G^0 PC Installation and Beam Studies

June & July 2006

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Pockels Cell Installation
June 20-21, 2006

- What did we accomplish?
  - Characterized Intensity Asymmetry (IA) Cell: λ/4, 16°
    - Measured dependence of intensity asymmetry on voltage : -23.59 ppm/V
  - Aligned Pockels Cell (PC)
    - Degree of linear polarization = 0.45%
    - Degree of circular polarization = 99.9%
    - Minimized x and y position differences.

Pockels Cell Installation
June 20-21, 2006

Steering (LP OUT)	IHWP IN	IHWP OUT	Goal
Δx	0.075 ± 0.017 μm	0.012 ± 0.011 μm	< 0.1 μm
Δy	-0.26 ± 0.008 μm	0.20 ± 0.008 μm	< 0.1 μm
Δcharge	54.83 ± 5.37 ppm	-30.79 ± 5.52 ppm	

Birefringence (LP IN)	IHWP IN	IHWP OUT	Goal
Δx	-5.82 ± 0.012 μm	1.94 ± 0.012 μm	< 6 μm
Δy	1.43 ± 0.009 μm	-0.56 ± 0.008 μm	< 6 μm
Δcharge	701.8 ± 89.2 ppm	-3425 ± 88.8 ppm	

Electrical Pickup	
Δx	-0.01255 ± 0.007813 μm
Δy	0.001276 ± 0.005298 μm
Δcharge	0.355 ± 3.648 ppm

w/ photocathode 3X larger in injector

w/ photocathode 20X smaller in injector

Injector	Happex
Δx	< 0.3 μm
Δy	< 0.3 μm
Δcharge	

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July 9, 2006

Electrical Pickup (PC OFF)	IHWP IN	IHWP OUT
Δx	-0.071 ± 0.043 μm	0.067 ± 0.038 μm
Δy	0.58 ± 0.038 μm	0.65 ± 0.037 μm
Δcharge	-9.84 ± 3.34 ppm	-4.02 ± 2.97 ppm

Big y position differences not consistent with zero!

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July 10, 2006

- To diagnose the electronic noise pick-up:
  - Disconnected 4 cables going to QPD and put them into an insulated sleeve
  - Turned off spiricon CCD, spiricon monitor, local CCD monitor, and small scope
  - Unplugged PC fiber
  - Unplugged helicity-magnet fiber
  - Unplugged 4 QPD signals

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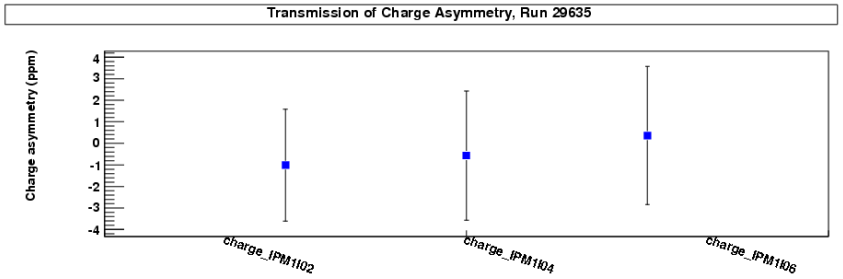
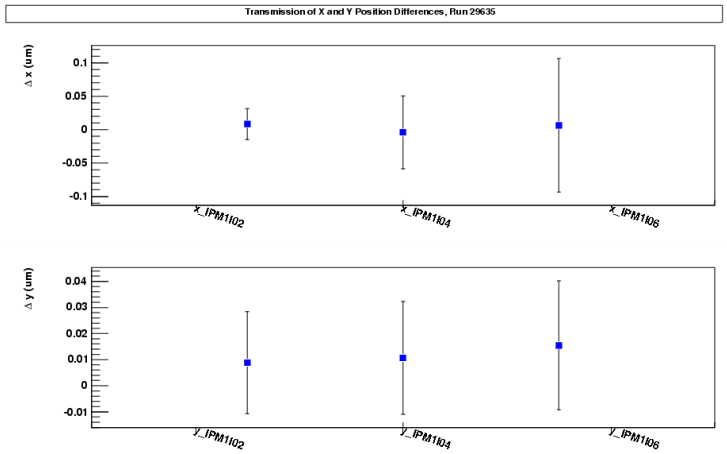
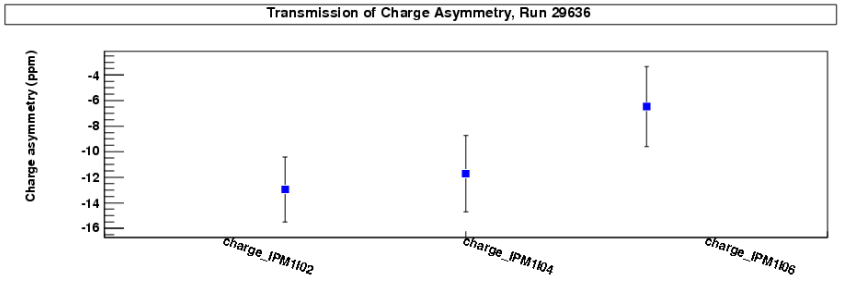
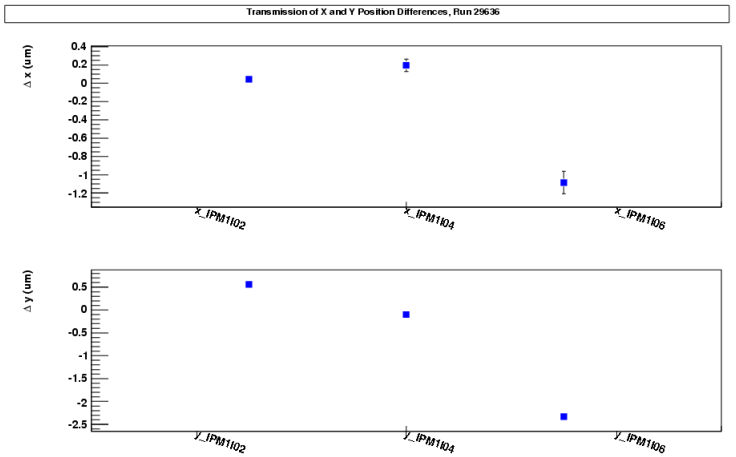
PC fiber unplugged





PC fiber plugged





Conclusion: The electrical noise pickup is coming from the in-time helicity fiber that travels from the helicity board to the IA and PC high voltages supplies.

Electron Beam Studies
July 12, 2006

- John Hansknecht found that a grounded BNC shell from a bundled cable was touching an IA BNC shell that is supposed to remain floating.
- This grounding point would indeed place real-time helicity information on to the cable that returns to the upstairs racks.
- The offending cable was relocated and the IA system was tested for proper functionality.

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July 12, 2006

Electrical Pickup (PC OFF)	IHWP IN
Δx	-0.0053 ± 0.018 μm
Δy	-0.0077 ± 0.016 μm
Δcharge	0.053 ± 1.99 ppm

- The position differences and charge asymmetry are consistent with zero.
- Therefore, we conclude that the cable was the source of the problem.

So we are good to go, right? No.

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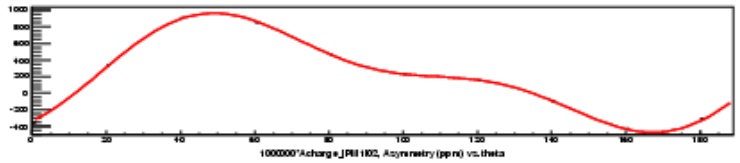
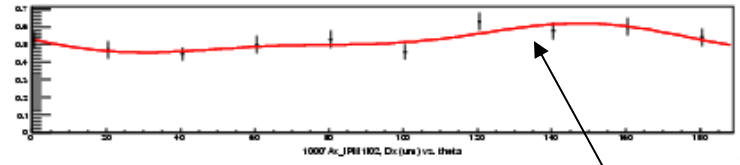
July 12, 2006

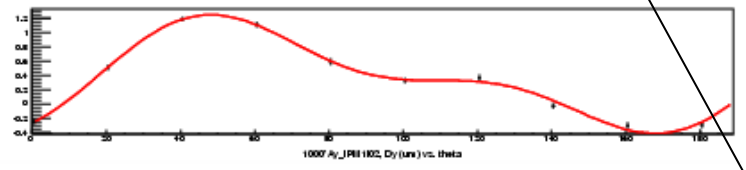
RHWP scan, Run 29653, IHWP IN, IPM1I02



Aq = 231.13 + -575.73 sin (2x+ 145.64) + -250.17 sin (4x+ 105.21)

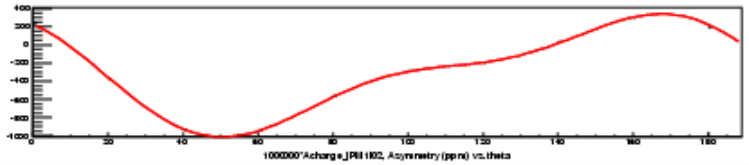


Dx = 0.53 + 0.07 sin (2x+ 168.84) + -0.03 sin (4x+ 21.44)

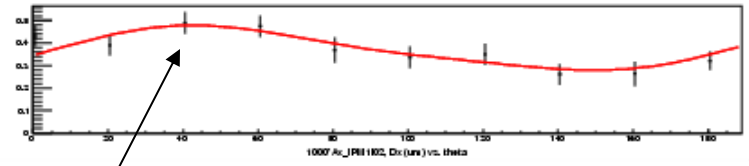


Dy = 0.39 + -0.64 sin (2x+ 147.48) + -0.32 sin (4x+ 104.34)

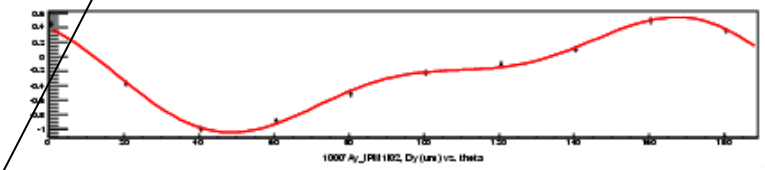
RHWP scan, Run 29656, IHWP OUT, IPM1I02



Aq = -304.64 + 562.67 sin (2x+ 146.00) + 218.30 sin (4x+ 98.08)



Dx = 0.37 + -0.09 sin (2x+ 172.40) + -0.02 sin (4x+ 136.03)

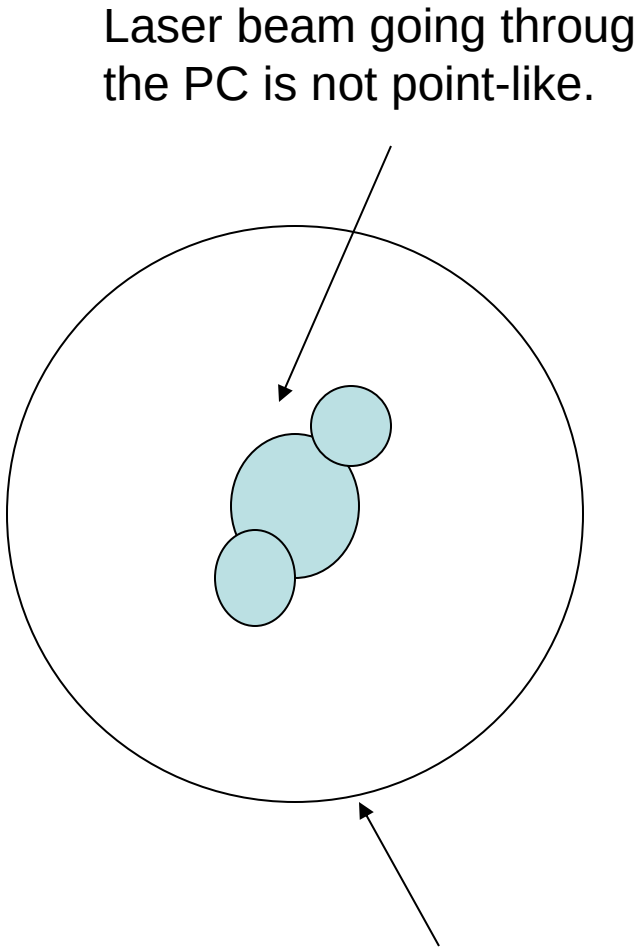


Dy = -0.23 + 0.63 sin (2x+ 146.65) + 0.28 sin (4x+ 105.37)

There is a 0.5 um position difference offset in x. Thus, we could not minimize the position differences using the RHWP and PITA.

Back Into the Injector
July 17, 2006

- The launch into the frequncy doubler changed since we last aligned the cell.
- This introduced satellite spots which accounted for the large position differences.
- After Matt and John realigned the doubler setup, the satellite spot went away.



Pockels Cell Installation
July 17, 2006

Steering (LP OUT)	IHWP IN	IHWP OUT	Goal
Δx	-0.10 ± 0.010 µm	0.096 ± 0.011 µm	< 0.1 µm
Δy	0.19 ± 0.0074 µm	-0.16 ± 0.007 µm	< 0.1 µm
Δcharge	30.15 ± 1.70 ppm	-43.94 ± 1.82 ppm	

Birefringence (LP IN)	IHWP IN	IHWP OUT	Goal
Δx	-7.82 ± 0.010 µm	5.90 ± 0.012 µm	< 6 µm
Δy	-10.05 ± 0.0075 µm	12.48 ±0.008 µm	< 6 µm
Δcharge	-3296 ± 58.12 ppm	2554 ± 70.4 ppm	

Electrical Pickup	PC OFF
Δx	-0.0007555 ± 0.00509 µm
Δy	-0.001146 ± 0.00365 µm
Δcharge	-5.405 ± 0.8676 ppm

w/ photocathode 3X larger in injector

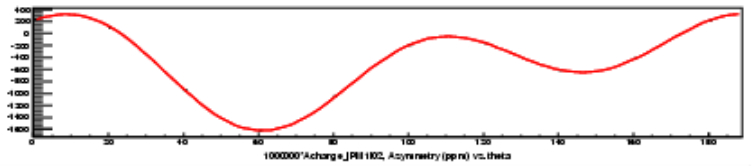
w/ photocathode 20X smaller in injector

Injector	Happex
Δx	< 0.3 µm
Δy	< 0.3 µm
Δcharge	

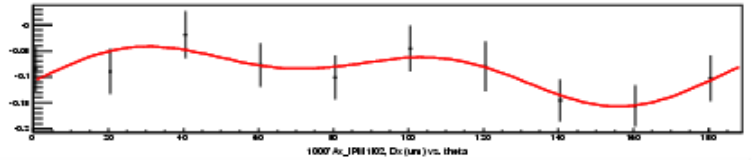
Electron Beam Studies
July 18, 2006

PITA=0

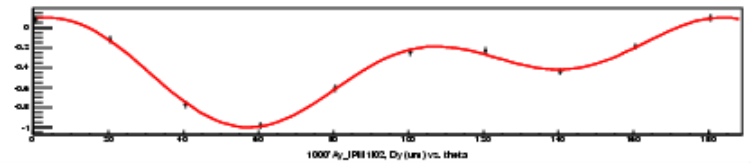
RHWP scan, Run 29765, IHWP OUT, IPM1I02



Aq = -519.73 + 524.15 sin (2x+ 130.49) + 605.99 sin (4x+ 33.40)



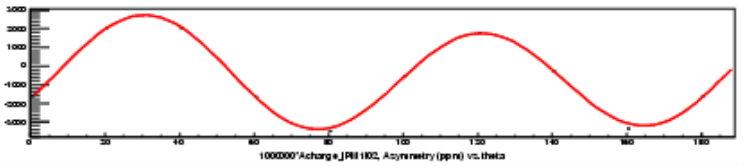
Dx = -0.09 + -0.04 sin (2x+ 150.78) + -0.03 sin (4x+ 178.11)



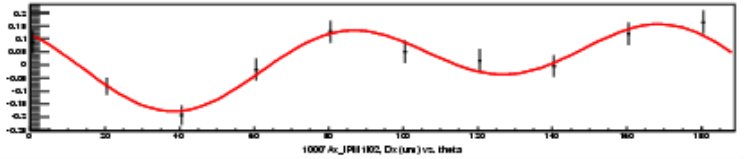
Dy = -0.39 + 0.33 sin (2x+ 133.66) + 0.31 sin (4x+ 51.49)

PITA=-180

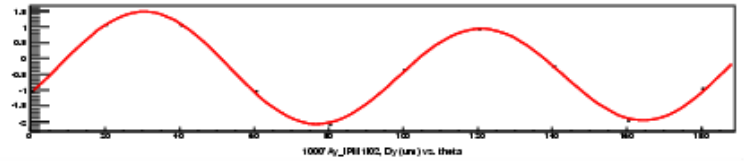
RHWP scan, Run 29766, IHWP OUT, IPM1I02



Aq = -515.22 + 494.22 sin (2x+ 39.76) + -2767.44 sin (4x+ 146.63)



Dx = 0.02 + -0.07 sin (2x+ 5.16) + 0.12 sin (4x+ 119.36)



Dy = -0.40 + 0.27 sin (2x+ 41.05) + -1.61 sin (4x+ 147.24)

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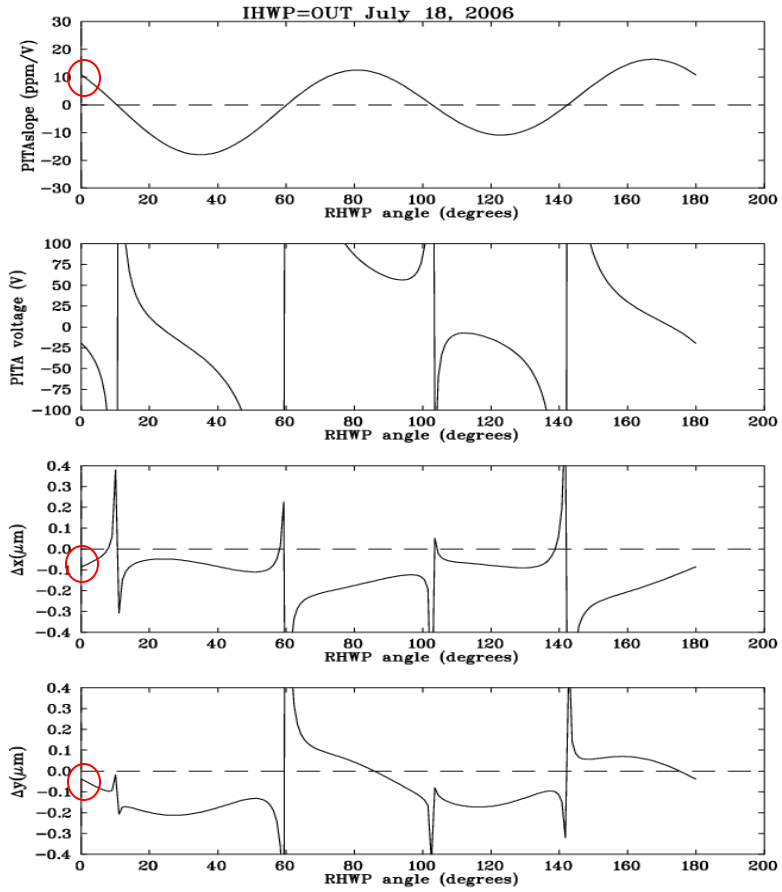
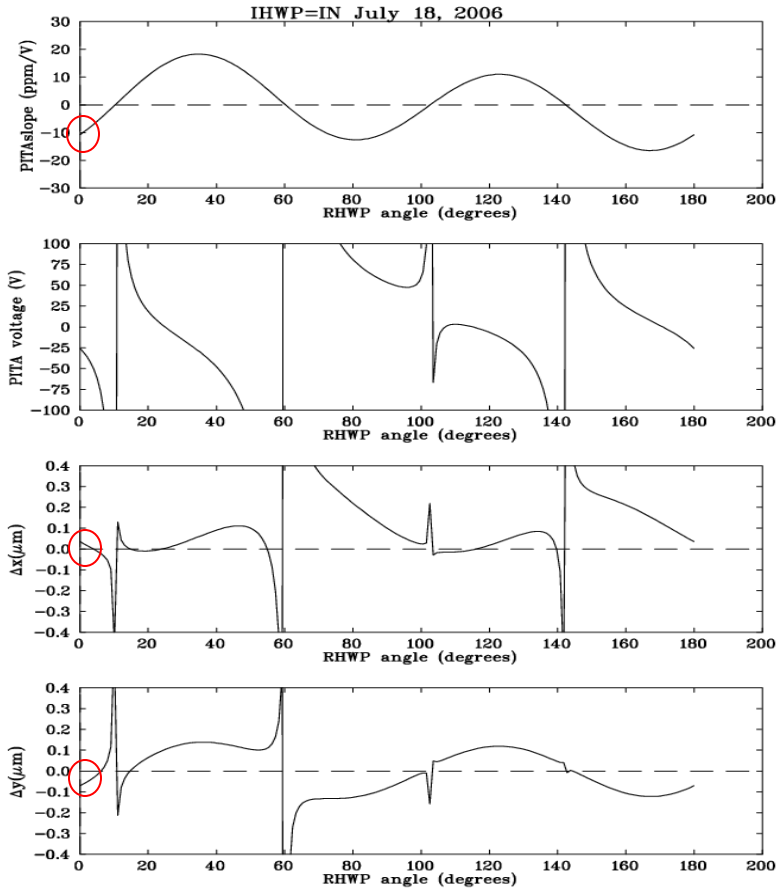
RHWP=0°



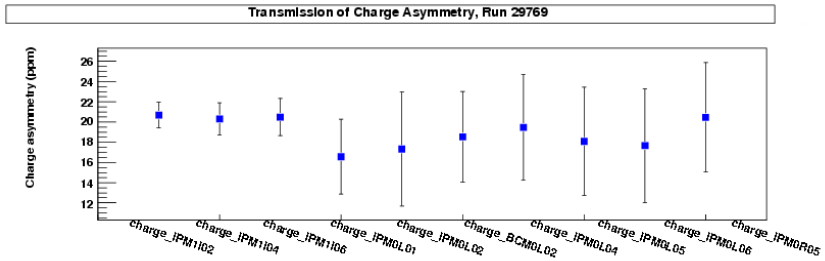
RHWP=0°

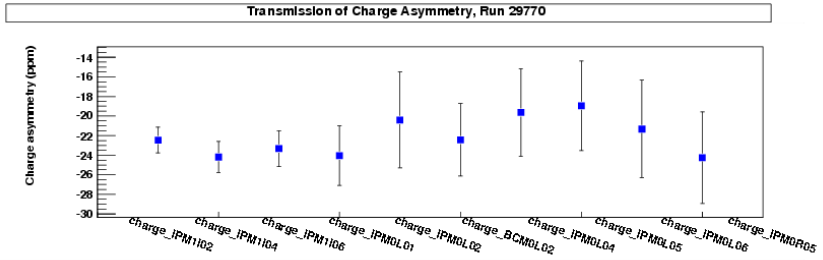


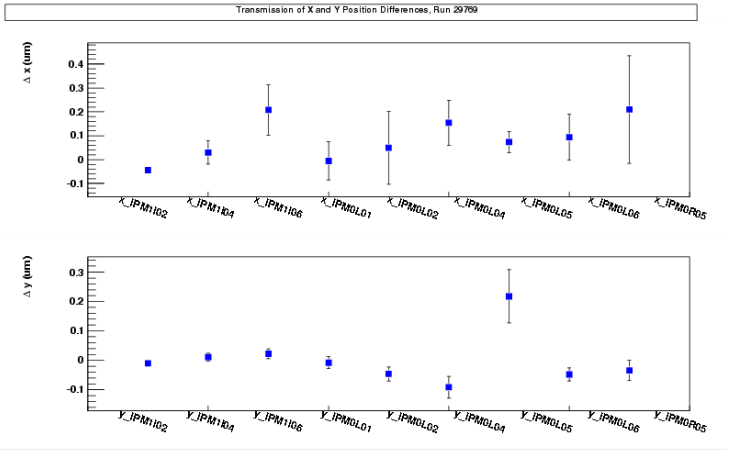
Electron Beam Studies
July 18, 2006

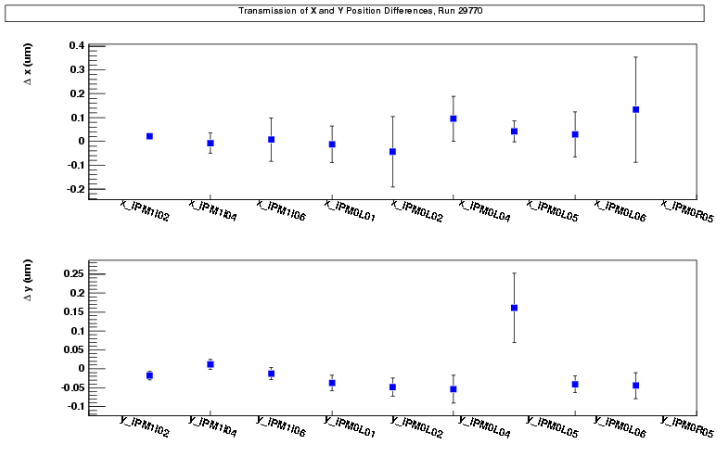
IHWP = OUT
RHWP = 0°
-22 ppm/V

IHWP = IN
RHWP = 0°
-28 ppm/V









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