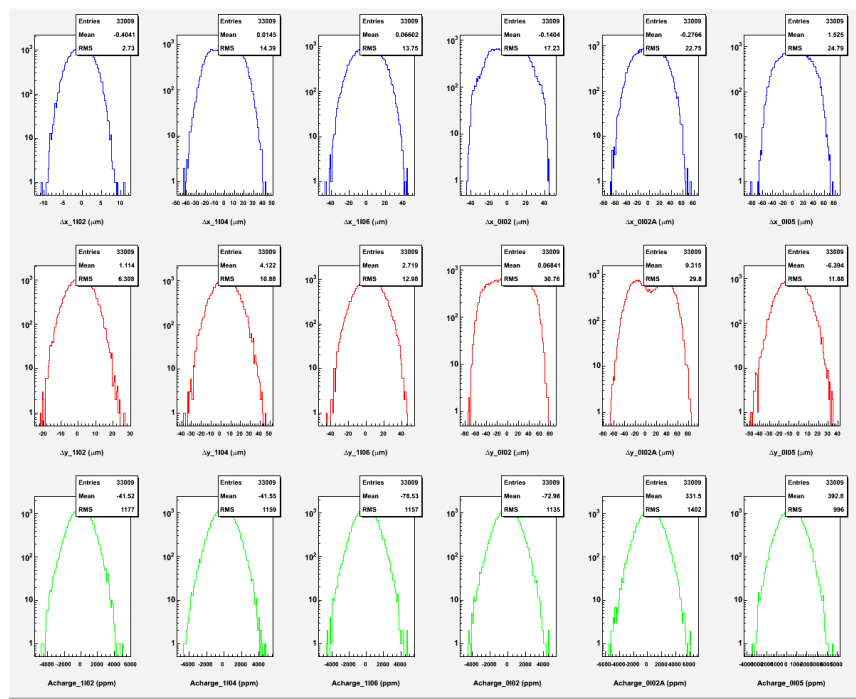
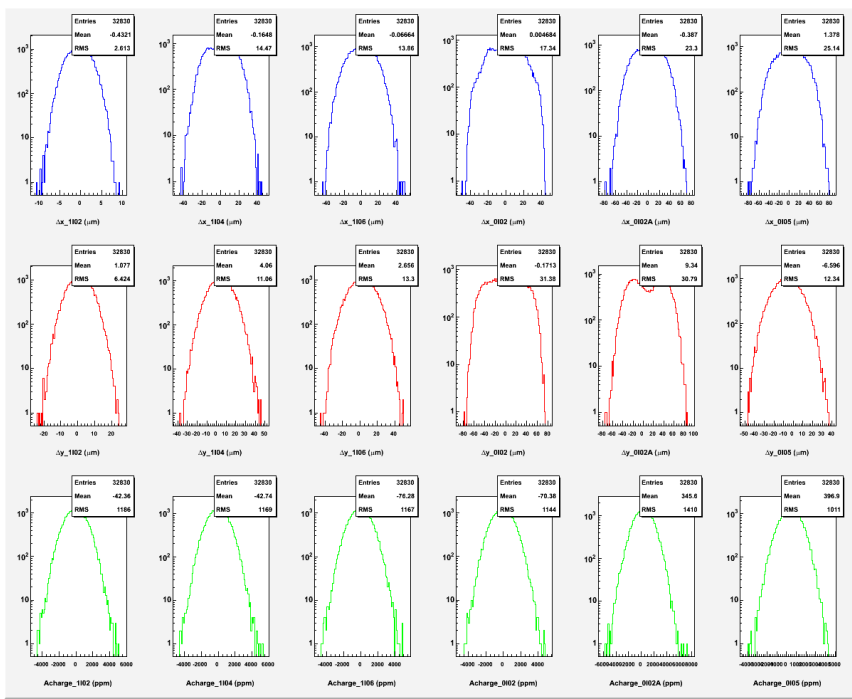
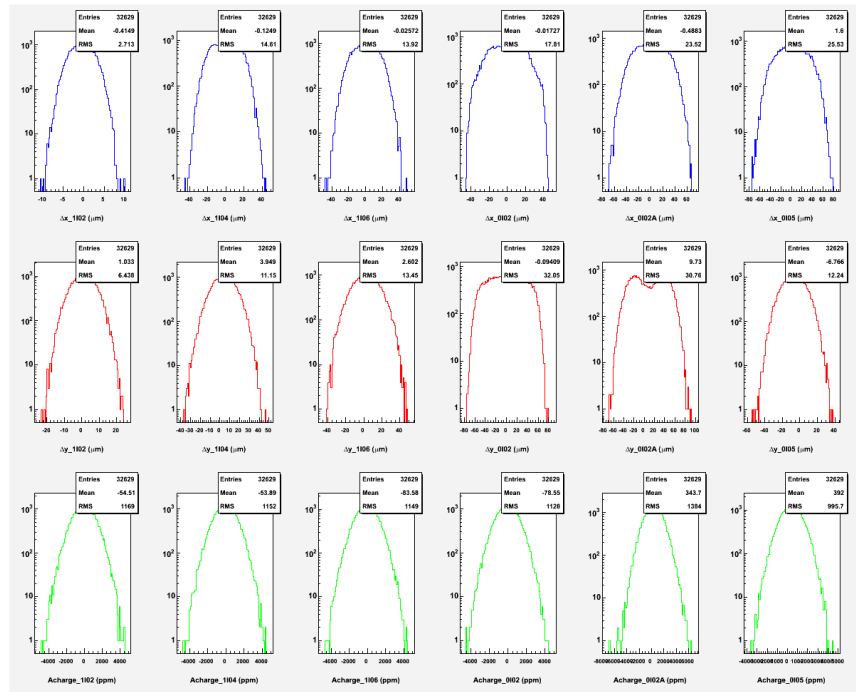
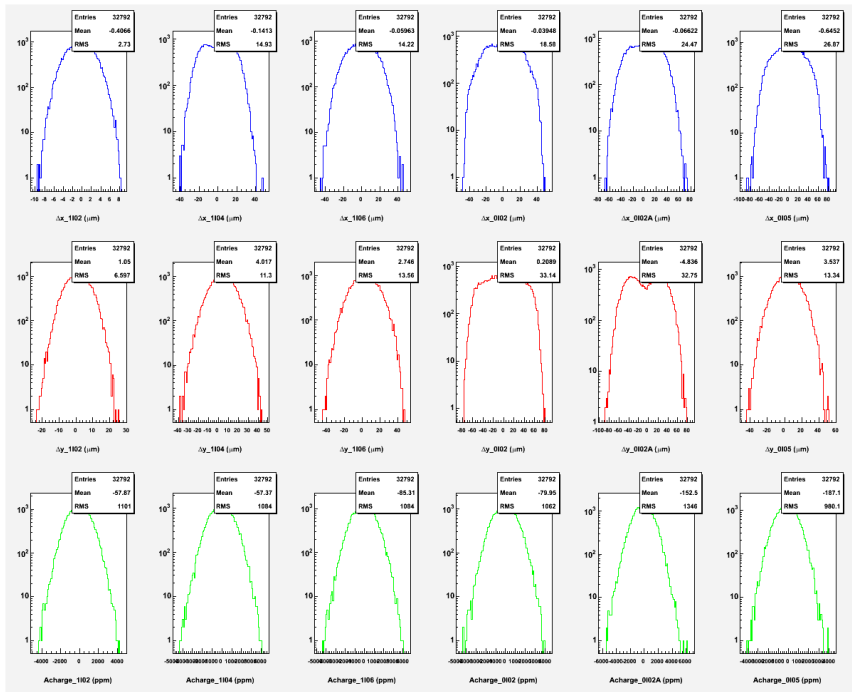




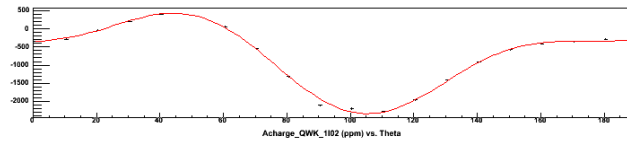
# PC OFF, 250 Hz, 500 $\mu$ s

# IHWP=OUT, 250 Hz, 500 $\mu$ s

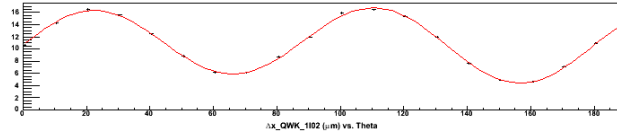




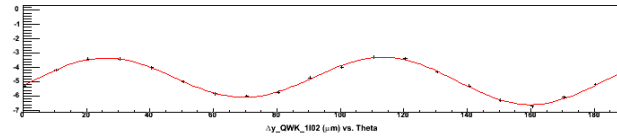
# 3- RHWP Study

**RHWP scan, PITA = 0, Run 356, IHWP OUT, QWK\_1102**

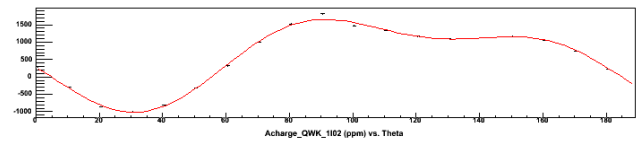
$$Aq = -753.94 + 1130.03 \sin(2x + 43.91) + -520.77 \sin(4x + 45.69)$$



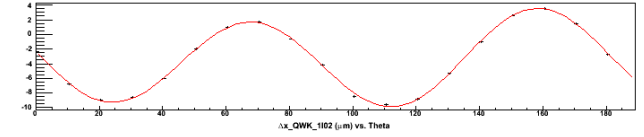
$$\Delta x = 10.84 + -0.77 \sin(2x + 121.74) + 5.68 \sin(4x + 4.56)$$



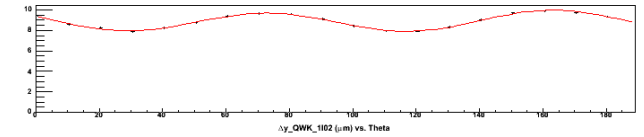
$$\Delta y = -4.83 + -0.26 \sin(2x + 124.03) + -1.51 \sin(4x + 171.11)$$

**RHWP scan, PITA = 0, Run 357, IHWP IN, QWK\_1102**

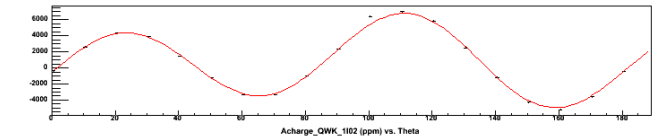
$$Aq = 596.87 + -1101.86 \sin(2x + 38.07) + 532.32 \sin(4x + 135.93)$$



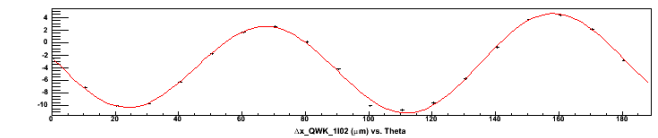
$$\Delta x = -3.47 + 0.97 \sin(2x + 115.39) + 6.09 \sin(4x + 177.61)$$



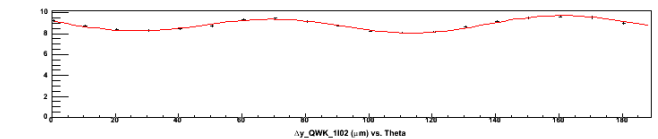
$$\Delta y = 8.89 + 0.14 \sin(2x + 113.01) + 0.94 \sin(4x + 158.44)$$

**RHWP scan, PITA = -180, Run 358, IHWP IN, QWK\_1102**

$$Aq = 689.07 + -1413.86 \sin(2x + 77.11) + 4853.48 \sin(4x + 1.34)$$



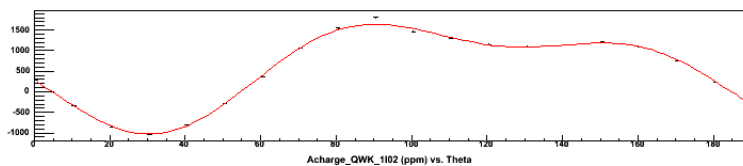
$$\Delta x = -3.56 + 1.13 \sin(2x + 110.51) + 7.15 \sin(4x + 178.63)$$



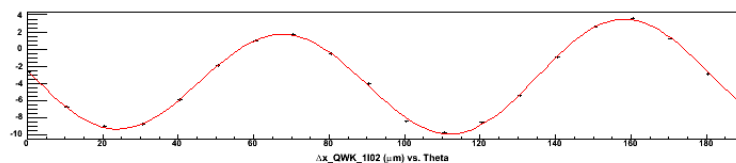
$$\Delta y = 8.86 + 0.20 \sin(2x + 101.69) + 0.69 \sin(4x + 169.63)$$

# 30 Hz, 60 $\mu$ s

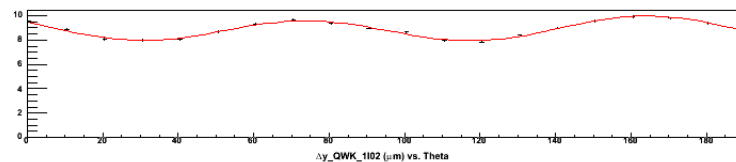
RHWP scan, PITA = 0, Run 359, IHWP IN, QWK\_1102



$$Aq = 604.37 + -1095.53 \sin(2x + 38.32) + 548.92 \sin(4x + 138.89)$$



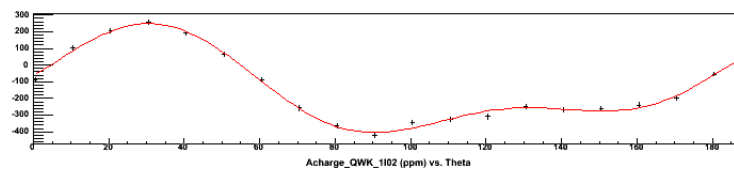
$$\Delta x = -3.49 + 0.92 \sin(2x + 115.97) + 6.11 \sin(4x + 178.29)$$



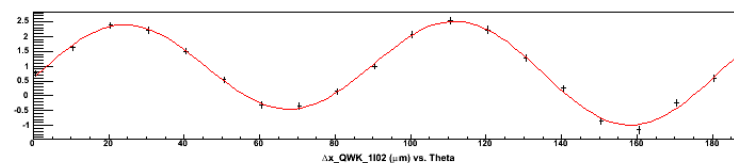
$$\Delta y = 8.88 + 0.20 \sin(2x + 118.32) + 0.90 \sin(4x + 154.31)$$

# 250 Hz, 60 $\mu$ s

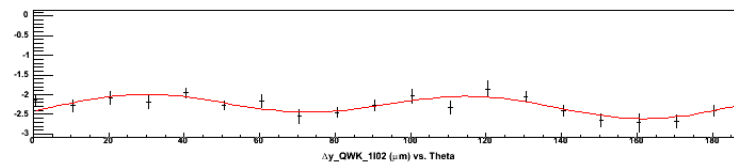
RHWP scan, PITA = 0, Run 360, IHWP IN, QWK\_1102



$$Aq = -143.87 + 266.21 \sin(2x + 39.61) + -133.50 \sin(4x + 136.64)$$

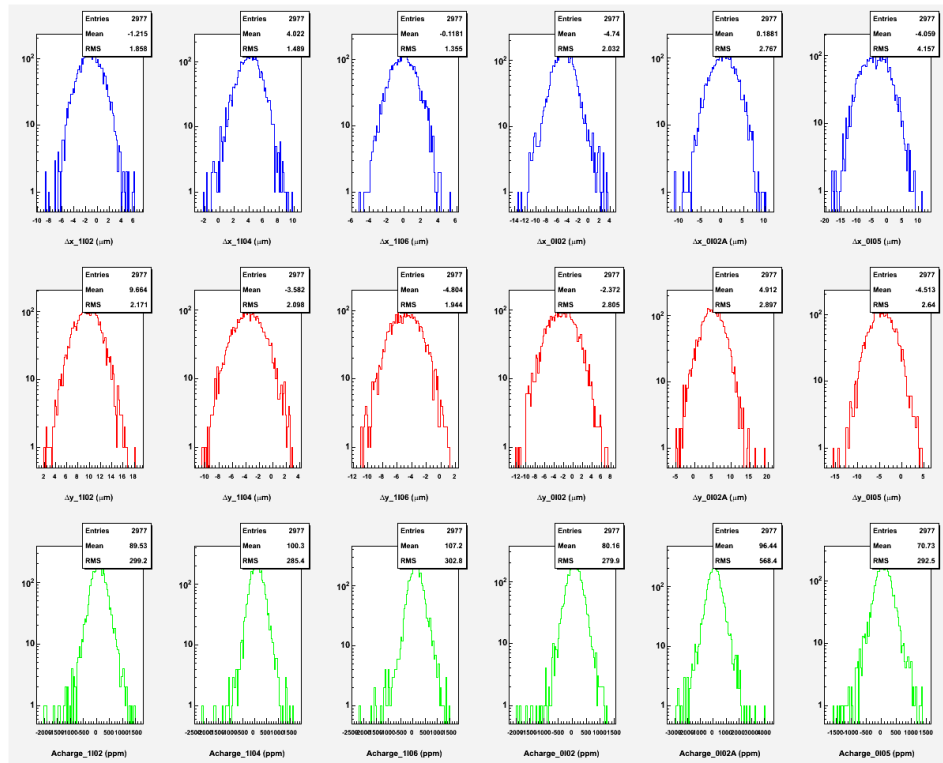
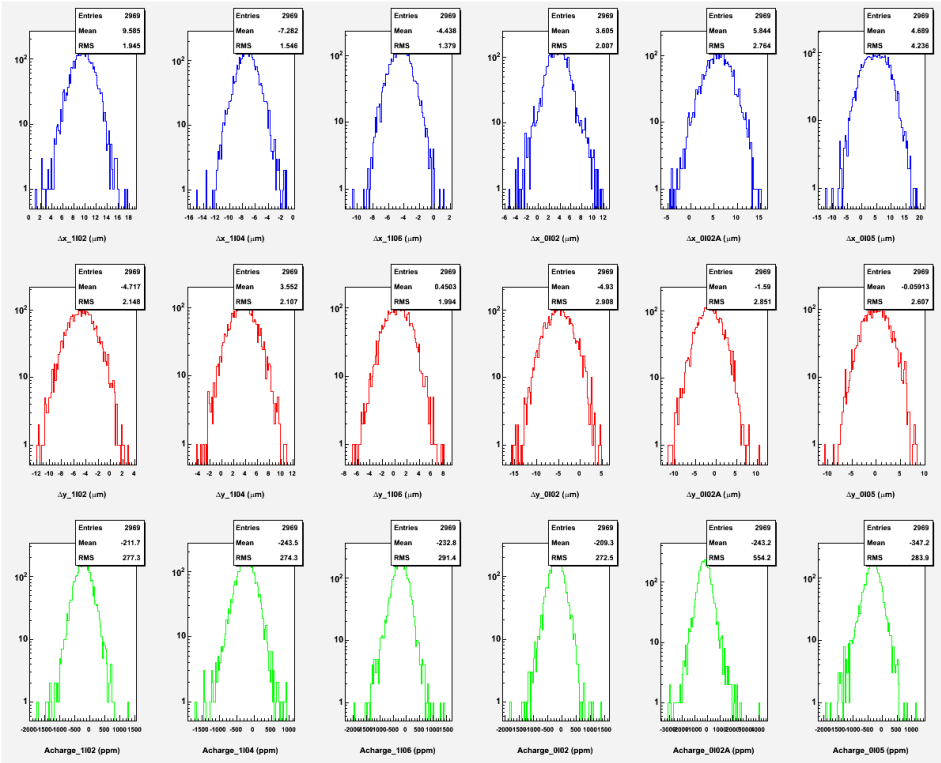


$$\Delta x = 0.87 + -0.27 \sin(2x + 121.90) + -1.58 \sin(4x + 178.25)$$

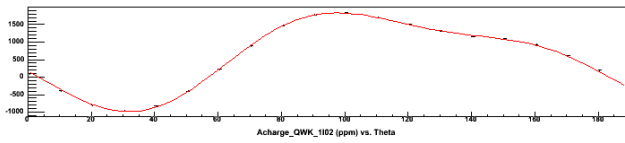


$$\Delta y = -2.27 + -0.09 \sin(2x + 141.43) + -0.25 \sin(4x + 160.43)$$

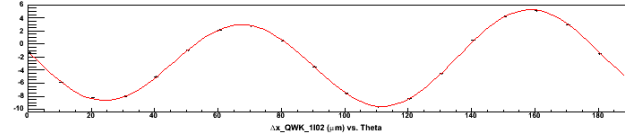
# 4- Photocathode Rotation Study



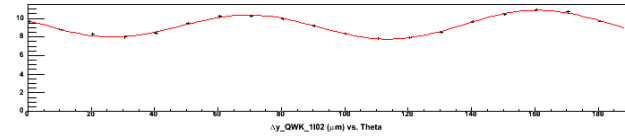
**RHWP scan, PC Angle = 0 deg, Run 365, IHWP IN, QWK\_1102**



$$Aq = 626.14 + -1253.84 \sin(2x + 39.32) + 406.12 \sin(4x + 122.66)$$

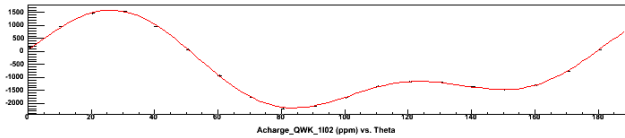


$$\Delta x = -2.49 + 1.22 \sin(2x + 112.37) + 6.57 \sin(4x + 177.87)$$

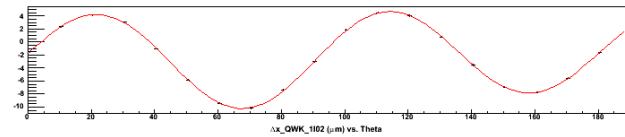


$$\Delta y = 9.26 + 0.29 \sin(2x + 104.40) + 1.36 \sin(4x + 169.05)$$

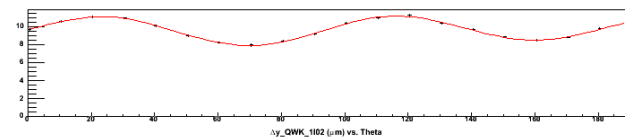
**RHWP scan, PC Angle = 90 deg, Run 367, IHWP IN, QWK\_1102**



$$Aq = -669.34 + 1432.36 \sin(2x + 48.63) + -868.64 \sin(4x + 156.10)$$

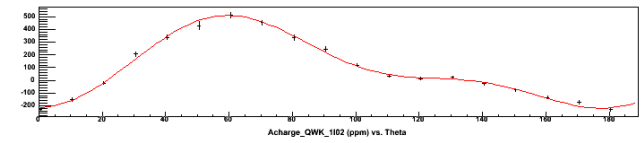


$$\Delta x = -2.31 + 1.22 \sin(2x + 145.36) + -6.73 \sin(4x + 178.66)$$

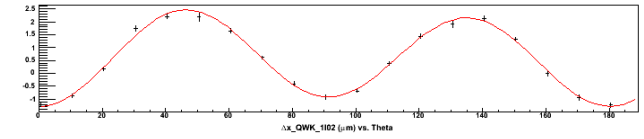


$$\Delta y = 9.71 + 0.31 \sin(2x + 135.51) + -1.46 \sin(4x + 171.01)$$

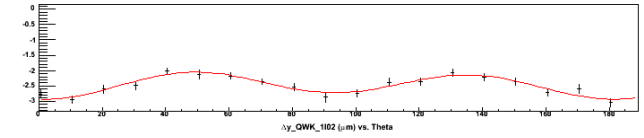
**RHWP scan, PC Angle = 45 deg, Run 366, IHWP IN, QWK\_1102**



$$Aq = 104.67 + -301.84 \sin(2x + 132.89) + -126.93 \sin(4x + 52.84)$$

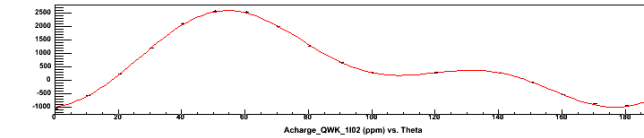


$$\Delta x = 0.61 + -0.24 \sin(2x + 128.80) + -1.70 \sin(4x + 87.12)$$

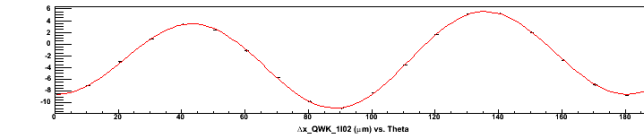


$$\Delta y = -2.46 + -0.12 \sin(2x + 108.86) + -0.36 \sin(4x + 81.06)$$

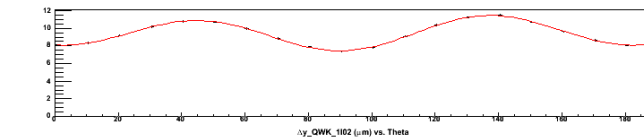
**RHWP scan, PC Angle = 135 deg, Run 368, IHWP IN, QWK\_1102**



$$Aq = 601.10 + -1302.52 \sin(2x + 140.12) + -812.29 \sin(4x + 68.76)$$

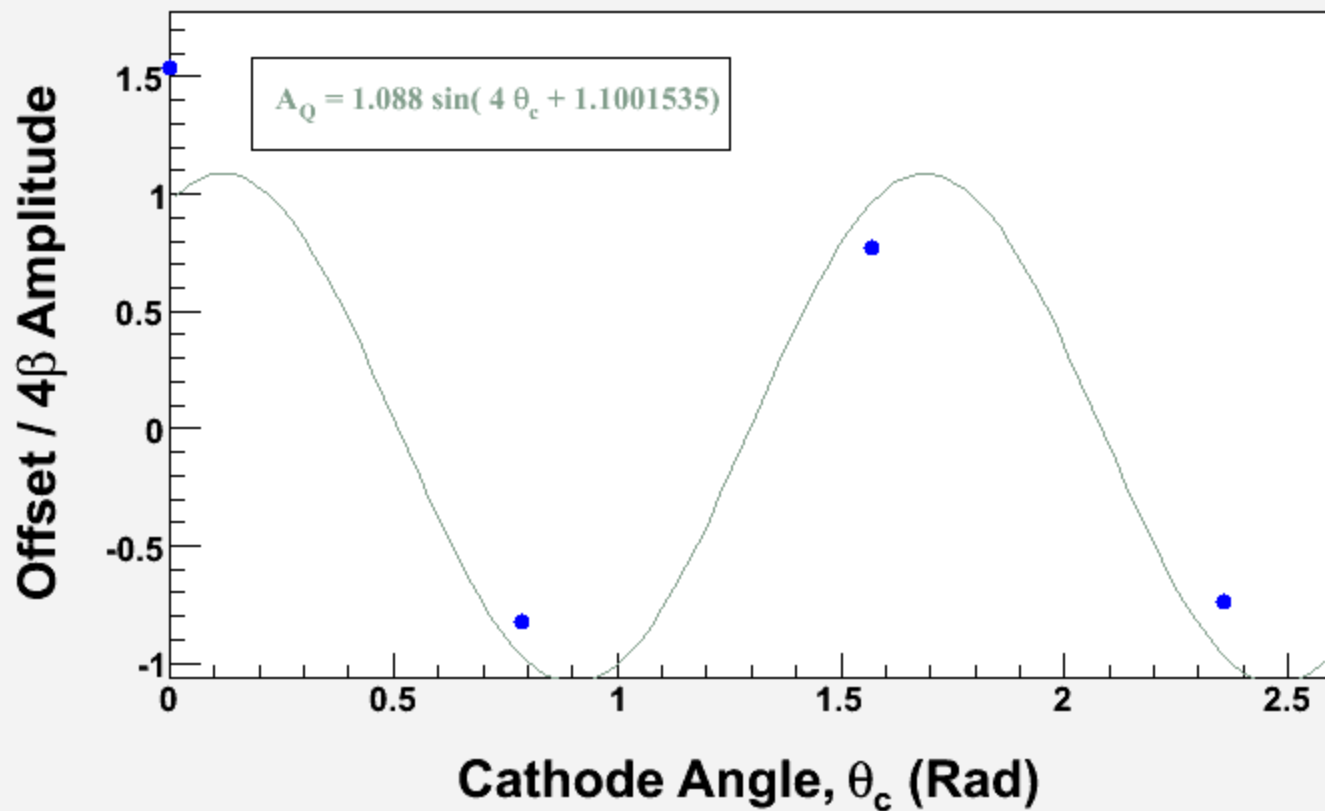


$$\Delta x = -2.62 + 1.59 \sin(2x + 133.33) + -7.08 \sin(4x + 92.06)$$



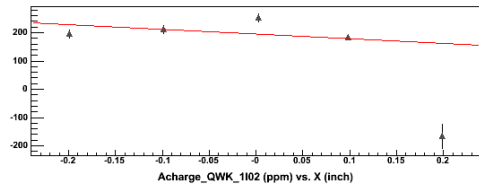
$$\Delta y = 9.47 + 0.43 \sin(2x + 130.39) + -1.69 \sin(4x + 85.69)$$



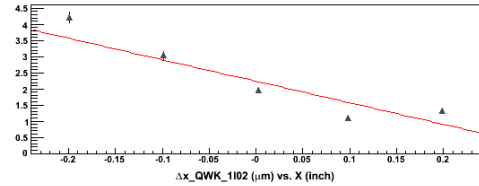


# 5- Pockels Cell Translation Study

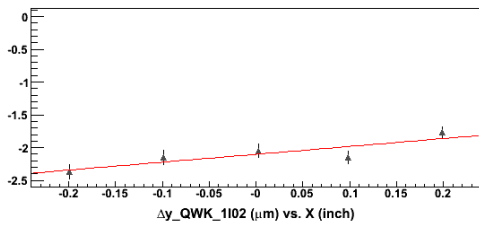
### PC X Scan, IHWP=IN, Y= 0, Run 369, QWK\_1102



$$Aq = 195.48 + -165.40 \times X$$

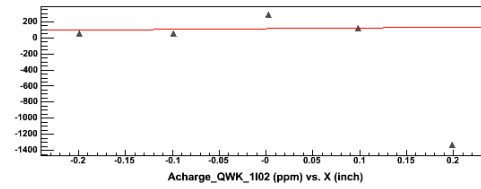


$$\Delta x = 2.24 + -6.67 \times X$$

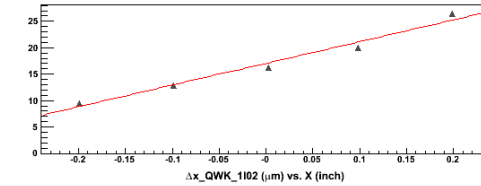


$$\Delta y = -2.10 + 1.20 \times X$$

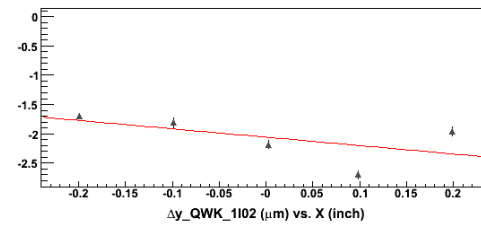
### PC X Scan, IHWP=OUT, Y= 0, Run 371, QWK\_1102



$$Aq = 115.12 + 92.44 \times X$$

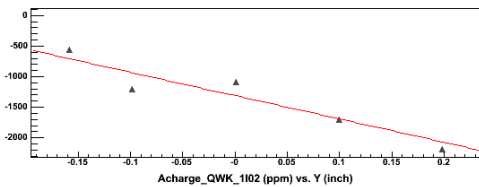


$$\Delta x = 17.04 + 41.00 \times X$$

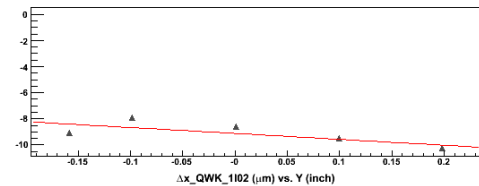


$$\Delta y = -2.06 + -1.43 \times X$$

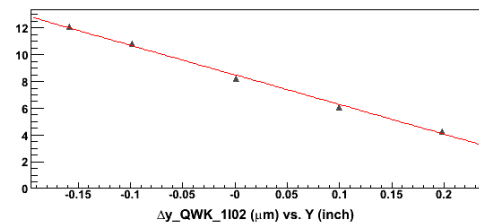
### PC Y Scan, IHWP=IN, X= 0, Run 373, QWK\_1102



$$Aq = -1309.87 + -3812.60 \times Y$$

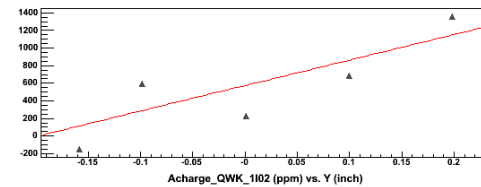


$$\Delta x = -9.12 + -4.52 \times Y$$

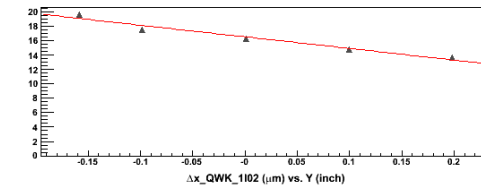


$$\Delta y = 8.49 + -22.13 \times Y$$

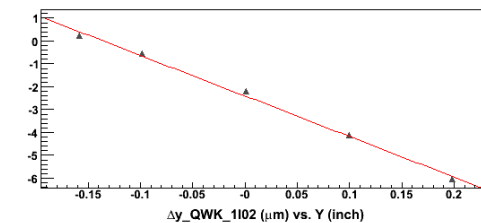
### PC Y Scan, IHWP=OUT, X= 0, Run 372, QWK\_1102



$$Aq = 574.99 + 2896.46 \times Y$$



$$\Delta x = 16.56 + -16.16 \times Y$$



$$\Delta y = -2.41 + -17.73 \times Y$$