

# G<sup>0</sup> PC Installation and Beam Studies

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# Presentation Outline

- Pockels Cell Installation (Injector)
- Electron Beam Studies

# Pockels Cell Installation (Injector)

## March 21-22, 2006

- What did we accomplish?
  - Characterized Intensity Asymmetry (IA) Cell:  
 $\lambda/4$ ,  $14^\circ$ 
    - Measured dependence of intensity loss on waveplate angle :  $-1.45\%/^\circ$  (20% at  $14^\circ$ )
    - Measured dependence of intensity asymmetry on voltage :  $-17.75$  ppm/V
  - Aligned Pockels Cell (PC)
    - Degree of linear polarization = 3.2%
    - Degree of circular polarization = 99.9%
    - Minimized x and y position differences.

# Pockels Cell Installation Results

## March 21-22, 2006

Steering (LP OUT)	IHWP IN	IHWP OUT	Goal
$\Delta x$	$0.024 \pm 0.023 \mu\text{m}$	$0.10 \pm 0.014 \mu\text{m}$	$< 0.1 \mu\text{m}$
$\Delta y$	$0.37 \pm 0.019 \mu\text{m}$	$-0.21 \pm 0.019 \mu\text{m}$	$< 0.1 \mu\text{m}$
$\Delta\text{charge}$	$41.72 \pm 0.63 \text{ ppm}$	$-29.33 \pm 0.62 \text{ ppm}$	

Birefringence (LP IN)	IHWP IN	IHWP OUT	Goal
$\Delta x$	$5.71 \pm 0.015 \mu\text{m}$	$-2.96 \pm 0.015 \mu\text{m}$	$< 6 \mu\text{m}$
$\Delta y$	$-5.12 \pm 0.023 \mu\text{m}$	$1.71 \pm 0.025 \mu\text{m}$	$< 6 \mu\text{m}$
$\Delta\text{charge}$	$-1.02\text{E}4 \pm 54 \text{ ppm}$	$1.31\text{E}4 \pm 52 \text{ ppm}$	

Electrical Pickup	
$\Delta x$	$0.035 \pm 0.014 \mu\text{m}$
$\Delta y$	$0.013 \pm 0.012 \mu\text{m}$
$\Delta\text{charge}$	$1.76 \pm 0.56 \text{ ppm}$

w/ photocathode  
3X larger in  
injector

w/ photocathode  
20X smaller in  
injector

Injector	Happex
$\Delta x$	$< 0.3 \mu\text{m}$
$\Delta y$	$< 0.3 \mu\text{m}$
$\Delta\text{charge}$	

# Electron Beam Studies

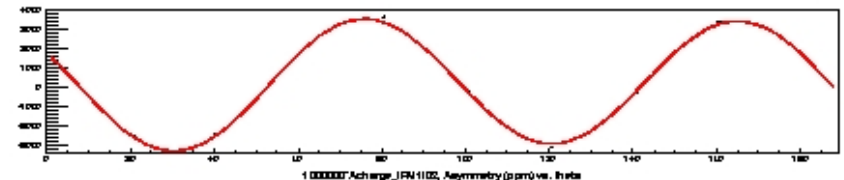
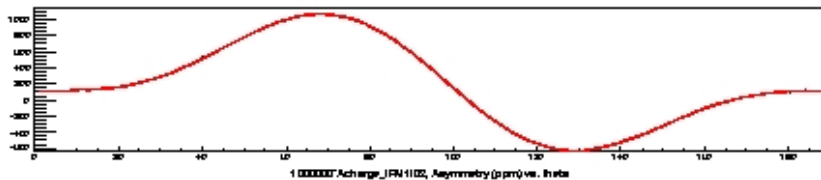
## March 23, 2006 (40 $\mu$ A)

PITA=0

PITA=-192

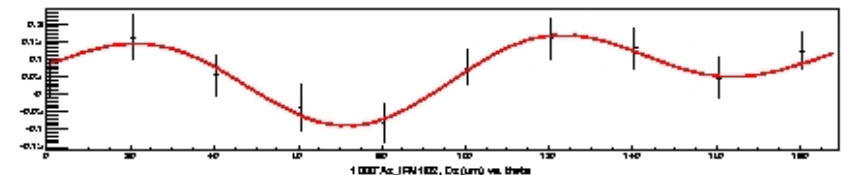
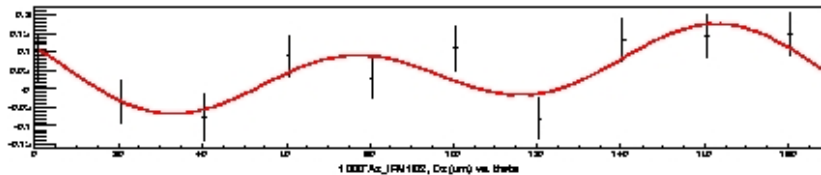
RHWP scan, Run 28126, IHWP IN, IPM1102

RHWP scan, Run 28127, IHWP IN, IPM1102



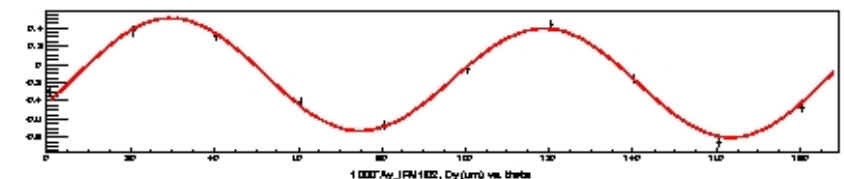
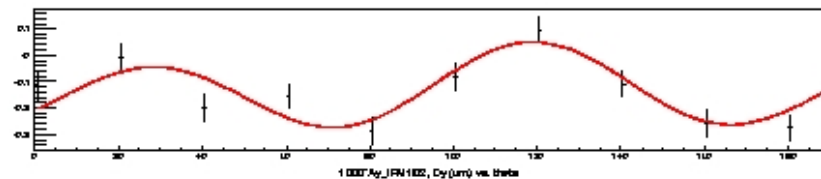
$$Aq = 184.86 + -664.69 \sin(2x + 158.77) + 311.90 \sin(4x + 149.27)$$

$$Aq = 169.58 + -197.75 \sin(2x + 46.59) + 3298.46 \sin(4x + 148.33)$$



$$Dx = 0.05 + 0.05 \sin(2x + 151.55) + 0.09 \sin(4x + 151.00)$$

$$Dx = 0.06 + 0.07 \sin(2x + 135.40) + -0.08 \sin(4x + 159.87)$$



$$Dy = -0.13 + -0.05 \sin(2x + 26.09) + -0.13 \sin(4x + 155.28)$$

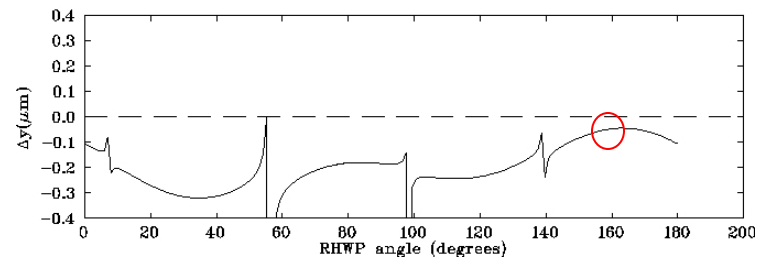
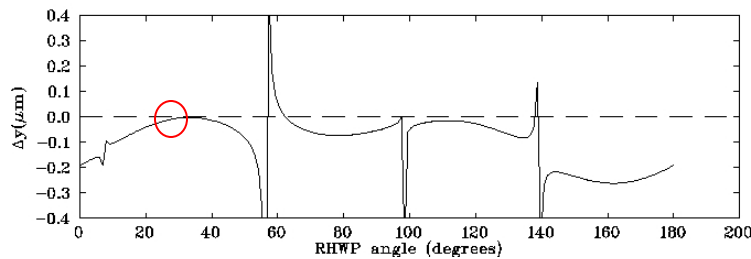
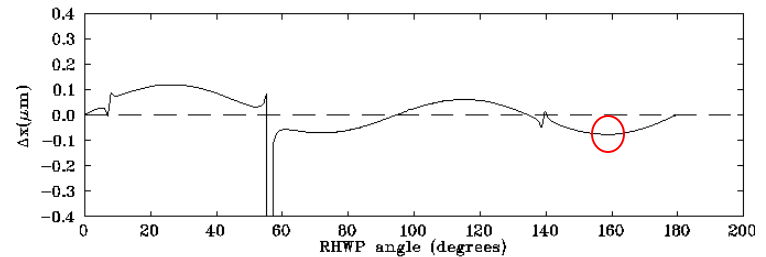
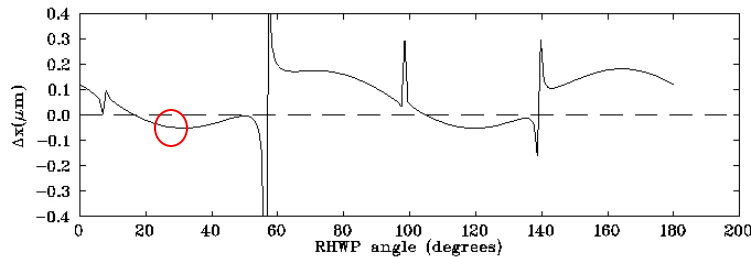
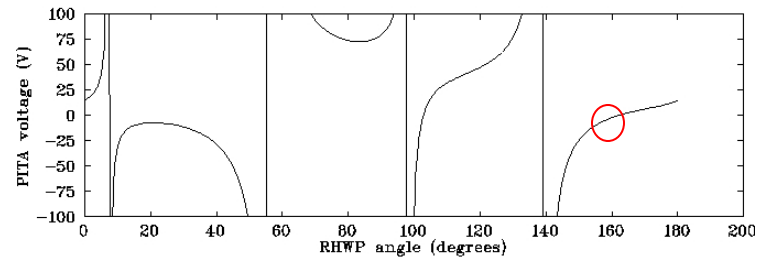
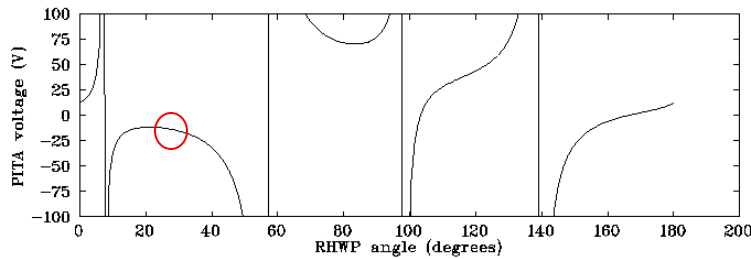
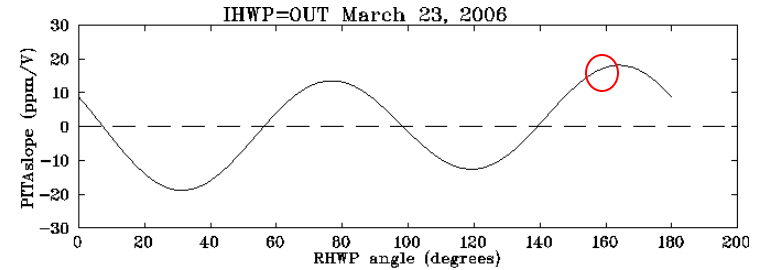
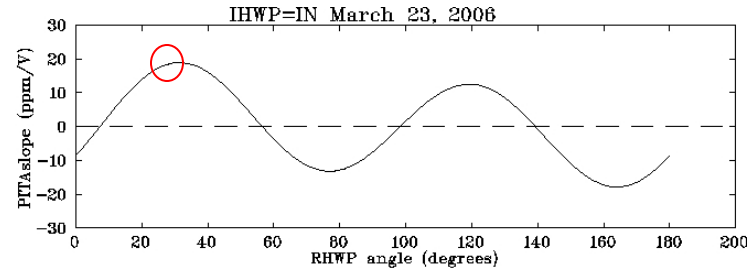
$$Dy = -0.16 + -0.07 \sin(2x + 179.72) + -0.61 \sin(4x + 153.43)$$

# Electron Beam Studies

## March 23, 2006 (40 $\mu\text{A}$ )

RHWP=30°

RHWP=160°



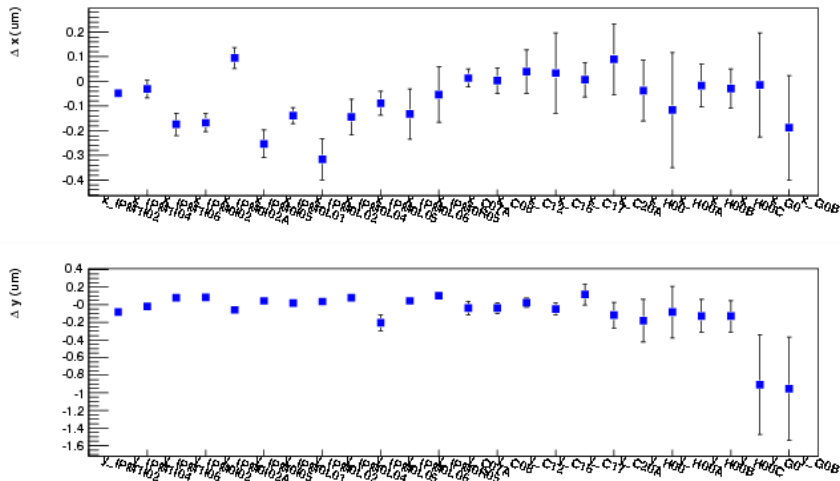
# Electron Beam Studies

## March 23, 2006 (40 $\mu$ A)

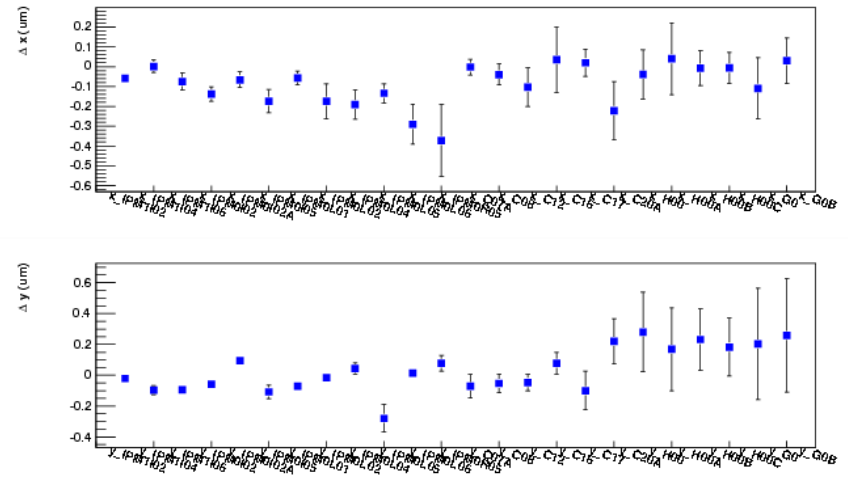
IHWP = OUT  
 RHWP =  $160^\circ$   
 17 ppm/V

IHWP = IN  
 RHWP =  $30^\circ$   
 18 ppm/V

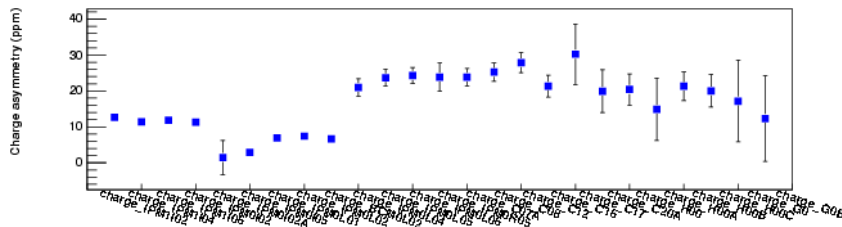
Transmission of X and Y Position Differences, Run 28134



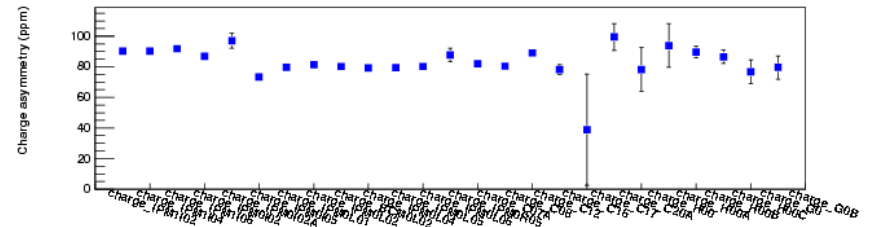
Transmission of X and Y Position Differences, Run 28137



Transmission of Charge Asymmetry, Run 28134



Transmission of Charge Asymmetry, Run 28137

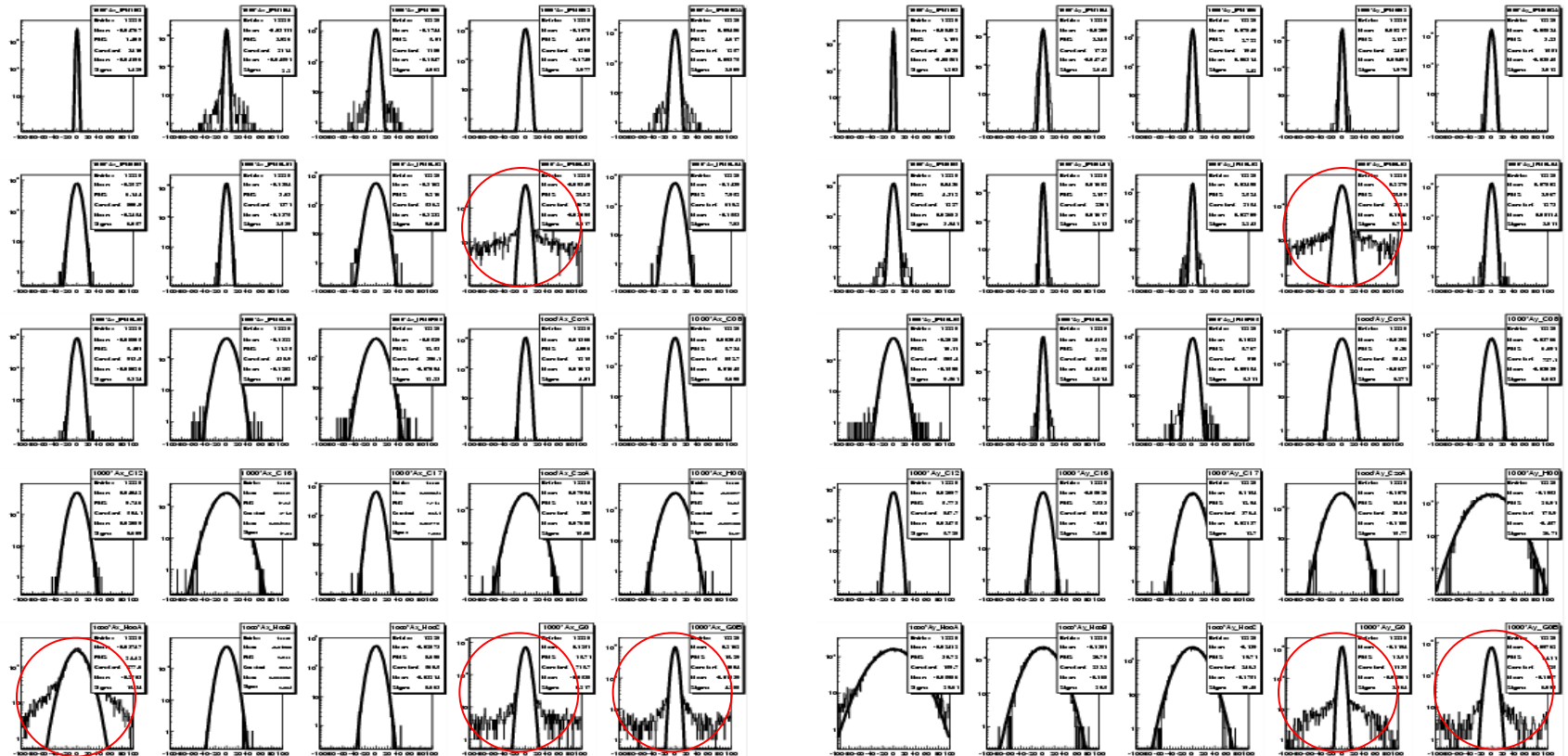


# Electron Beam Studies

## March 23, 2006 (40 $\mu$ A)

### X BPM Position Differences

### Y BPM Position Differences





# Electron Beam Studies

## March 23, 2006 (40 $\mu\text{A}$ )

- Summary
  - In the 100 keV region of the injector, all of the position differences are less than 0.3  $\mu\text{m}$ .
  - Charge asymmetry can easily be controlled with the size of the PITA slope.