



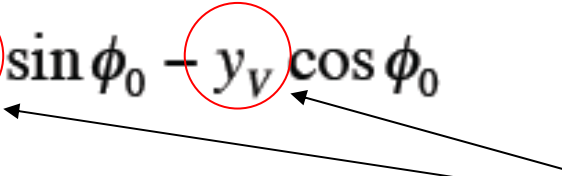
# Level 0 Alignment

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IFIC

# Introduction

- Method to estimate Level 1 parameters
- Based on track parameter correlations
- $d_0$  vs  $\phi_0$  plot:

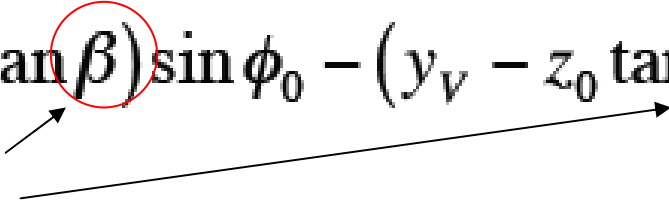
- Fit:

$$d_0 = x_V \sin \phi_0 - y_V \cos \phi_0$$


- We can extract the position of primary vertex

- $d_0$  vs  $\phi_0$  vs  $z_0$  plot:

- Fit:

$$d_0 = (x_V + z_0 \tan \beta) \sin \phi_0 - (y_V - z_0 \tan \alpha) \cos \phi_0$$


- We can extract the angles

- $z_0$  vs  $\eta$  plot:

- Fit: A straight line
- We can obtain  $z_0$
- Only Barrel

# Selection levels

Level	Track Selection	Tracks	Hits
0	All	823339	7826684
1	Used in alignment	204995	2121891
2	2 Pix & 5 SCT	353401	3719723
3	+ 1 hit SCT Layer 3	218642	2270338
4	+ 1 hit PIX Layer 0	201656	2110982
5	2 Pix & 5 SCT (1 in Endcap)	109122	1198765

All detector

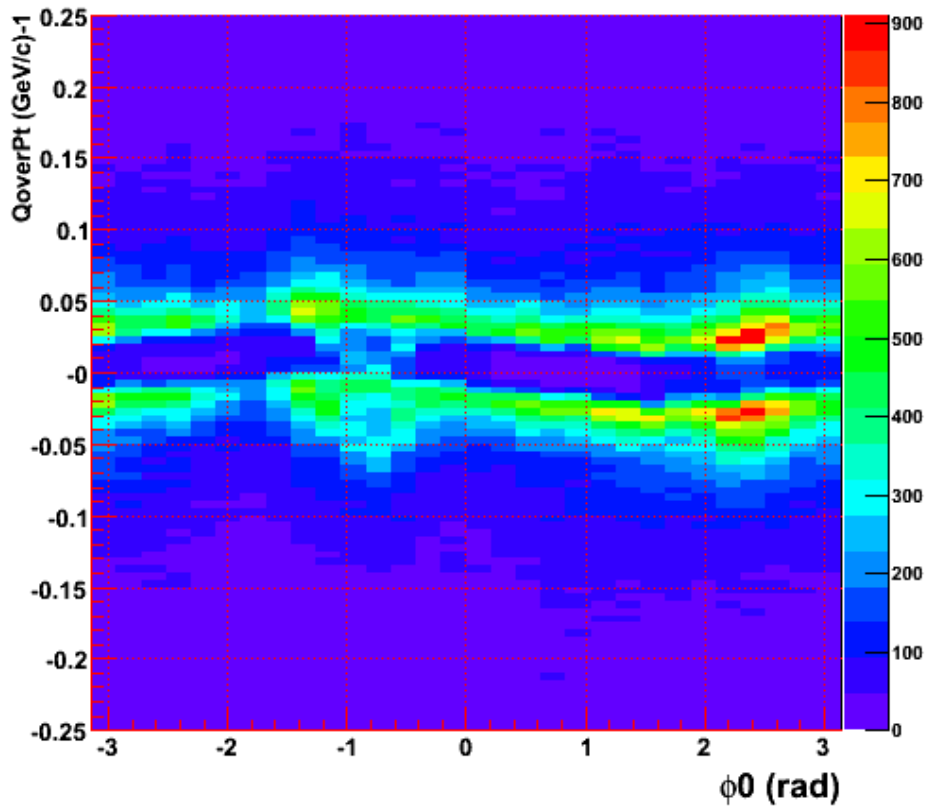
Barrel

Endcaps

# Barrel + Endcaps (Selection 2)

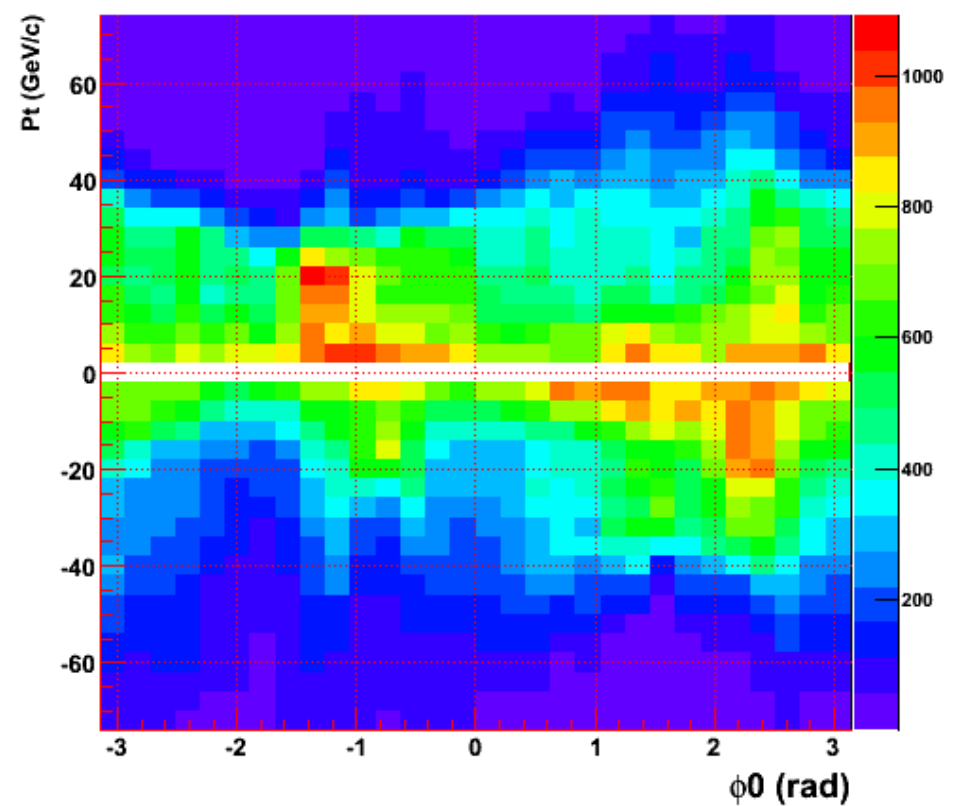
Reconstructed Q/Pt vs  $\phi_0$

Entries 353401



Reconstructed Pt vs  $\phi_0$

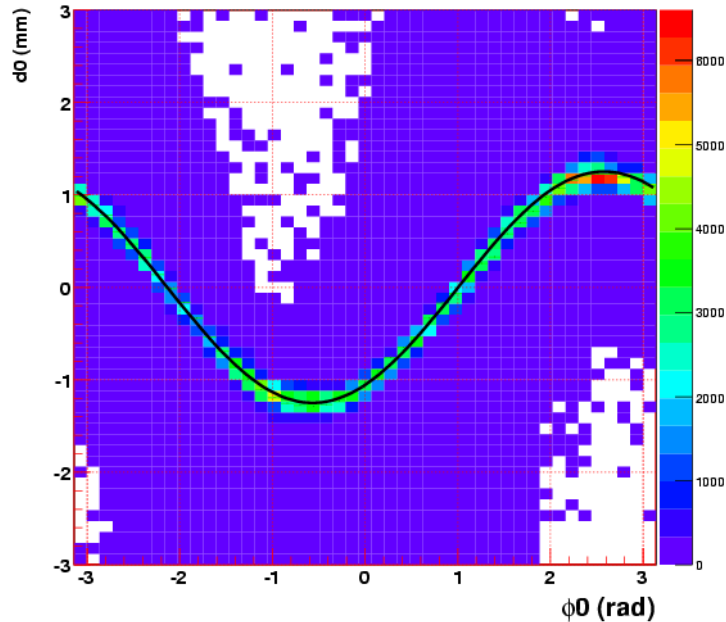
Entries 353401



# Barrel + Endcap (Selection 2)

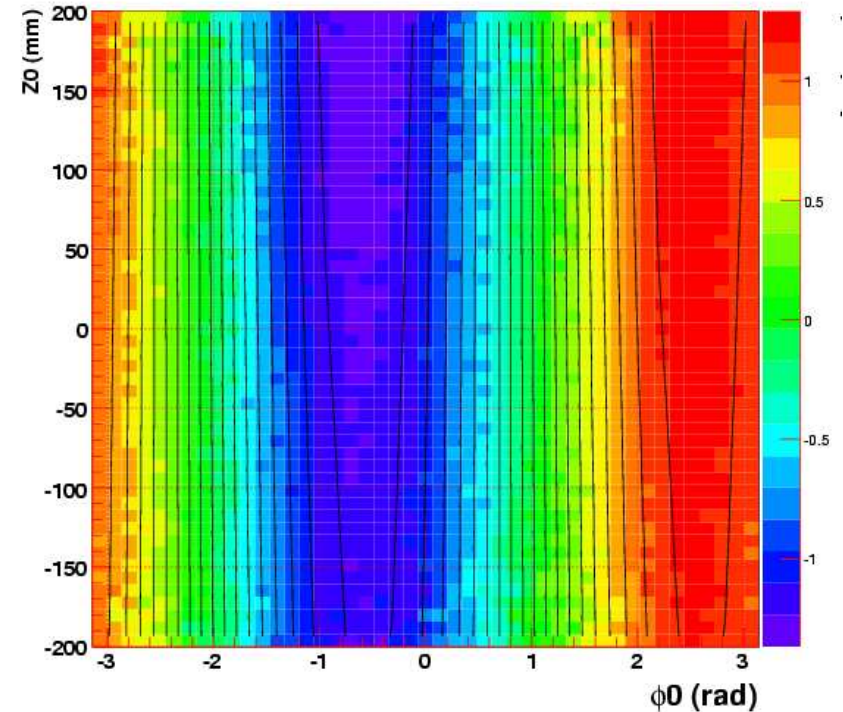
Reconstructed d0 vs  $\phi_0$

Entries 353401



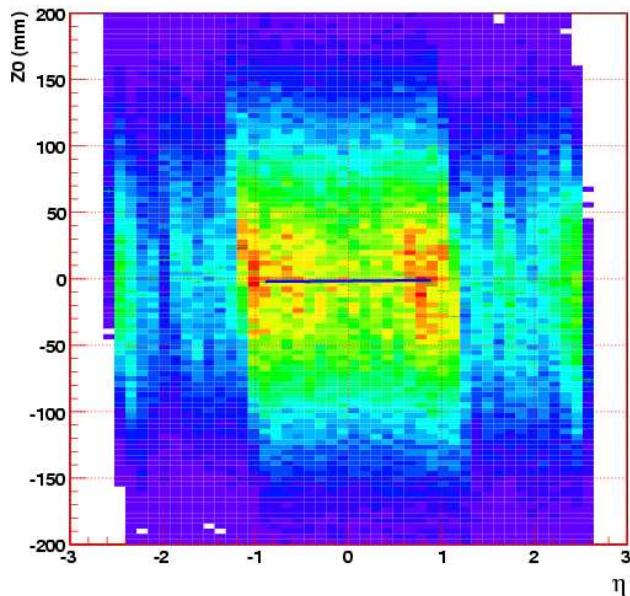
Reconstructed d0 vs  $\phi_0$ -Z0

Entries 341159



Reconstructed Z0 vs  $\eta$

Entries 353401



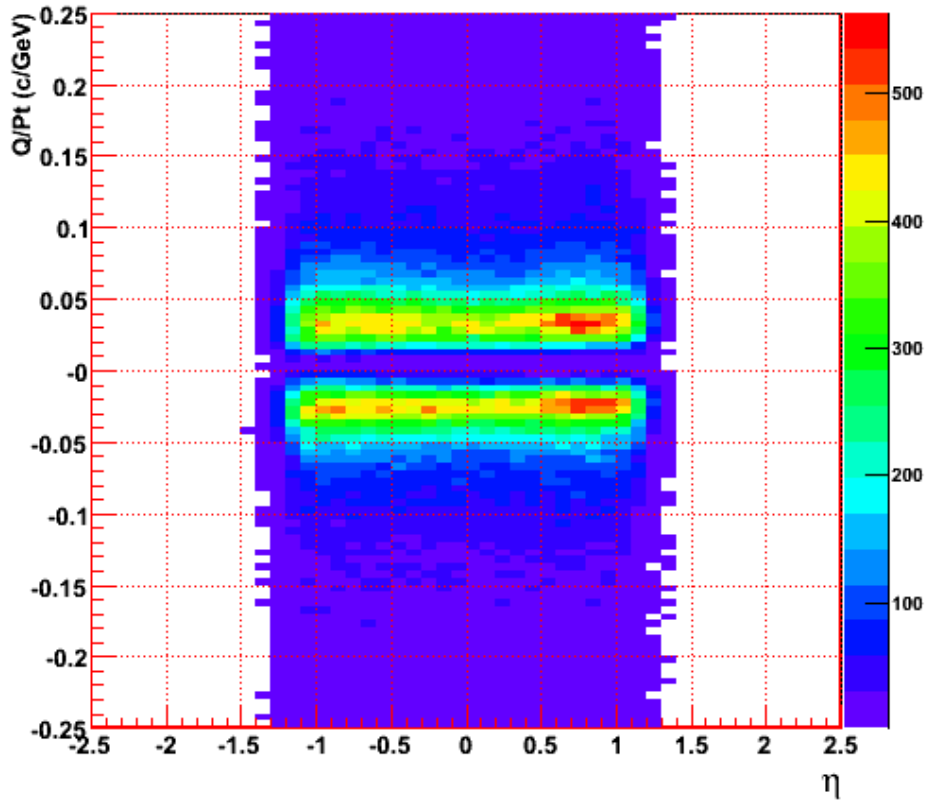
## Fit:

- $x_V = 0.655 \pm 0.0006$  mm
- $y_V = 1.050 \pm 0.0005$  mm
- $\alpha = -0.177 \pm 0.006$  mrad
- $\beta = 0.215 \pm 0.006$  mrad
- $z_V = 1.590 \pm 0.3$  mm

# Barrel (Selection 3)

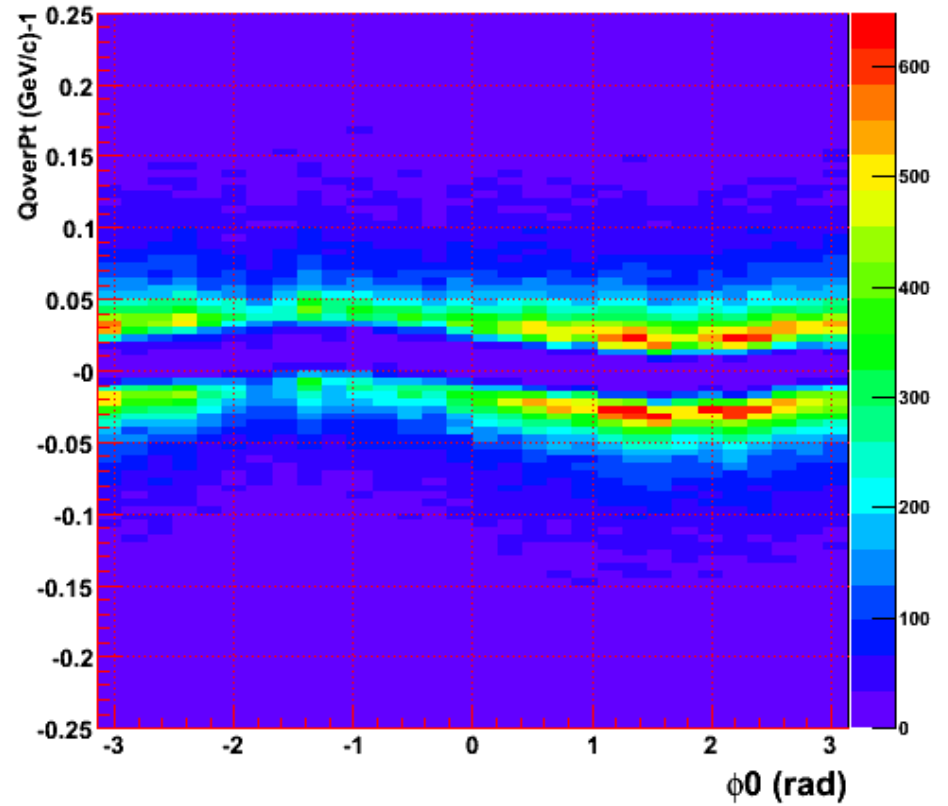
Reconstructed Q/Pt vs  $\eta$

Entries 218642



Reconstructed Q/Pt vs  $\phi_0$

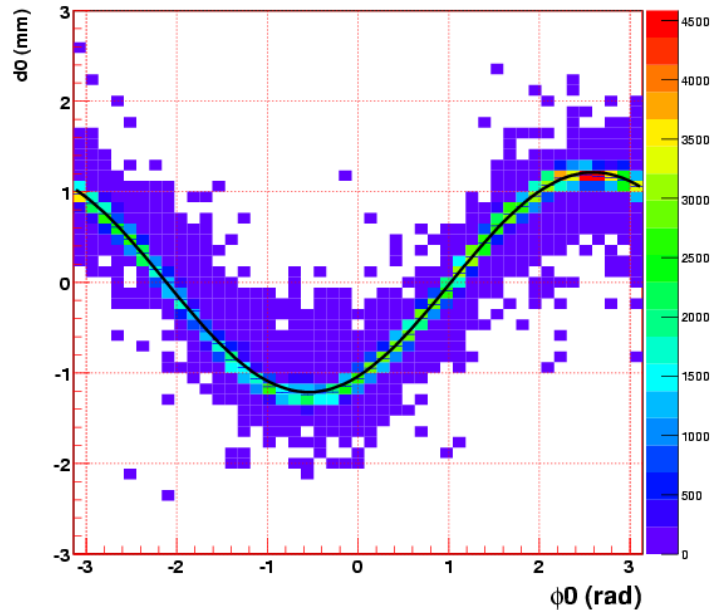
Entries 218642



# Barrel (Selection 3)

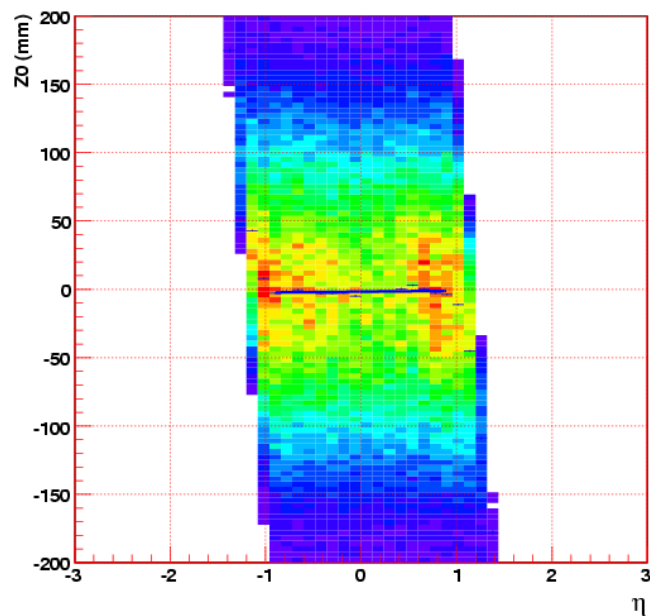
Reconstructed d0 vs  $\phi_0$

Entries 218642



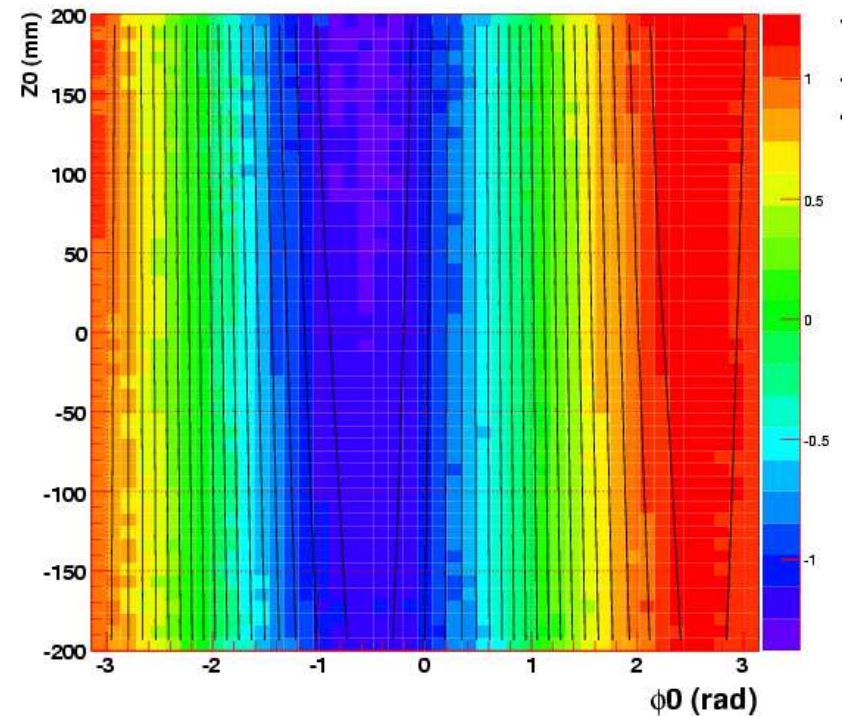
Reconstructed Z0 vs  $\eta$

Entries 218642



Reconstructed d0 vs  $\phi_0$ -Z0

Entries 218613



## Fit:

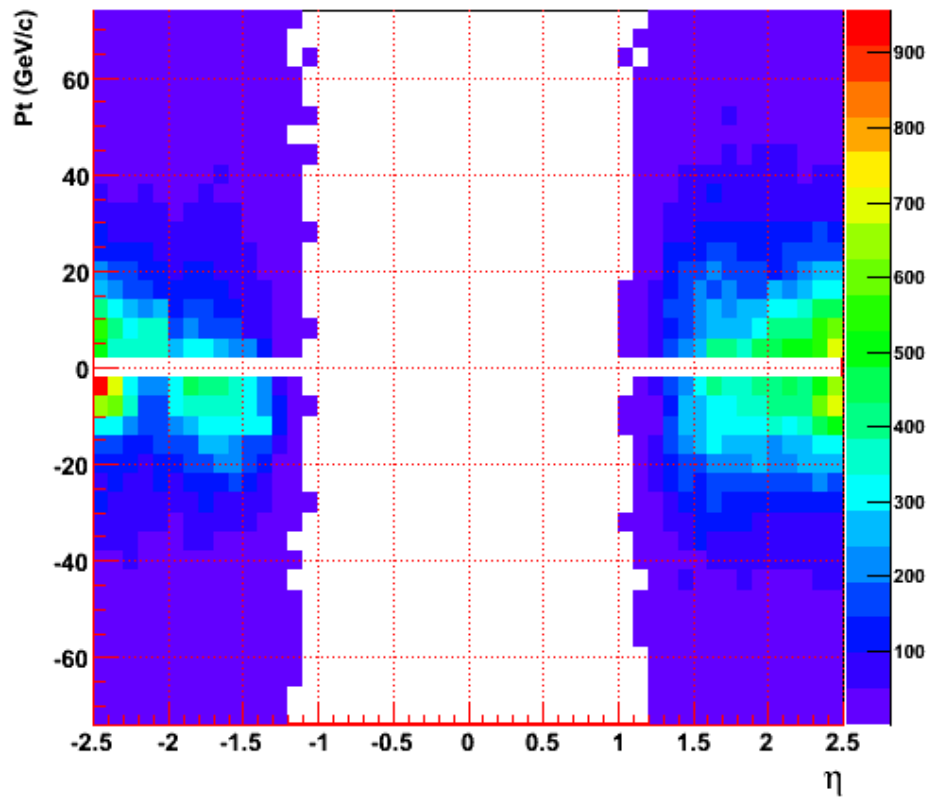
- $x_V = 0.631 \pm 0.0003$  mm
- $y_V = 1.040 \pm 0.0002$  mm
- $\alpha = -0.119 \pm 0.003$  mrad
- $\beta = 0.304 \pm 0.003$  mrad
- $z_V = 1.710 \pm 0.3$  mm



# Endcap (Selection 5)

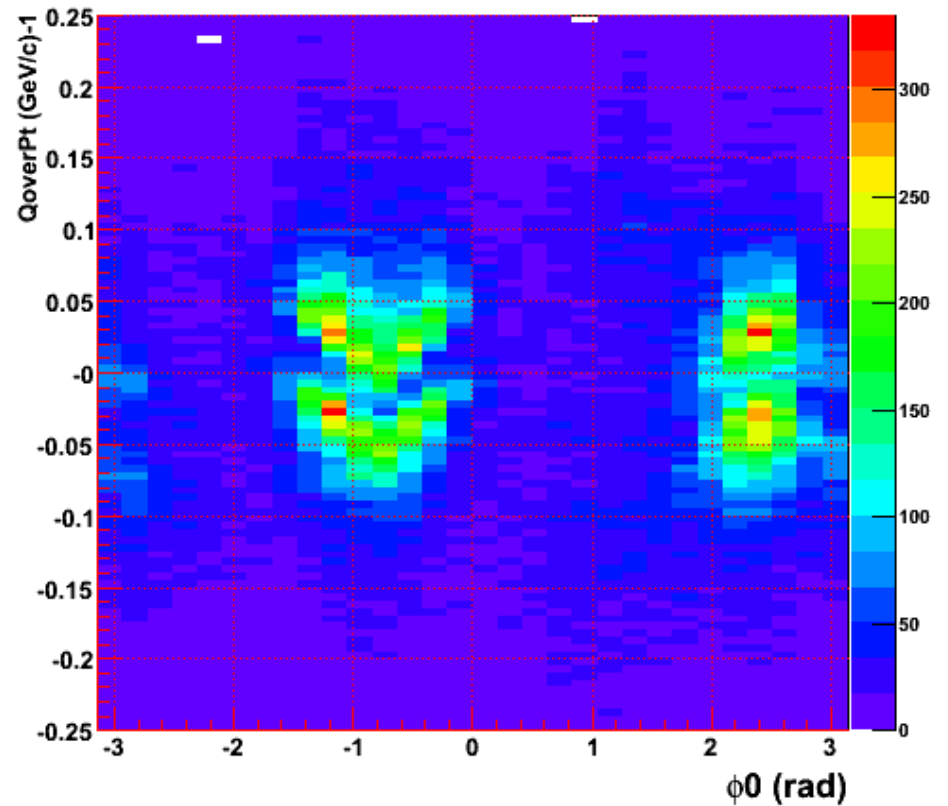
Reconstructed Pt vs  $\eta$

Entries 109122



Reconstructed Q/Pt vs  $\phi_0$

Entries 109122

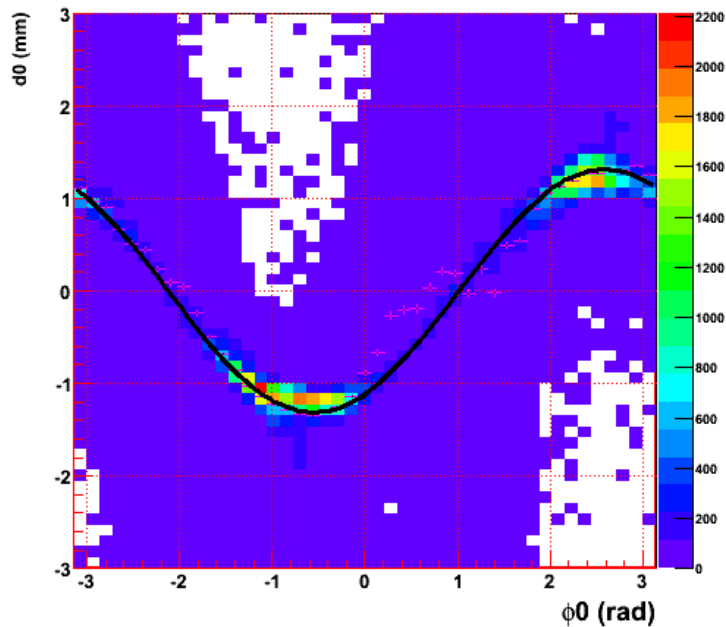




# Endcap (Selection 5)

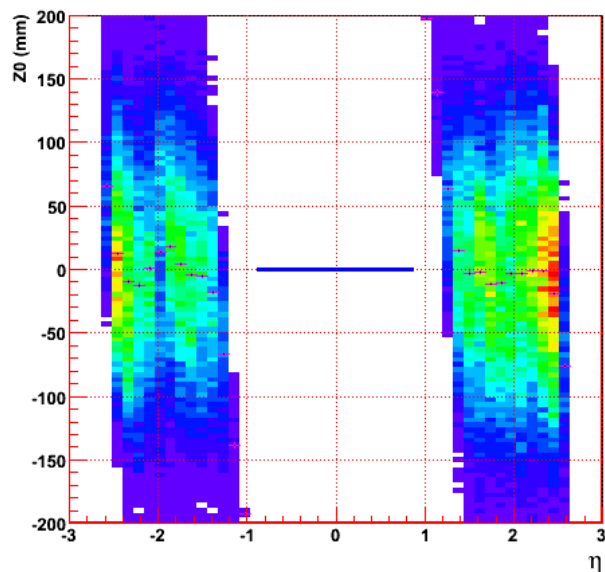
Reconstructed d0 vs  $\phi_0$

Entries 109122



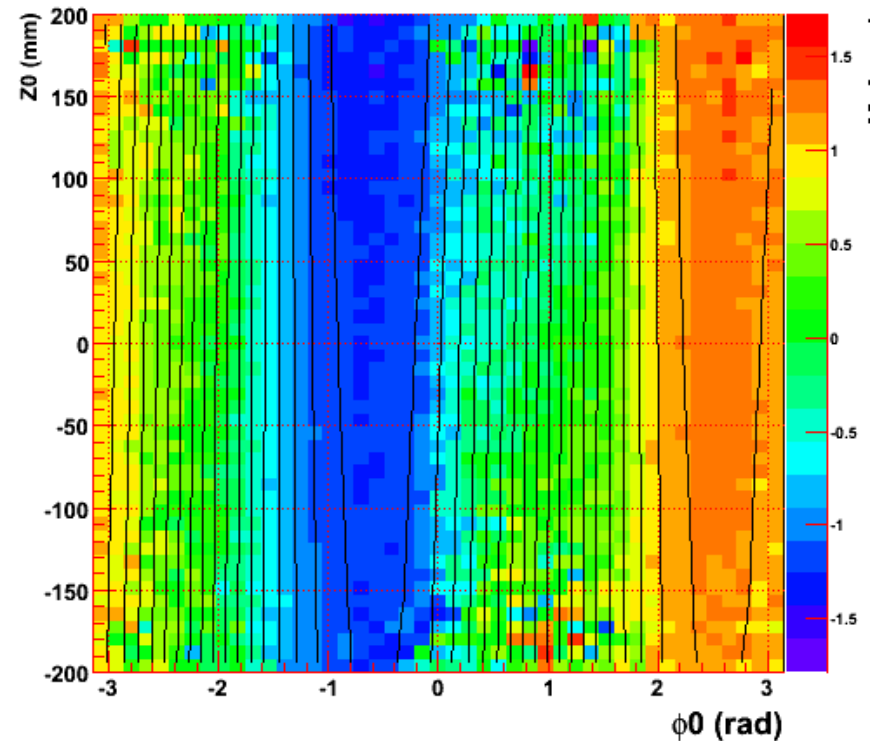
Reconstructed Z0 vs  $\eta$

Entries 109122



Reconstructed d0 vs  $\phi_0$ -Z0

Entries 97173



## Fit:

- $x_V = 0.675 \pm 0.0001$  mm
- $y_V = 1.080 \pm 0.0001$  mm
- $\alpha = -0.123 \pm 0.003$  mrad
- $\beta = 0.0071 \pm 0.01$  mrad

# Results

Analyze Level	x_v (mm)	E(x_v)	y_v	E(y_v)	alpha( mrad)	E(alpha)	beta	E(beta)	z_v(mm)	E(z_v)
0	0,629	0,0009	0,945	0,0010	-0,341	0,010	-0,0231	0,010	1,250	0,200
1	0,633	0,0003	1,040	0,0003	-0,126	0,003	0,317	0,004	1,320	0,300
2	0,655	0,0006	1,050	0,0005	-0,177	0,006	0,215	0,006	1,590	0,300
3	0,631	0,0003	1,040	0,0002	-0,119	0,003	0,304	0,003	1,710	0,300
4	0,645	0,0002	1,040	0,0002	-0,123	0,003	0,316	0,003	1,820	0,300
5	0,675	0,0010	1,080	0,0010	-0,308	0,010	-0,0071	0,010		