$G^0$ PC Installation and Beam Studies

March 2006

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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°
    • Measured dependence of intensity loss on waveplate angle: -1.45%/° (20% at 14°)
    • 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)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IHWP IN</th>
<th>IHWP OUT</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δx</td>
<td>0.024 ± 0.023 µm</td>
<td>0.10 ± 0.014 µm</td>
<td>&lt; 0.1 µm</td>
</tr>
<tr>
<td>Δy</td>
<td>0.37 ± 0.019 µm</td>
<td>-0.21 ± 0.019 µm</td>
<td>&lt; 0.1 µm</td>
</tr>
<tr>
<td>Δcharge</td>
<td>41.72 ± 0.63 ppm</td>
<td>-29.33 ± 0.62 ppm</td>
<td></td>
</tr>
</tbody>
</table>

Birefringence (LP IN)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IHWP IN</th>
<th>IHWP OUT</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δx</td>
<td>5.71 ± 0.015 µm</td>
<td>-2.96 ± 0.015 µm</td>
<td>&lt; 6 µm</td>
</tr>
<tr>
<td>Δy</td>
<td>-5.12 ± 0.023 µm</td>
<td>1.71 ± 0.025 µm</td>
<td>&lt; 6 µm</td>
</tr>
<tr>
<td>Δcharge</td>
<td>-1.02E4 ± 54 ppm</td>
<td>1.31E4 ± 52 ppm</td>
<td></td>
</tr>
</tbody>
</table>

Electrical Pickup

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δx</td>
<td>0.035 ± 0.014 µm</td>
</tr>
<tr>
<td>Δy</td>
<td>0.013 ± 0.012 µm</td>
</tr>
<tr>
<td>Δcharge</td>
<td>1.76 ± 0.56 ppm</td>
</tr>
</tbody>
</table>

Injector

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δx</td>
<td>&lt; 0.3 µm</td>
</tr>
<tr>
<td>Δy</td>
<td>&lt; 0.3 µm</td>
</tr>
<tr>
<td>Δcharge</td>
<td></td>
</tr>
</tbody>
</table>

w/ photocathode

- 3X larger in injector
- 20X smaller in injector
Electron Beam Studies
March 23, 2006 (40 μA)

PITA=0

RHWP scan, Run 28126, IHWP IN, IPM1102

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

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

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

PITA=-192

RHWP scan, Run 28127, IHWP IN, IPM1102

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

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

Dy = -0.16 + -0.07 sin (2x + 179.72) + -0.61 sin (4x + 153.43)
Electron Beam Studies
March 23, 2006 (40 μA)

RHWP=30°

RHWP=160°
Electron Beam Studies
March 23, 2006 (40 μA)

IHWP = OUT
RHWP = 160°
17 ppm/V

IHWP = IN
RHWP = 30°
18 ppm/V
Electron Beam Studies
March 23, 2006 (40 \( \mu \text{A} \))

X BPM Position Differences

Y BPM Position Differences
Electron Beam Studies
March 23, 2006 (40 μA)

• Summary
  – In the 100 keV region of the injector, all of the position differences are less than 0.3 um.
  – Charge asymmetry can easily be controlled with the size of the PITA slope.