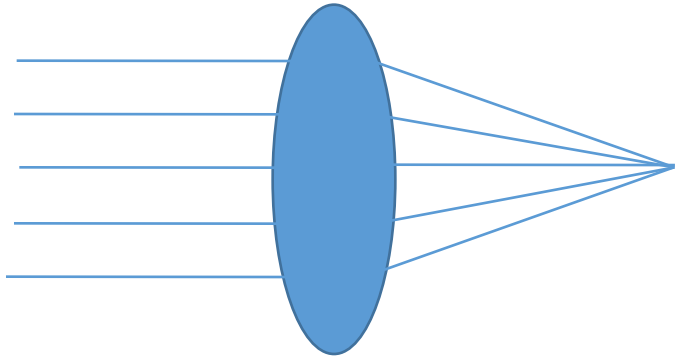
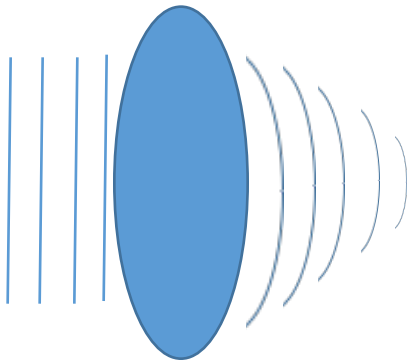
Steering Control in RTP with GND

12/8/2016

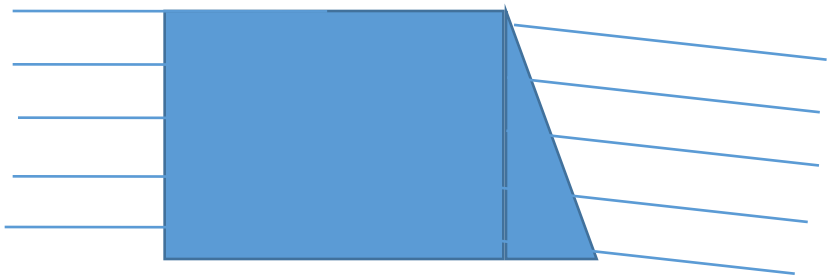
Steering in RTP : Field Gradients

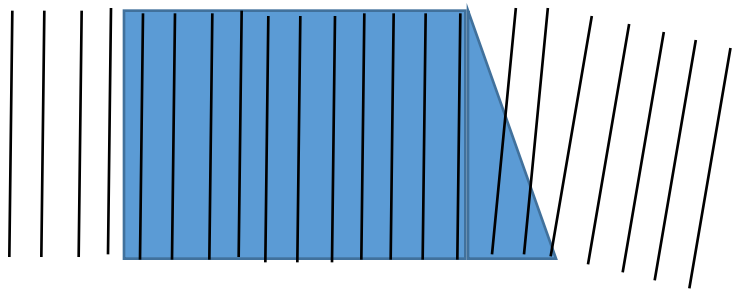


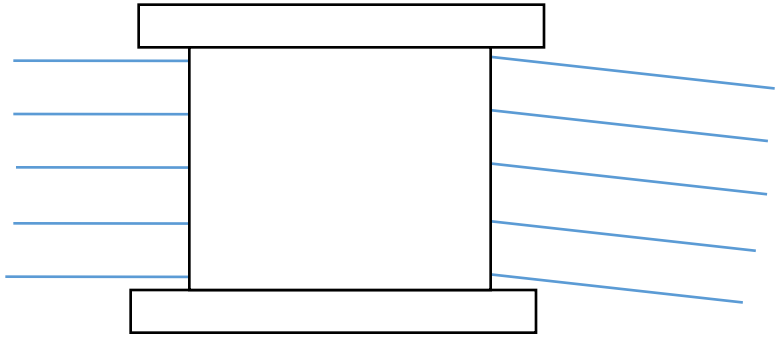


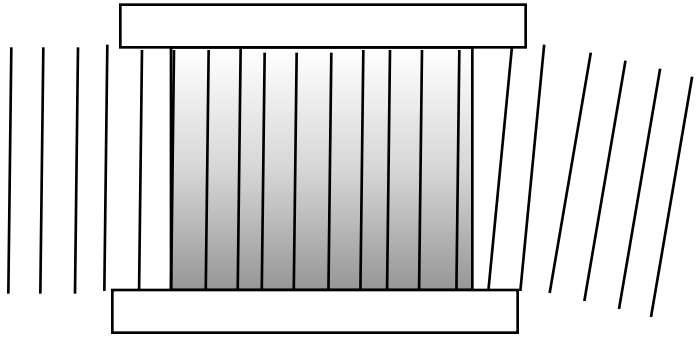
$$\varphi = 2\pi nL/\lambda$$

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







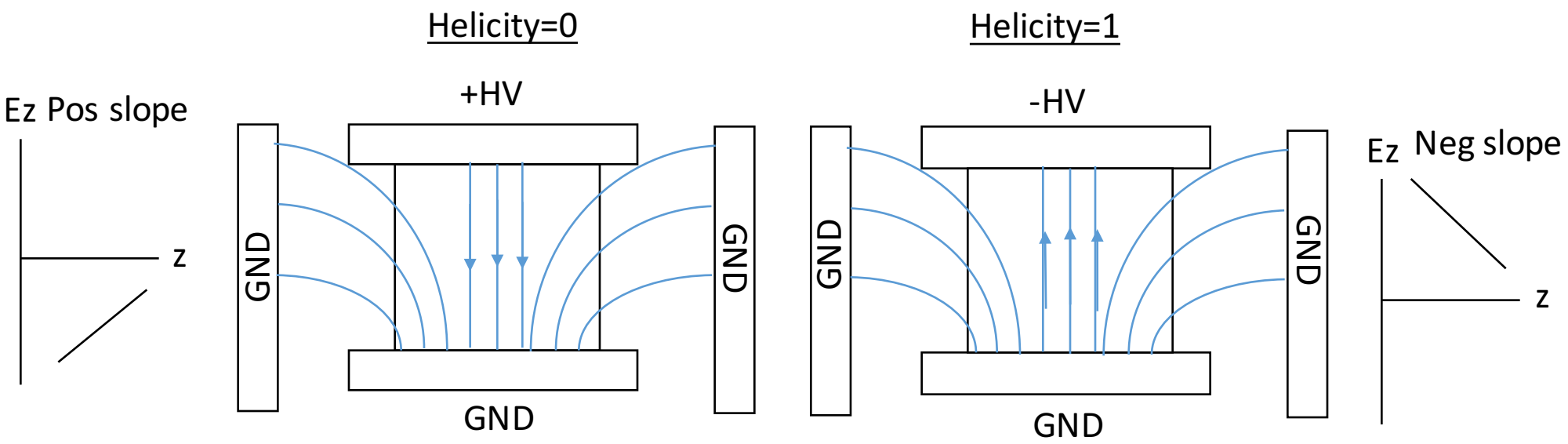


$$n_z = n_{z0} - 1/2 n_{z0}^3 r_{33} E_z$$

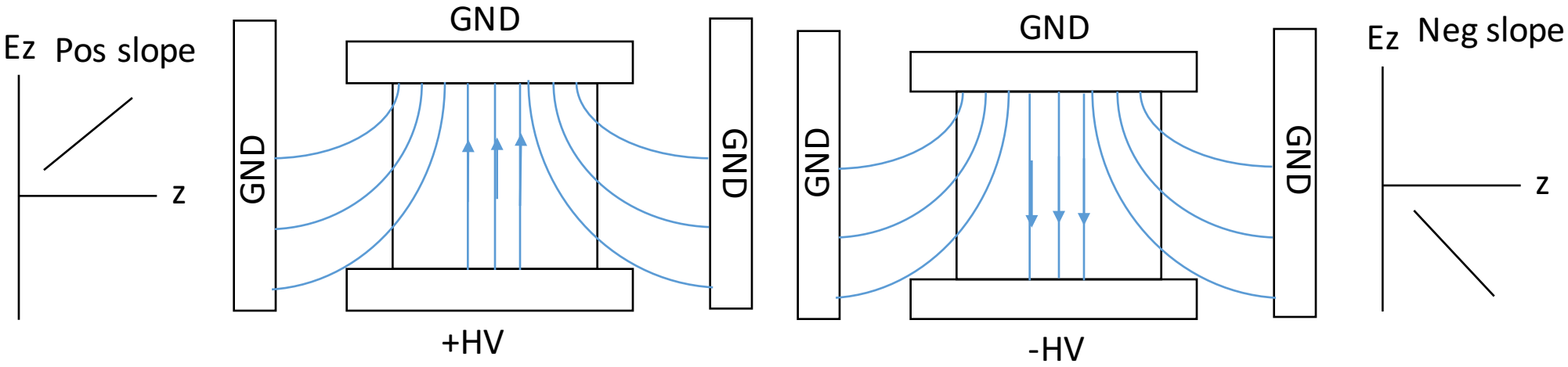
$$n_y = n_{y0} - 1/2 n_{y0}^3 r_{23} E_z$$

Helicity Correlated Steering in RTP : Stray Fields

$$\Delta\theta \sim \frac{\partial E0}{\partial Z} - \frac{\partial E1}{\partial Z}$$

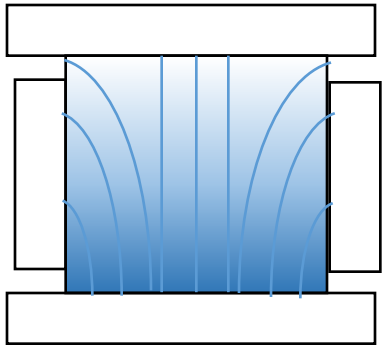


$$\Delta\theta \sim pos - neg \sim 2pos$$
$$\Delta\theta > 0 \sim 1urad$$

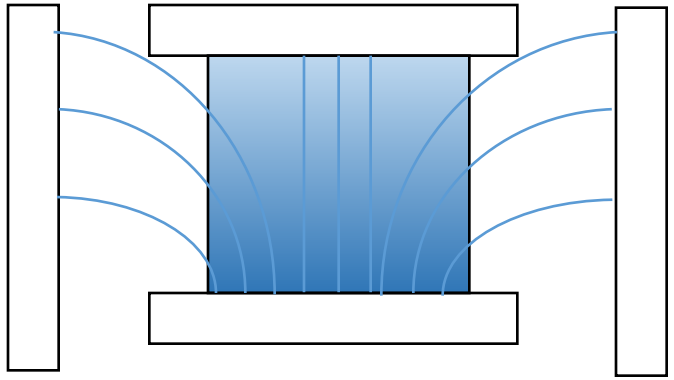


$$\Delta\theta \sim pos - neg \sim 2pos$$
$$\Delta\theta > 0 \sim 1urad$$

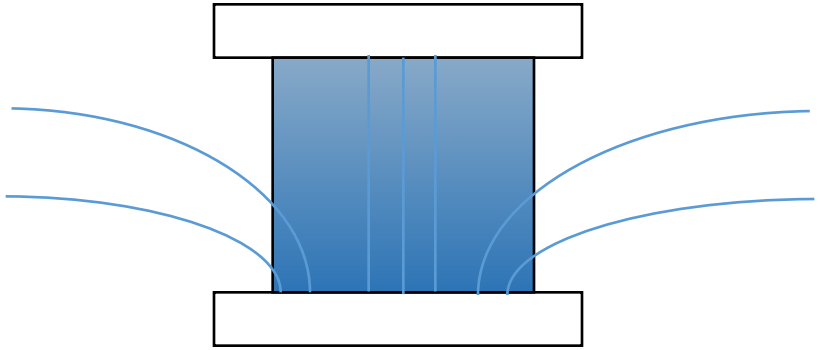
Bigger Stray Fields & Bigger Steering Test



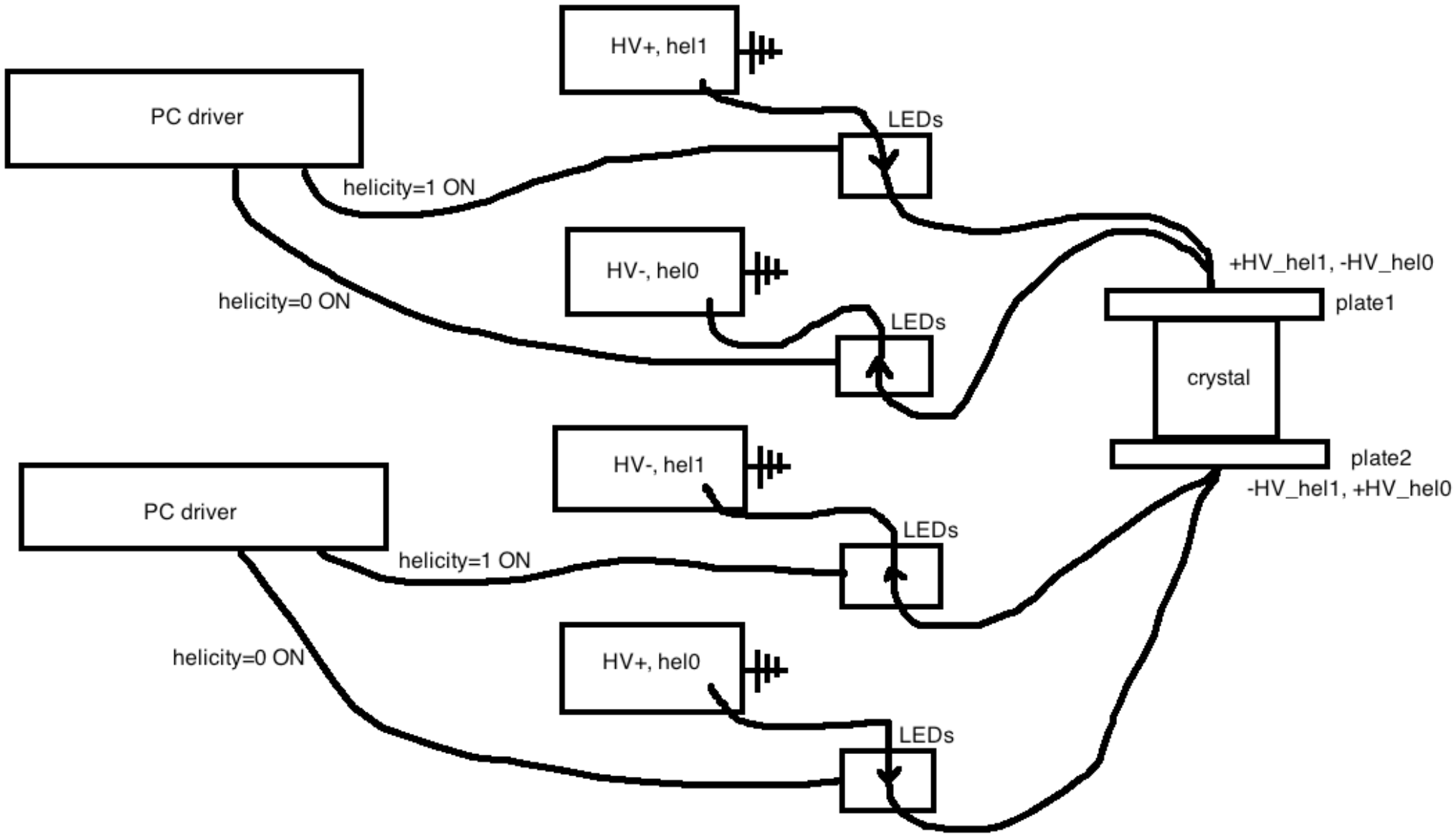
$$\Delta\theta > 10urad$$



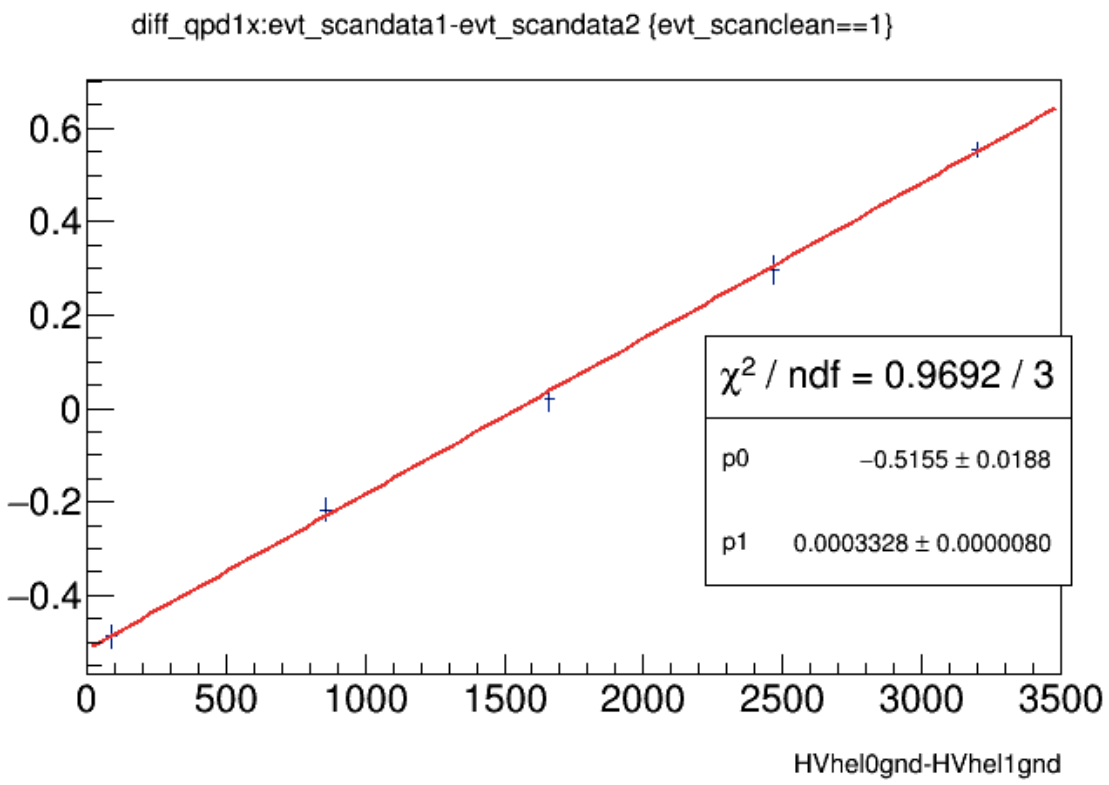
$$\Delta\theta \sim 1urad$$



$$\Delta\theta \sim 0.3urad$$

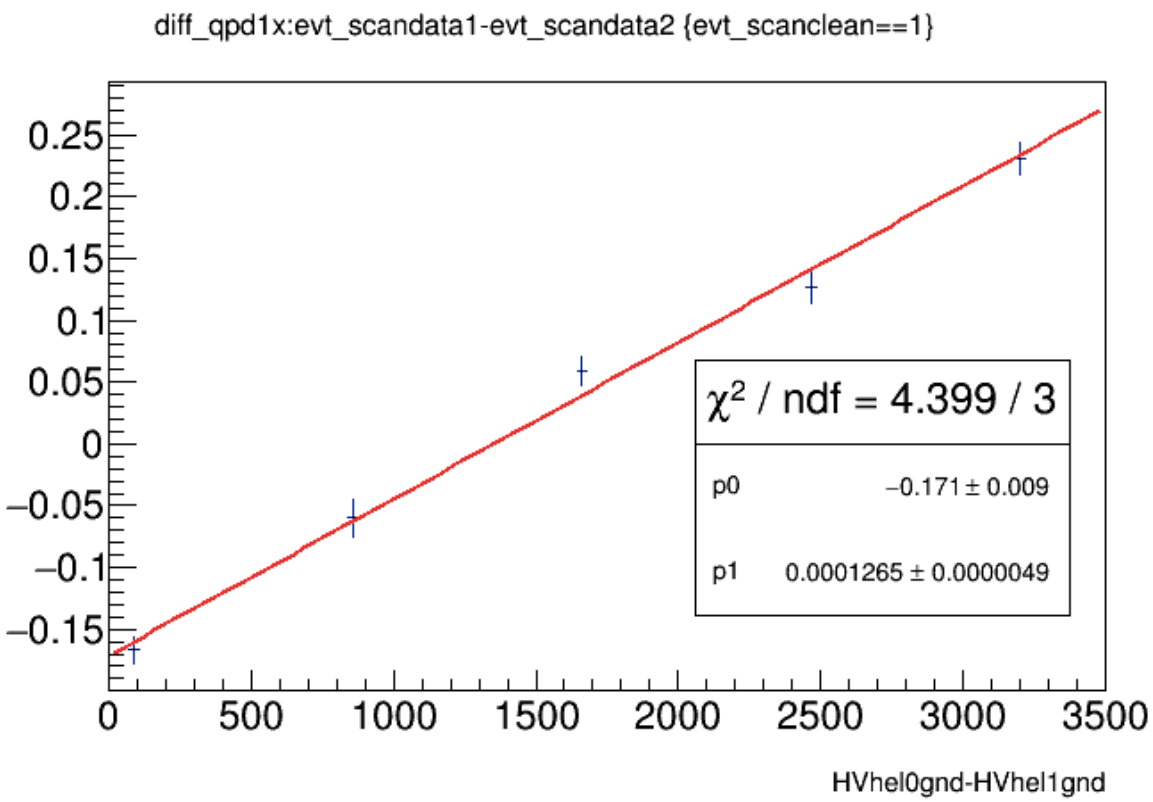

PC driver
HV+, hel1
LEDs
helicity=1 ON
HV-, hel0
helicity=0 ON
LEDs
+HV_hel1, -HV_hel0
plate1
crystal
plate2
-HV_hel1, +HV_hel0
PC driver
HV-, hel1
LEDs
helicity=1 ON
helicity=0 ON
HV+, hel0
LEDs

Control over steering & Control over GND



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

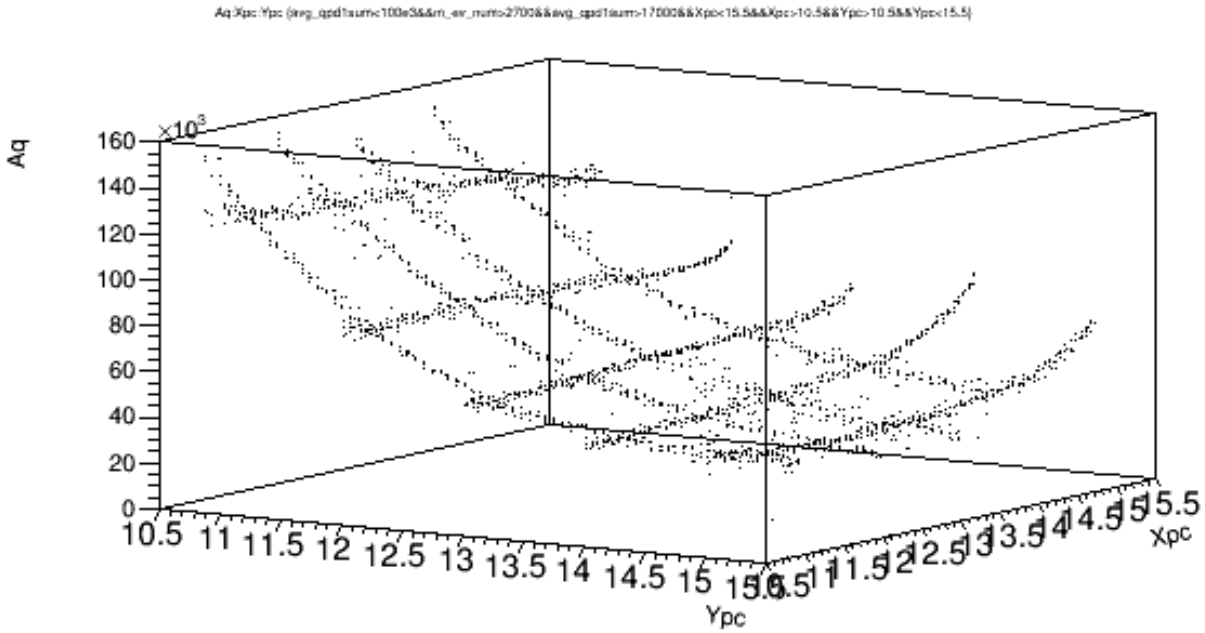
Run3143, qpd 70cm, Full metal jacket



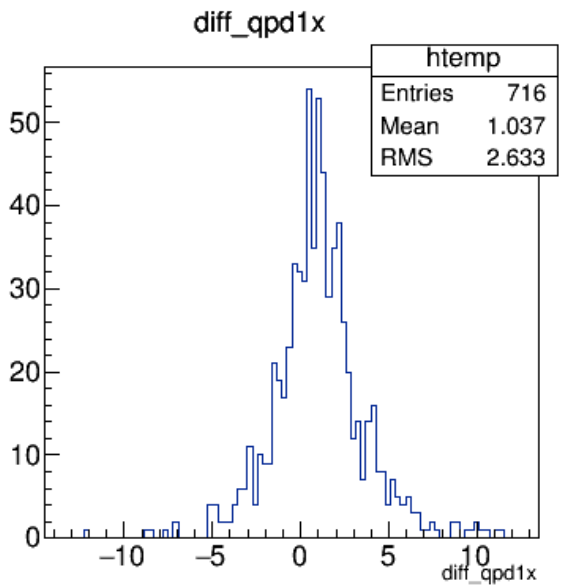
$$n_y = n_{y0} - 1/2 n_{y0}^3 r_{23} E_z$$

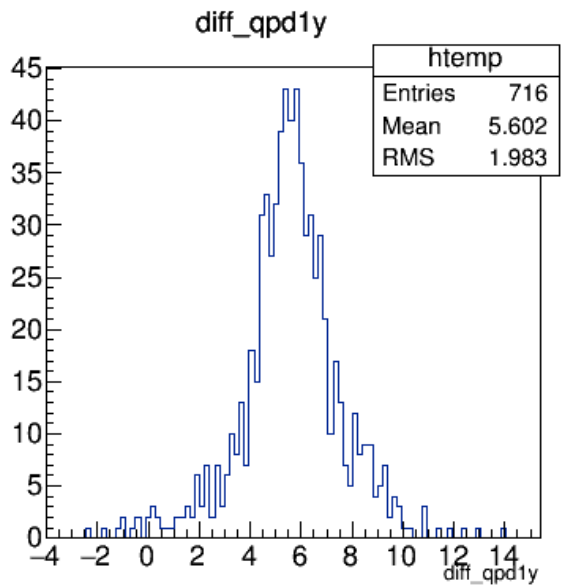
Run3148, qpd 70cm, full metal jacket

Position Differences from Analyzing- what about them?



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**