

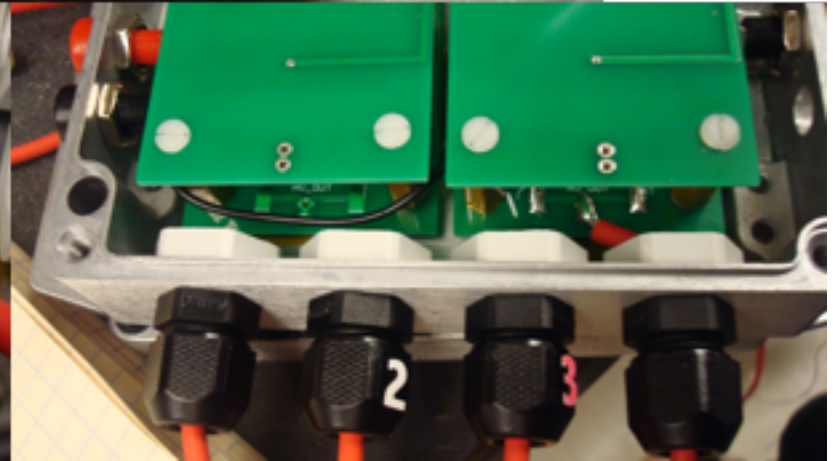
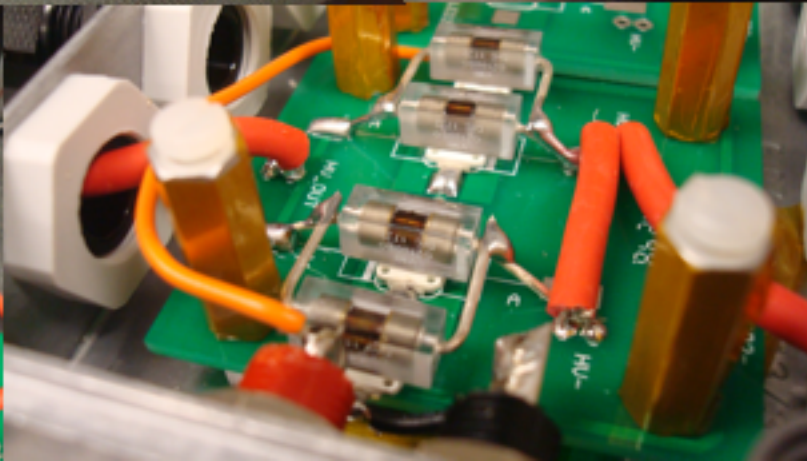
New RTP System

Caryn Palatchi

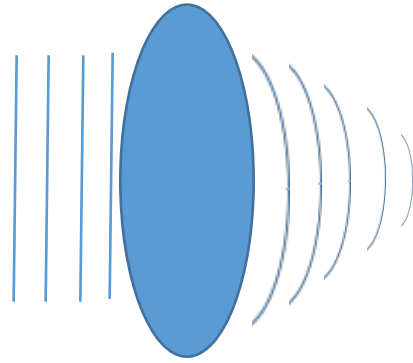
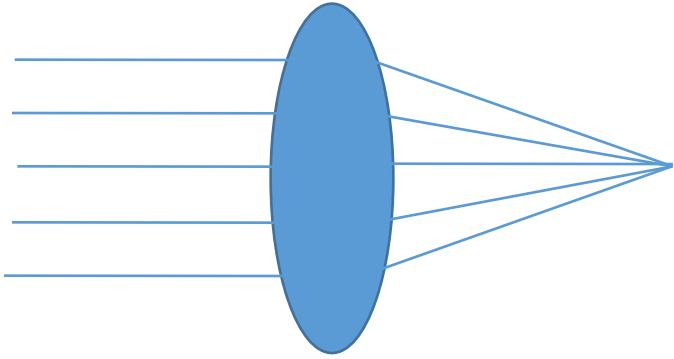
PQB Meeting 7/6/2017

8HV design

- 4 Dragon LEDs + 4 optocouplers used for each HV
- John prototyping solid state switch!

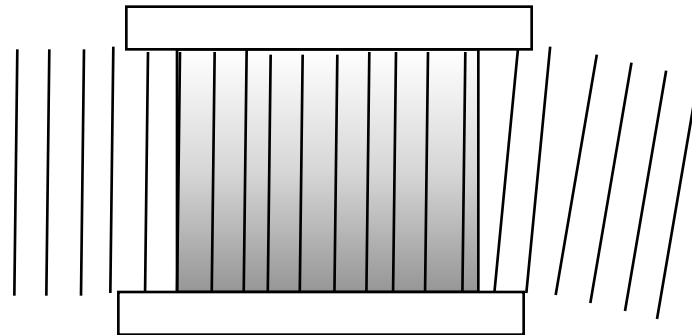
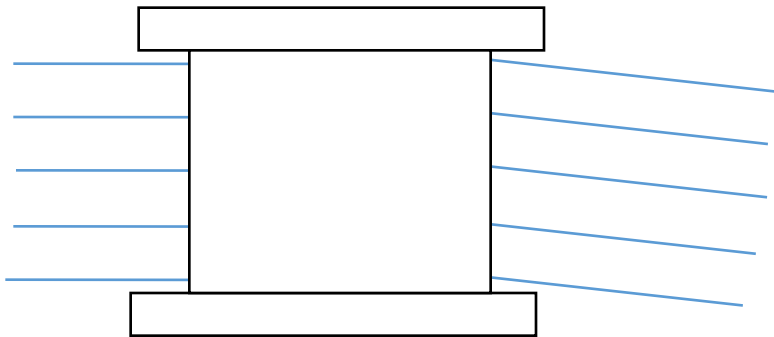
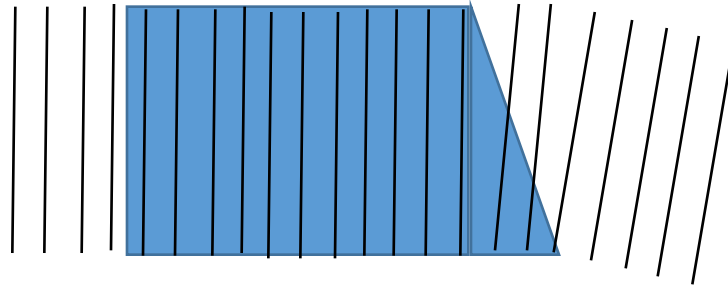
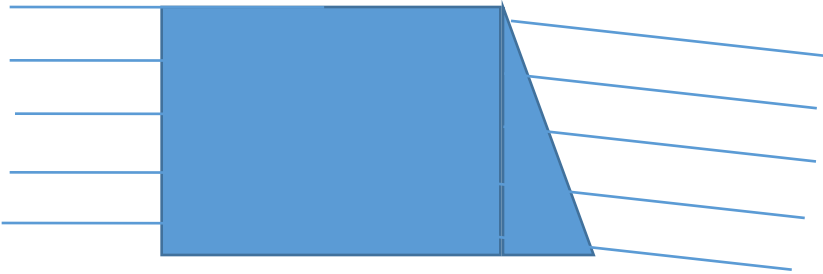


Steering in RTP : Field Gradients



$$\varphi = 2\pi nL/\lambda$$

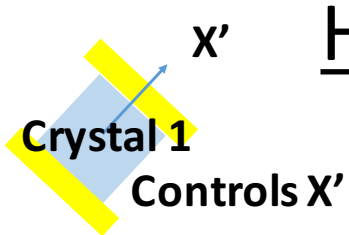
$$\theta \sim \frac{\partial \varphi}{\partial Z}$$



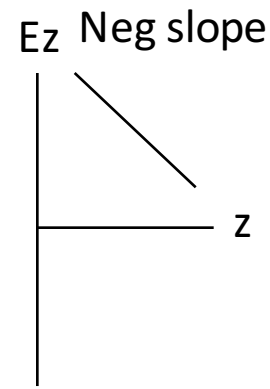
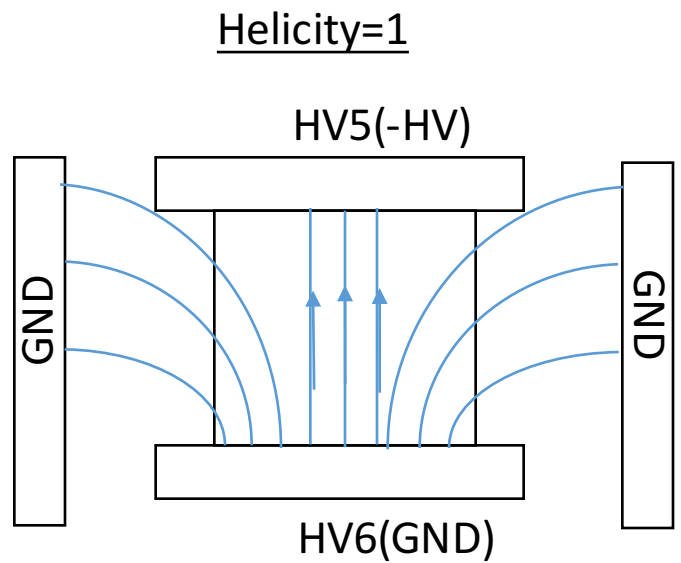
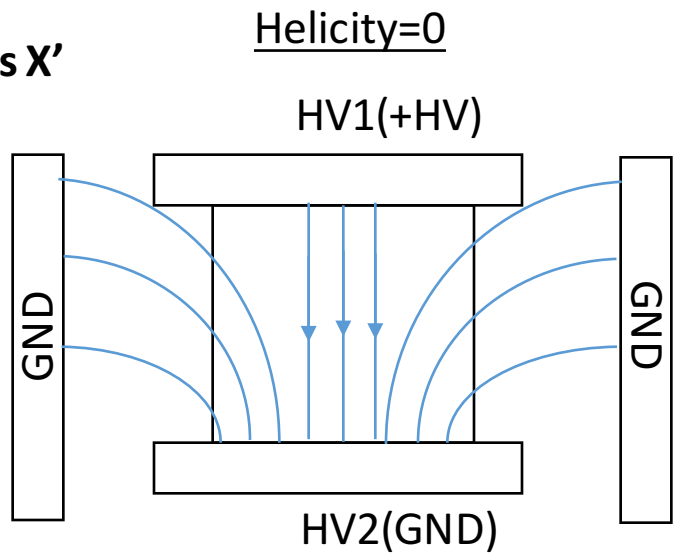
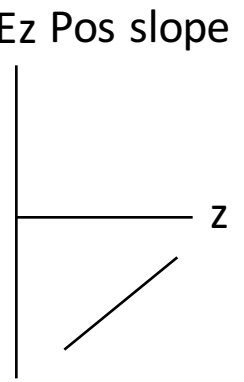
$$n_z = n_{z0} - 1/2 n_{z0}^3 r_{33} E_z$$

$$n_y = n_{y0} - 1/2 n_{y0}^3 r_{23} E_z$$

Helicity Correlated Steering in RTP : Field Gradient

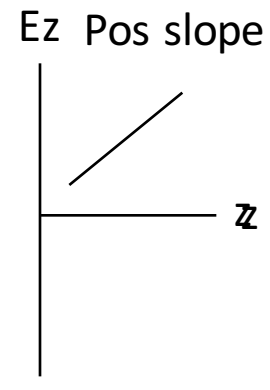
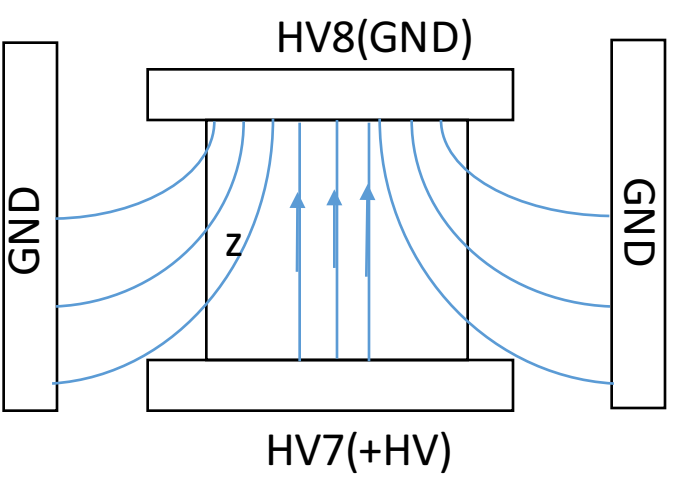
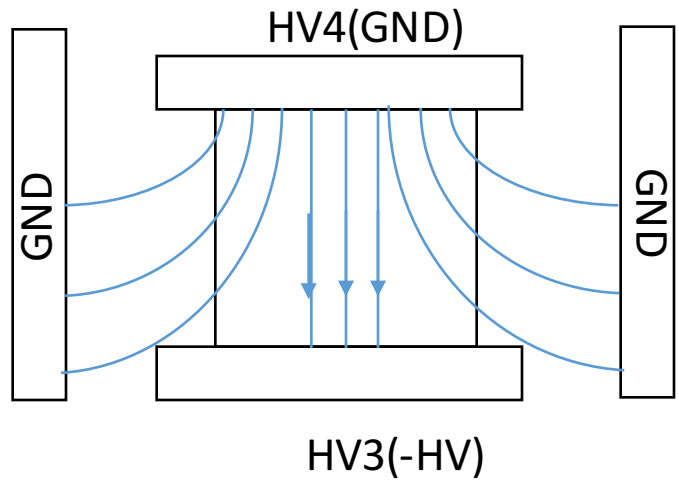
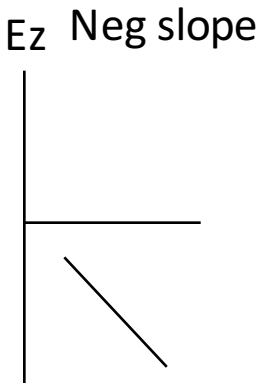


$$\Delta\theta \sim \frac{\partial E_0}{\partial Z} - \frac{\partial E_1}{\partial Z}$$



$$\Delta\theta \sim pos - neg \sim 2pos$$

$$\Delta\theta > 0 \sim 1\mu rad$$

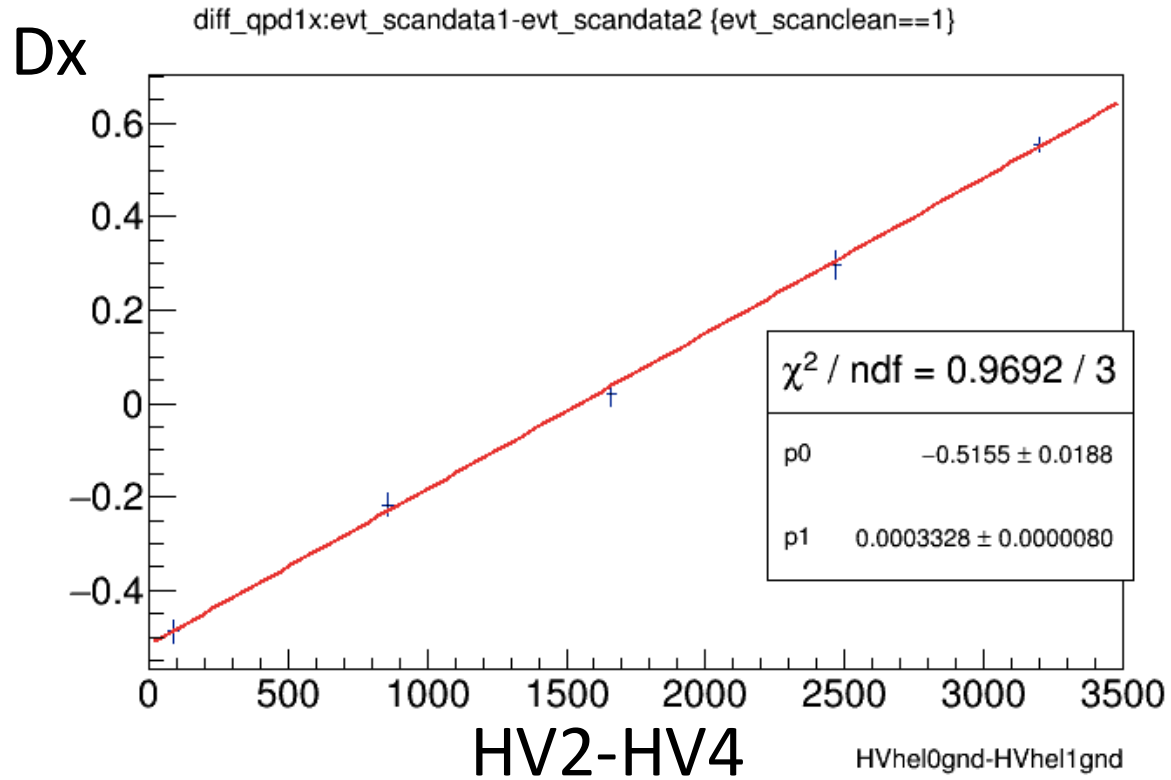
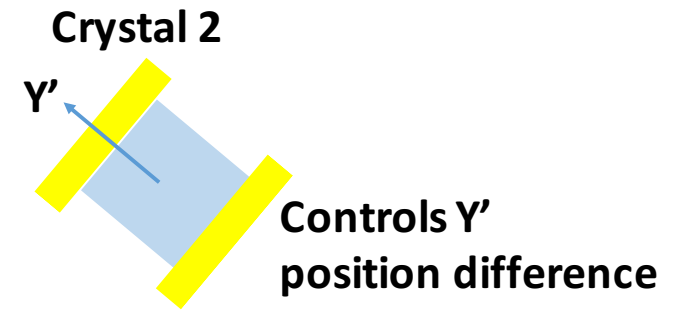
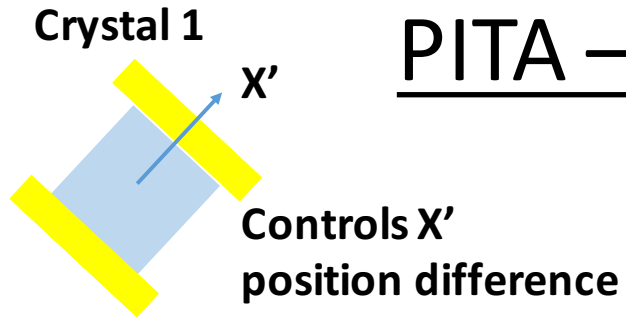


$$\Delta\theta \sim neg - pos \sim -2pos$$

$$\Delta\theta > 0 \sim 1\mu rad$$

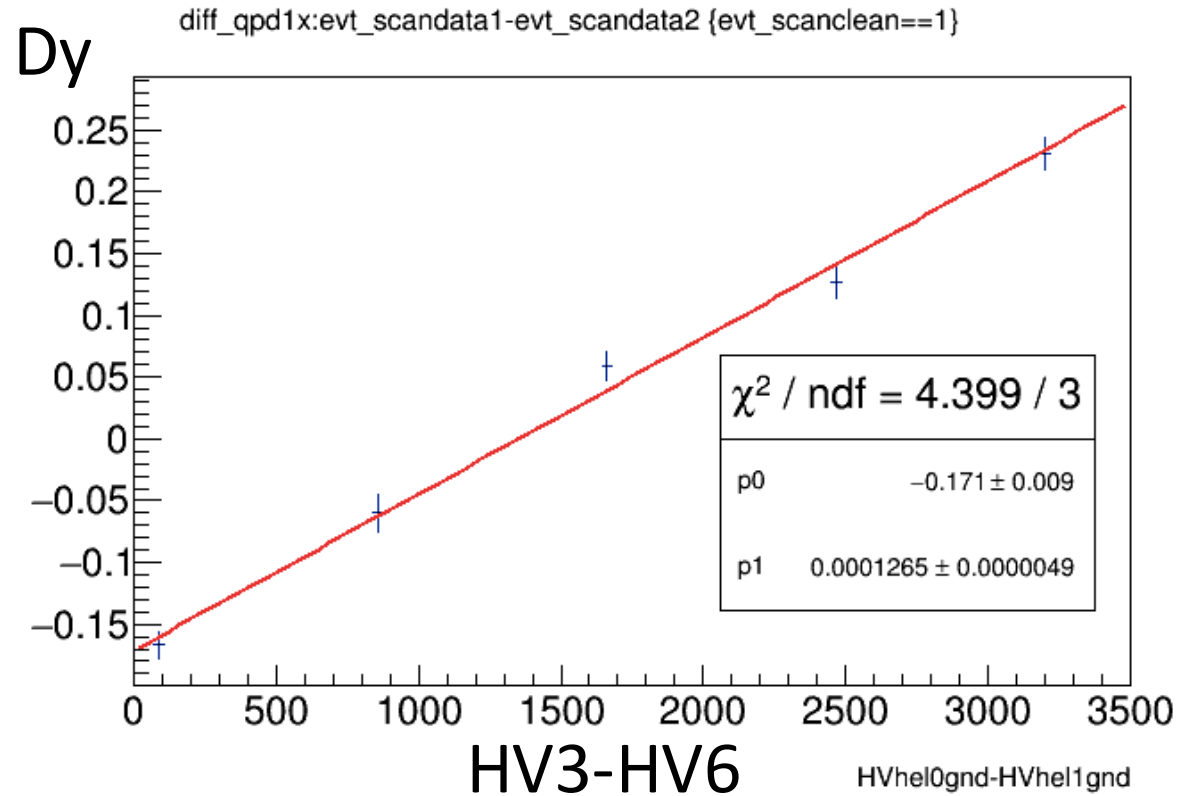


PITA – POSITION SCANS



$$n_z = n_{z0} - 1/2 n_{z0}^3 r_{33} E_z$$

Run3143, qpd 70cm, Full metal jacket

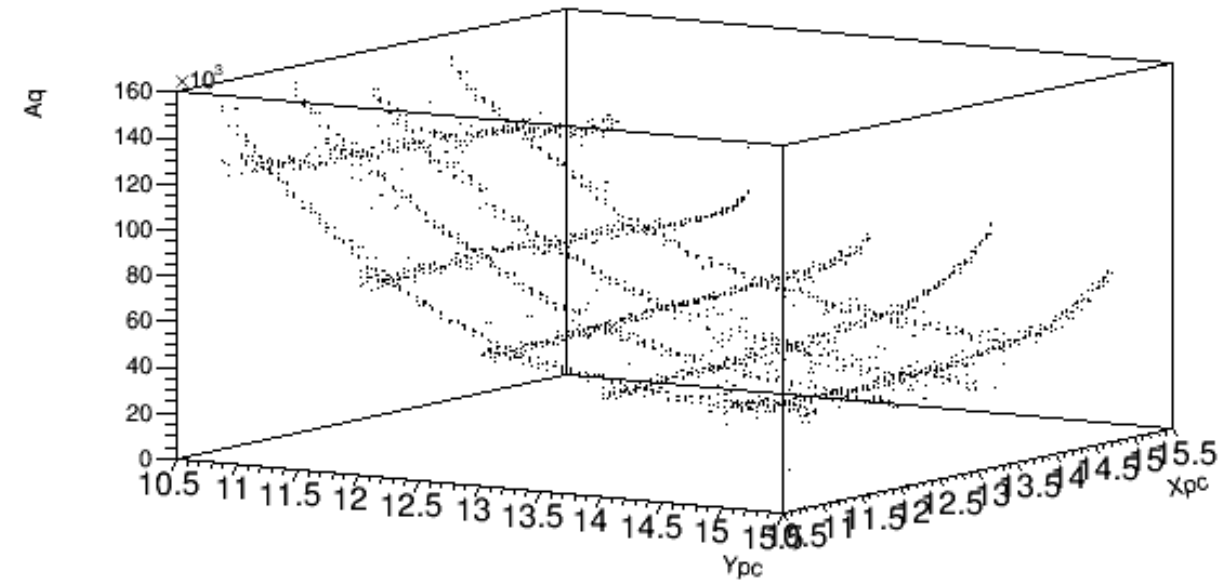


$$n_y = n_{y0} - 1/2 n_{y0}^3 r_{23} E_z$$

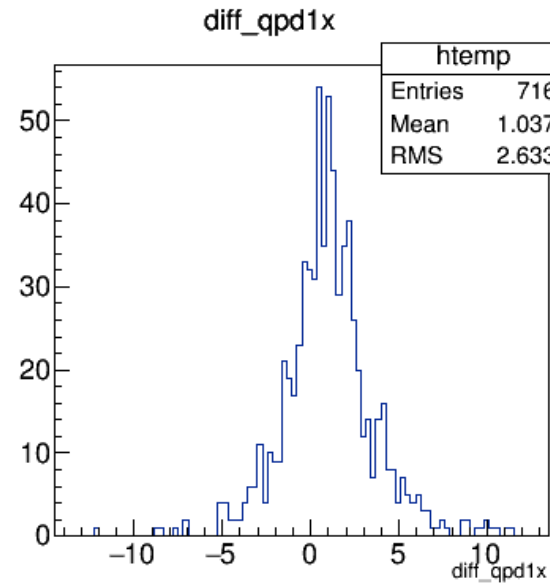
Run3148, qpd 70cm, full metal jacket

Position Differences from Analyzing- what about them?

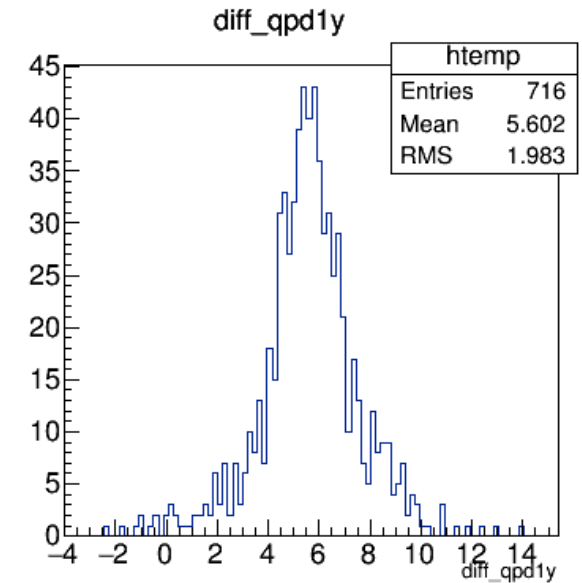
Aq: Xpc: Ypc: (avg_qpd1sum=100e3&&arr_nurto=2700&&avg_qpd1sum=17000&&Xpc<15.5&&Xpc>10.5&&Ypc<15.5)



Run3169 – E&G, no Al siding



Run3174 – E&G



- 5um Position Difference for no Al siding on mount
- 10-15um Position Difference for Metal Jacket on mount
- +0.2urad range in steering control for Al siding on mount
- +0.6urad range in steering control for Metal Jacket on mount

Cancel Position Differences from Analyzing with Steering via GND Control!

15um Position Difference for Metal Jacket on mount
+-0.6urad range in steering control for Metal Jacket on mount

- Photocathode: 3% analyzing power takes 15um to **0.4um position difference** for **1mm diameter beam**
- For 1.3m throw, +-0.6urad range = **+-0.78um range in steering control**
- Can correct position difference with steering for this example geometry
- **Playing a numbers game:**
 - **Position Difference ~ (Diameter at PC)*(Diameter and photocathode)**
 - **Steering Correction ~ Effective Throw to photocathode**

Before Run...

- **Parity Quality Beam starts with the laser**
 - **Want to plan on using both HallC laser and the HallA laser in August (since C laser doesn't have a tail/better mode)**
 - **Need 2X spot-size reduction of both lasers be performed using the 2nd PPLN telescope lens before August 21**
1. Hookup new injector bpms (Caryn)
 2. KD*P benchmark – when injector in ‘good place’, let me know, I’ll take data, will change helicity to 1kHz (Joe information)
 3. Smaller beam with PPLN telescope 2nd lens– 1mm Hall A laser, Hall C laser – good mode (John)
 4. DAC channels for 6 low-res channels and at least 2 high-res channels (John)
 5. Transport and plug in some of the equipment from Uva (Caryn)

Run Plan

- **RTP test HV control of Position Differences , Linear Array Studies,**
- **RTP Alignment in Injector Beamline- fundamental qualification of RTP working for MOLLER**
- **KD*P electron beam/show actual Parity Quality Beam (not yet achieved)**

1. Aug21- benchmark KD*P with 1mm spot (e-beam, HallA&C lasers)
2. Aug22- setup electronics for RTP (John, HallA&Clasers)
3. Aug23-25 Align RTP mount with qpd
4. Aug25- laser RHWP scans
5. Aug26-e-beam RHWP scans (e-beam, HallA&Clasers)
6. Aug26-PITA-position scan X & Y (e-beam, HallA&C lasers) – demonstrate HV control of Pos Diff
7. Aug27-Linear array setup
8. Aug28-RTP spot-size asymmetry studies – dependence angle, translation, HV analyzer S1&S2&out, along x&y&45deg
9. Aug29-Align RTP mount with linear array + RHWP scans
10. Aug30-KD*P reinsert
11. Aug31-KD*P realign with qpd for smaller spot
12. Aug31-KD*P RHWP scans
13. Sept1-KD*P e-beam RHWP scans (e-beam, HallA&Clasers)

Scheduling questions

- Aug26-27 is the weekend. Is having e-beam an issue on Sat-Sun
- If we get RTP aligned quicker, could we do Friday e-beam? Would that be easier than Sat-Sun e-beam?
- Do we need to set aside time in the Aug21-Sept1 schedule for PPLN telescope 2X spot reduction stuff at the beginning or can John get to that sooner/July/early August?
- If we get done early, can we work on the MODE of the HallA beam with John and try to get rid of the beam tail?