

# Momentum and Position Resolution at the CKOV plane for the GlueX detector system

Joachim Kuhn

*Carnegie Mellon University  
Department of Physics  
5000 Forbes Ave.  
Pittsburgh, PA 15213*

7 October 2004

---

## **Abstract**

This is a position and momentum resolution study for the GlueX detector system at the z-position of the proposed Cerenkov detector. Tracks are generated from the reaction  $\gamma p \rightarrow \eta_1(1800)p \rightarrow \pi^+\pi^-\pi^+\pi^-p$  (see Ref [1]).

---

## **1 Introduction**

**2  $y$ - vs  $x$ -position at the face of the CKOV**

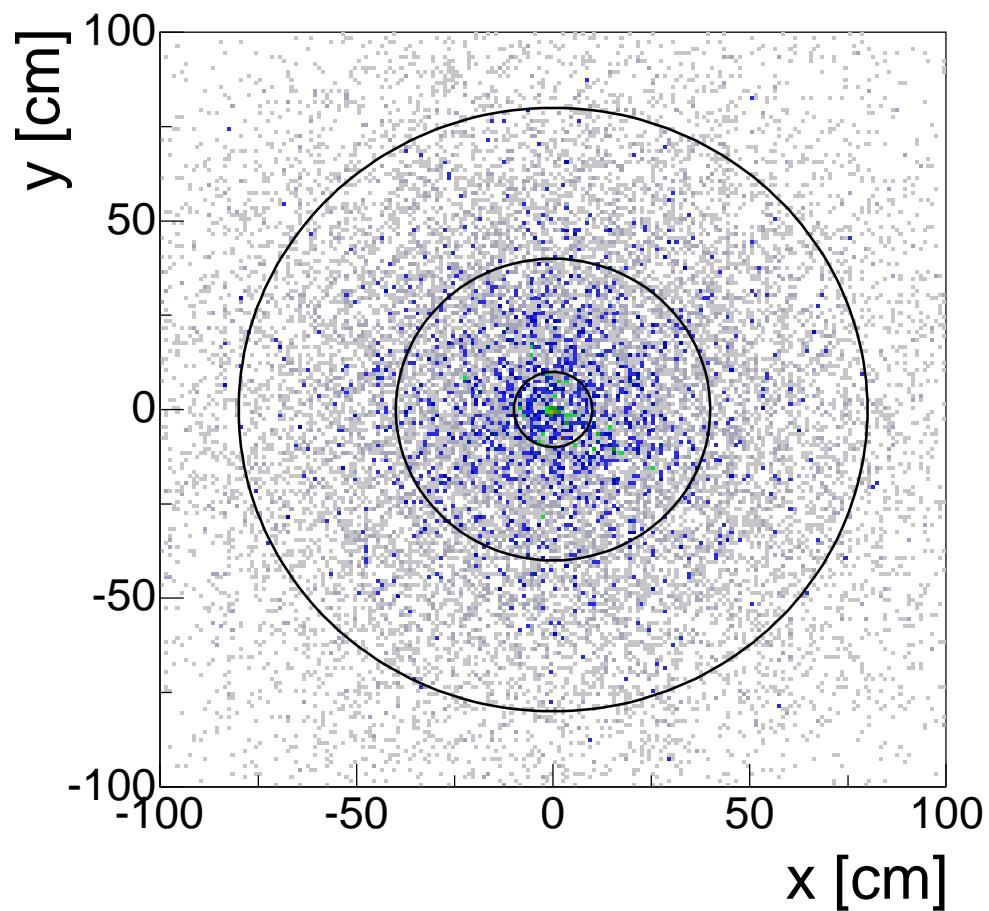
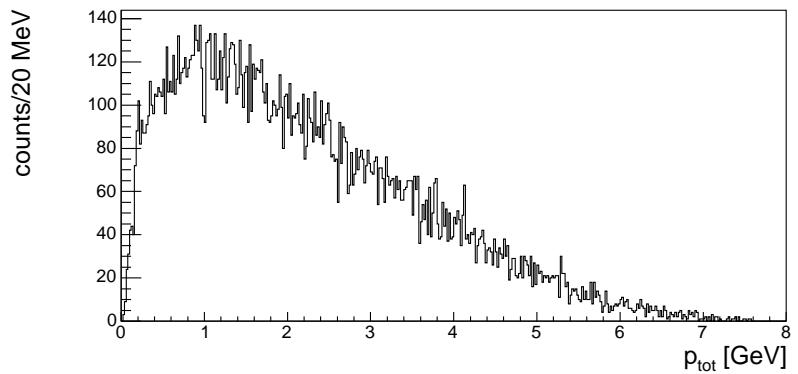


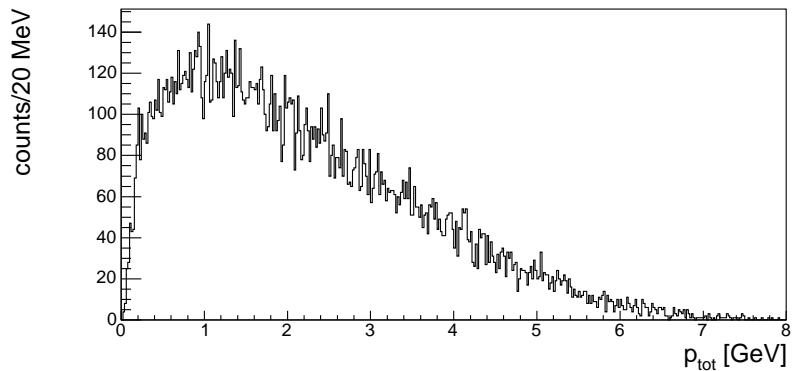
Fig. 1.  $y$ - vs  $x$ -position at  $z = 420.0$  cm

### **3 Momentum distribution at the face of the CKOV**

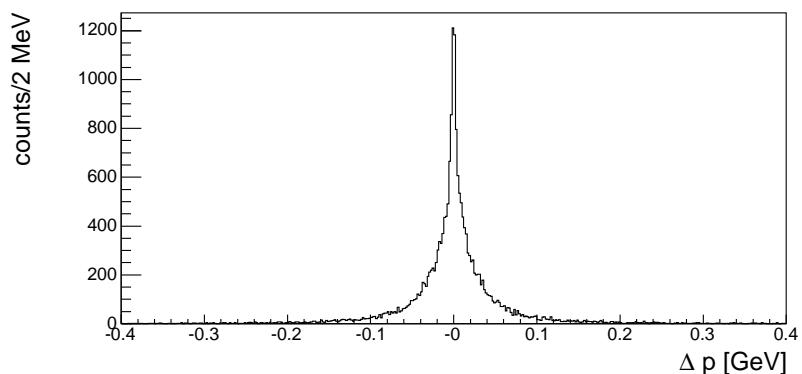
### 3.1 All events



(a) unsmeared tracks



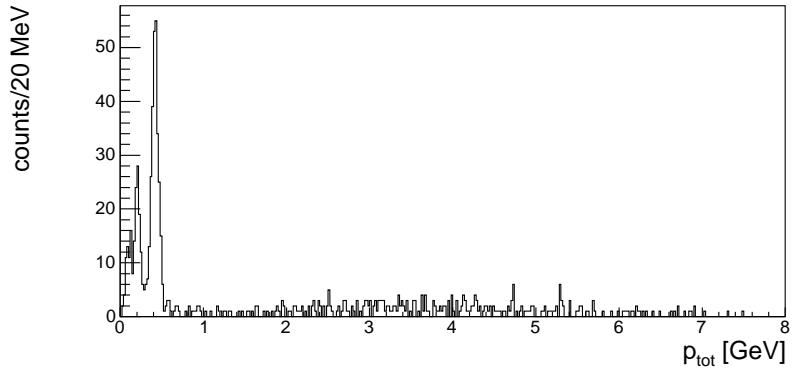
(b) smeared tracks



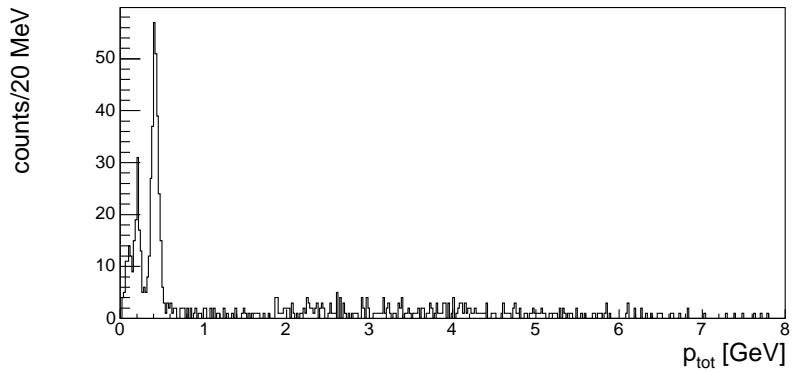
(c)  $\Delta p$

Fig. 2. Momentum,  $|\vec{p}|$ , for all four tracks.

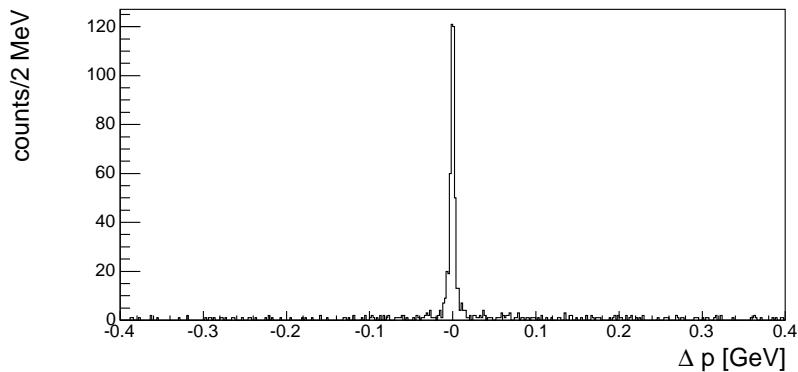
### 3.2 $R \leq 10.0$ cm



(a) unsmeared tracks



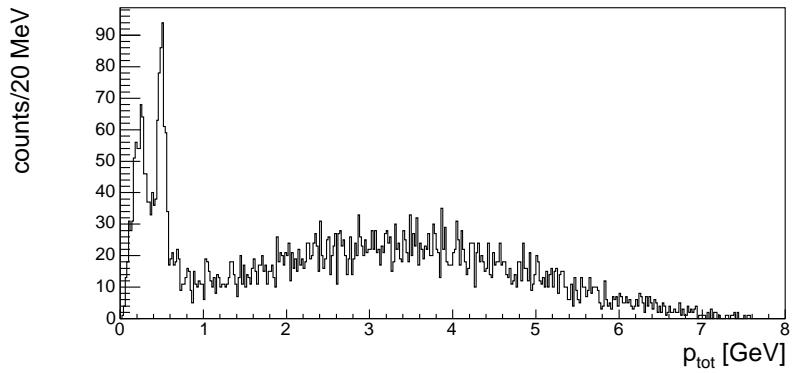
(b) smeared tracks



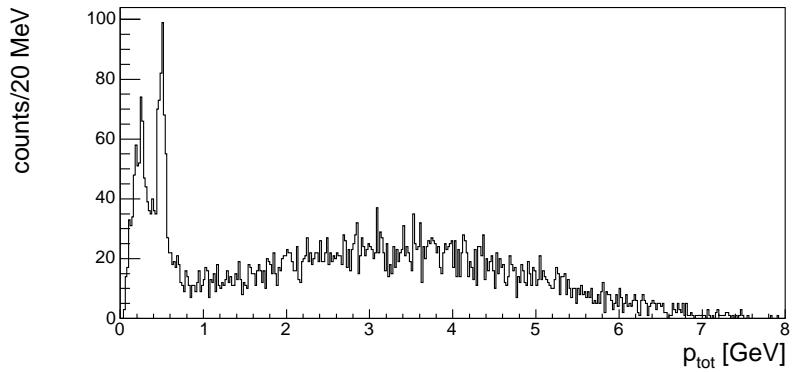
(c)  $\Delta p$

Fig. 3. Momentum,  $|\vec{p}|$ , for tracks with  $R \leq 10.0$  cm.

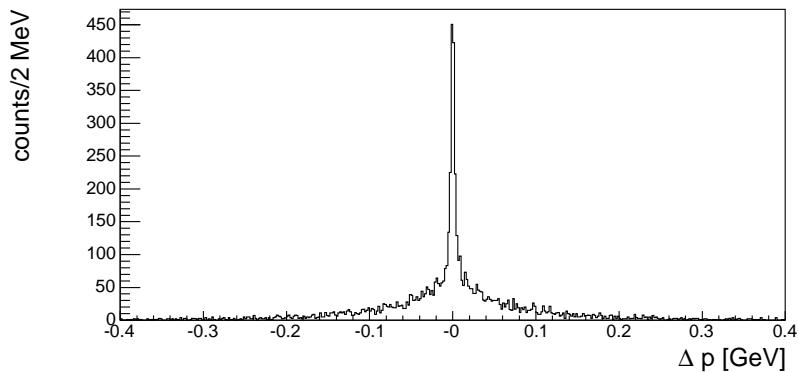
3.3  $10.0 \text{ cm} < R \leq 40.0 \text{ cm}$



(a) unsmeared tracks



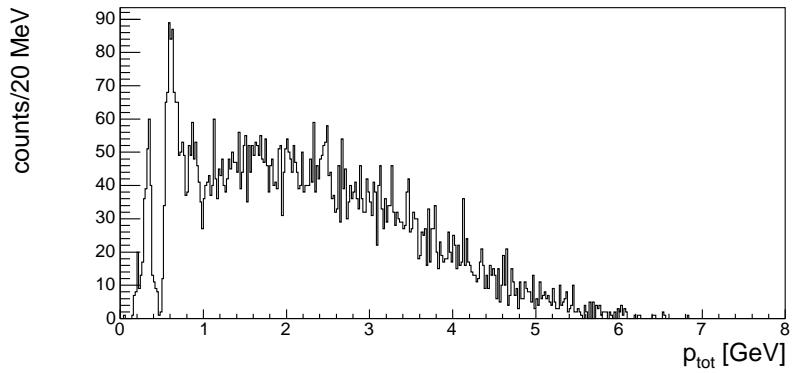
(b) smeared tracks



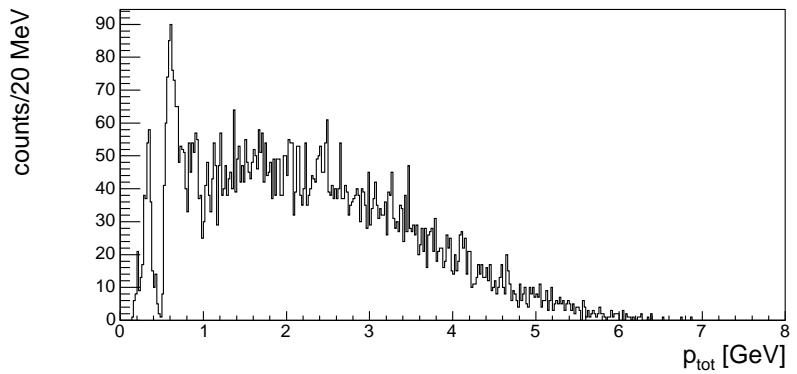
(c)  $\Delta p$

Fig. 4. Momentum,  $|\vec{p}|$ , for tracks with  $10.0 \text{ cm} < R \leq 10.0 \text{ cm}$ .

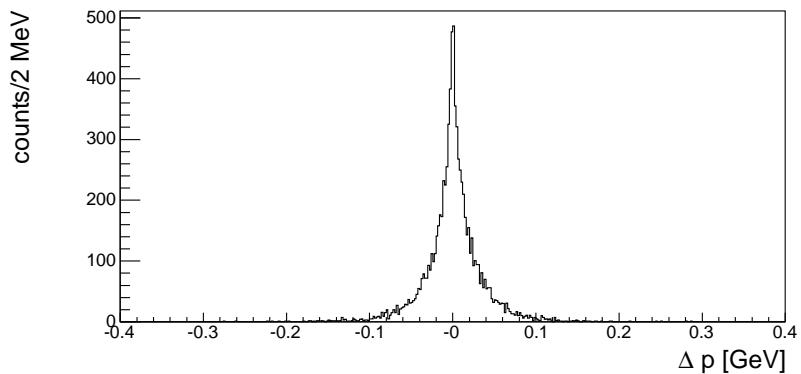
3.4  $40.0 \text{ cm} < R \leq 80.0 \text{ cm}$



(a) unsmeared tracks



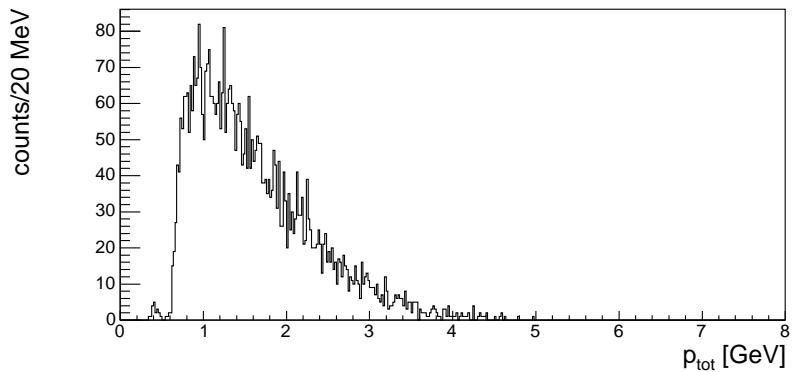
(b) smeared tracks



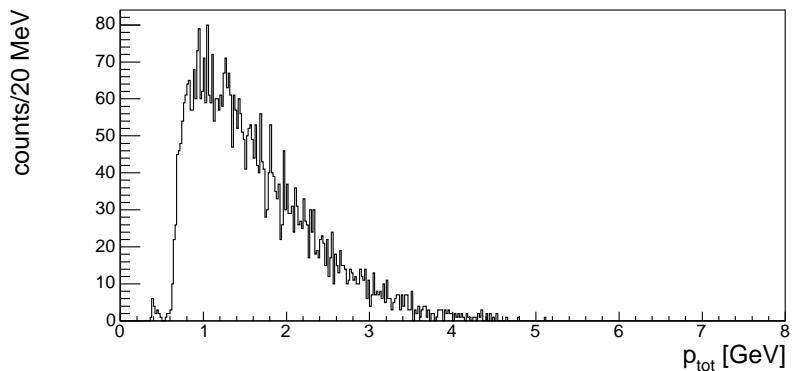
(c)  $\Delta p$

Fig. 5. Momentum,  $|\vec{p}|$ , for tracks with  $40.0 \text{ cm} < R \leq 80.0 \text{ cm}$ .

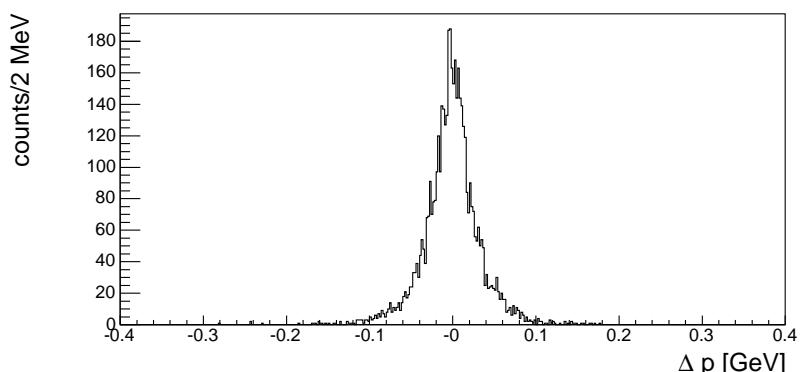
### 3.5 $R > 80.0$ cm



(a) unsmeared tracks



(b) smeared tracks

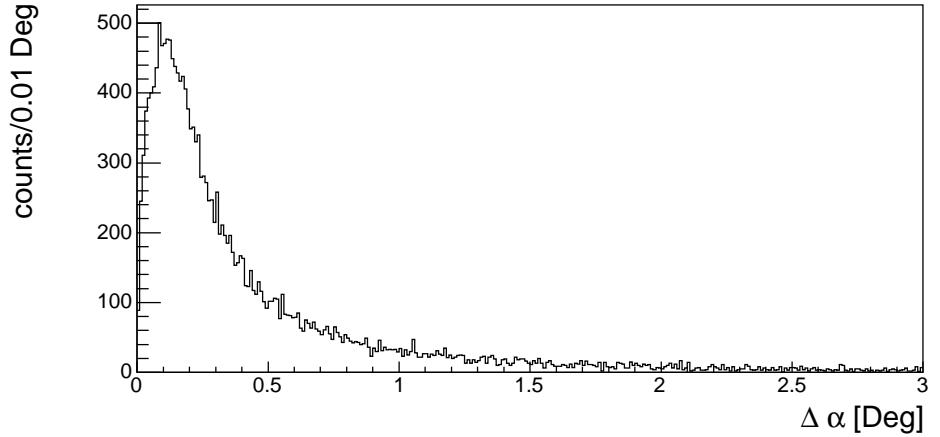


(c)  $\Delta p$

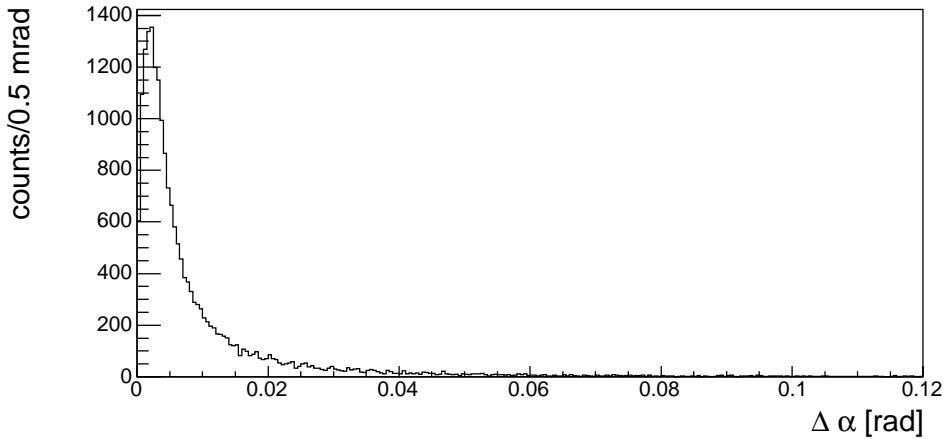
Fig. 6. Momentum,  $|\vec{p}|$ , for tracks with  $R > 80.0$  cm.

**4 Angle between smeared and unsmeared tracks at the face of the CKOV**

#### 4.1 All events



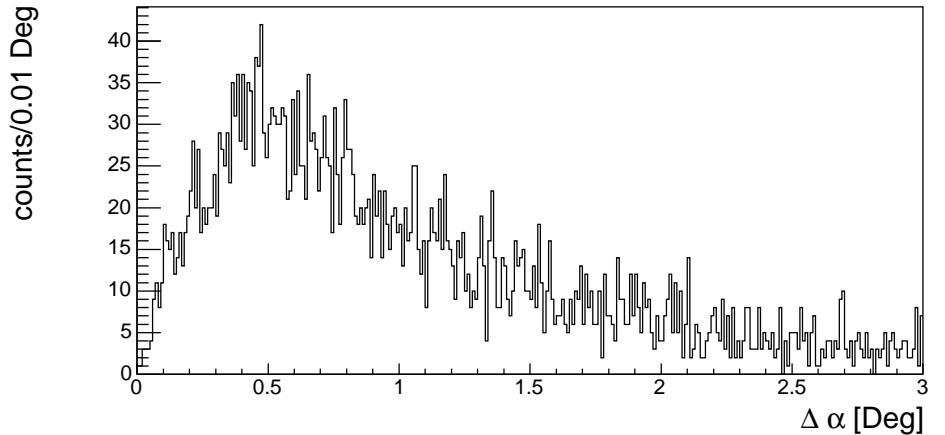
(a) Degrees



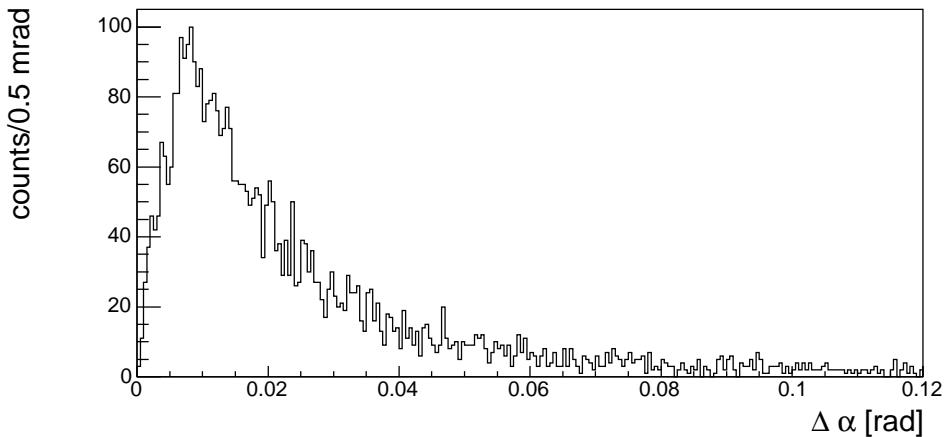
(b) Radians

Fig. 7. Opening angle  $\Delta\alpha$  between smeared and unsmeared tracks for all four tracks.

4.2  $|\vec{p}| \leq 1.0 \text{ GeV}/c$



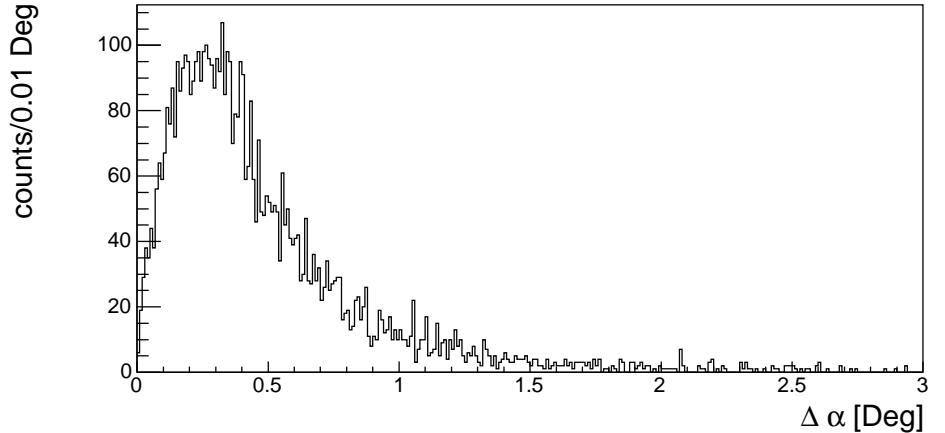
(a) Degrees



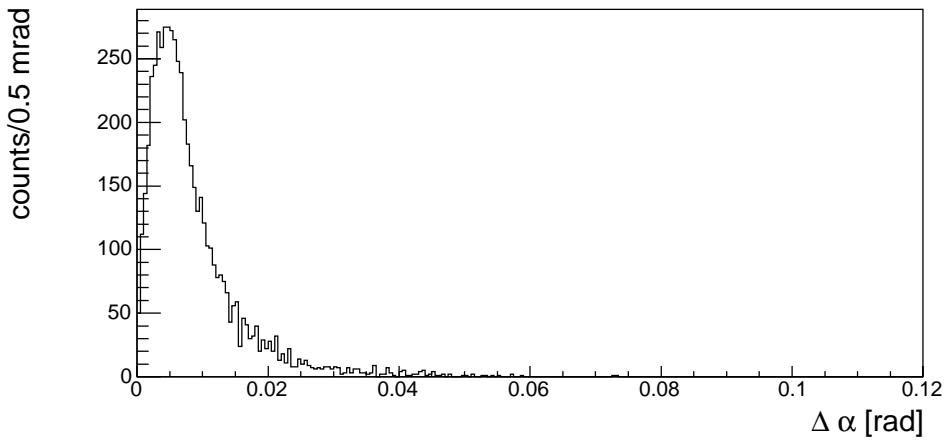
(b) Radians

Fig. 8. Opening angle  $\Delta\alpha$  between smeared and unsmeared tracks for tracks with  $|\vec{p}| \leq 1.0 \text{ GeV}/c$ .

4.3  $1.0 \text{ GeV}/c < |\vec{p}| \leq 2.0 \text{ GeV}/c$



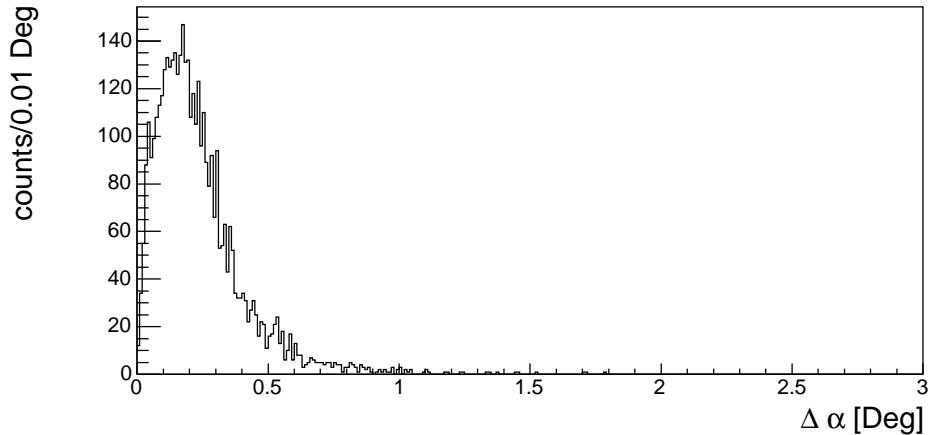
(a) Degrees



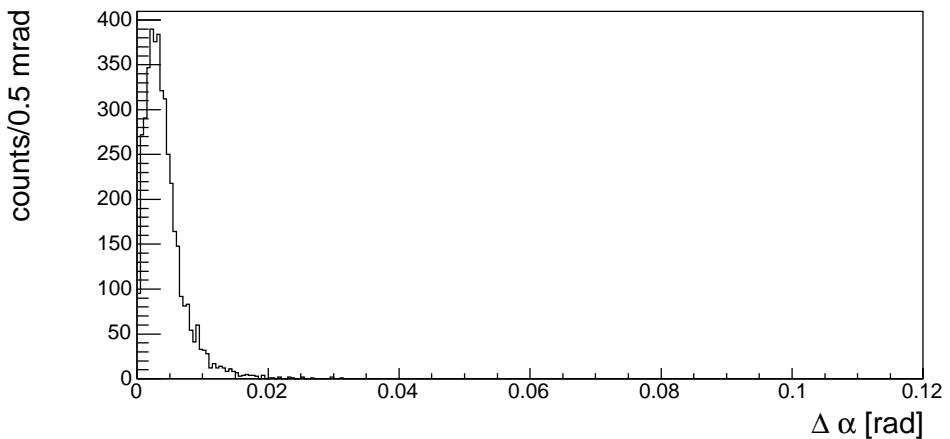
(b) Radians

Fig. 9. Opening angle  $\Delta\alpha$  between smeared and unsmeared tracks for tracks with  $1.0 \text{ GeV}/c < |\vec{p}| \leq 2.0 \text{ GeV}/c$ .

4.4  $2.0 \text{ GeV}/c < |\vec{p}| \leq 3.0 \text{ GeV}/c$



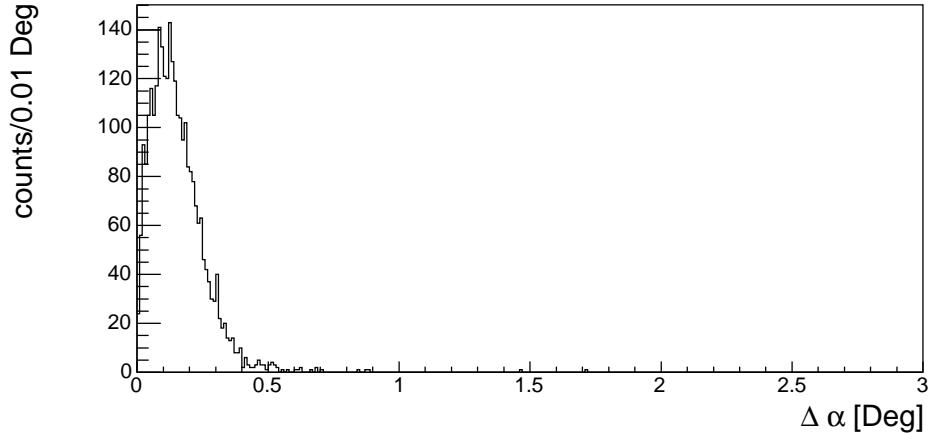
(a) Degrees



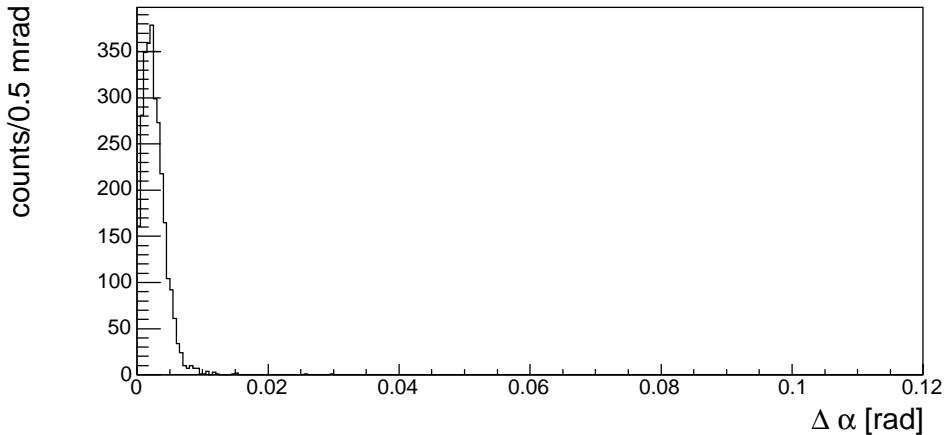
(b) Radians

Fig. 10. Opening angle  $\Delta\alpha$  between smeared and unsmeared tracks for tracks with  $2.0 \text{ GeV}/c < |\vec{p}| \leq 3.0 \text{ GeV}/c$ .

4.5  $3.0 \text{ GeV}/c < |\vec{p}| \leq 4.0 \text{ GeV}/c$



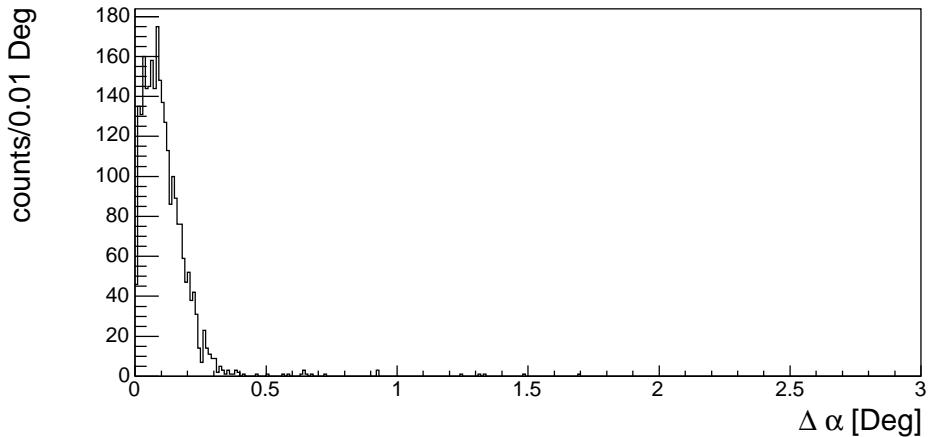
(a) Degrees



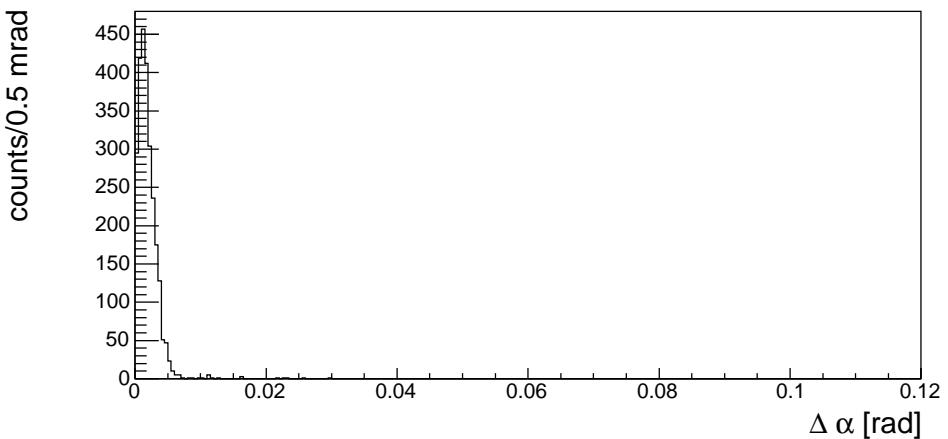
(b) Radians

Fig. 11. Opening angle  $\Delta\alpha$  between smeared and unsmeared tracks for tracks with  $3.0 \text{ GeV}/c < |\vec{p}| \leq 4.0 \text{ GeV}/c$ .

4.6  $|\vec{p}| > 4.0 \text{ GeV}/c$



(a) Degrees



(b) Radians

Fig. 12. Opening angle  $\Delta\alpha$  between smeared and unsmeared tracks for tracks with  $|\vec{p}| > 4.0 \text{ GeV}/c$ .

## References

- [1] J. Kuhn, C. A. Meyer, Acceptance study for the gluex detector, gluex-doc-264, Carnegie Mellon University (2004).