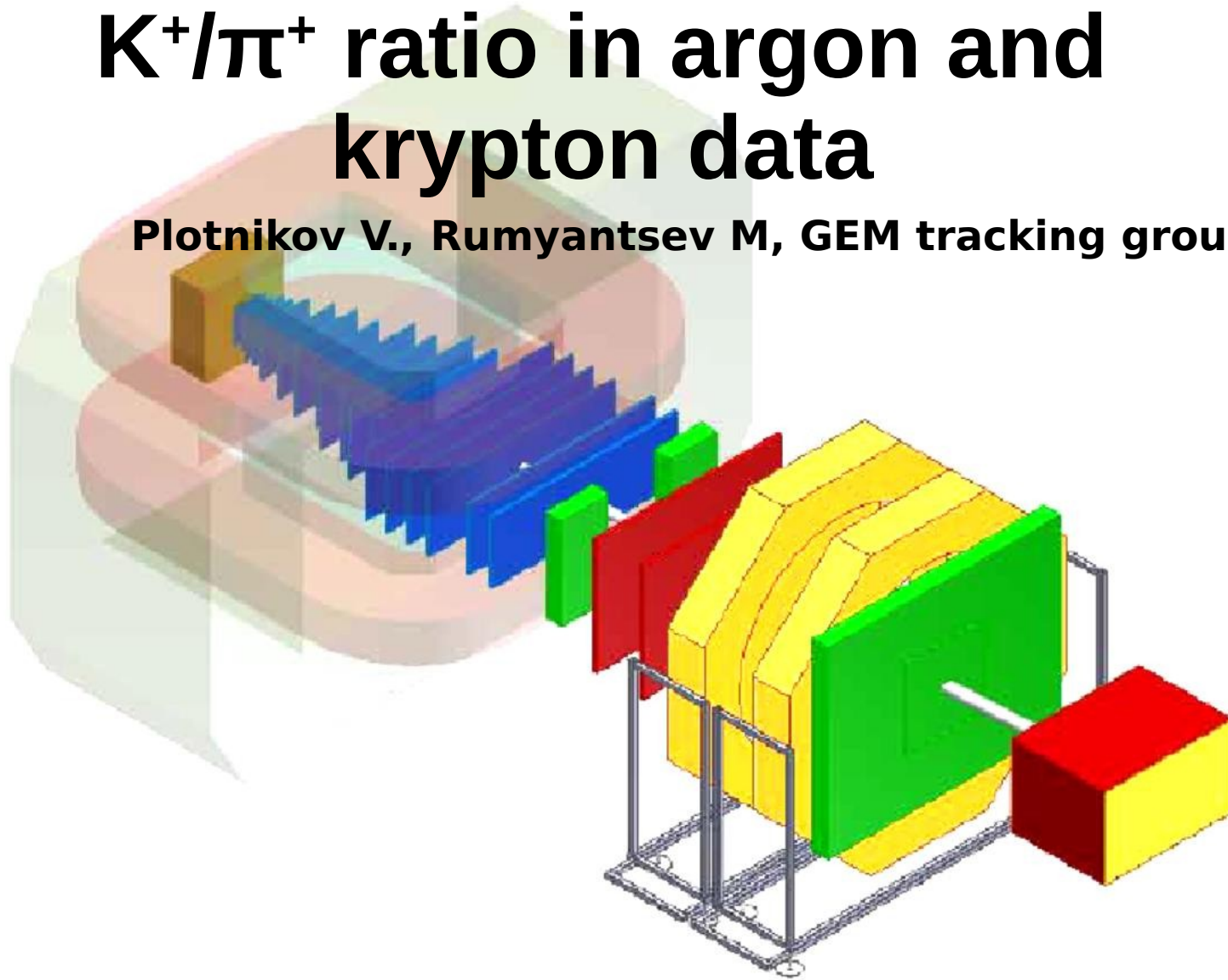
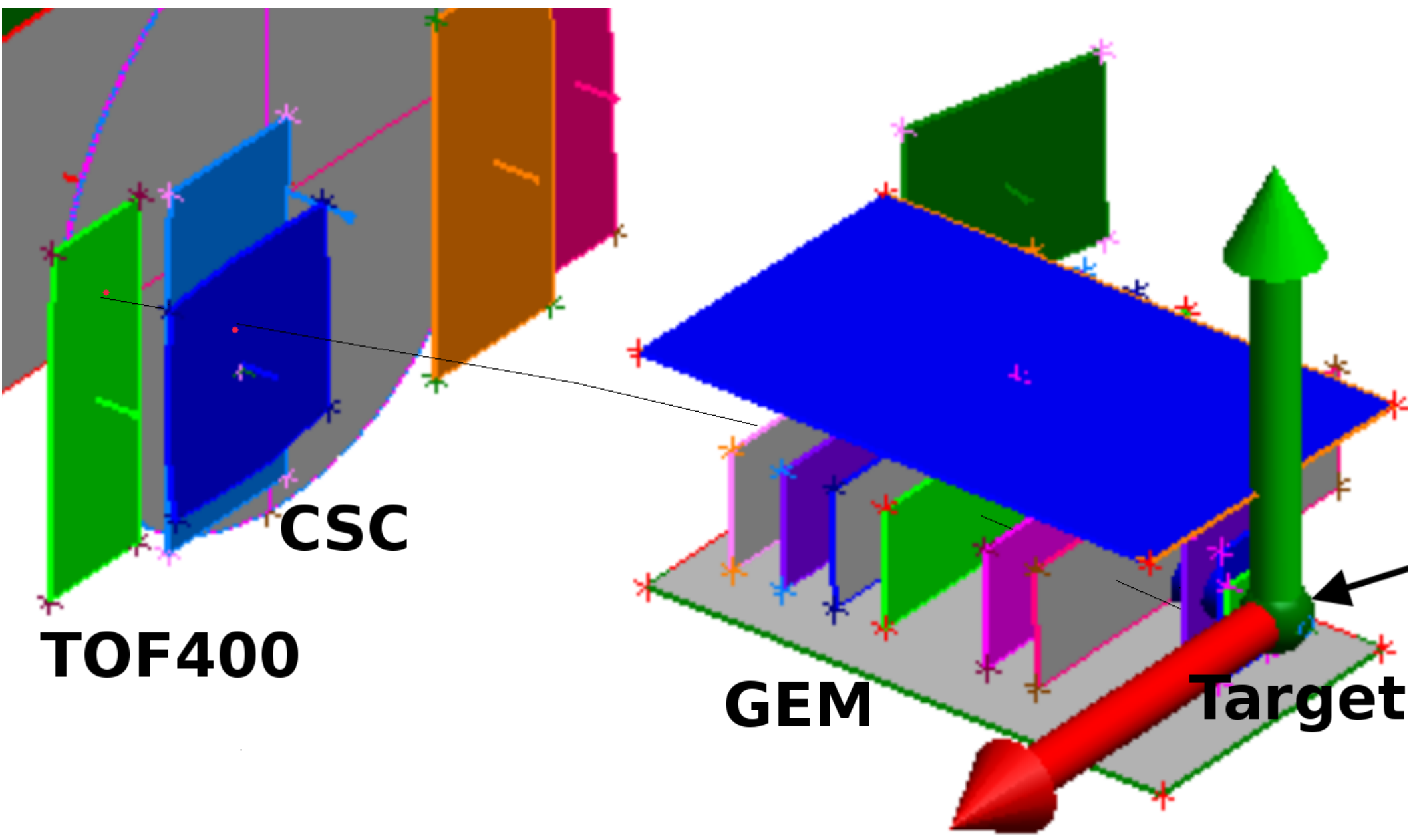


# $K^+/\pi^+$ ratio in argon and krypton data

Plotnikov V., Rumyantsev M, GEM tracking group.

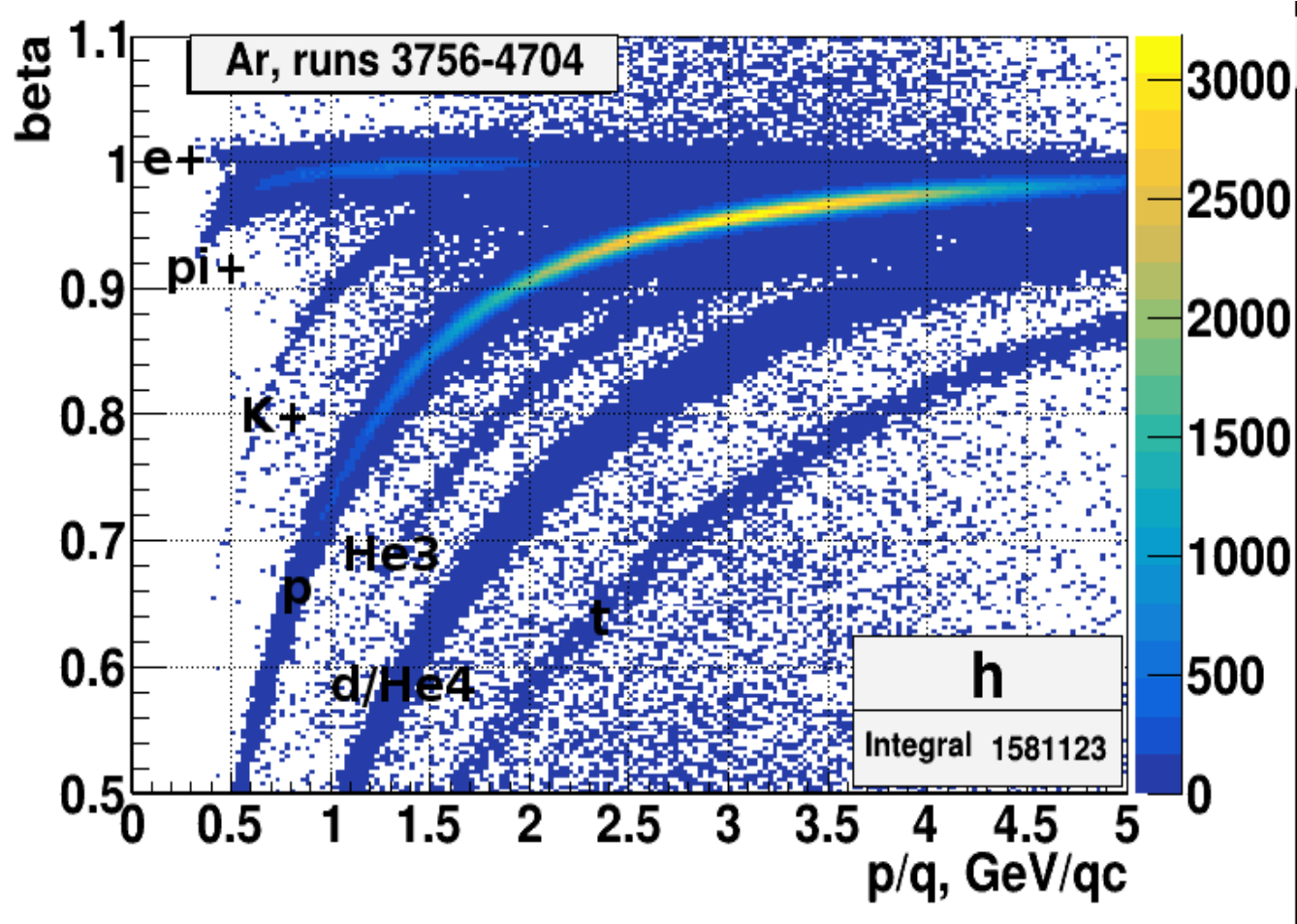


# Identification method



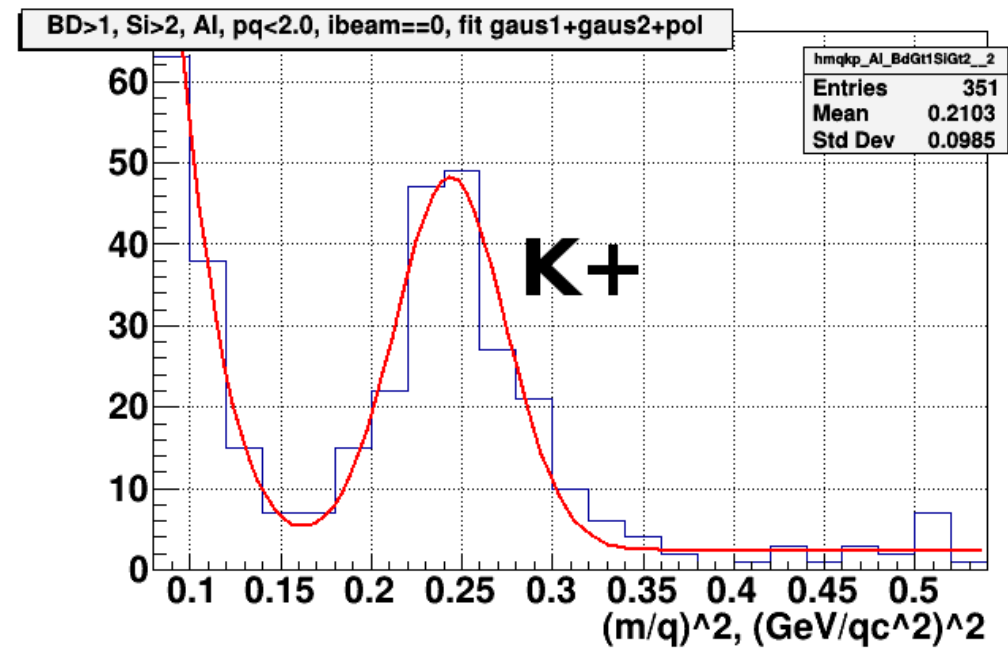
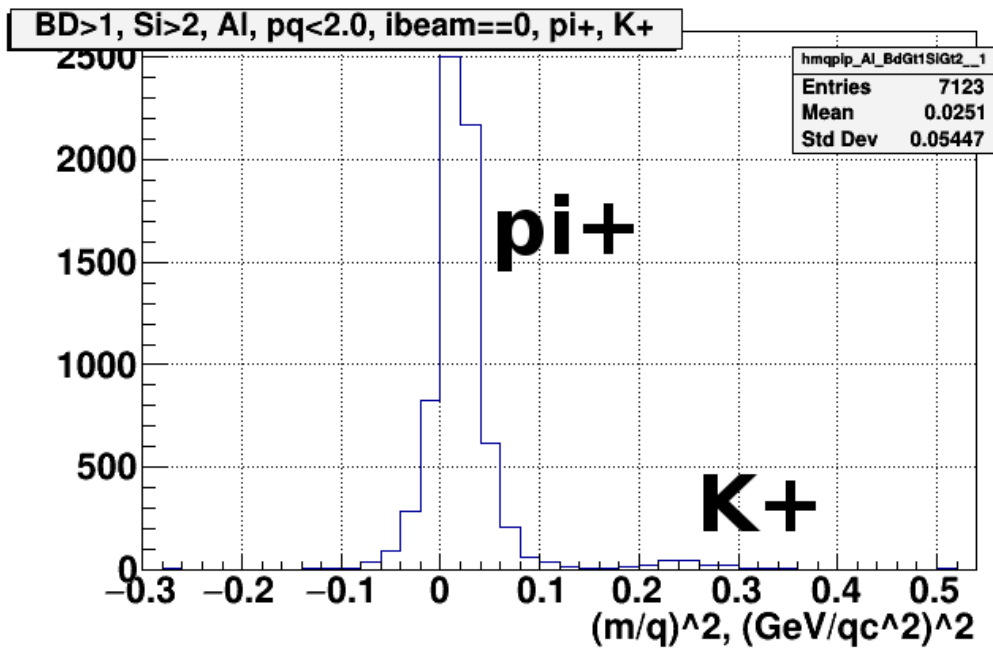
# Argon

# Identification for Ar



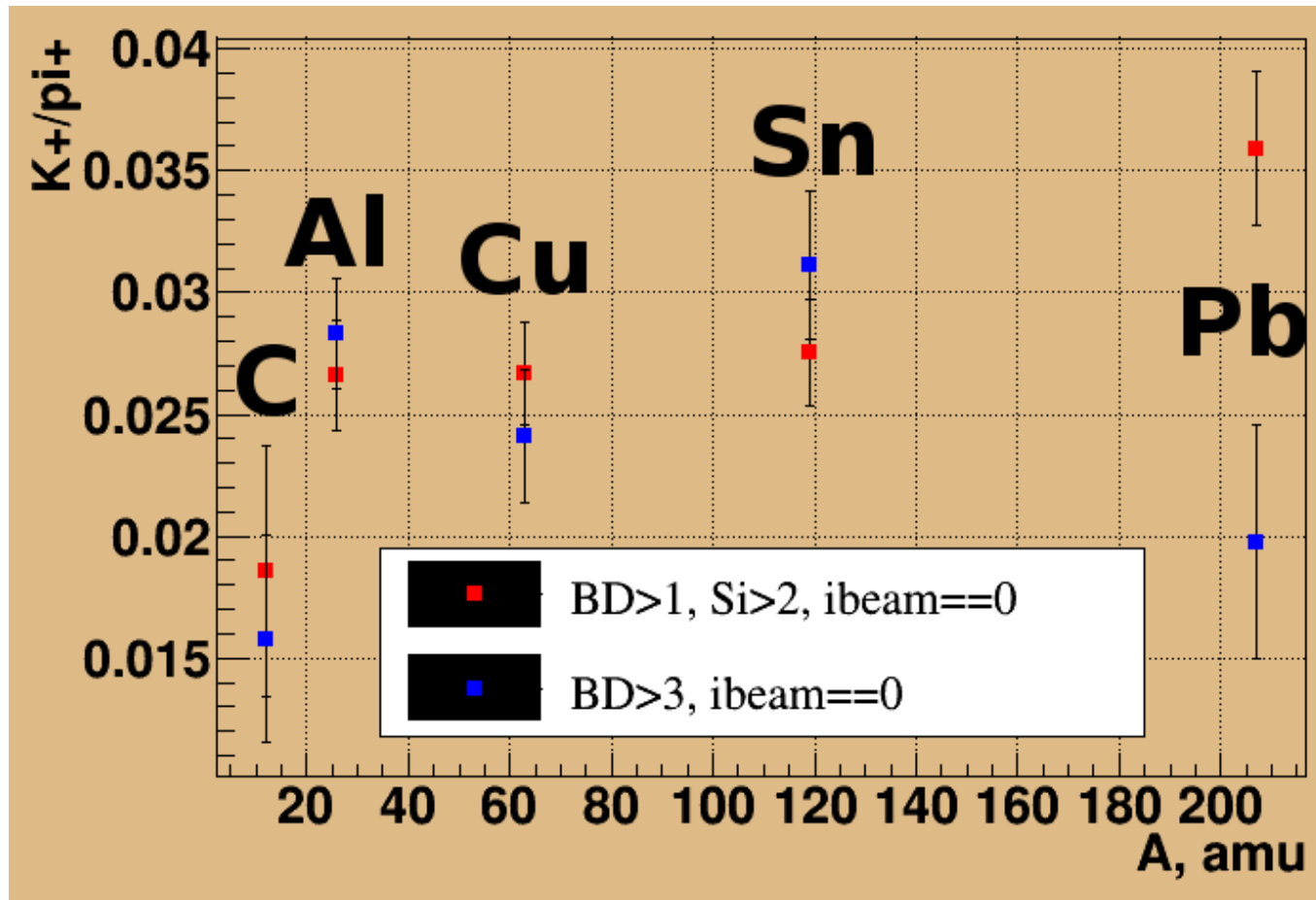
- For positive particles, all Ar

# Kaon identification, Al, BD>1 && Si>2



- Gaus2 – Kaon's peak
- Gaus1 – background from pions
- pol0 – background from misidentified particles

# $K^+/\pi^+(A)$ for two triggers

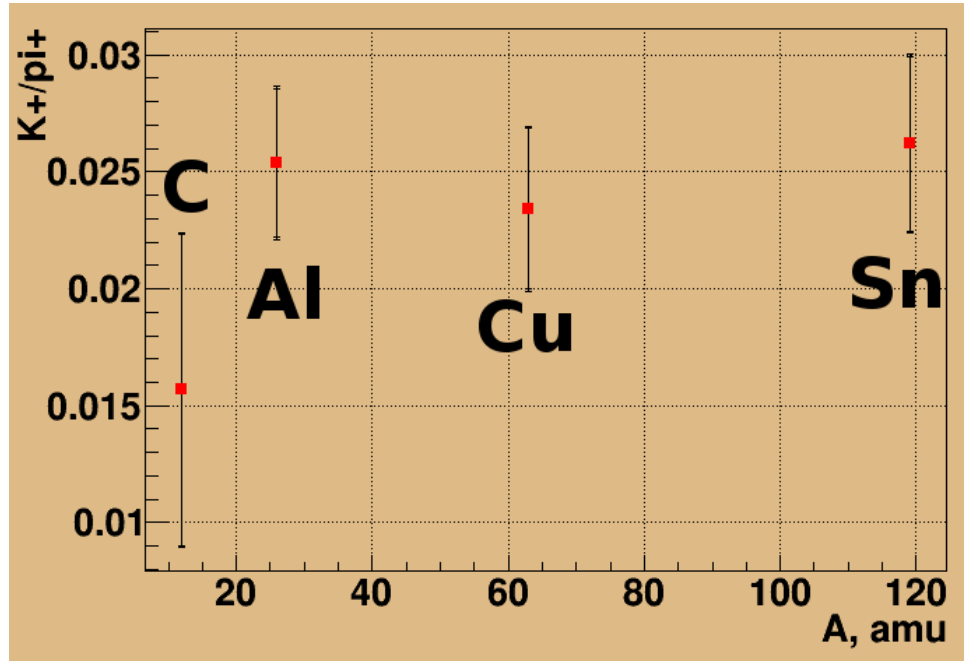


- Before corrections

# Efficiency of triggers correction

- Triggers could select  $\pi^+$  and  $K^+$  differently (more  $\pi^+$  with low multiplicity)
- $\text{CorrEff}(S_i) = \frac{K^+/\pi^+(B_d + S_i)}{K^+/\pi^+(B_d)}$
- $\text{CorrEff}(B_d) = \frac{K^+/\pi^+(S_i + B_d)}{K^+/\pi^+(S_i)}$

# $K^+/\pi^+(A)$ with efficiency of triggers correction



- Pb data are rejected
- Averaged by two triggers using their efficiencies
- Statistical and full errors are presented
- 4 sources of systematics (see next slide)



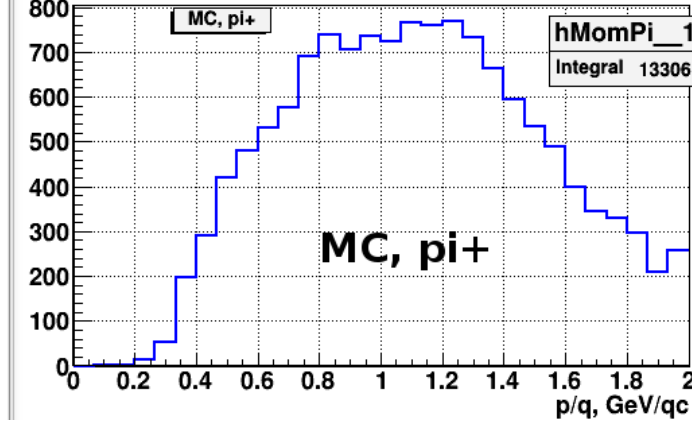
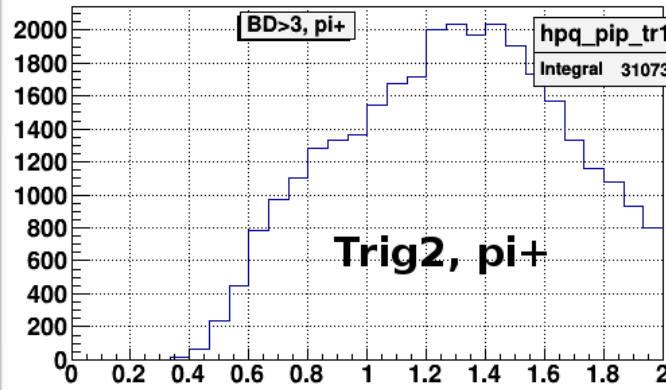
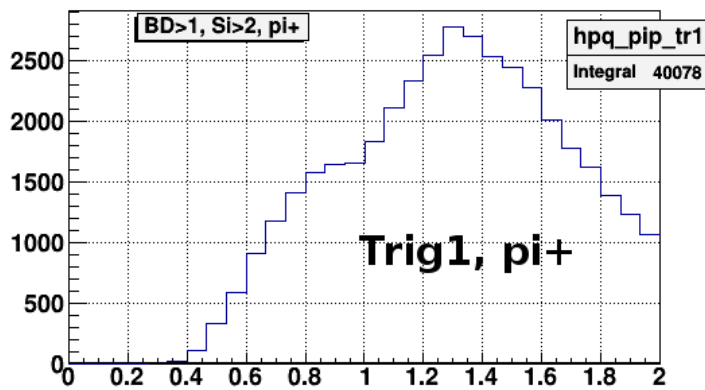
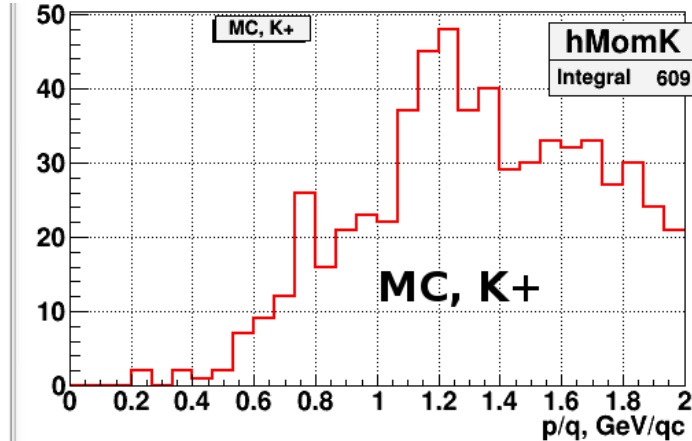
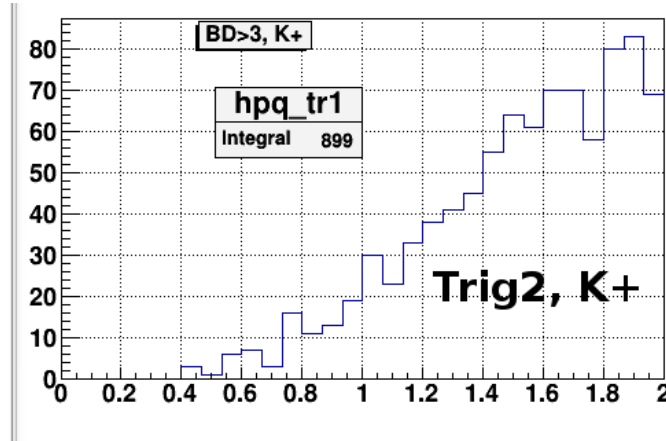
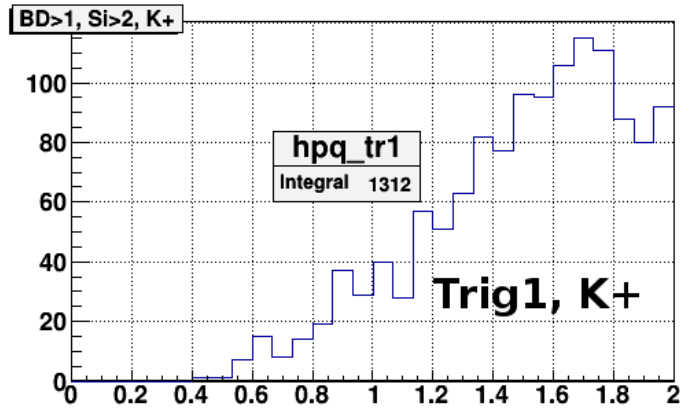
# Systematics

Source of systematic error	Without 096pq scaling	Strips corrected to protons in $2 < p q < 5$	dt vs amplitude alignment fit	Unidentified background fit
Value, %	2.8	0.3	0.2	1.9

# Monte Carlo ArCu, DCM-QGSM

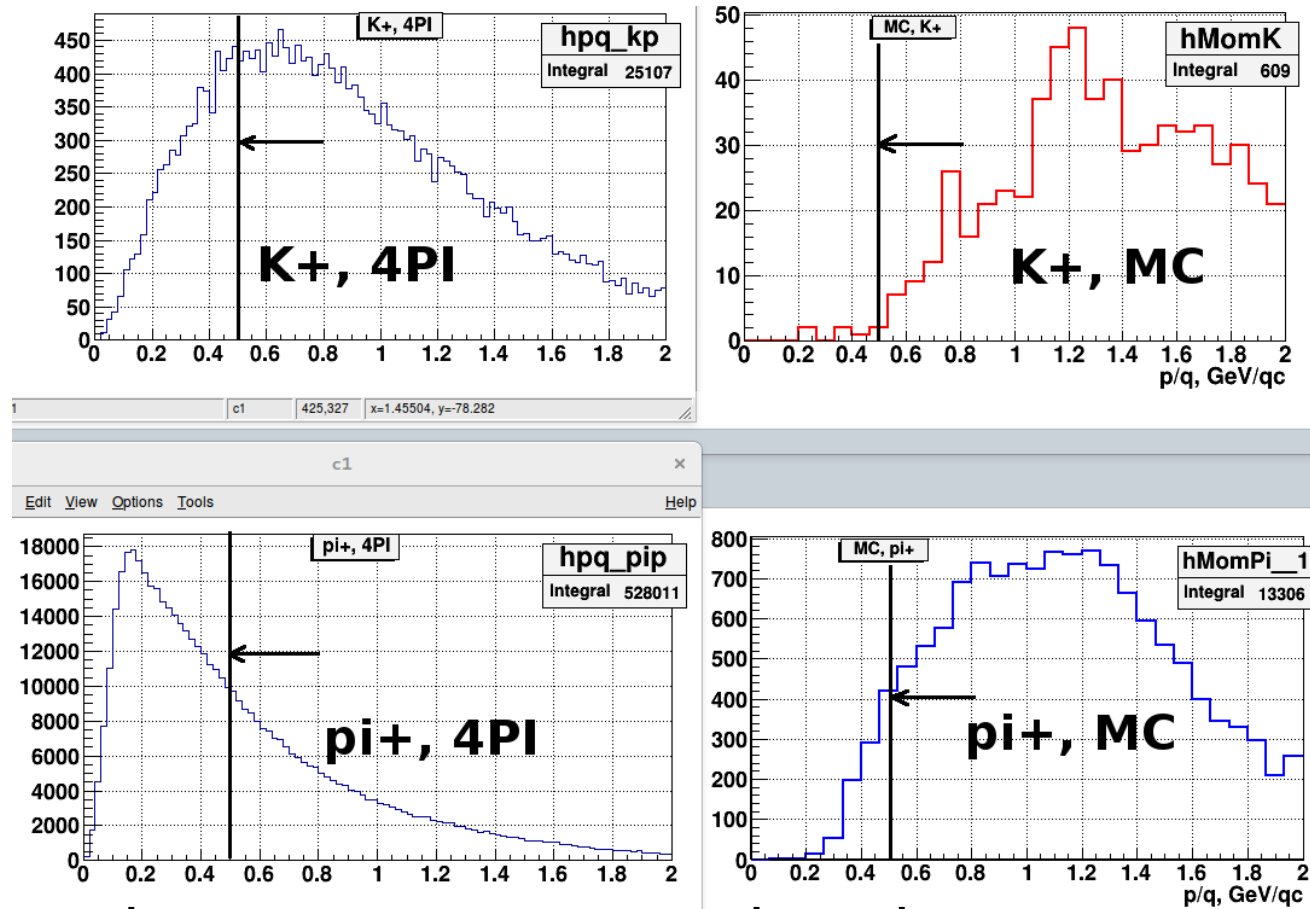
- GEM + TOF400 geometry for run 7
- Without reconstruction
- 100K events
- **Identifiable track** = Min 5 GEM + TOF400 hit + from Primary Vertex

# $K^+$ , $\pi^+$ $pq$ spectra, Exp vs MC



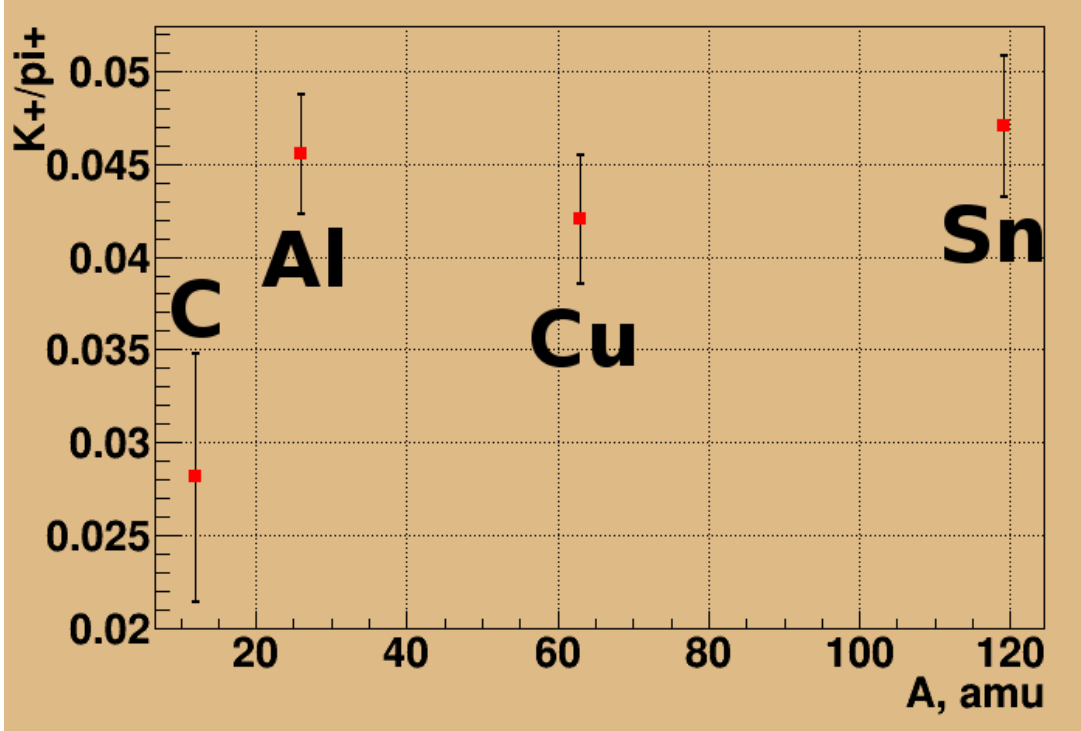
- Left – trigger1, middle – trigger2, right – MC
- $K^+$  spectra are differ larger
- About 2200  $K^+$  in experiment

# Acceptance correction



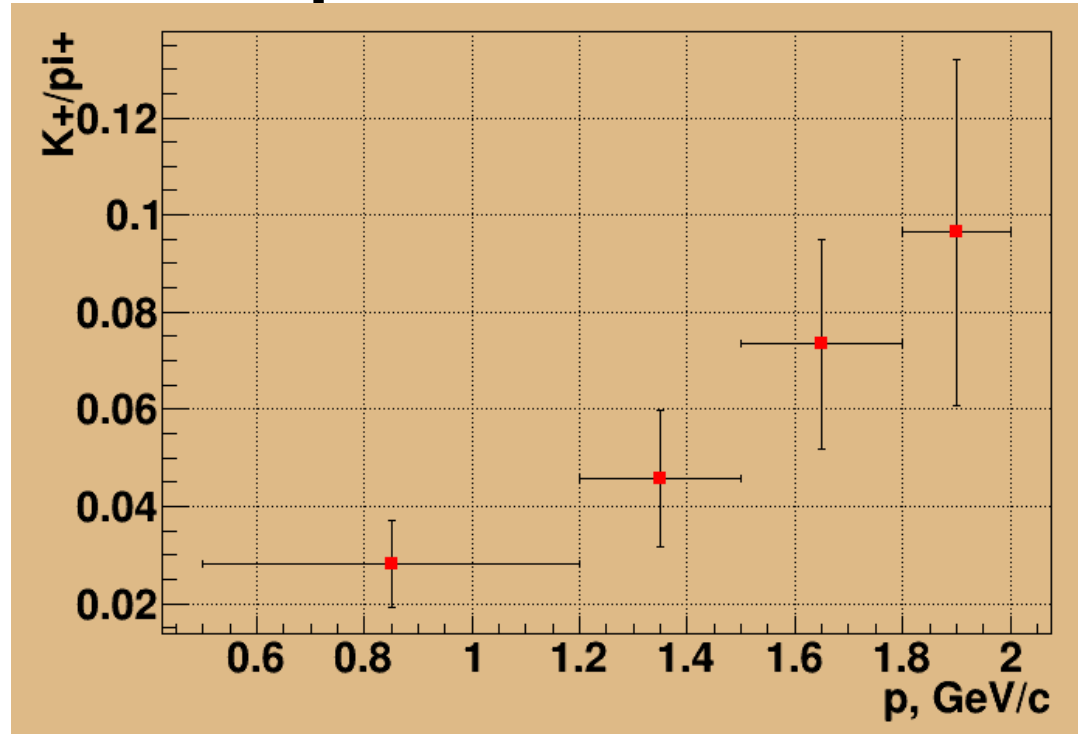
- 2 corrections: acceptance and  $K^+$  decay
- Low edge from Exp 0.5  $\text{GeV}/qc$
- Full  $K^+$  and  $\pi^+$  spectra are dropped monotonically after 0.5  $\text{GeV}/qc$

# $K^+/\pi^+(A)$ with efficiency of triggers and acceptance corrections



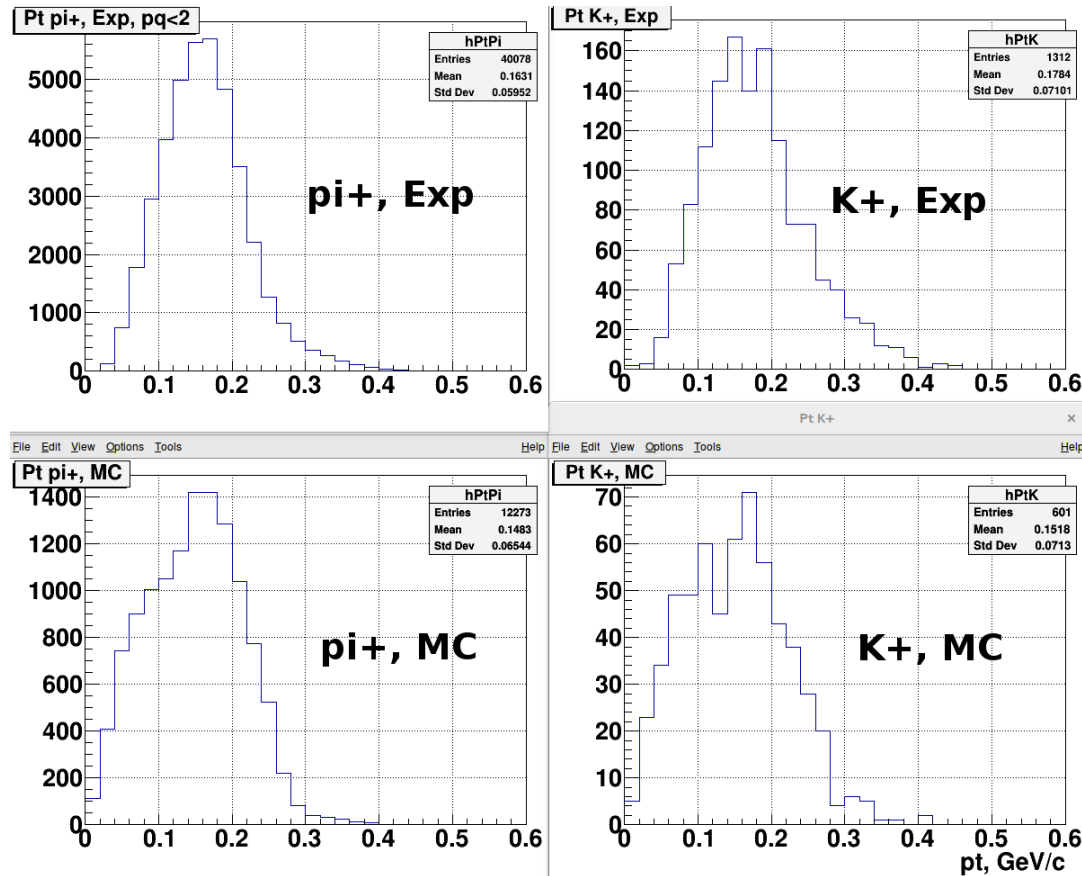
- $AccCorr = K^+/\pi^+(TOF400) / K^+/\pi^+(4\pi) = 0.5568$
- Same correction for all targets

# $K^+/\pi^+(p)$ with efficiency of triggers and acceptance corrections



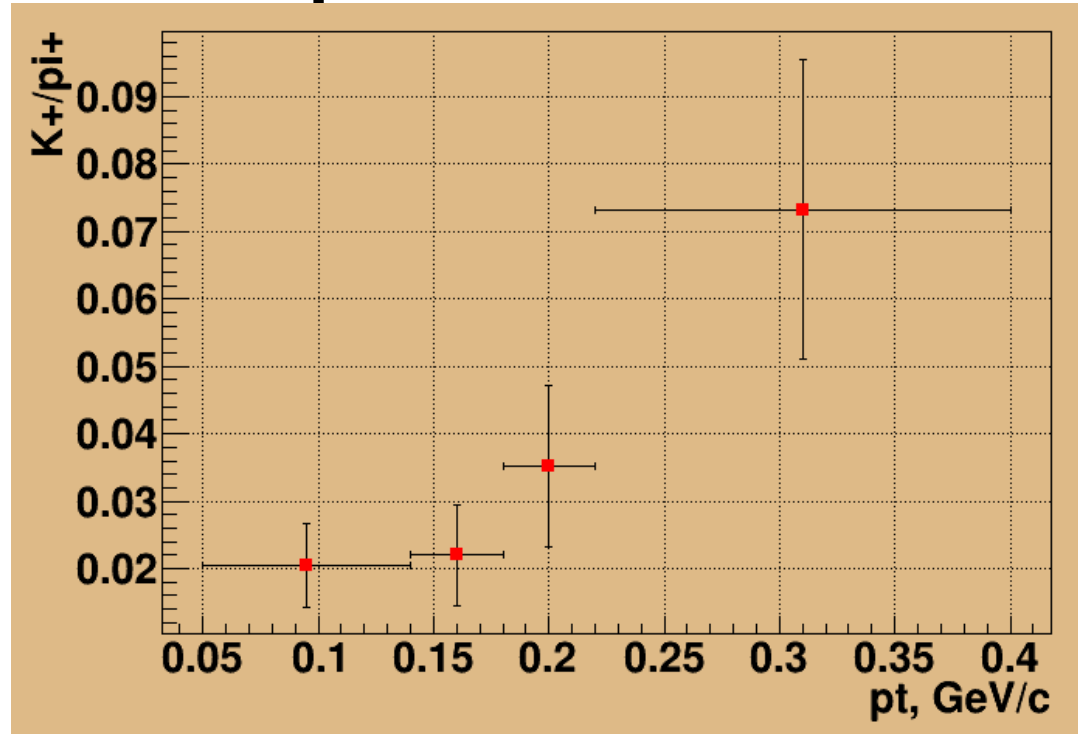
- Efficiency of triggers correction error  $\sim 25\%$
- Acceptance correction error  $\sim 7\%$

# Pt spectra for $K^+$ and $\pi^+$ , Exp vs MC



- For MC identifiable tracks are shown
- Common pt interval 0-0.5 GeV/c
- MC spectrum is softer than Exp spectrum

# $K^+/\pi^+(pt)$ with efficiency of triggers and acceptance corrections

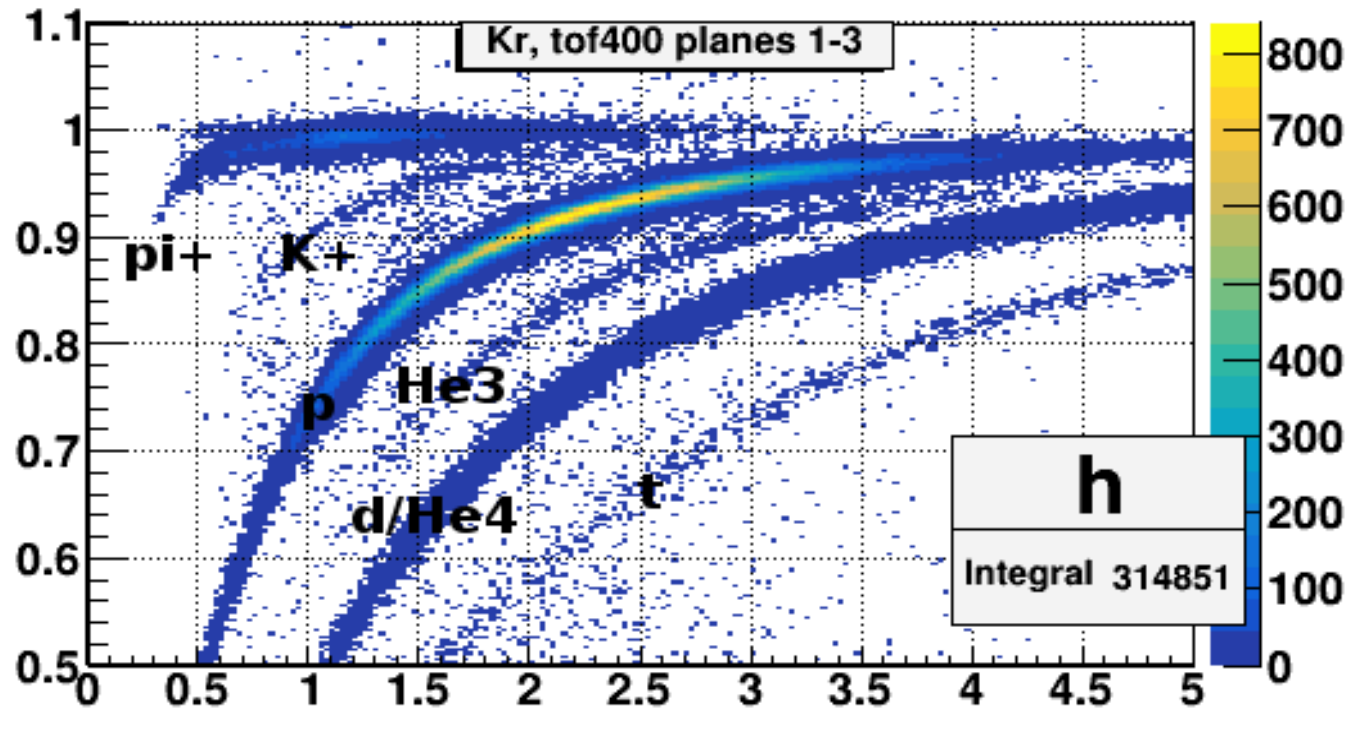


- Corrections errors as for the p dependence case



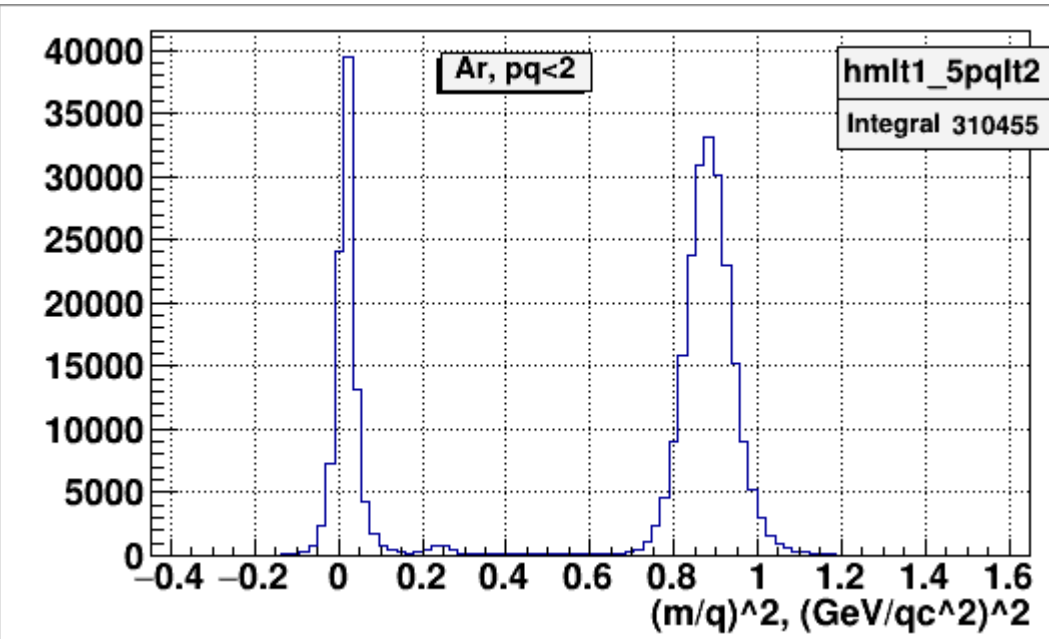
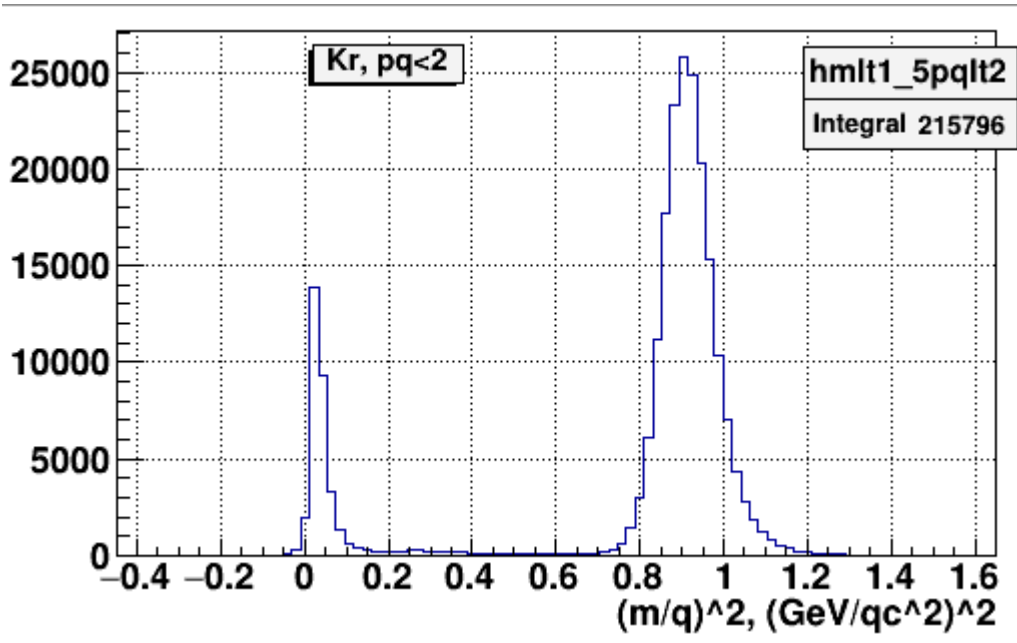
# Krypton

# Identification for Kr, TOF400 outer planes



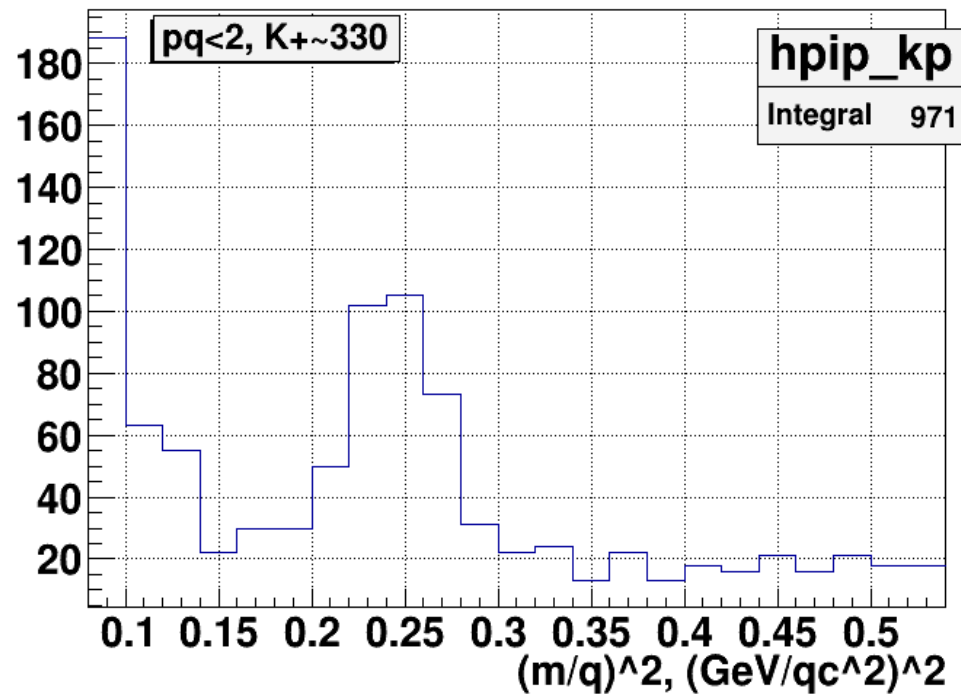
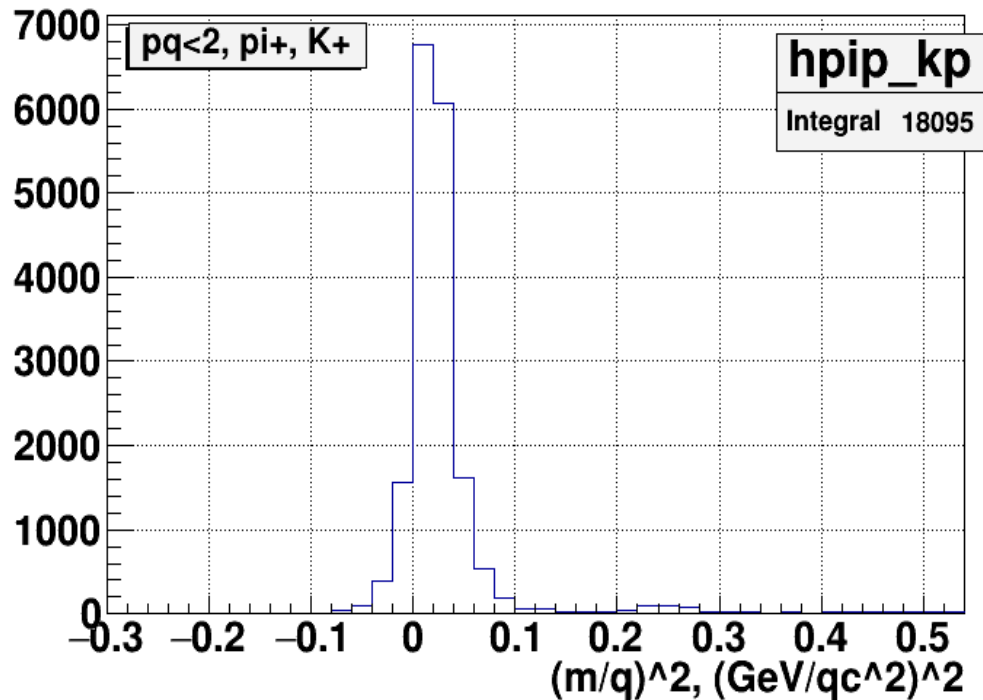
- For positive particles, all Kr
- $p/q < 2.0$  GeV/qc cut

# Identification Kr vs Ar



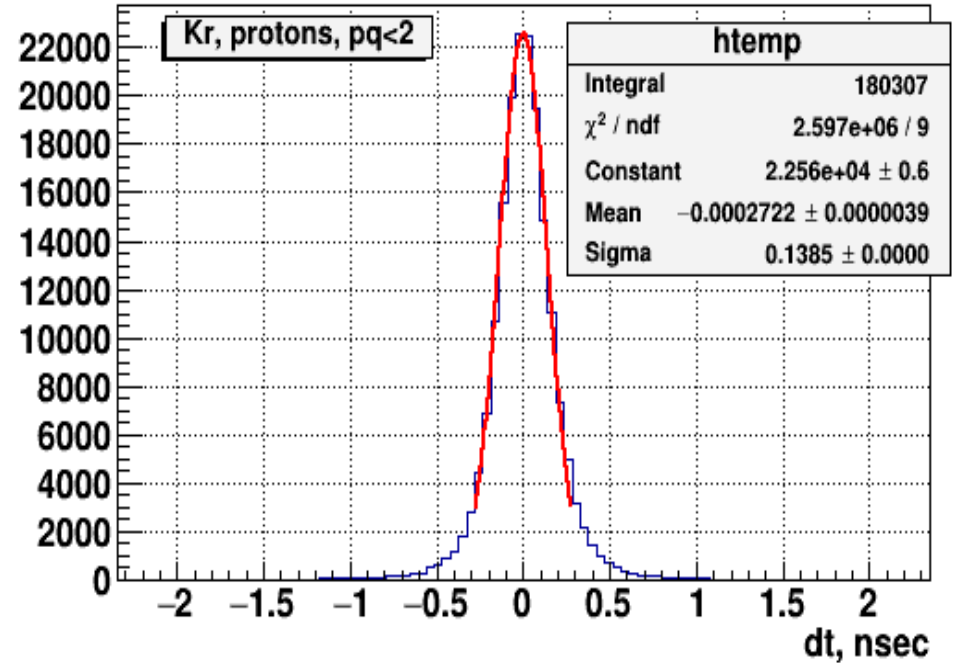
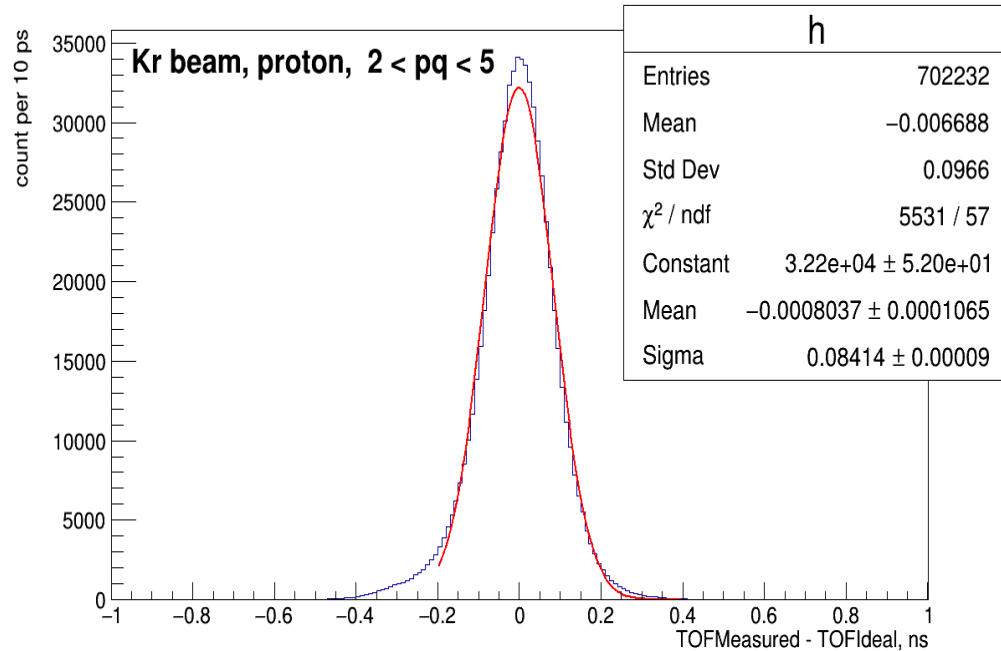
- $\pi^+/p(\text{Kr}) < \pi^+/p(\text{Ar})$

# Kaons identification for Kr



- About 330  $K^+$

# Time resolution for Kr



- Left –  $2 < p/q < 5$ , right –  $p/q < 2$
- Time resolutions for Kr  $\sim 84$  psec
- It is comparable with Ar

**Thank you!**

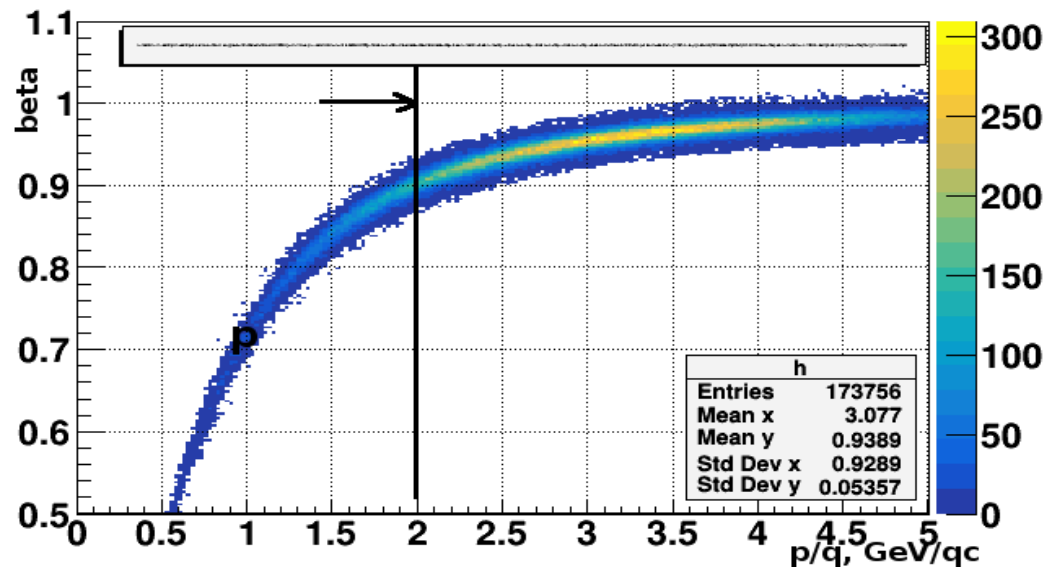
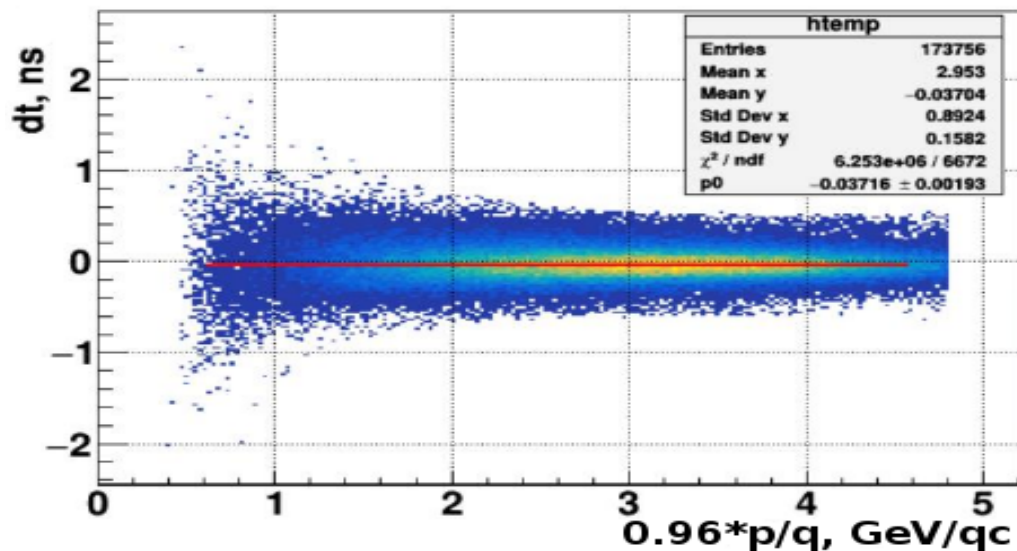


# Backup

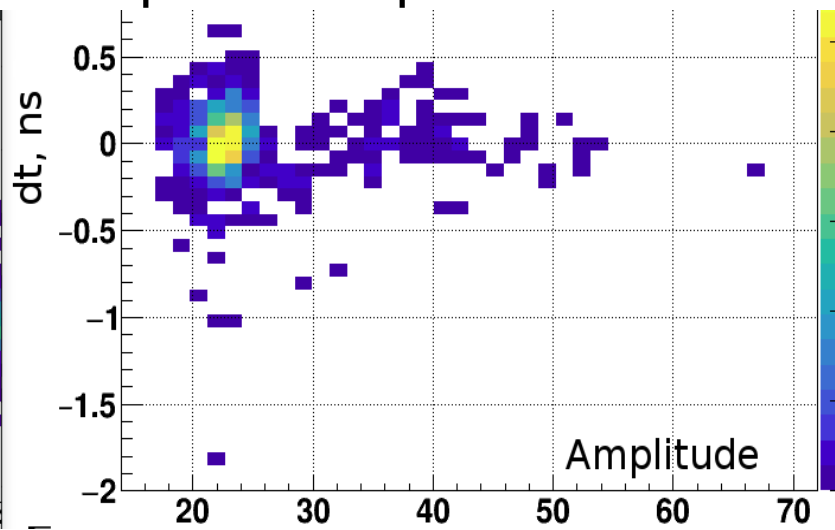
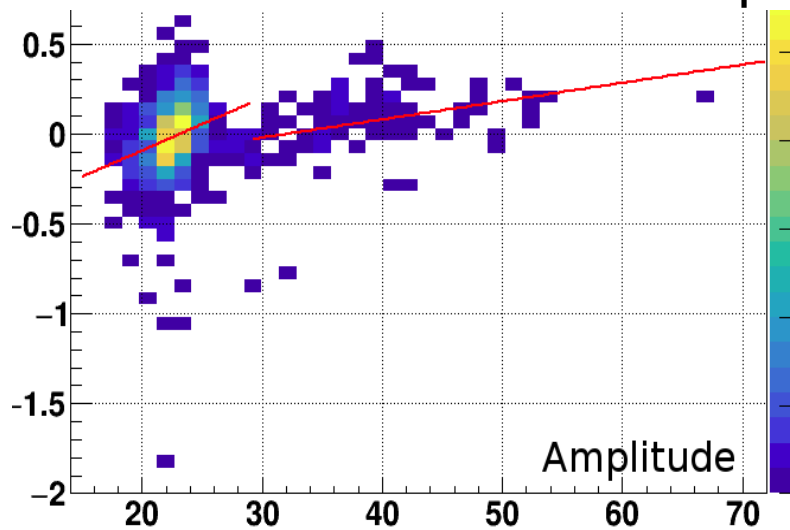
# Preparation to identification for Ar

Scale  $p \rightarrow 0.96 * p$

Align tof400 strips to proton band

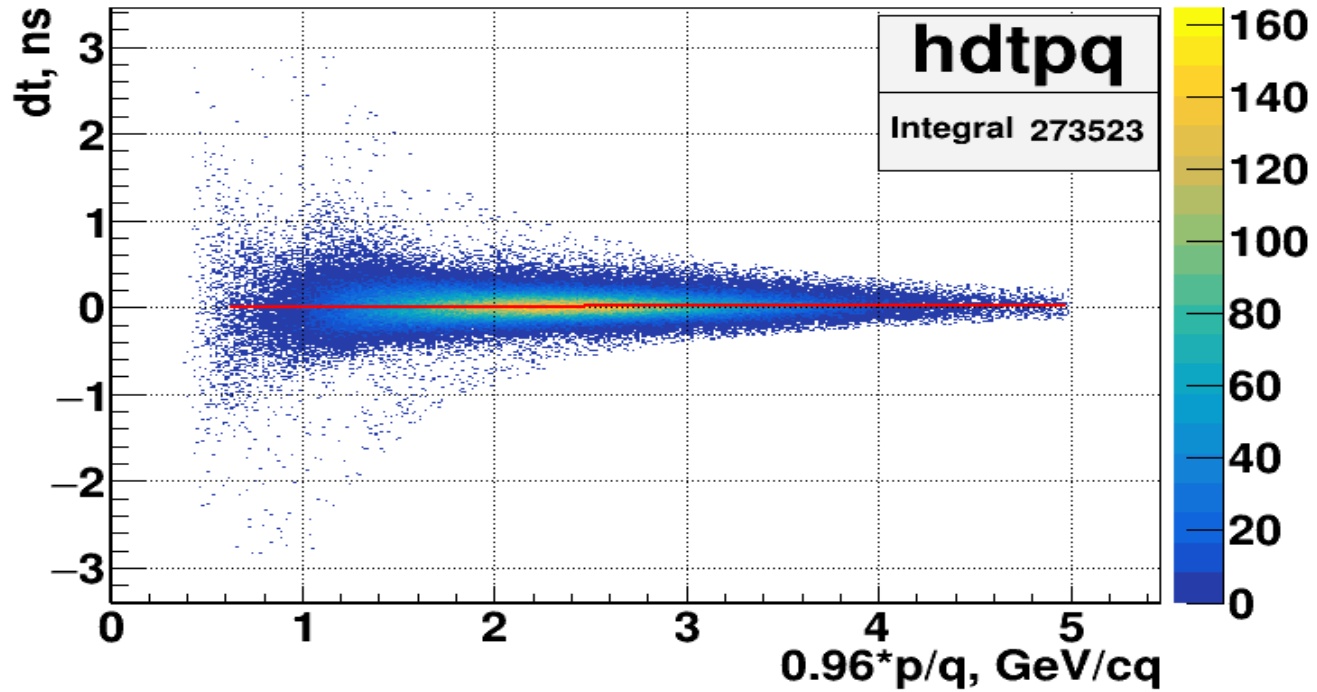


Correct tof400 strips t-Amplitude dependence



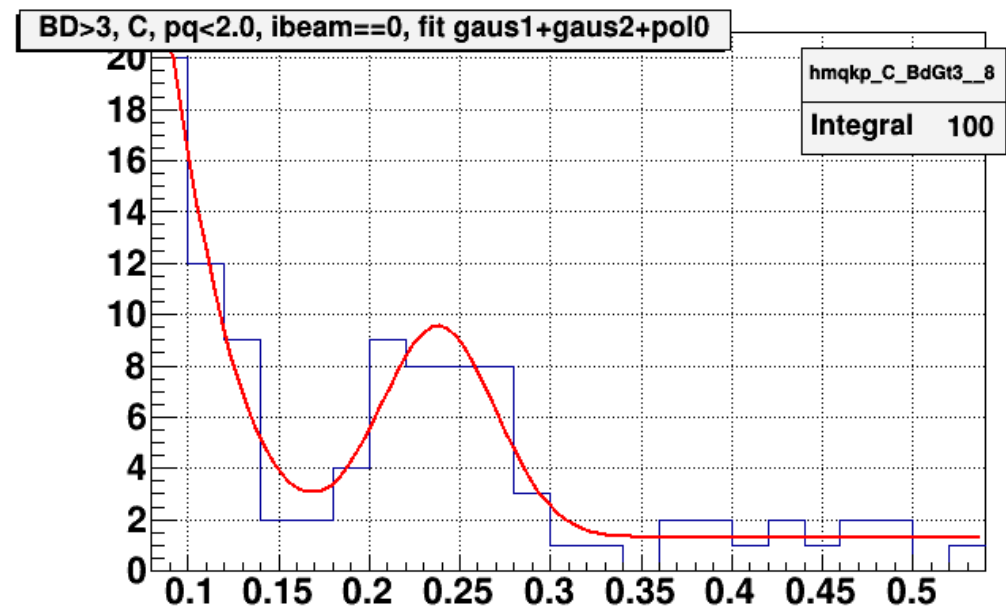
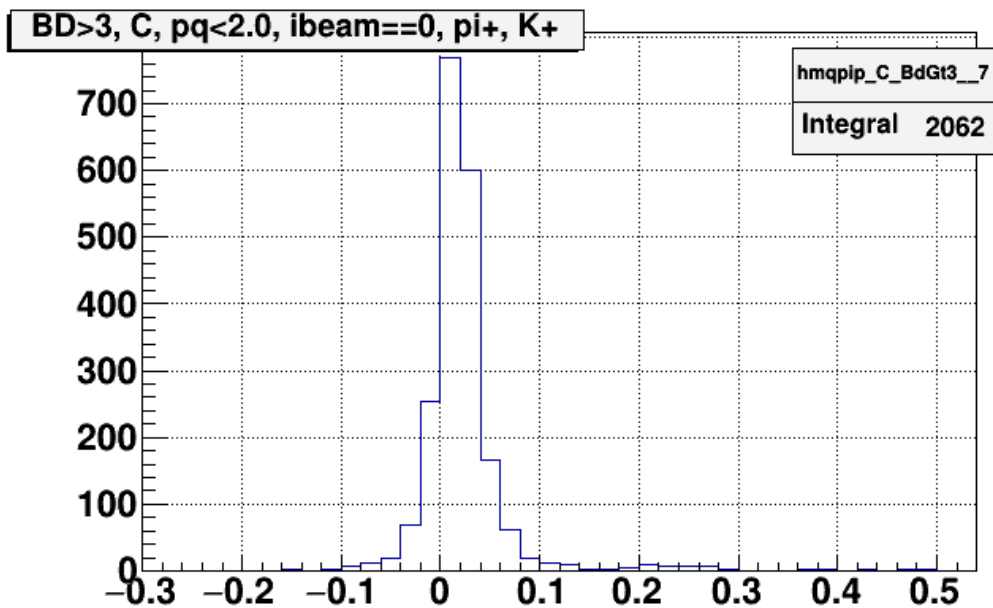
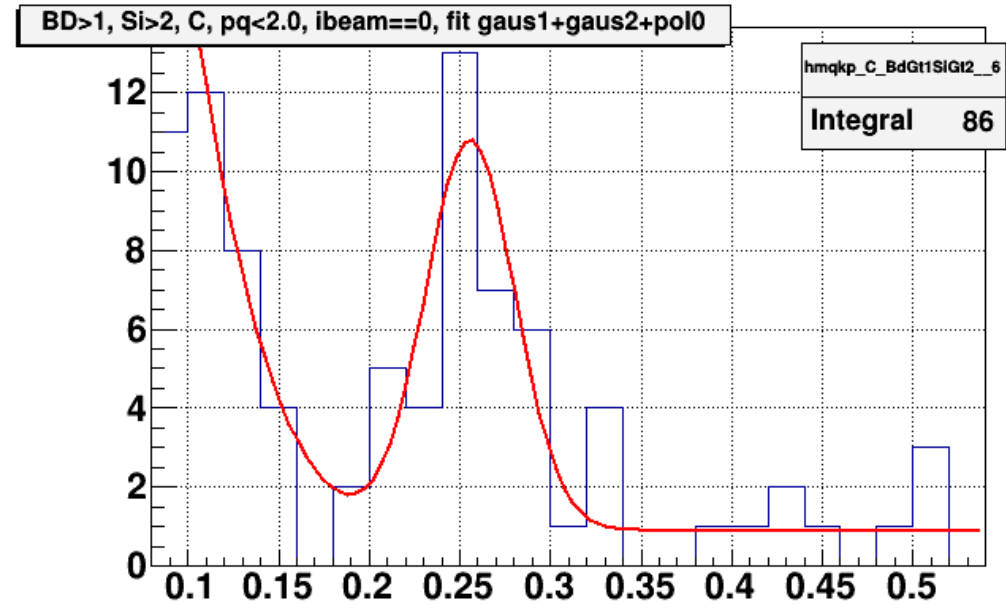
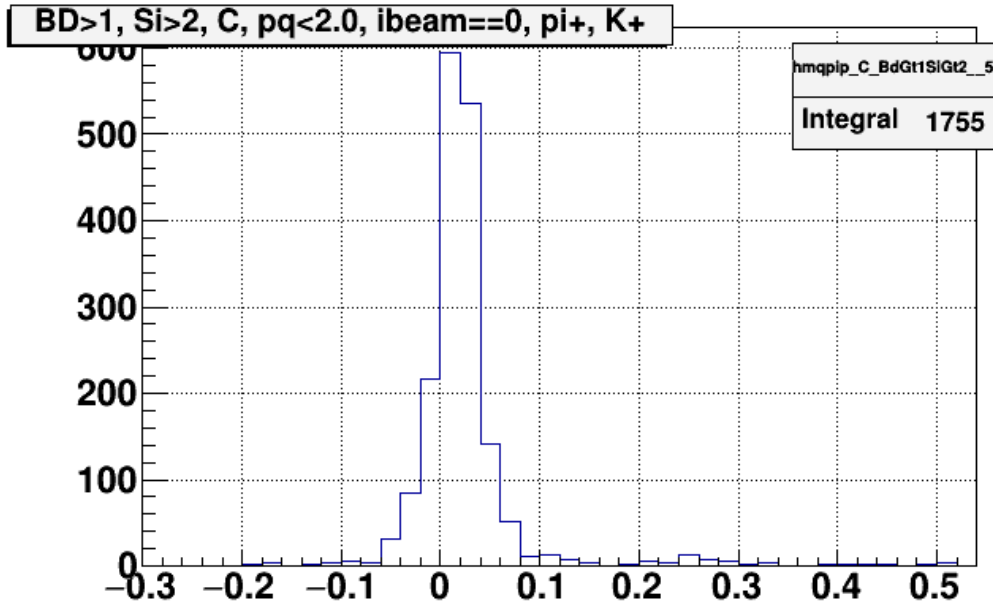


# dt vs p/q for Kr

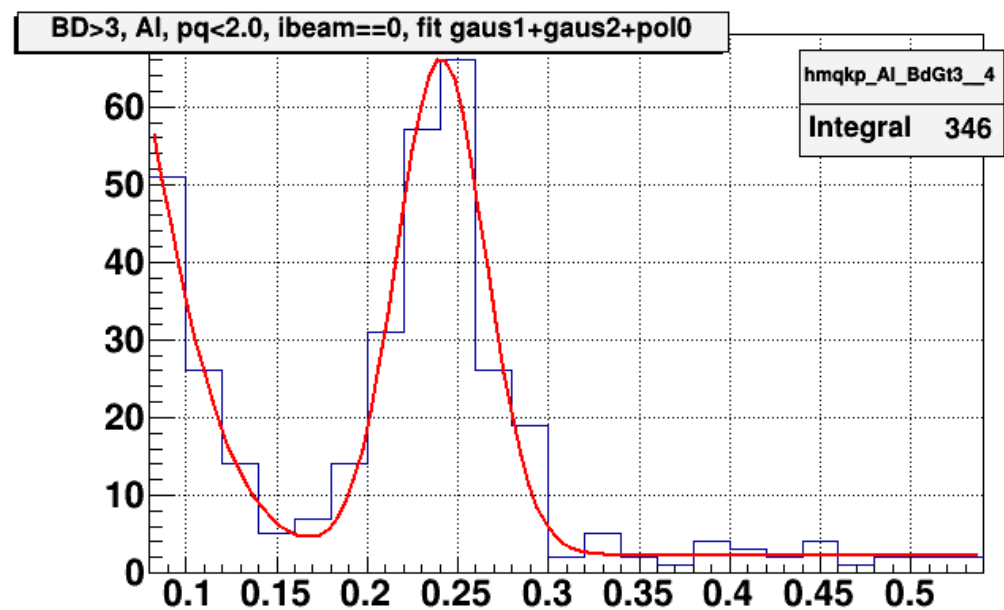
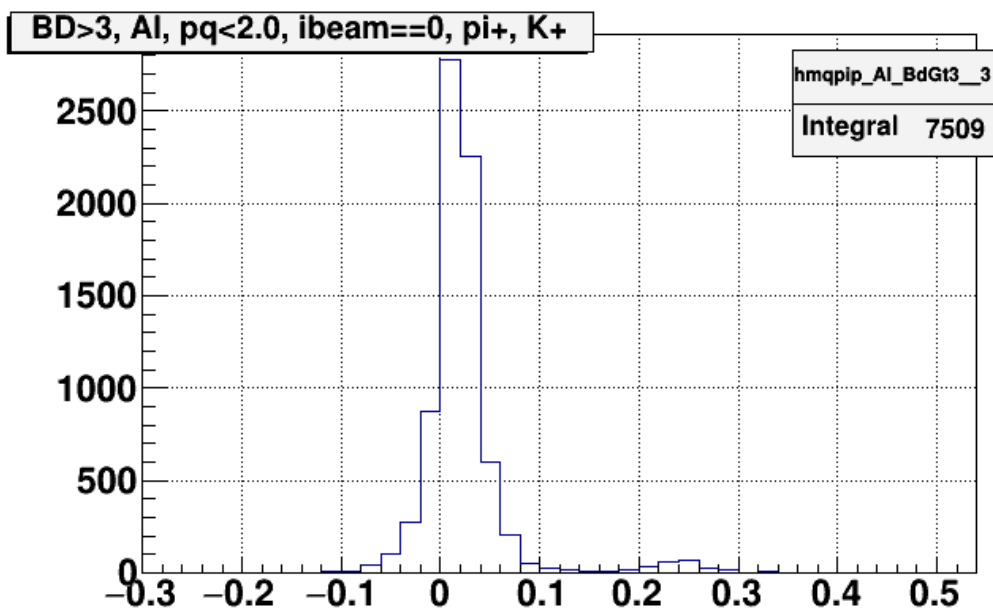
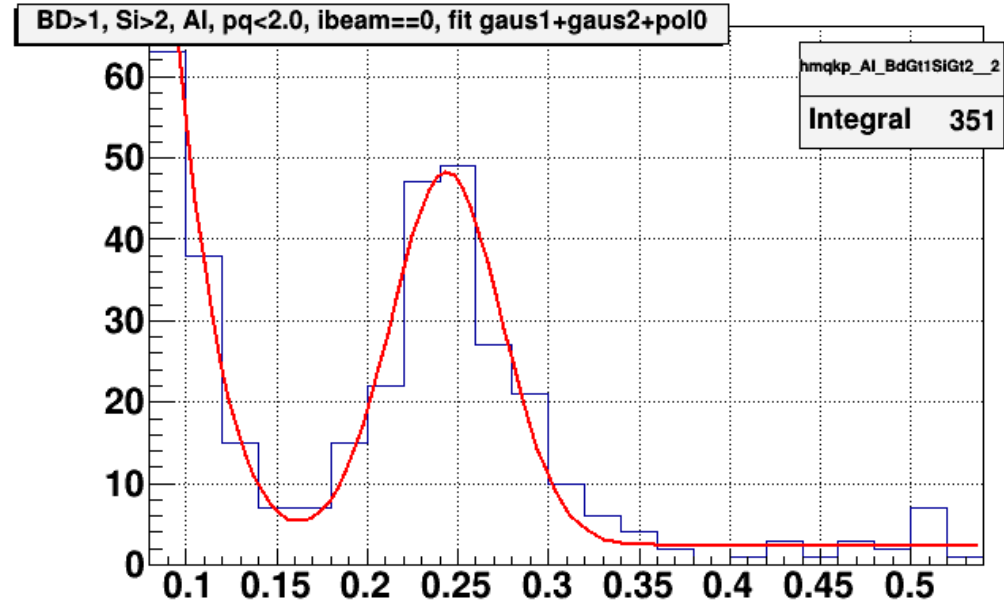
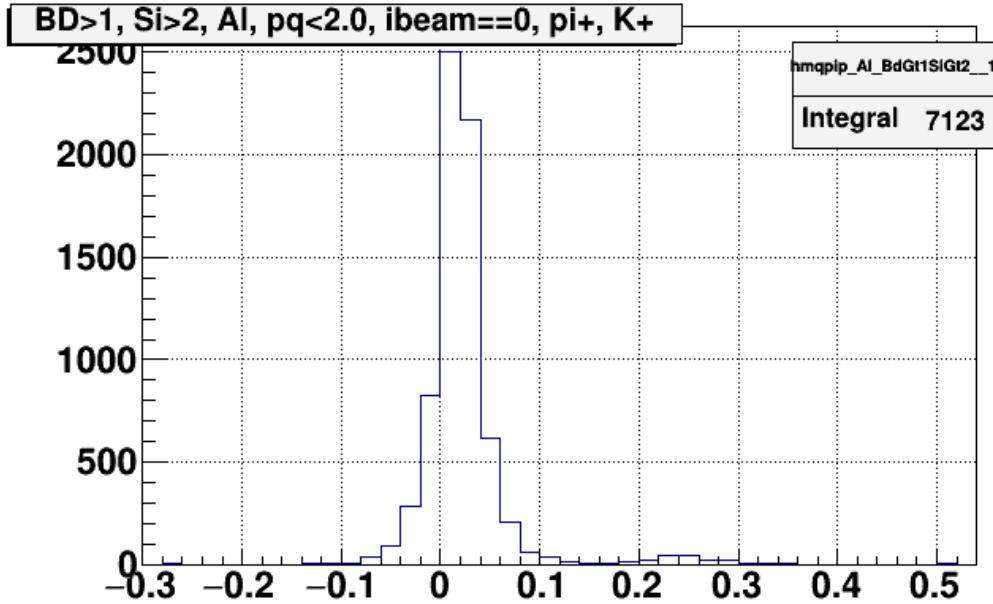


- Distribution seems to be horizontal enough

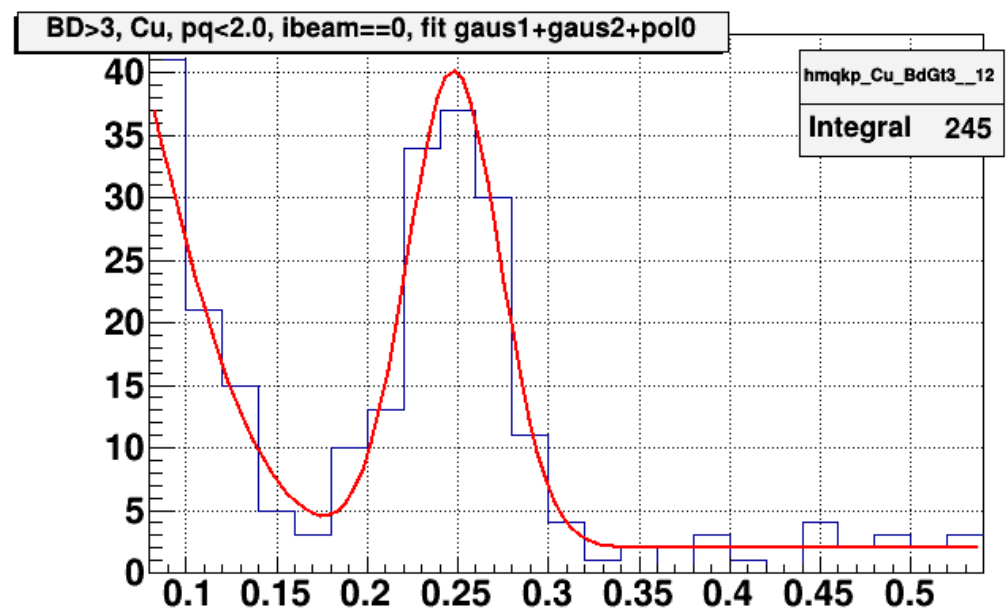
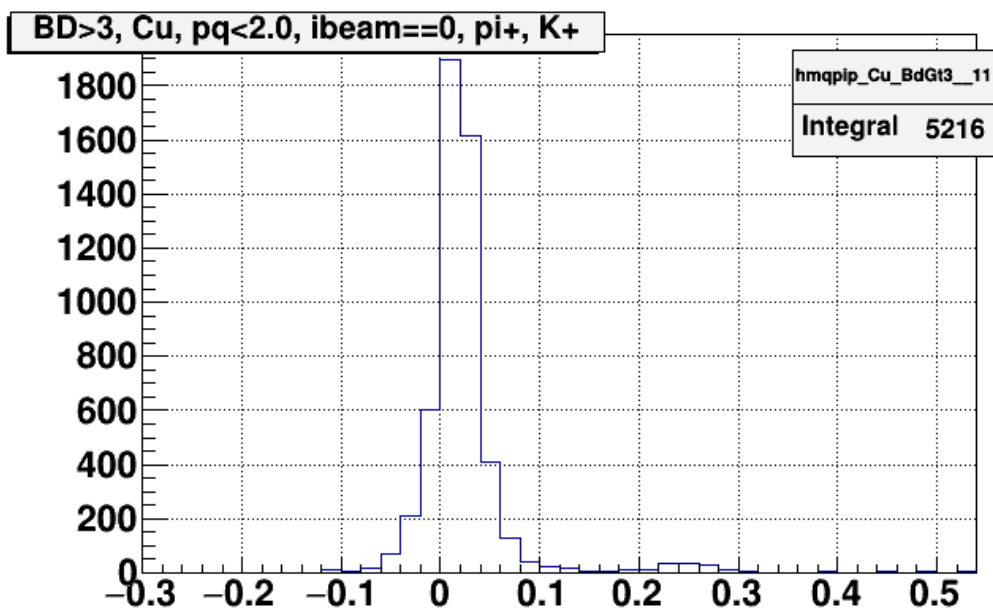
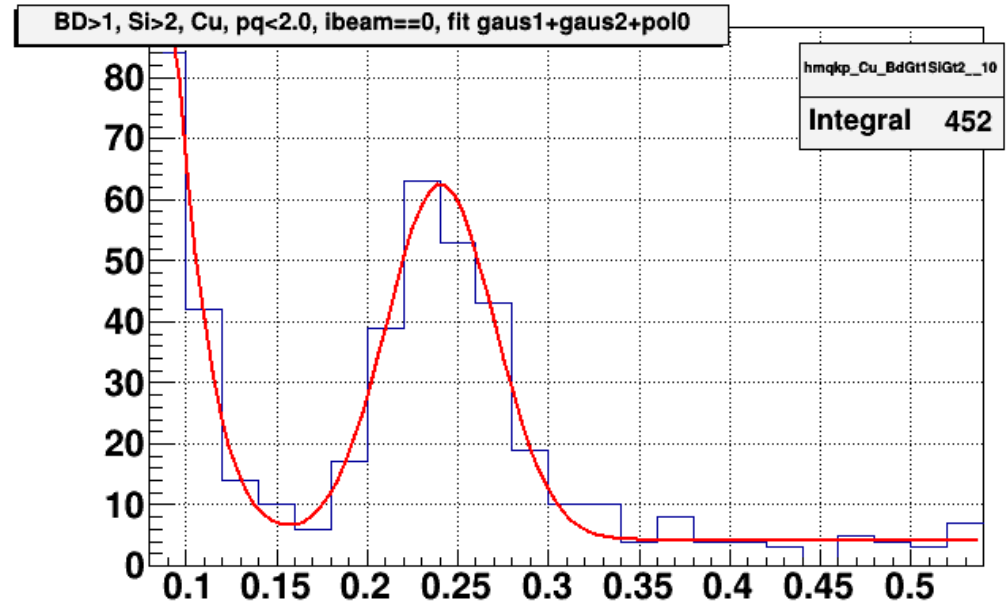
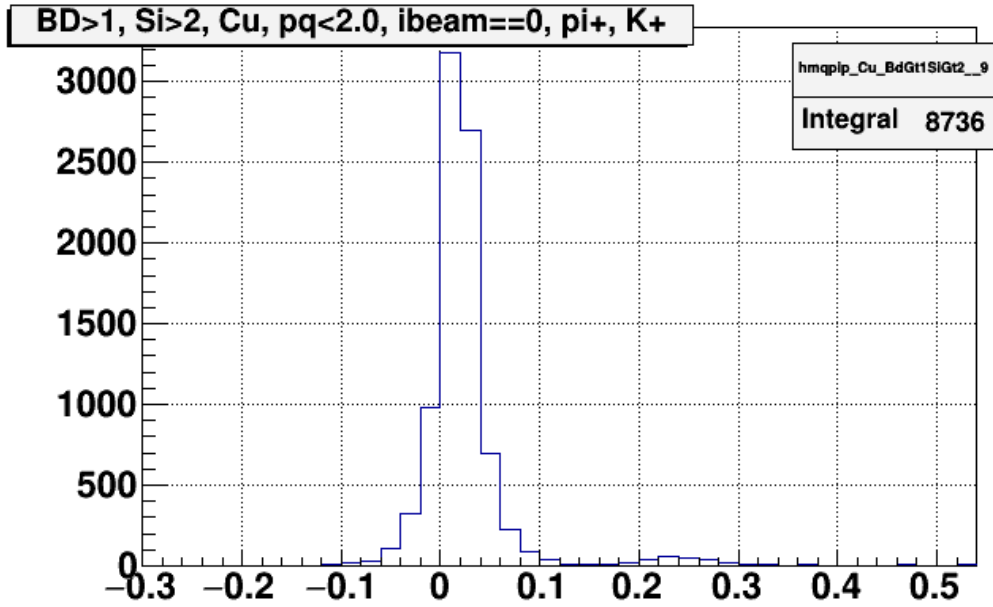
# Ar, Control Plots, C



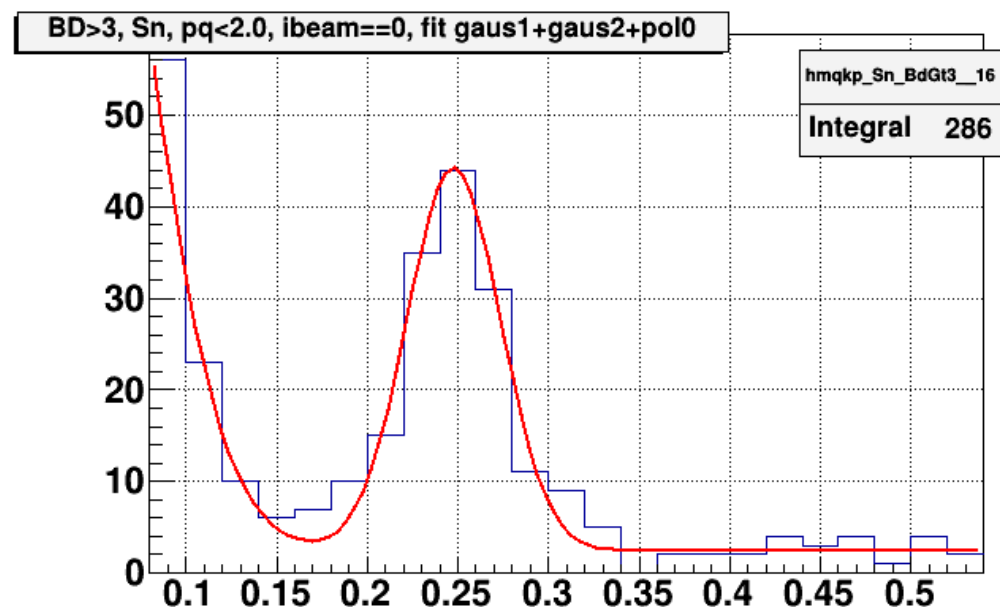
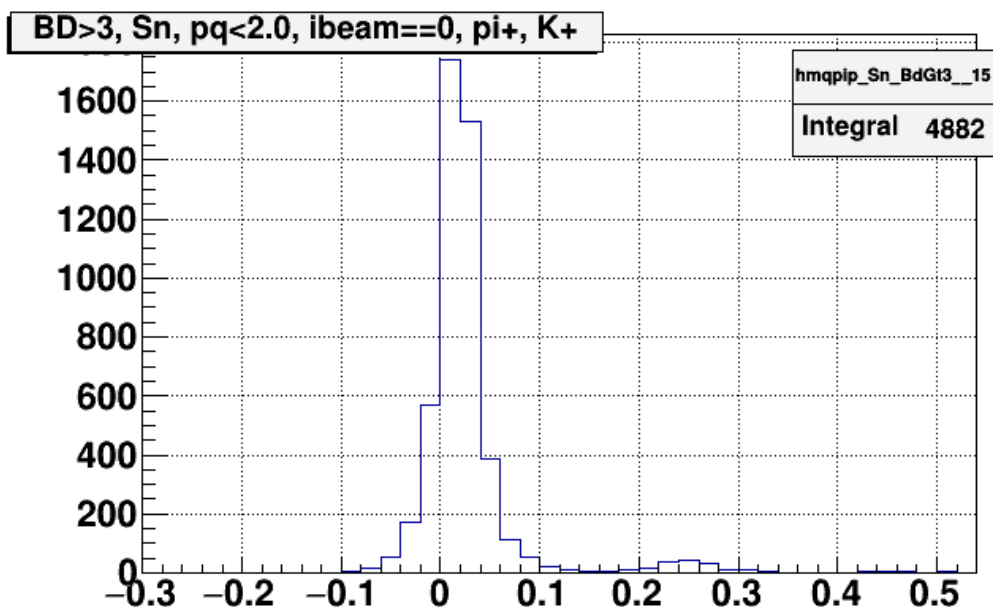
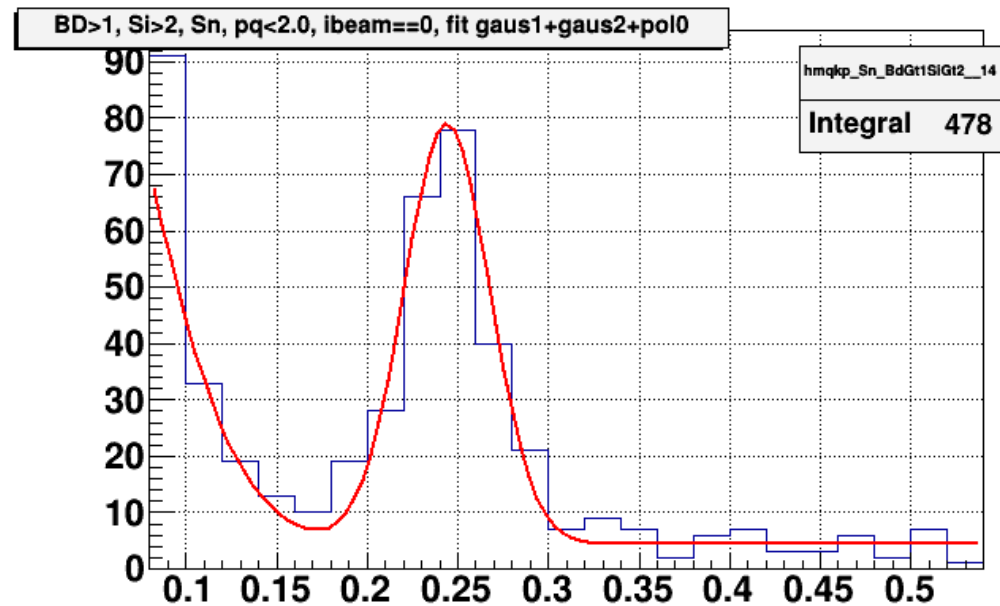
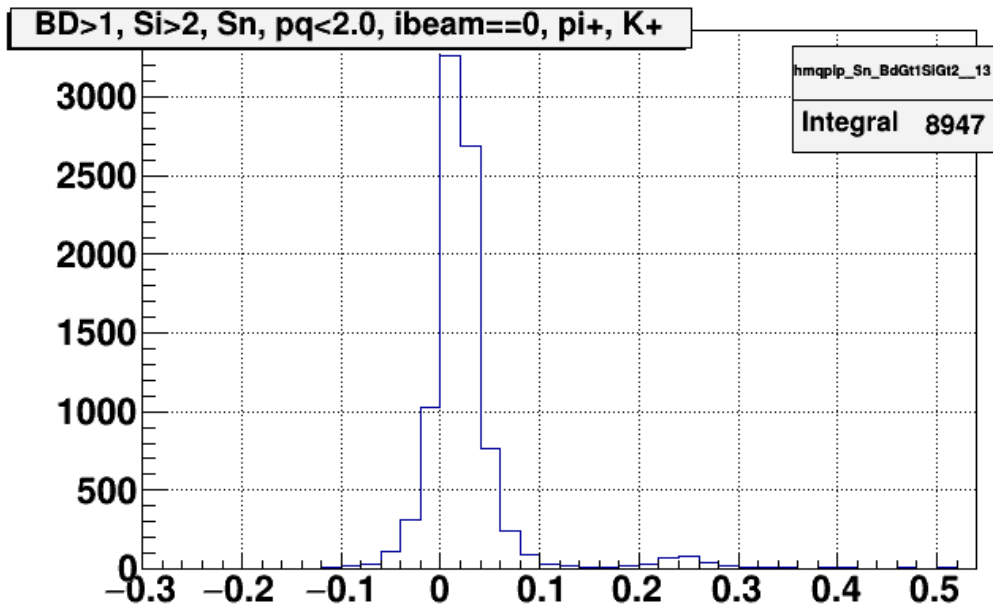
# Ar, Control Plots, AI



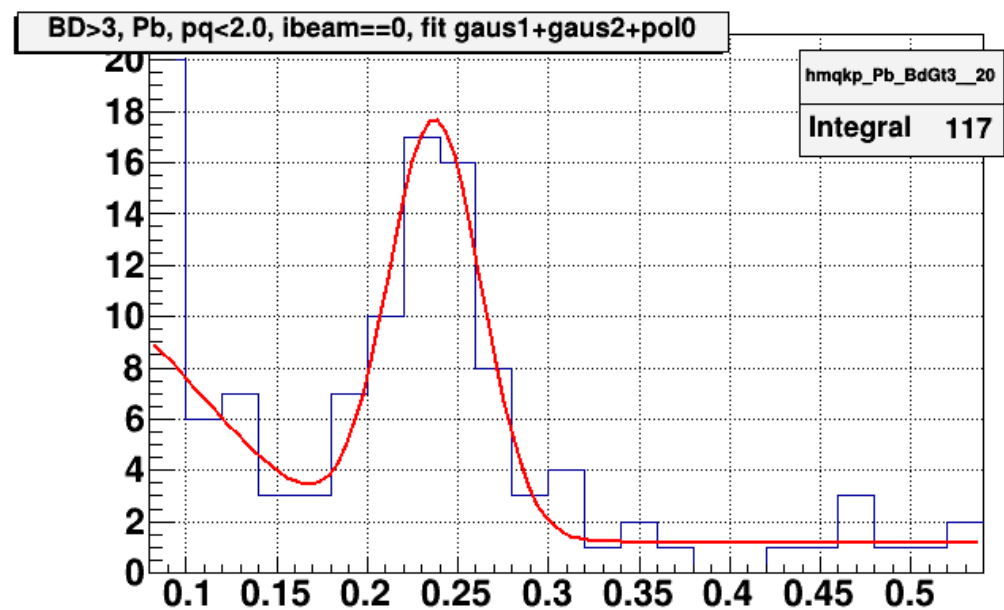
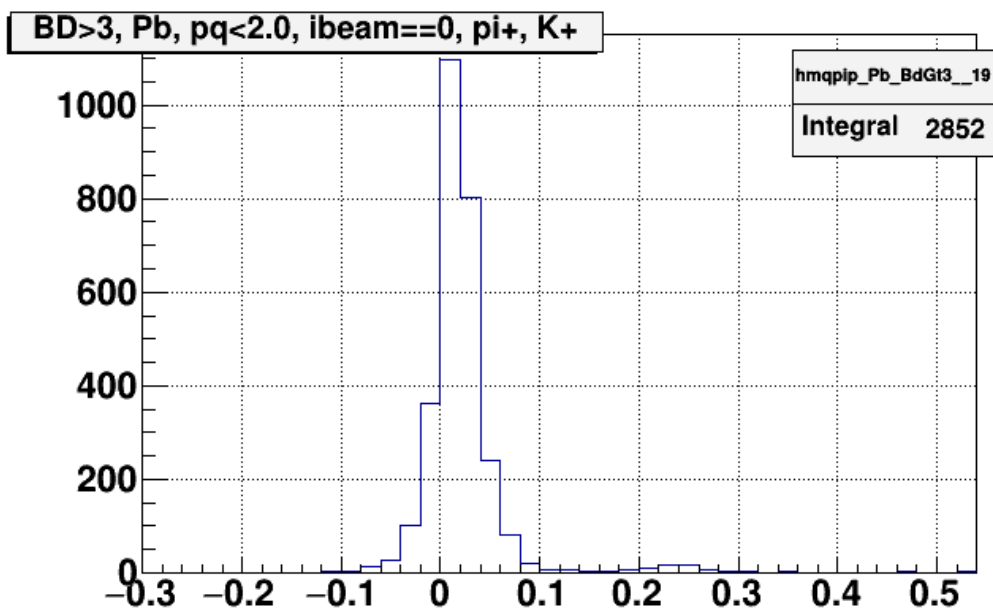
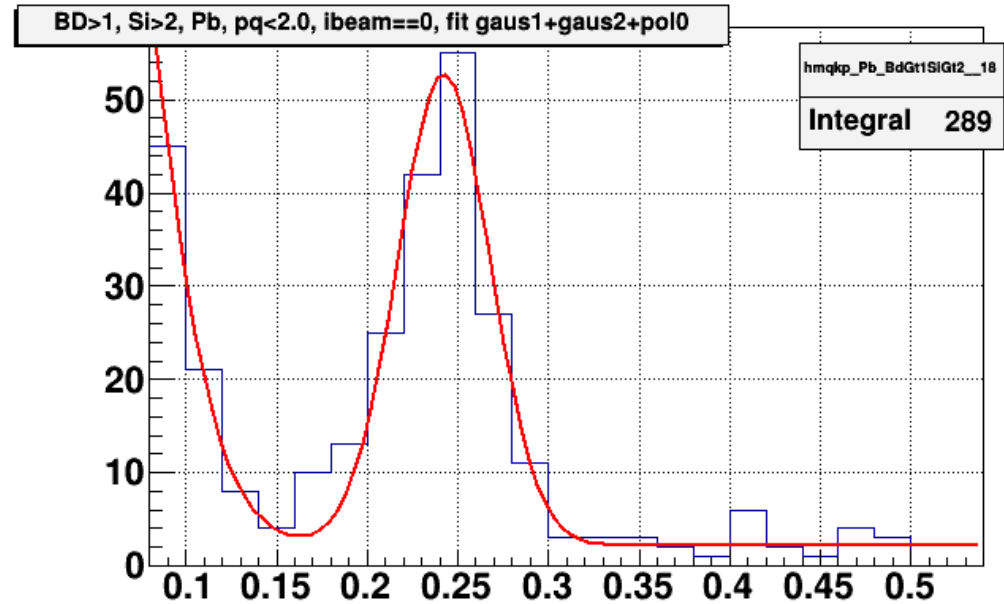
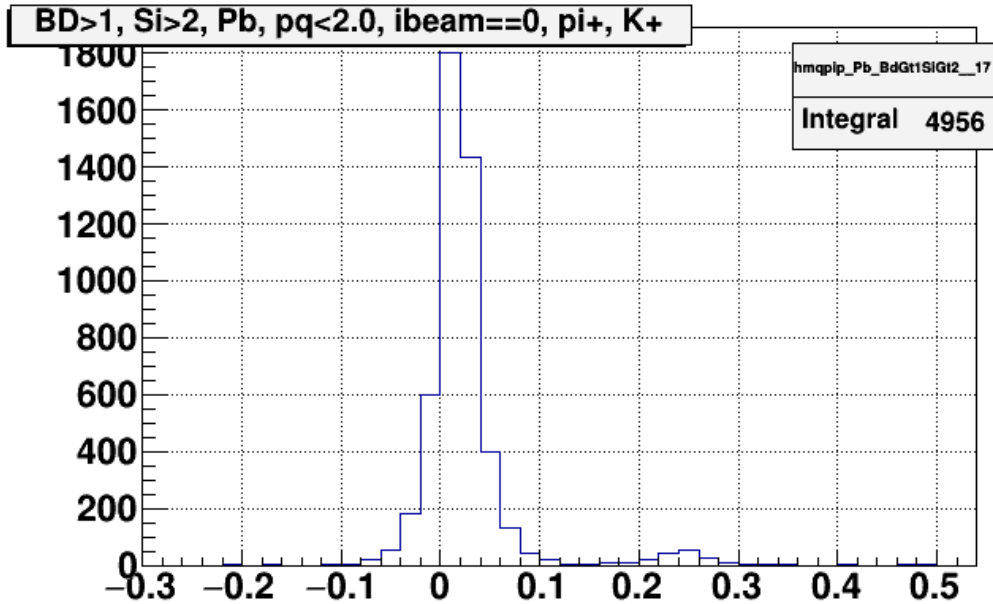
# Ar, Control Plots, Cu



# Ar, Control Plots, Sn



# Ar, Control Plots, Pb



# Statistical error estimation

- Background error,  $\sigma_{K+bkg}$ , – from fitting
- $\sigma_{K+} = \sqrt{(N_{K+bkg} + \sigma_{K+bkg}^2)}$ ,  $N_{K+bkg} = N_K + N_{bkg}$
- Background error,  $\sigma_{\pi+bkg}$ , – from fitting
- $\sigma_{\pi+} = \sqrt{(N_{\pi+bkg} + \sigma_{\pi+bkg}^2)}$ ,  $N_{\pi+bkg} = N_{\pi} + N_{bkg}$
- $\sigma_{K+/\pi+} = \sqrt{((\sigma_{K+}/N_{\pi})^2 + (N_K \cdot \sigma_{\pi+}/N_{\pi}^2)^2)}$

# Averaging $K^+/\pi^+$ by triggers and by targets

- $K^+/\pi^+(A)=$

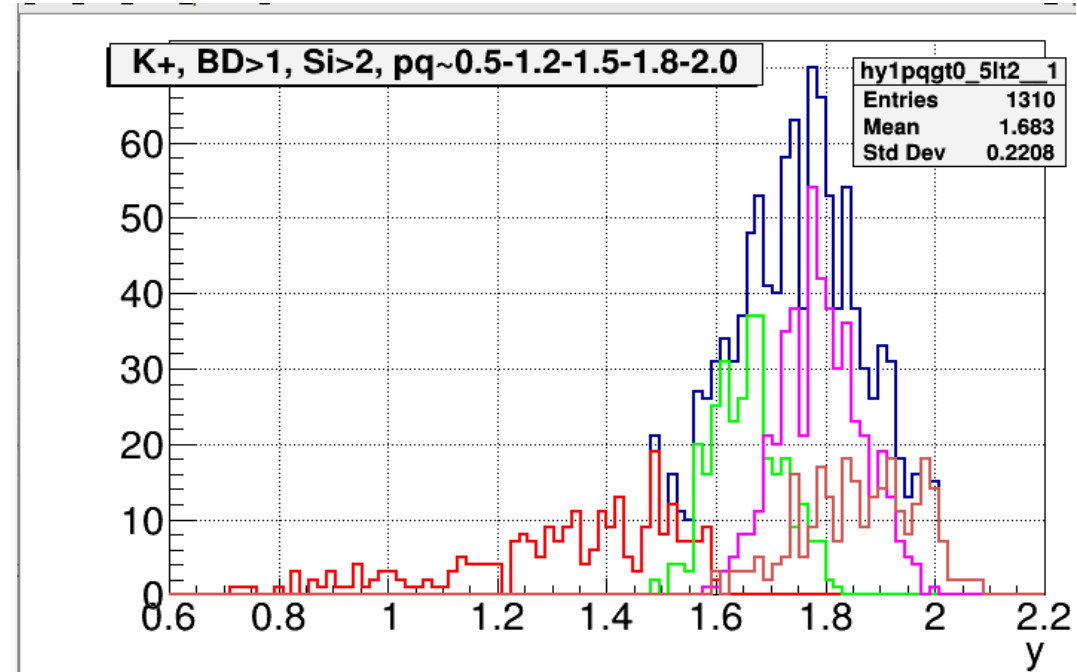
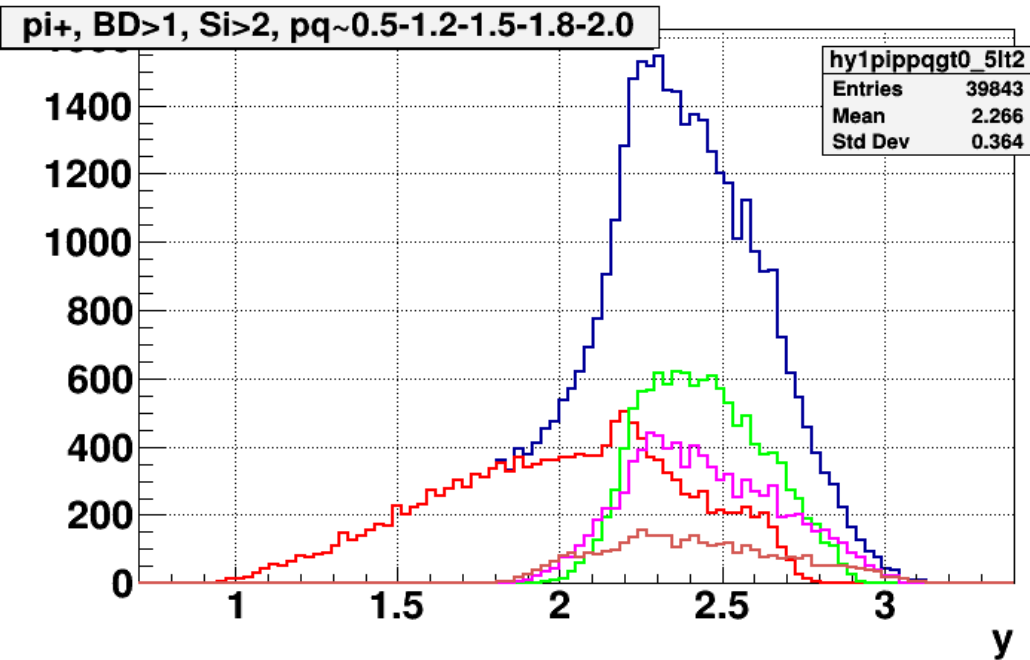
$$\frac{(K^+/\pi^+(A, Tr1)/Eff(Tr1)/\sigma(A, Tr1)^2 + K^+/\pi^+(A, Tr2)/Eff(Tr2)/\sigma(A, Tr2)^2)}{(1/\sigma(A, Tr1)^2 + 1/\sigma(A, Tr2)^2)}$$

- For systematic errors assessment

$$K^+/\pi^+ = \frac{\sum_{Targ} \sum_{Tr} (K^+/\pi^+(A, Tr_i)/Eff(Tr_i)/\sigma(A, Tr_i)^2)}{\sum_{Targ} \sum_{Tr} (1/\sigma(A, Tr_i)^2)}, \quad A=C, Al, Cu, Sn, \quad i=1, 2$$

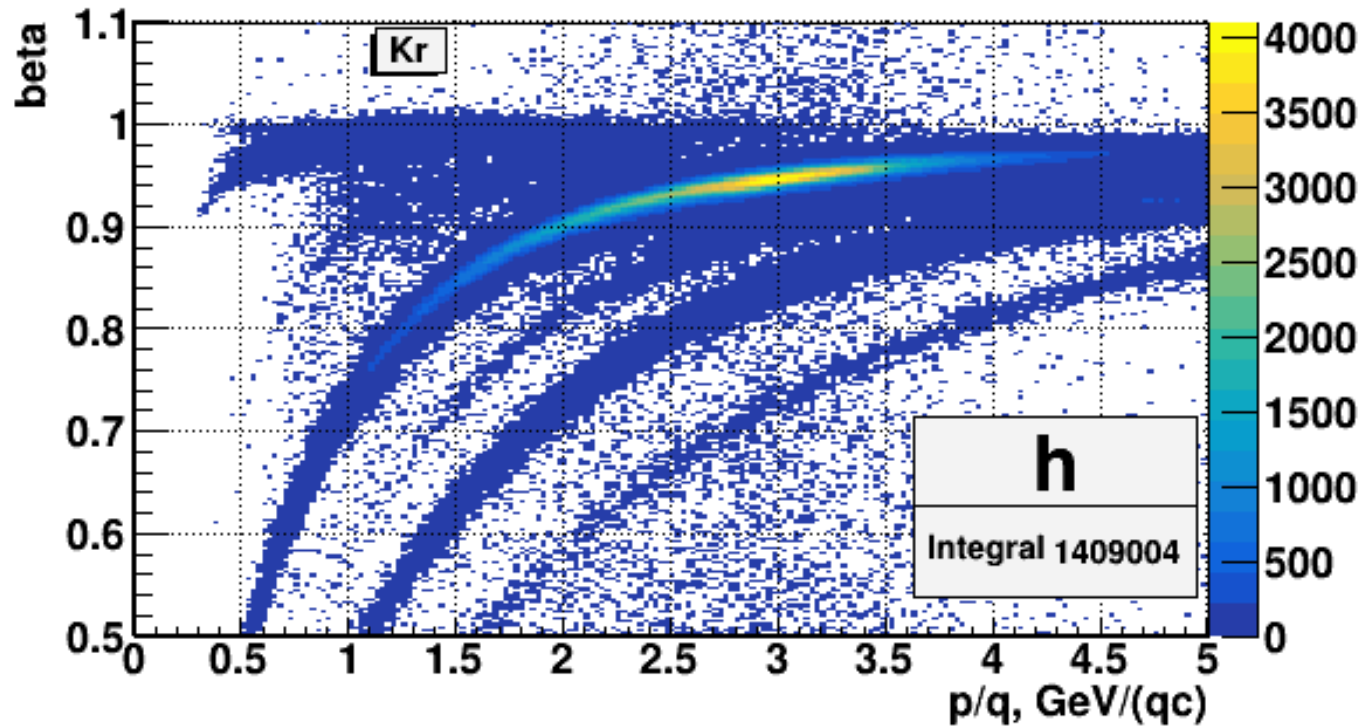


# $K^+$ and $\pi^+$ $\gamma$ spectra



- Spectra for  $K^+$  and  $\pi^+$  are pretty different

# Identification in Kr



- All bands as for Ar well visible except  $K^+$
- High background under  $K^+$