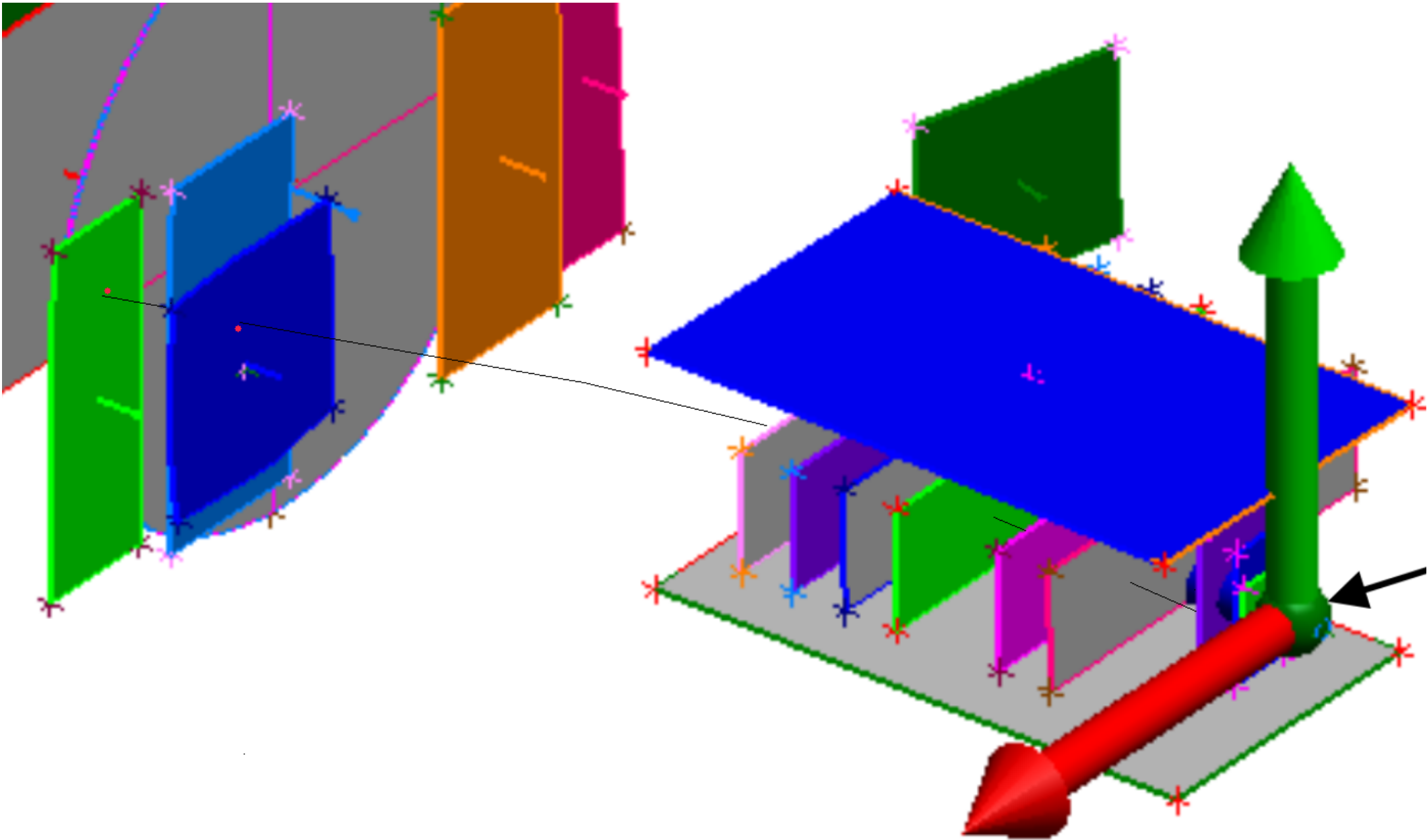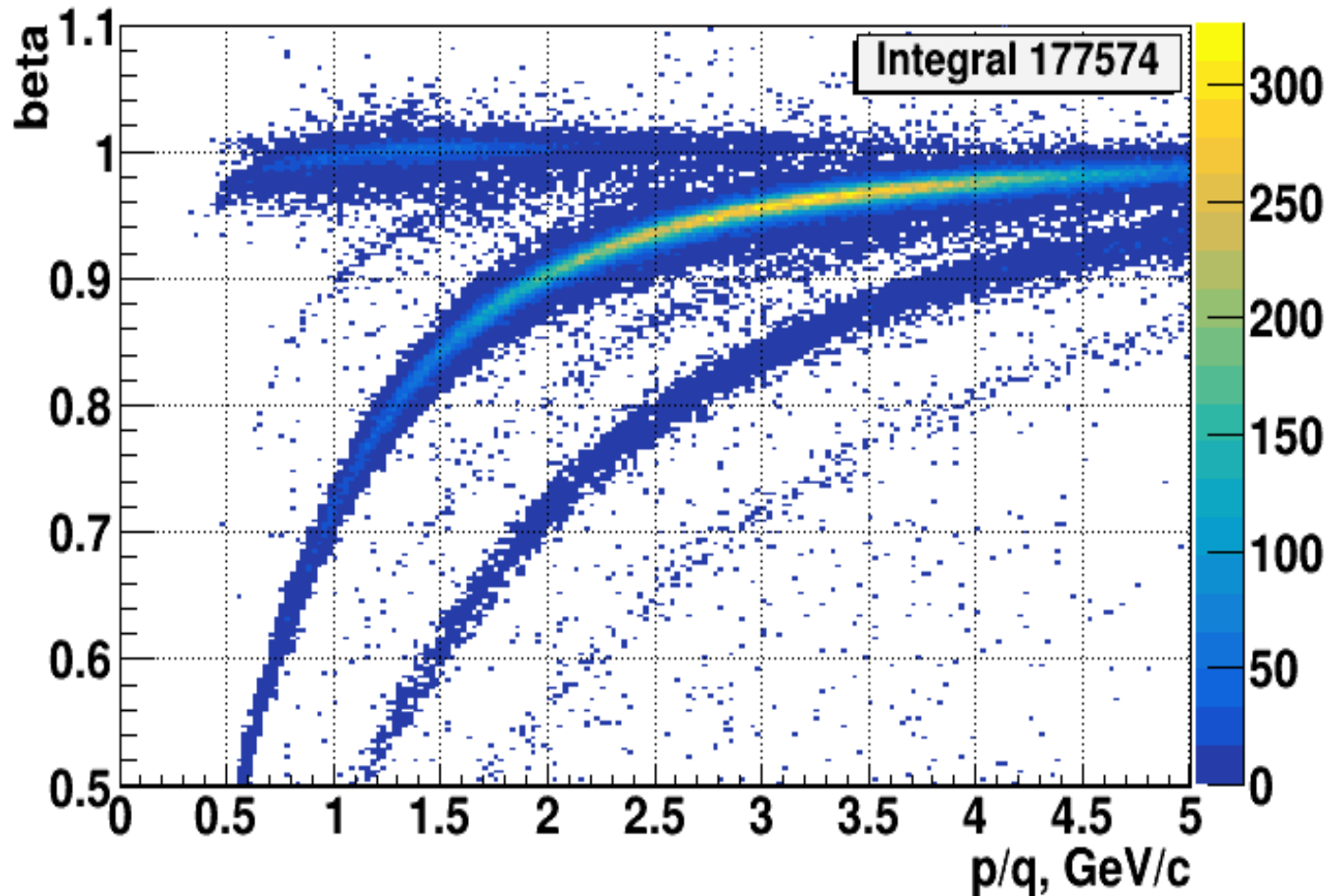# Status of particle identification and K+/pi+ ratio in Ar run

Mikhail Kapishin, <u>Vasilii Plotnikov</u>, 23.01.2019

Identification method

Current result of identification
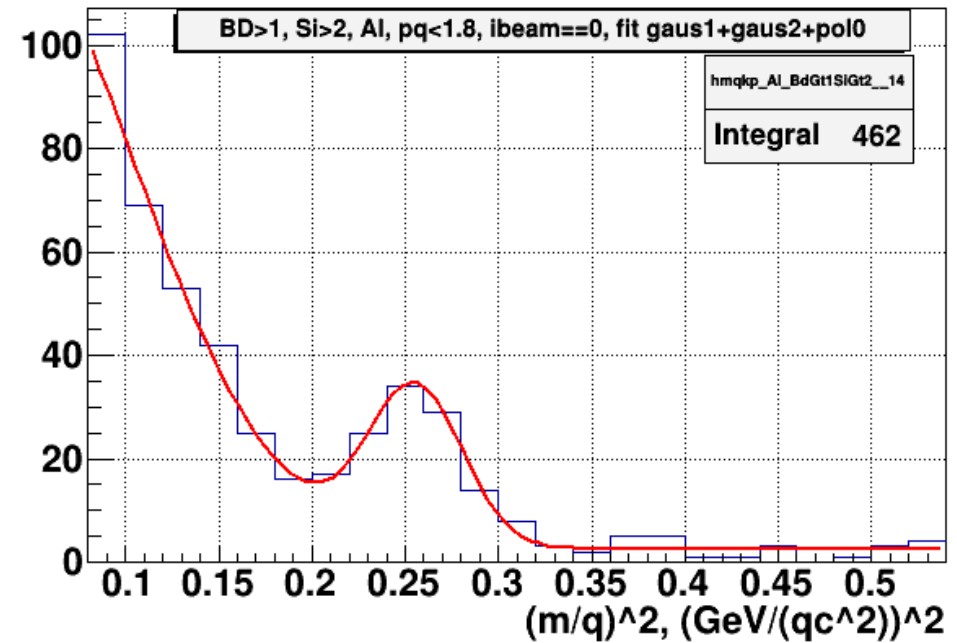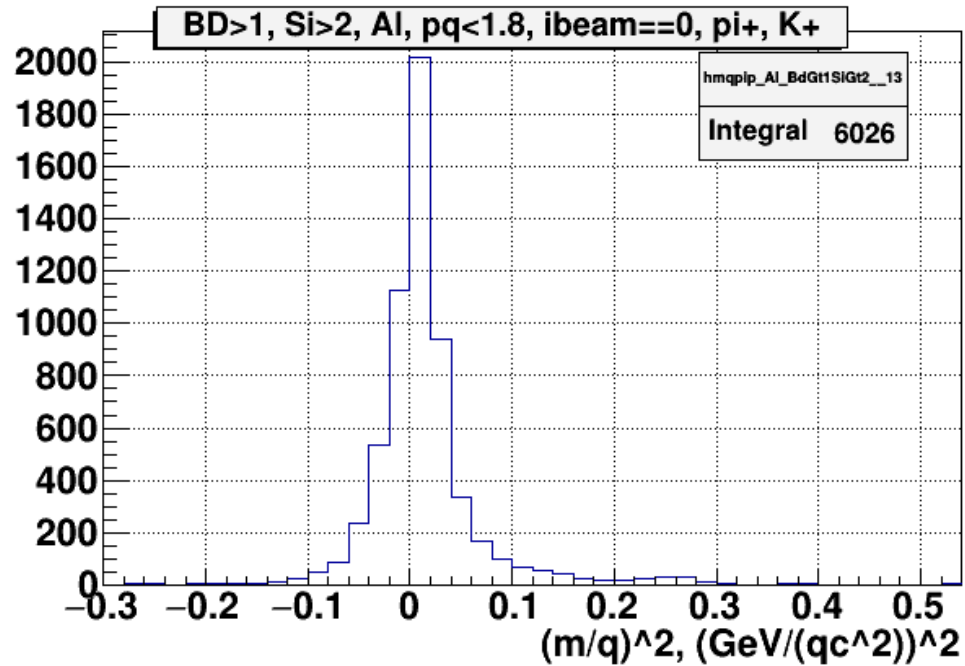

- For positive particles, runs 4611-4704
- p/q<1.8 GeV/c cut

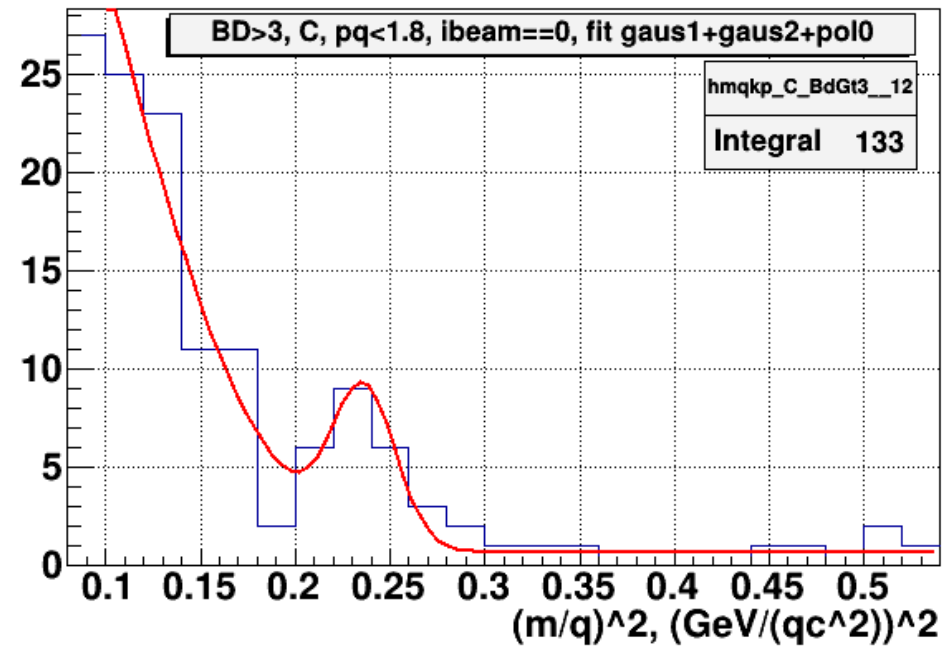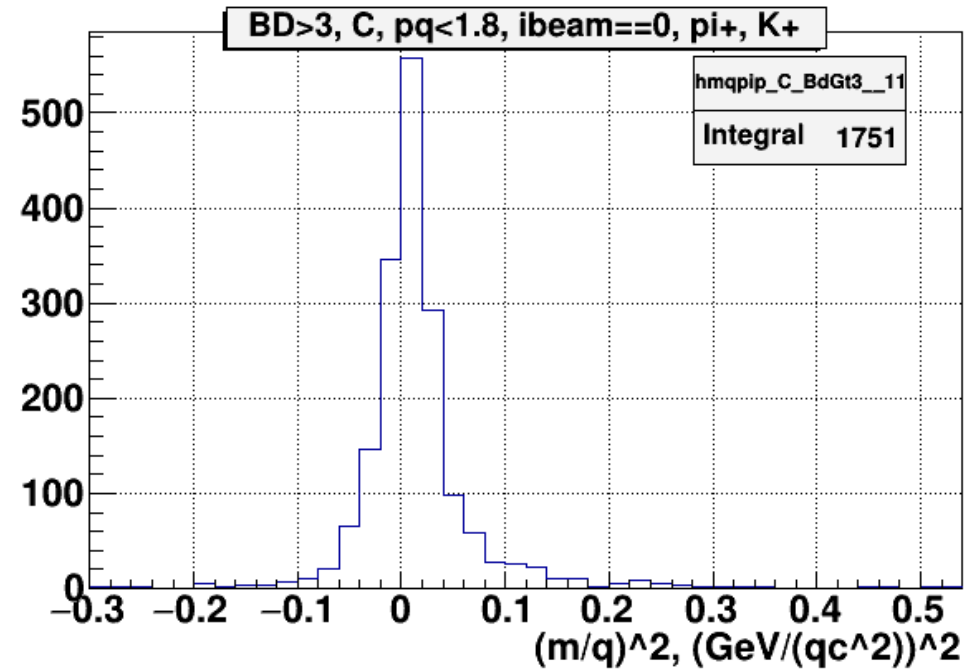# Data set

- B=1252 A, T=3,2 GeV/nucl

- Targets C, Al, Cu, Sn, Pb
- Runs 3756-4704, BD>1 && Si>2
- 393 runs in total
- Runs 3756-4704, BD>3
- 204 runs in total

Kaon identification, Al, BD>1 && Si>2, ibeam==0, good fit
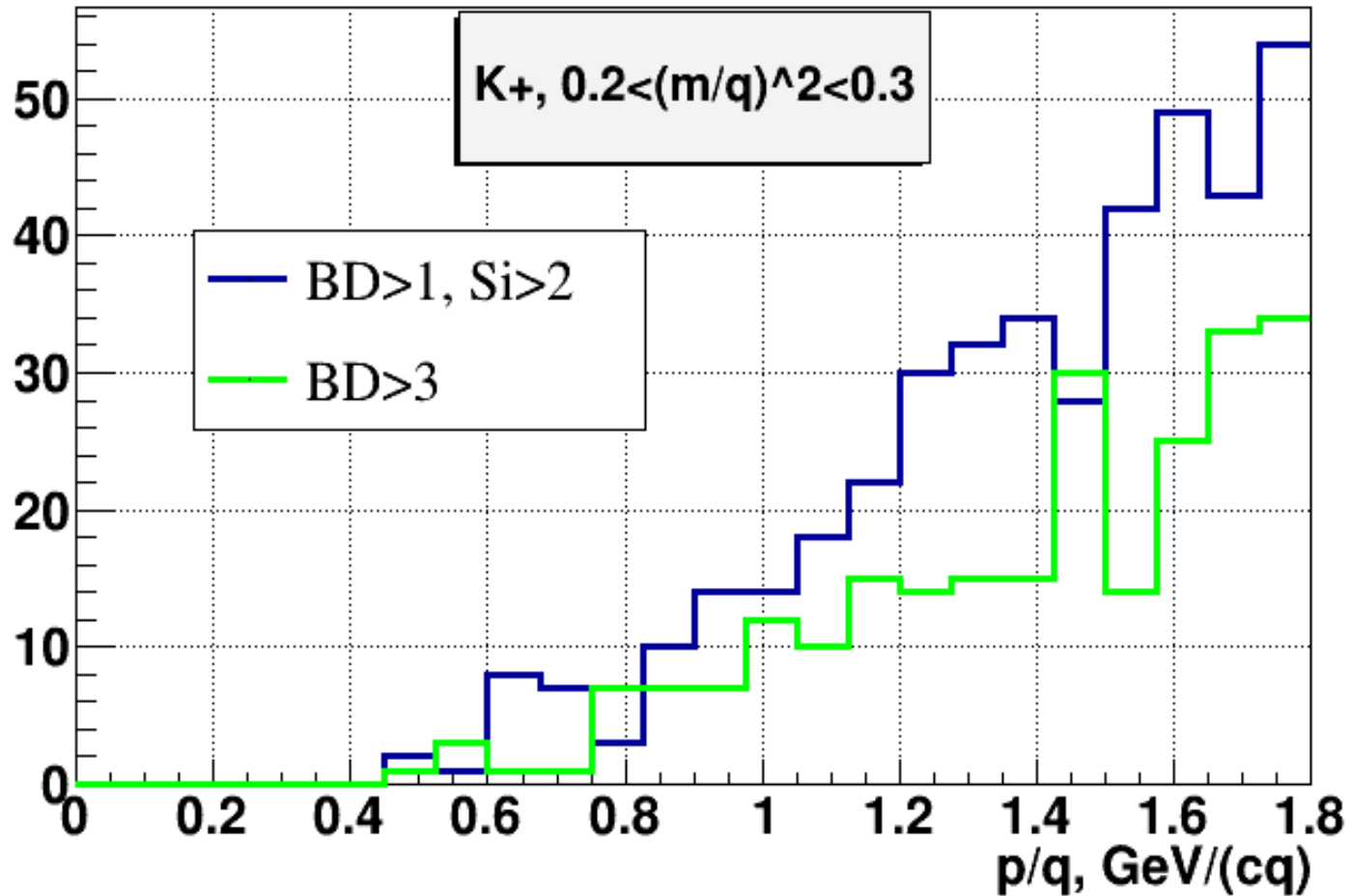

- Gaus2 – Kaon's peak

- Gaus1 – background from pions (empty bin choice!?)

- pol0 – background from misidentified particles

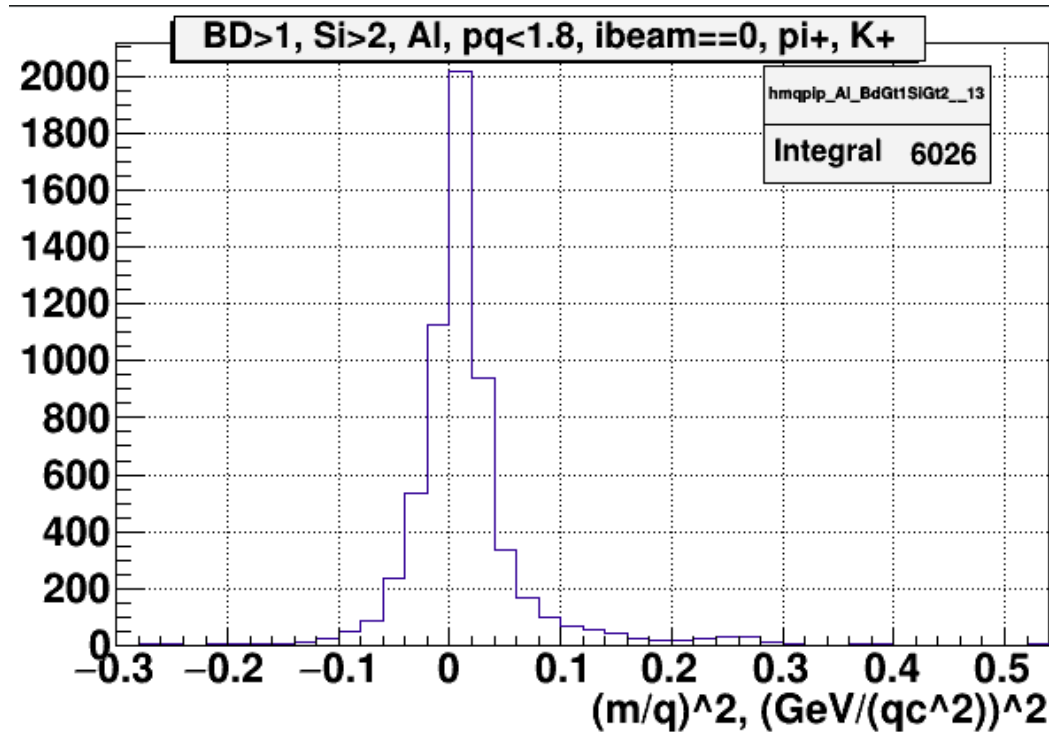# Kaon identification, C, BD>3, ibeam==0, bad fit

- Gaus2 – Kaon's peak

- Gaus1 – background from pions (empty bin choice!?)

- pol0 – background from misidentified particles

Kaon spectrum

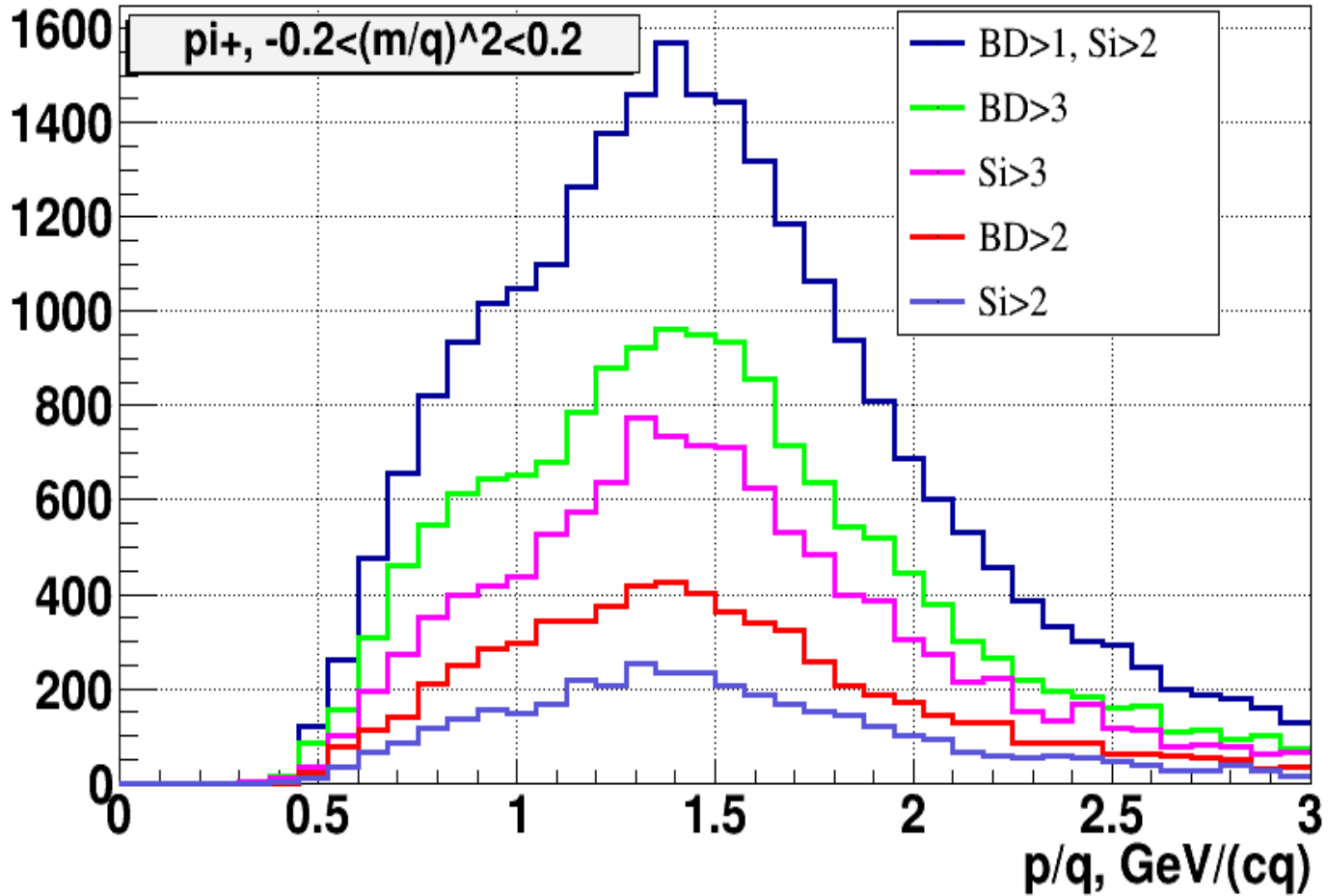- No explicit maximum here
- Discrepancy in 1.2<p/q<1.5 GeV/(cq)

Pion identification, p/q<1.8 GeV/(cq)

- Low background

- Background from misidentified particles (main)

- Background from kaons

Pion spectrum


- Peak in 1.3-1.4 GeV/(cq)

K$^+$/π^+

Trigger /Target	N$_{K+}$, number	N$_{\pi+}$, number	K$_+$/π_+
BD>1 && Si>2/C	27±6	1410±38	0.0192±0.0042
BD>3/C	18±6	1707±42	0.0106±0.0034

- Corrections for tails
- Full number of particles after corrections
- K$_+$/π_+

K^+/π^+

| Trigger /Target	N_{K+}, number	$N_{\pi+}$, number	K^+/π^+
BD>1 && Si>2/Al	97±12	5817±77	0.0167±0.0020
BD>3/Al	114±12	6205±80	0.0184±0.0020
BD>1 && Si>2/Cu	128±13	7159±86	0.0179±0.0019
BD>3/Cu	72±10	4314±66	0.0167±0.0023
BD>1 && Si>2/Sn	180±14	7293±86	0.0247±0.0019
BD>3/Sn	87±11	3962±64	0.0220±0.0026
BD>1 && Si>2/Pb	97±11	4006±64	0.0243±0.0028
BD>3/Pb	38±7	2364±49	0.0162±0.0031

K$^+$/π$^+$(A)
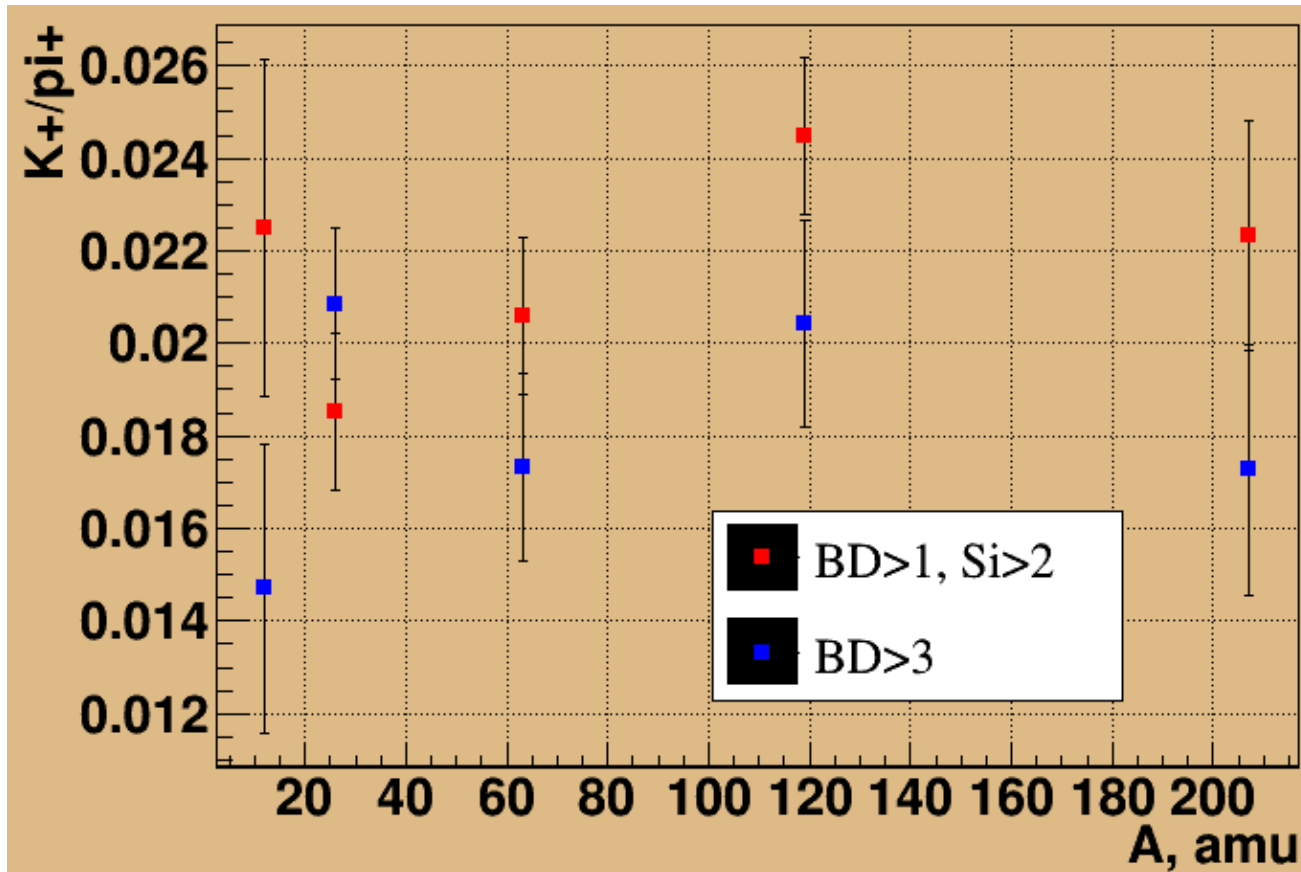
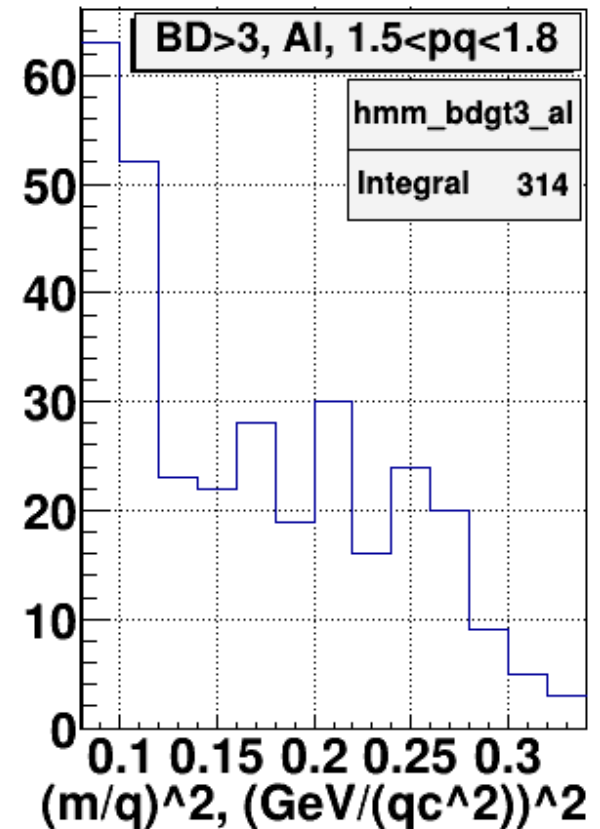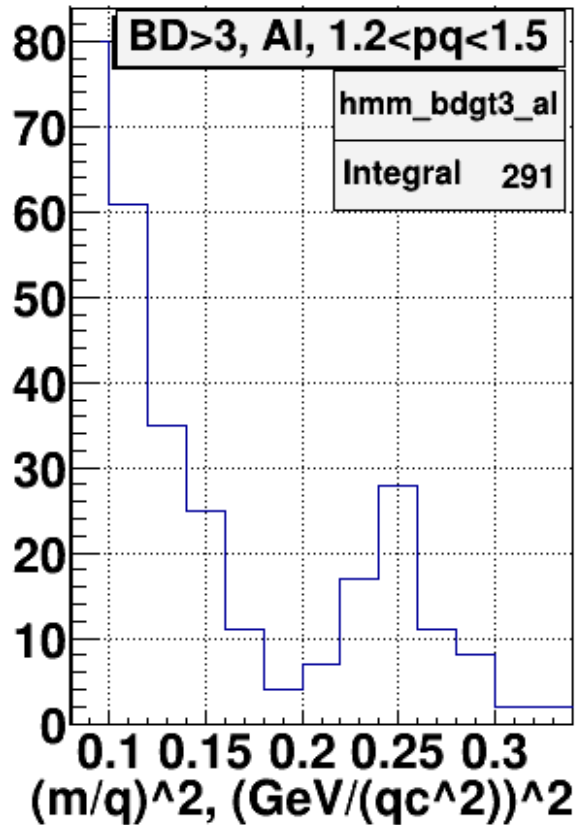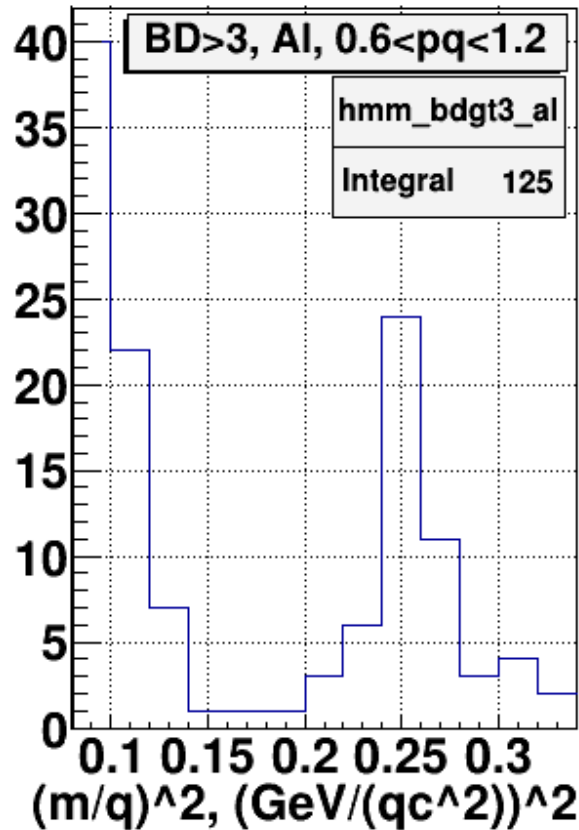- For each target ratios from two triggers lays inside two error bars

K⁺,Al, BD>3, TOF400 planes 1-3 and 6-8
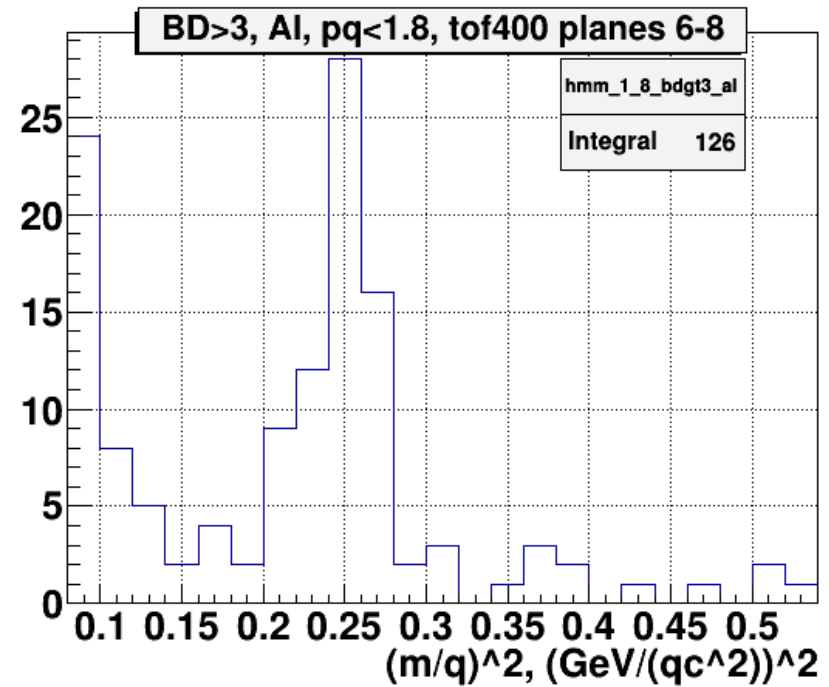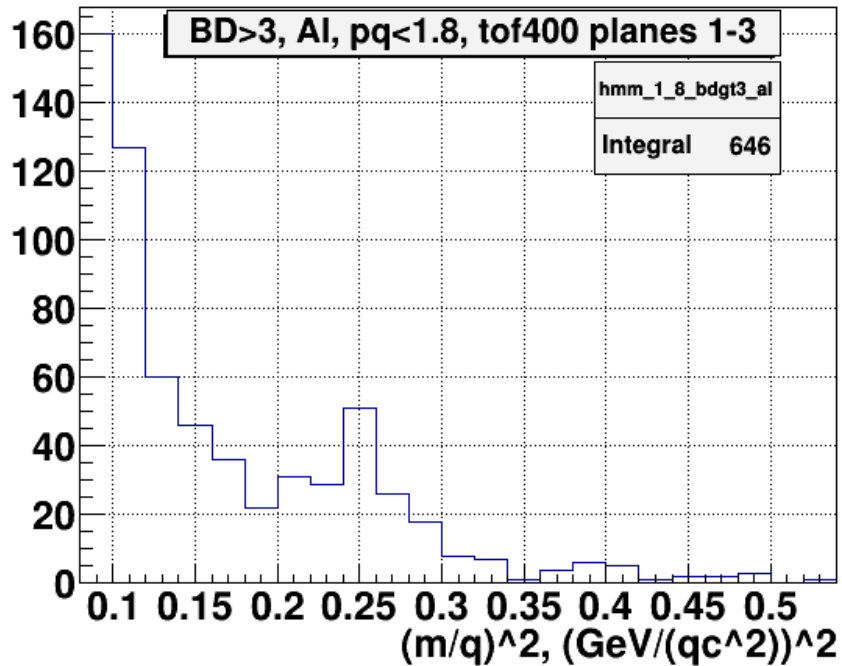
- For TOF400 planes 6-8 K⁺ and π⁺ widths are less

K$^+$,Al, BD>3, p/q intervals

- K$^+$ and π$^+$ widths are increase with p/q

Discussions

- Manual bins choice for pion tail's background. Error ~ 10%

- Alternative kaon's extraction methods - in p/q bins and in TOF400 planes. Kaon peak is not gaussian
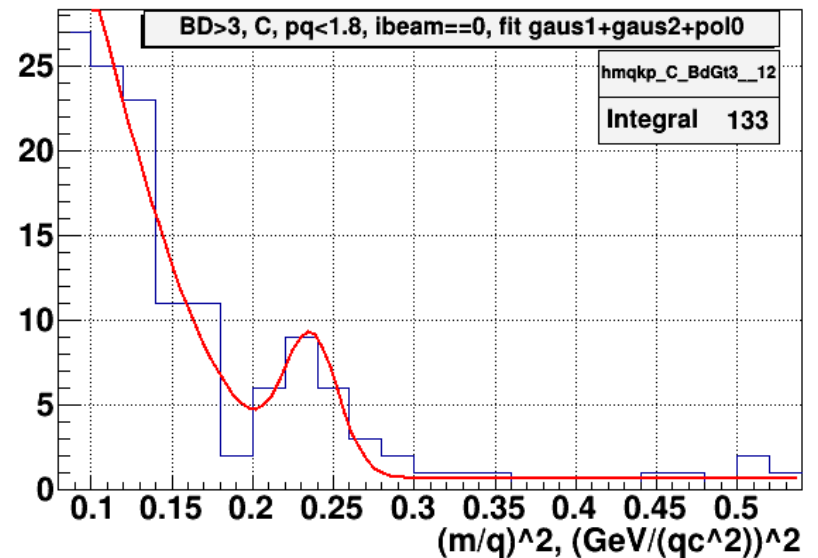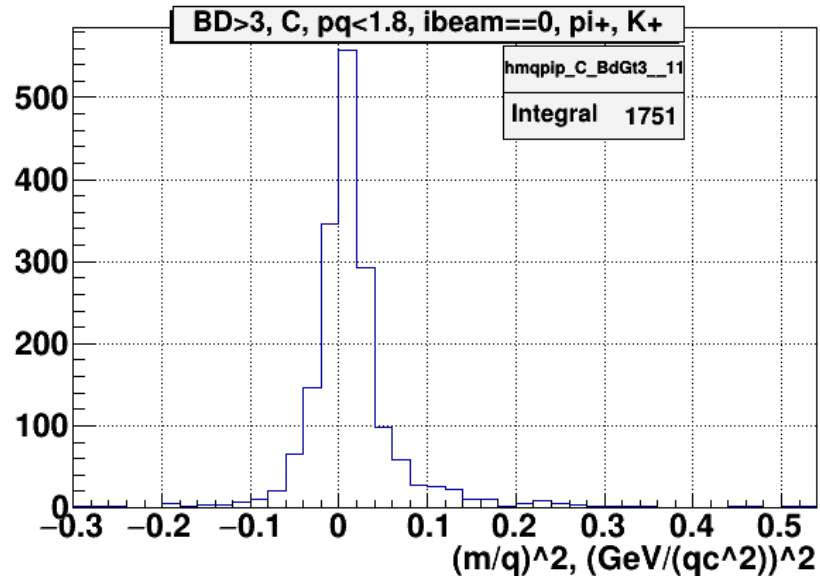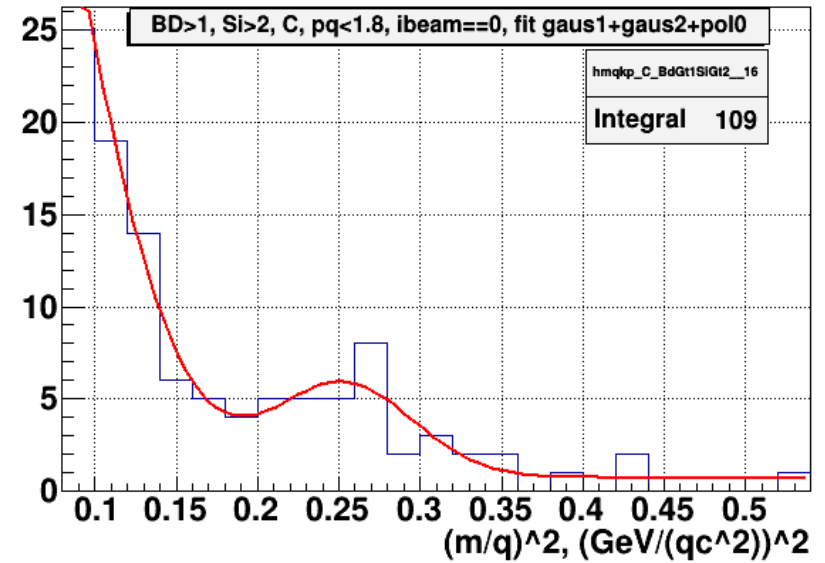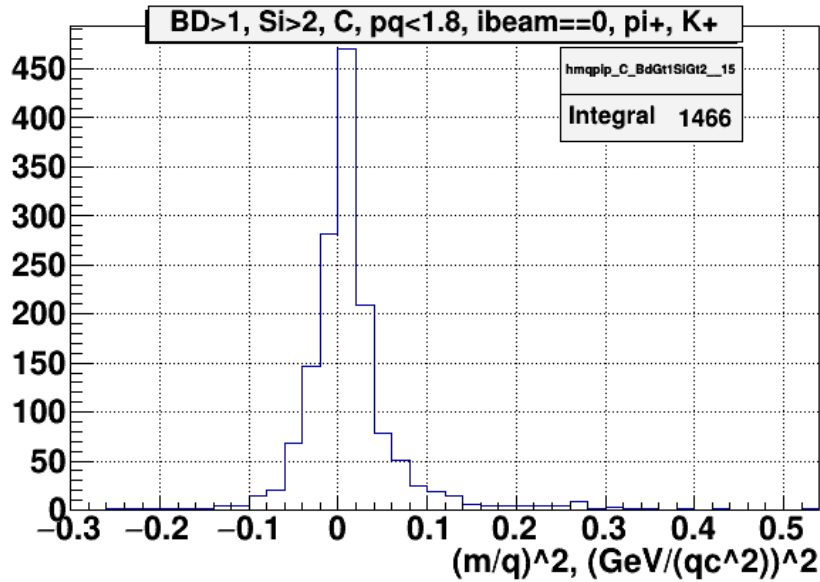
Additional corrections

- Kaon's decay (MC)
- Acceptance (MC)
- Reconstruction inefficiency (MC)
- e^+/μ^+ contamination for π^+ (MC)

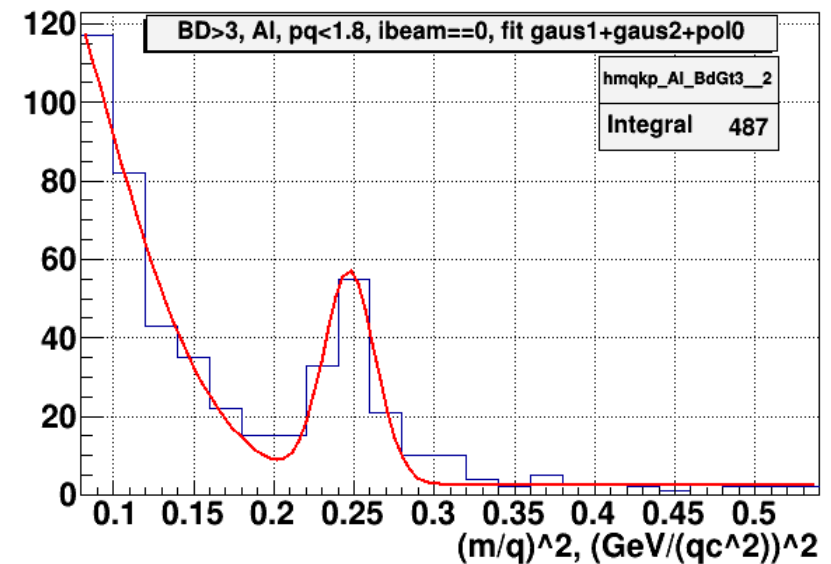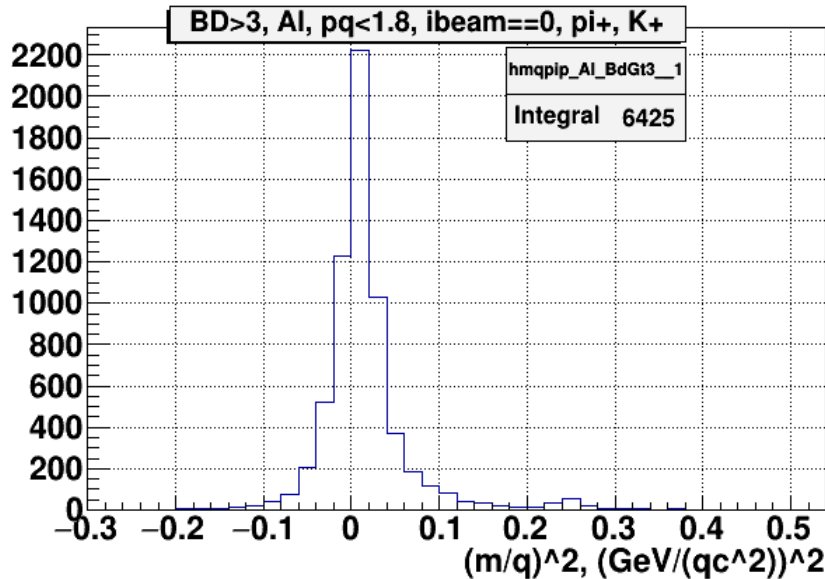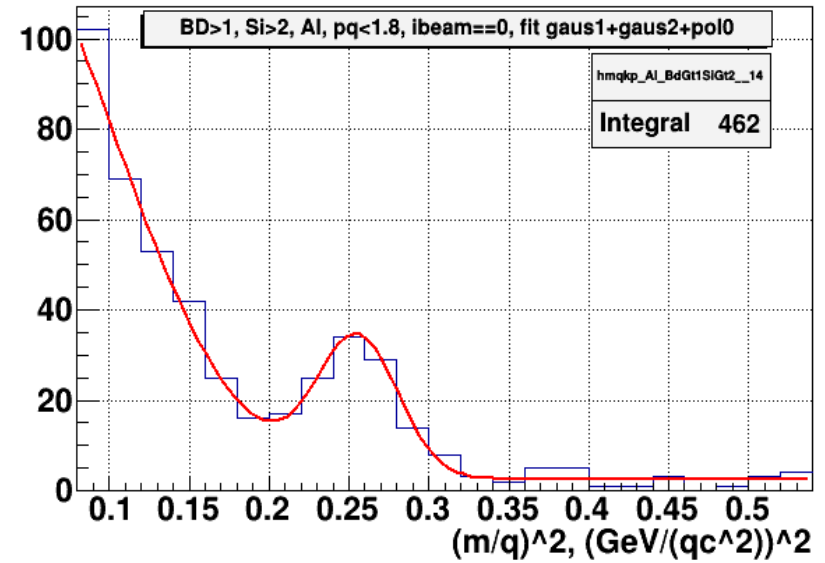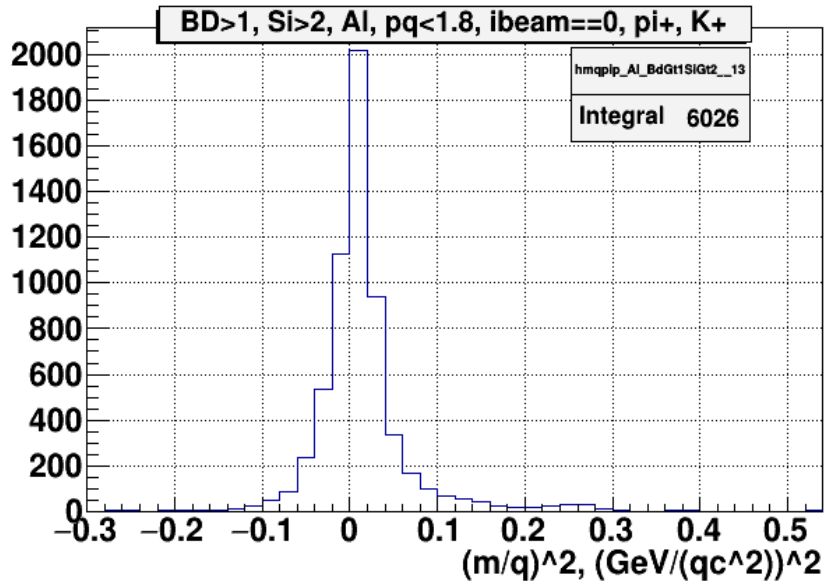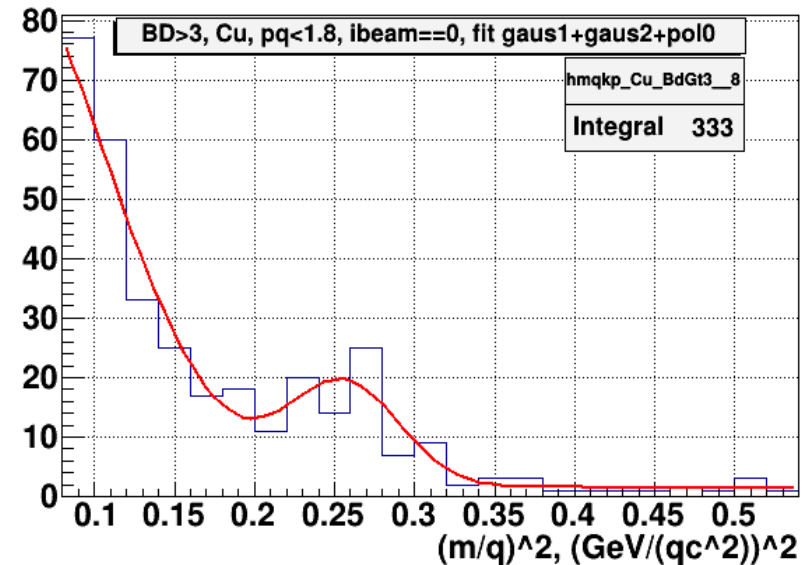# Backup

Control Plots, C, ibeam==0

Control Plots, Al, ibeam==0

Control Plots, Cu, ibeam==0
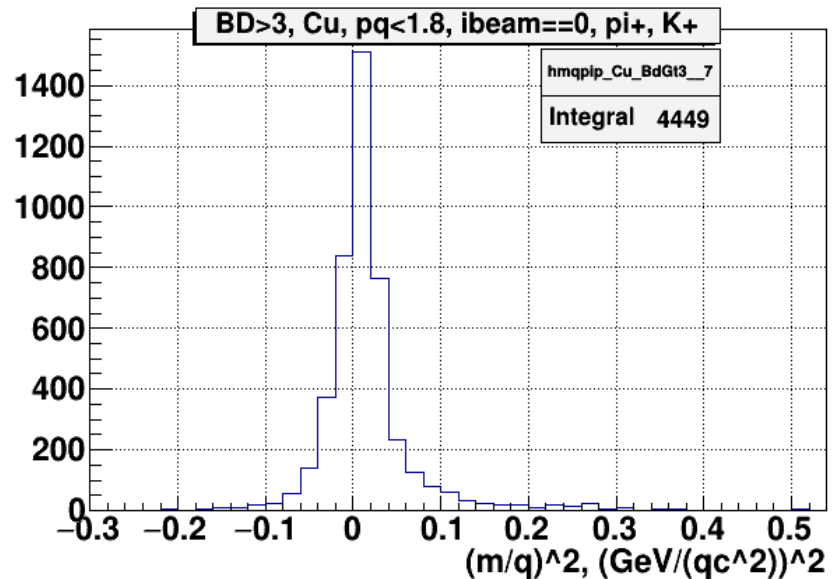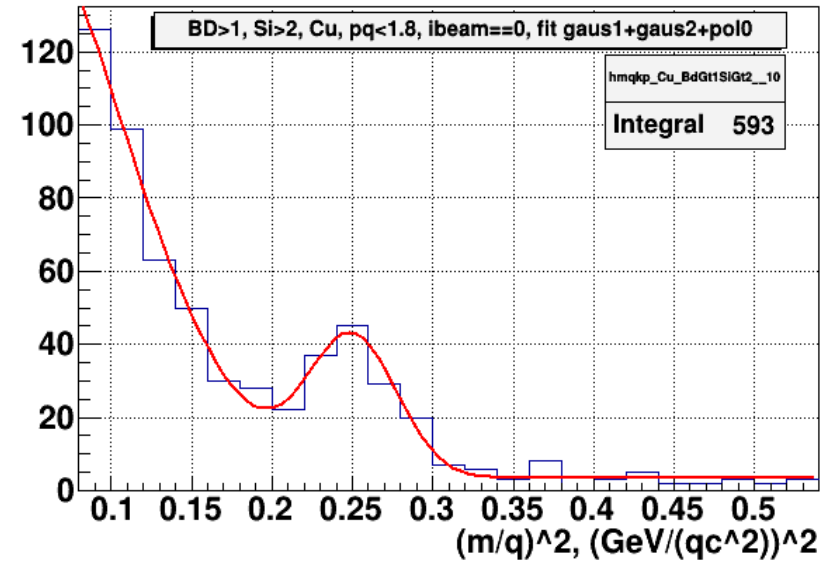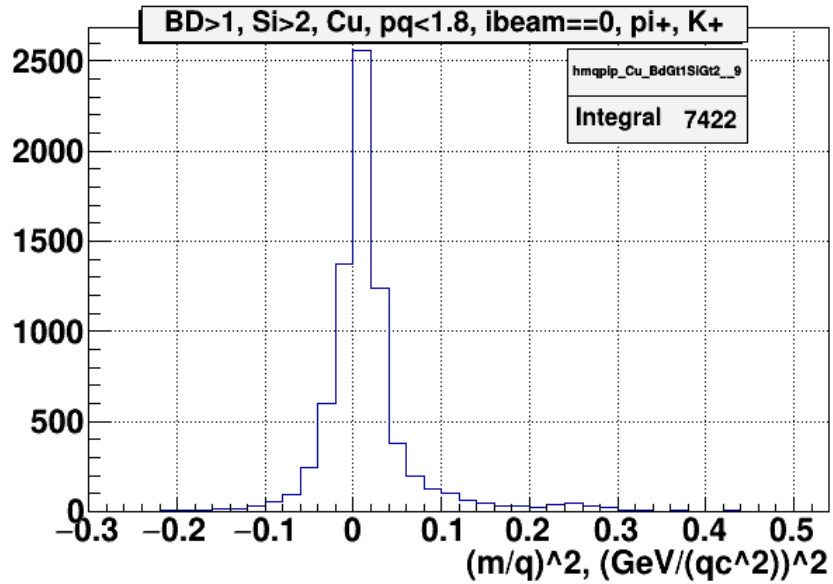
Control Plots, Sn, ibeam==0
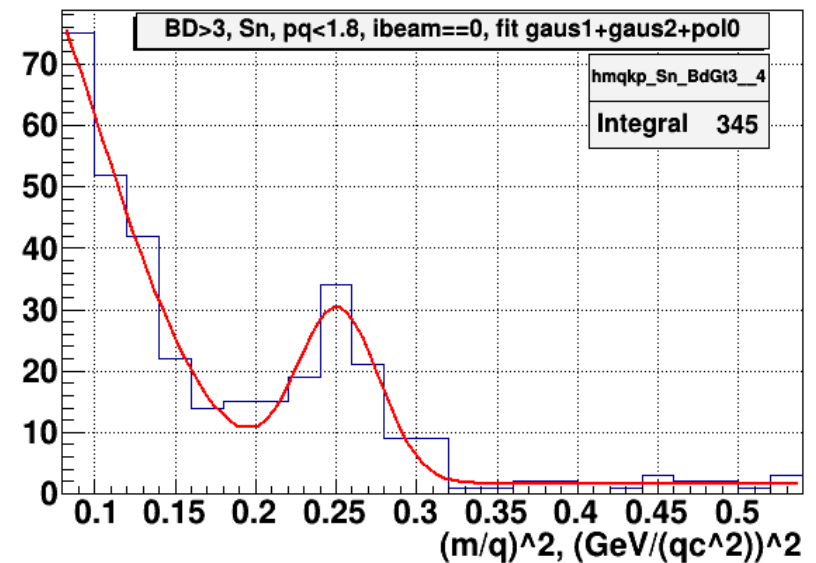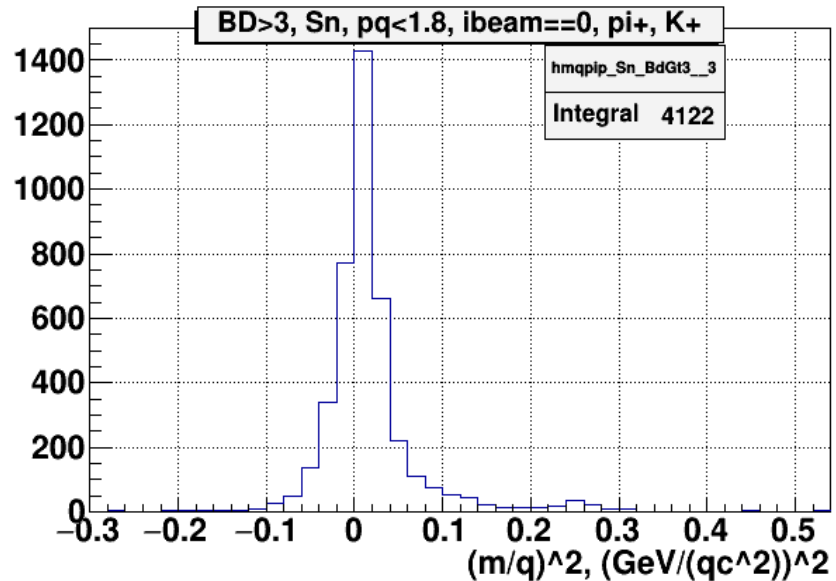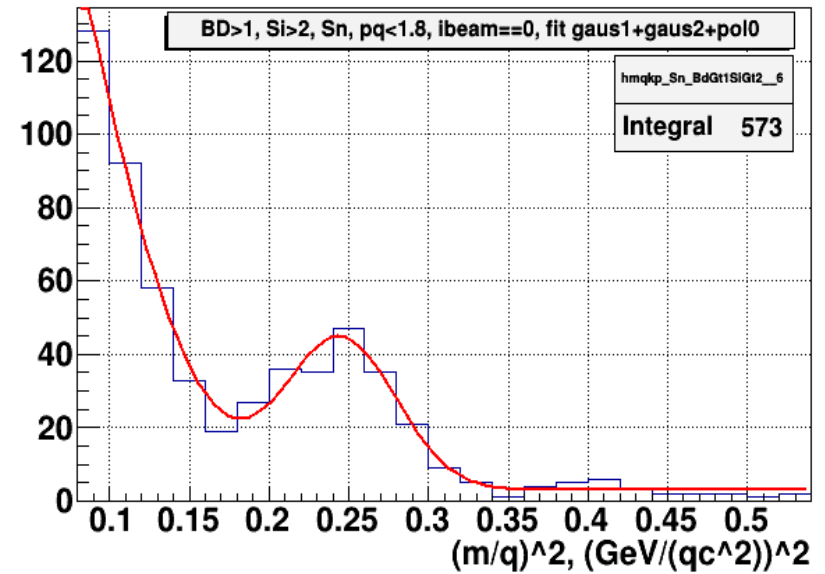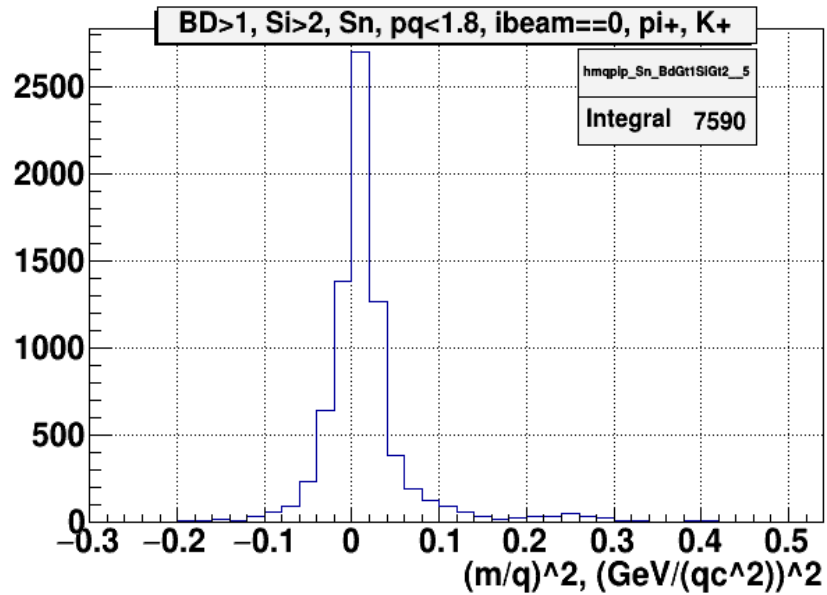
Control Plots, Pb, ibeam==0
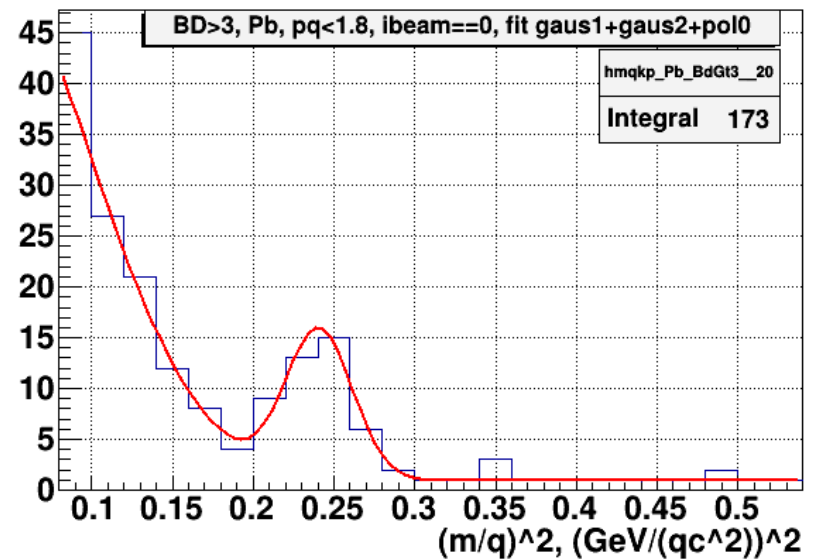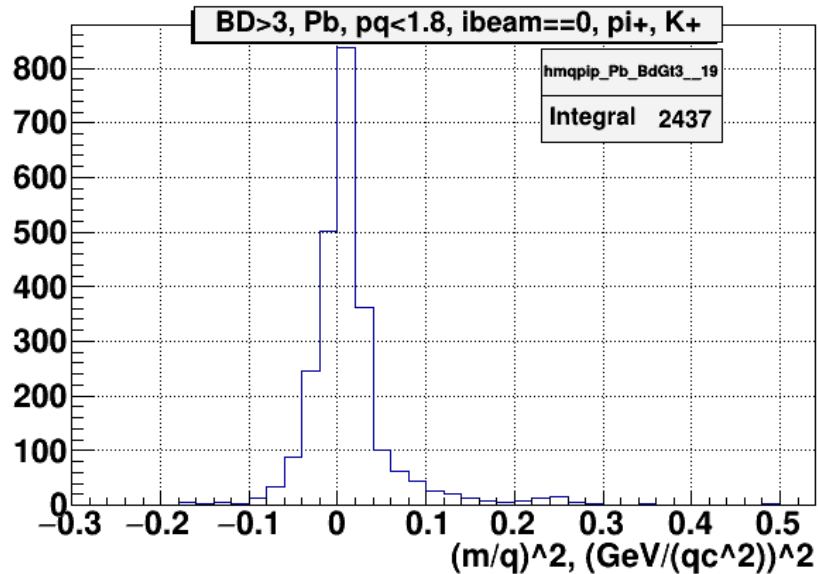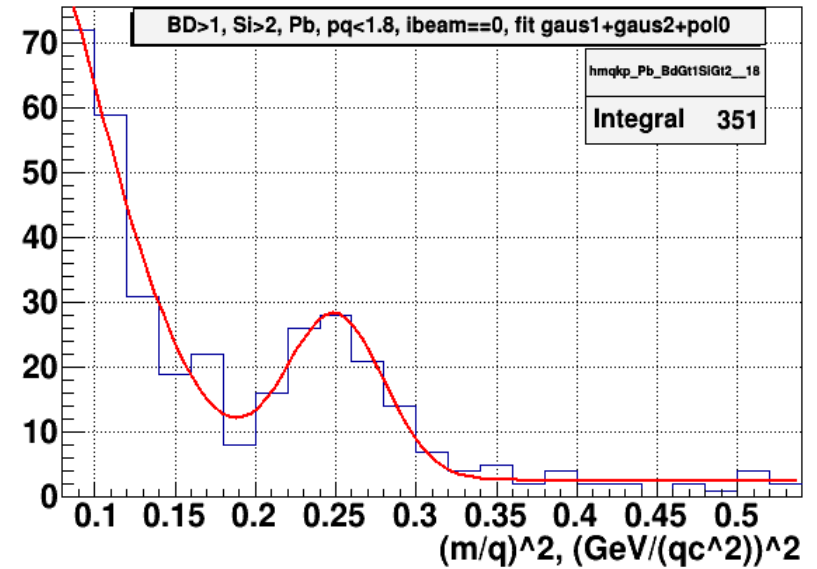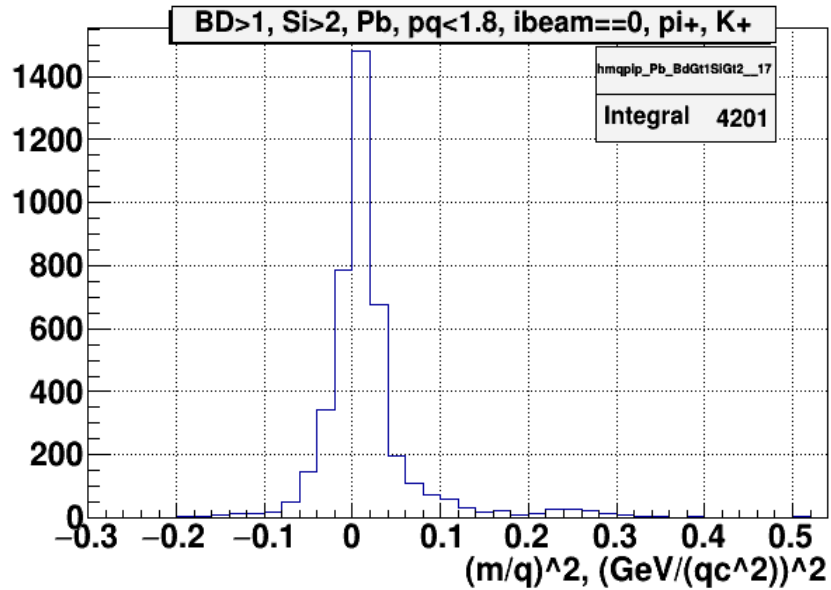
Kaon identification results

Trigger /Target	Number of good tracks in CSC	K_+, number N_K	bkg, number N_{bkg}	K_+/bkg	Significance
BD>1 && Si>2/C	36551	20 ± 5	5 ± 2	4.4	4.1
BD>3/C	41566	18 ± 6	8 ± 3	2.3	3.6

- $0.2 < (m/q)^2 < 0.3$ $(GeV/(qc^2))^2$
- Background error, σ_{K+bkg}, – from fitting
- $\sigma_{K+} = \sqrt{(N_{K+bkg} + \sigma_{K+bkg}^2)}$, $N_{K+bkg} = N_K + N_{bkg}$.

Kaon identification results

Trigger /Target	Number of good tracks in CSC	K_+, number N_K	bkg, number N_{bkg}	K_+/bkg	Significance
BD>1 && Si>2/Al	130859	92±12	27±4	3.4	8.4
BD>3/Al	141390	114±12	20±4	5.7	9.9
BD>1 && Si>2/Cu	164473	119±13	34±5	3.6	9.7
BD>3/Cu	97587	60±10	17±4	3.5	6.8

Kaon identification results

Trigger /Target	Number of good tracks in CSC	$K+$, number N_K	bkg, number N_{bkg}	$K+$/bkg	Significance
BD>1 && Si>2/Sn	162537	153±14	21±4	7.1	11.6
BD>3/Sn	92288	83±10	15±4	5.4	8.3
BD>1 && Si>2/Pb	87551	88±11	17±4	5.0	8.5
BD>3/Pb	53559	37±7	8±3	5.0	5.6

Pion identification results

Trigger /Target	Number of good tracks in CSC	π^+, number N_π	bkg, number N_{bkg}	π_+/bkg	Significance
BD>1 && Si>2/C	36551	1408±38	18±5	79	37
BD>3/C	41566	1701±42	13±5	134	41

- $-0.2 < (m/q)^2 < 0.2$ $(GeV/(qc^2)^2$
- Background error, $\sigma_{\pi+bkg}$, – from fitting
- $\sigma_{\pi+} = \sqrt{(N_{\pi+bkg} + \sigma_{\pi+bkg}^2)}$, $N_{\pi+bkg} = N_\pi + N_{bkg}$.

Pion identification results

Trigger /Target	Number of good tracks in CSC	π^+, number N_π	bkg, number N_{bkg}	π_+/bkg	Signifi cance
BD>1 && Si>2/Al	130859	5801±77	52±10	111	76
BD>3/Al	141390	6197±80	53±10	118	78
BD>1 && Si>2/Cu	164473	7140±86	72±11	99	84
BD>3/Cu	97587	4304±66	35±8	122	65

Pion identification results

Trigger /Target	Number of good tracks in CSC	π^+, number N_π	bkg, number N_{bkg}	π_+/bkg	Significance
BD>1 && Si>2/Sn	162537	7285±86	78±11	94	85
BD>3/Sn	92288	3954±64	35±8	114	63
BD>1 && Si>2/Pb	87551	4001±64	56±10	71	63
BD>3/Pb	53559	2361±49	19±6	124	48