THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

$K^0_L + p \rightarrow \pi^+ + \Lambda$

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K LONG FACILITY

Jefferson Lab

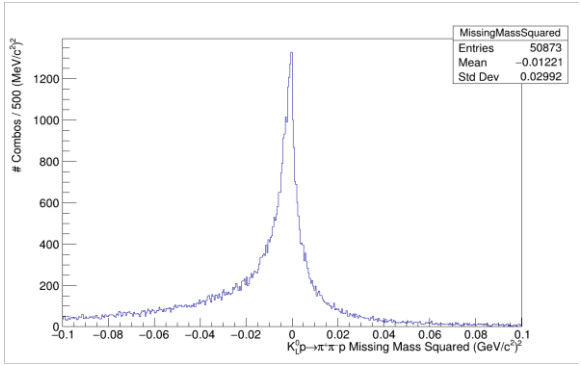
KL4 RXN AND GENERATING STEPS

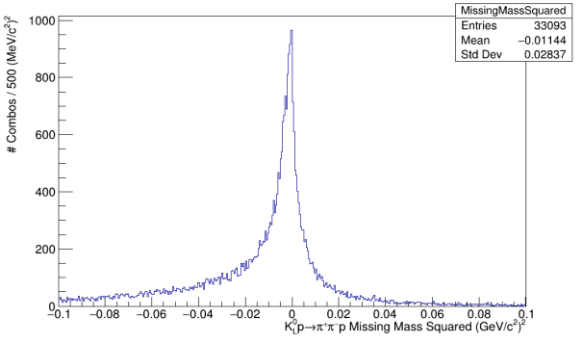
- Kl4 : $K^0_L + p \rightarrow \pi+ + \Lambda$
  - $\Lambda \rightarrow p + \pi^-$ (63.9%) ; Current priority
  - $\Lambda \rightarrow n + \pi^0$ (35.8%)
- Generated histograms/root files (Monitoring Histograms, ReactionFilter, mcthrown_tree)
  - hd_root --nthreads=8 -PPLUGINS=PEVENTRFBUNCH:USE_TAG=KLong -PVERTEX:USEWEIGHTEDAVERAGE=1 -PPLUGINS=monitoring_hists foo_smeared.hddm
  - hd_root --nthreads=8 -PPLUGINS=PEVENTRFBUNCH:USE_TAG=KLong -PVERTEX:USEWEIGHTEDAVERAGE=1 -PPLUGINS=ReactionFilter –PReaction1=10_14__8_18 foo_smeared.hddm
  - hd_root --nthreads=8 -PPLUGINS=PEVENTRFBUNCH:USE_TAG=KLong -PVERTEX:USEWEIGHTEDAVERAGE=1 -PPLUGINS=mcthrown_tree foo_smeared.hddm

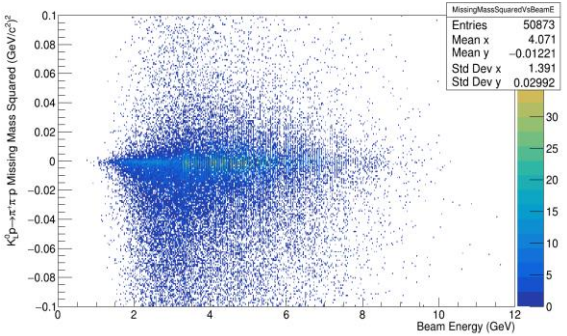
M^2_X Pre and Post Kinematic Fit : KL4

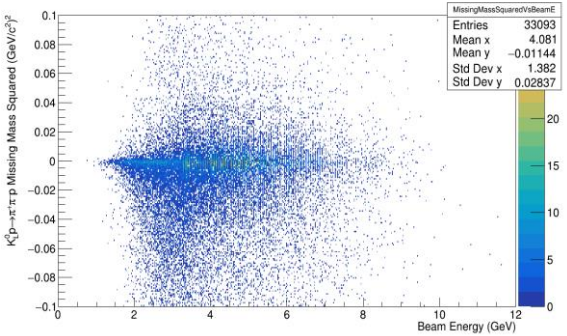
Left(Right) columns are pre(post) kinematic fitting

- Results from the rxn filter hd_root file
- More than half of the events have a negative value of M^2_x
- This is also shown in the KL5 and KL6 files.



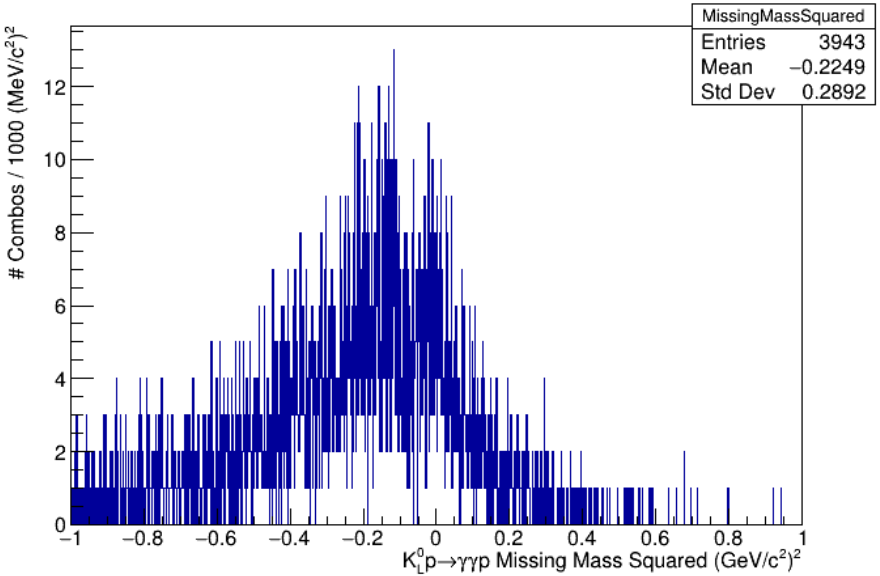


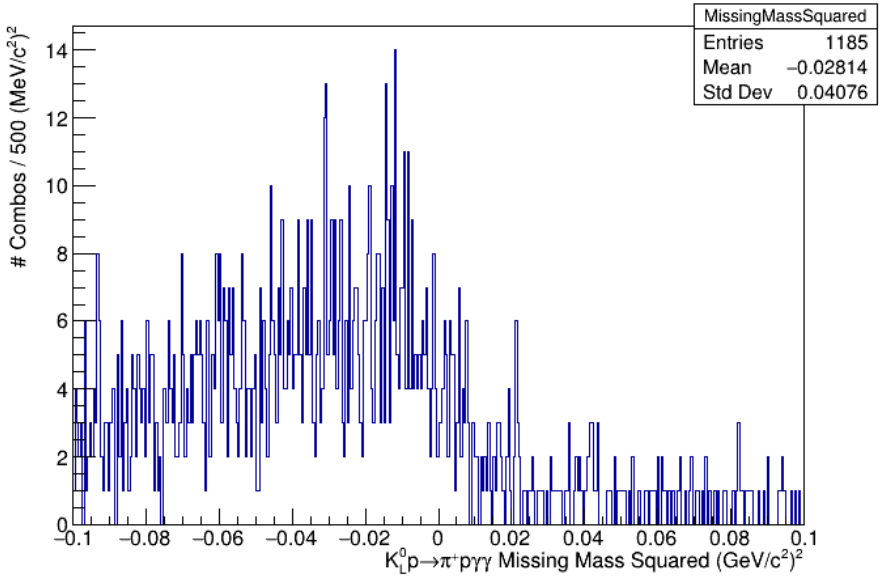




M^2_X Post Kinematic Fit : KL5 ($K^0_L + P \rightarrow \Pi^0 + \Sigma^+$) & KL6 ($K^0_L + P \rightarrow \Pi^+ + \Sigma^0$)

Right(left) plots are the M^2_x distributions for KL5(KL6)

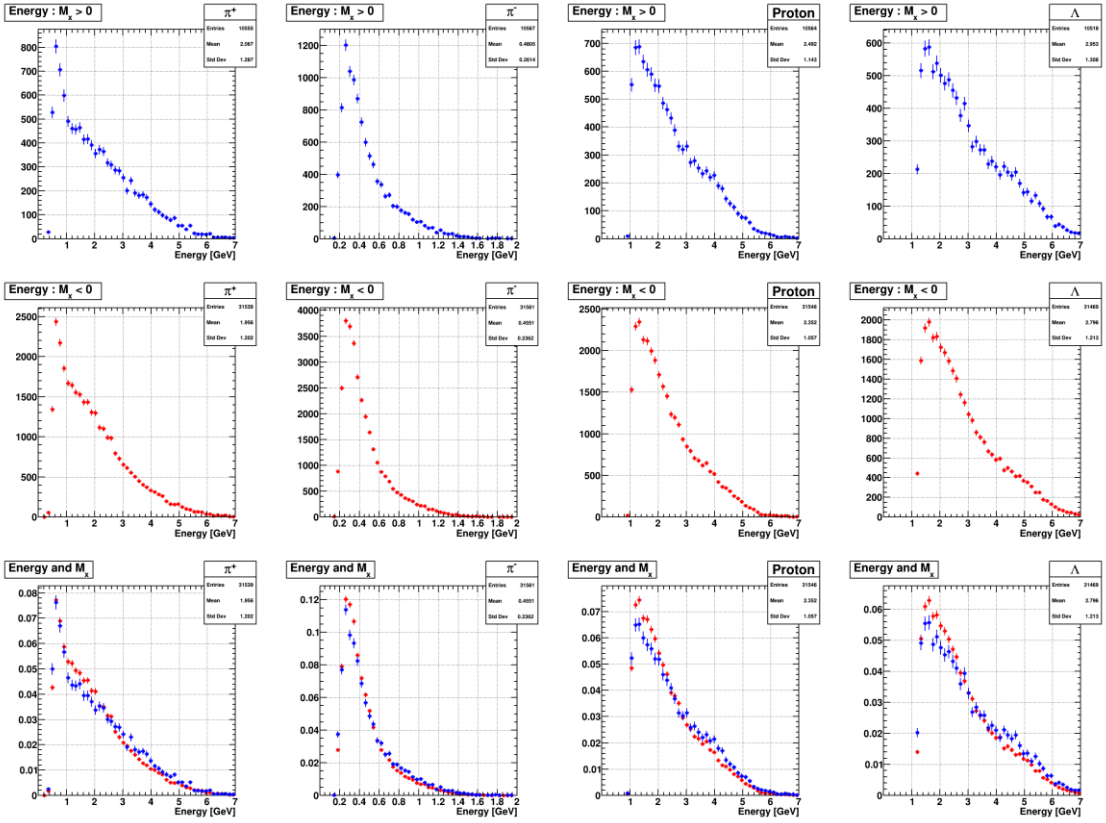




PARTICLES : ENERGY VS M_X

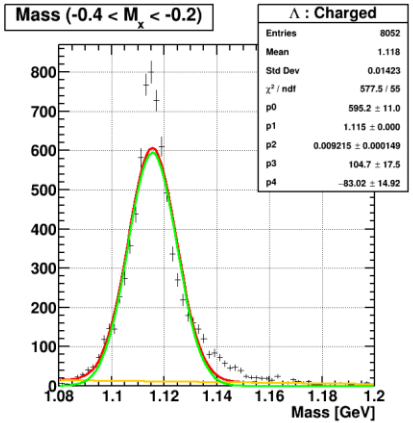
Energy for each particle. Red(Blue) denote M_x>0(M_x<0). Last row is normalized

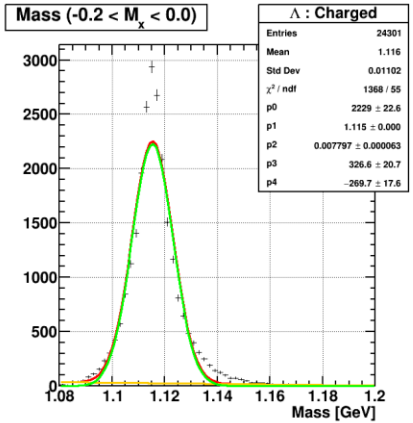
- The shapes of the energy distributions are the same below M_x = 0 as above M_x = 0.
- This is seen also with the theta distributions, which are in the back up slides.

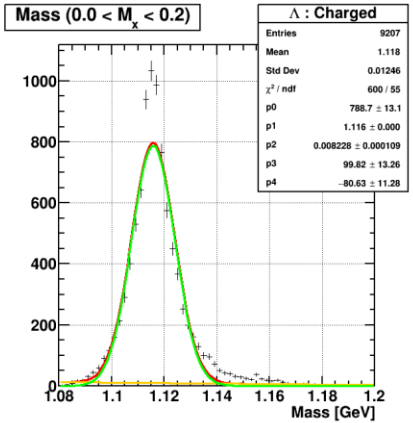


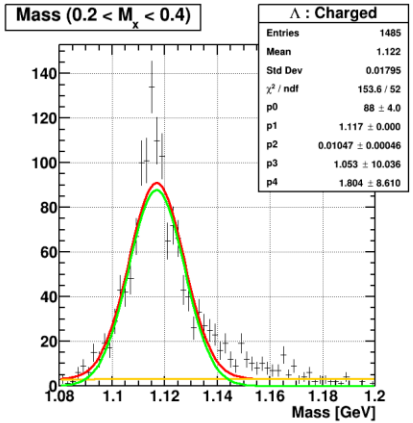
Lambda charged Decay : Mass(M_X)

- There is not a significant difference between the invariant mass distributions of the Λ in the 4 M_x bins or in the M_x greater than or less than zero regions.

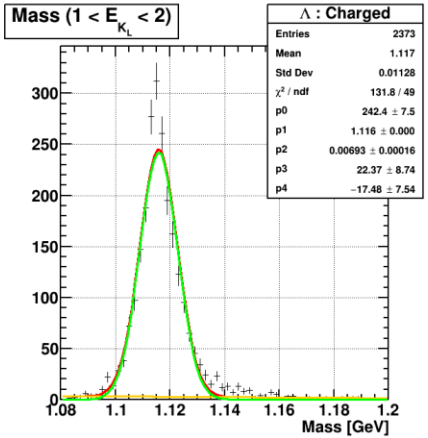


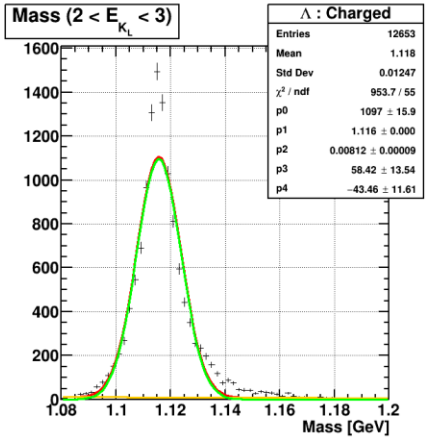


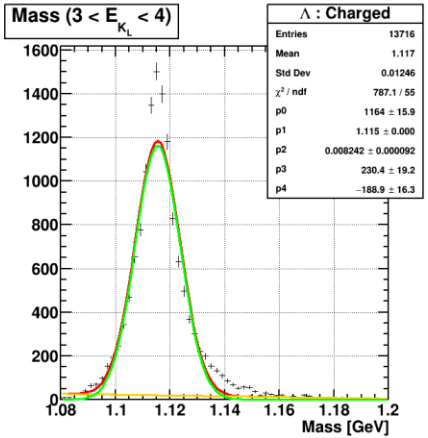


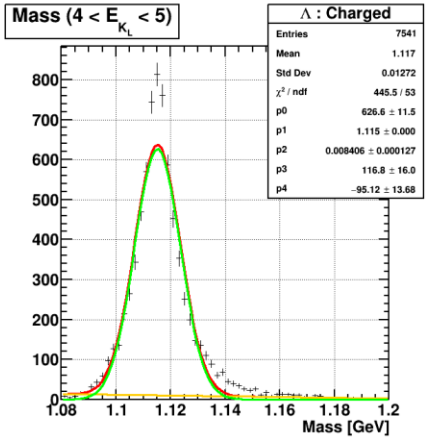


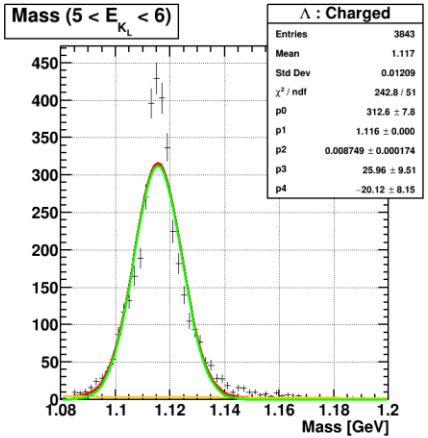
Lambda charged Decay : Mass resolution

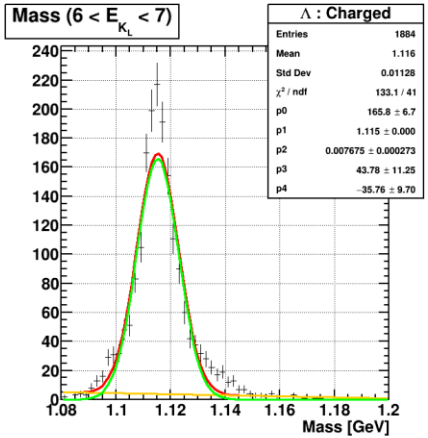


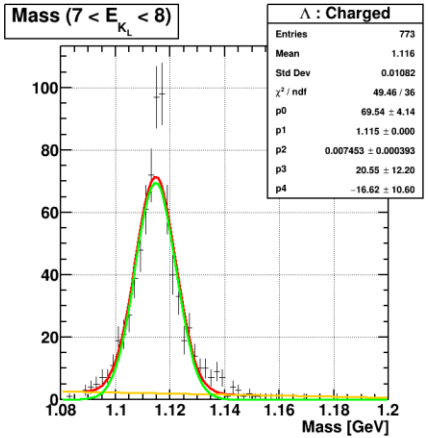












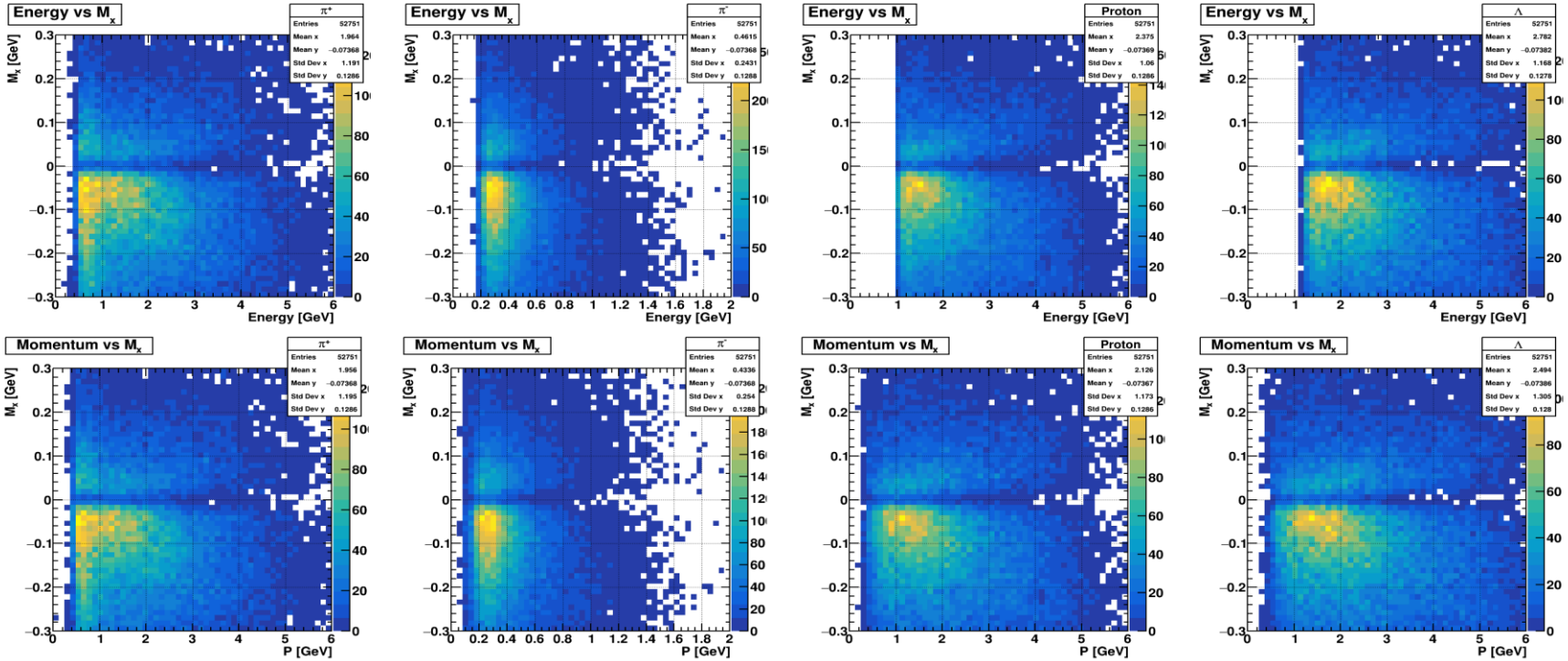
- m_Λ = 1.115 GeV; fits are within 0.1% of this.
- Distributions are sharply peaked.
- Sharper than a gaussian
- Reduced χ^2 is okay
- Pol1 background better fit than none.

Back up slides

Particle Energy and Momentum vs M_X

Top(Bottom) rows show Particle energy(momentum) vs. M_x

- As the plots below show the mean M_x is the same across all particle species

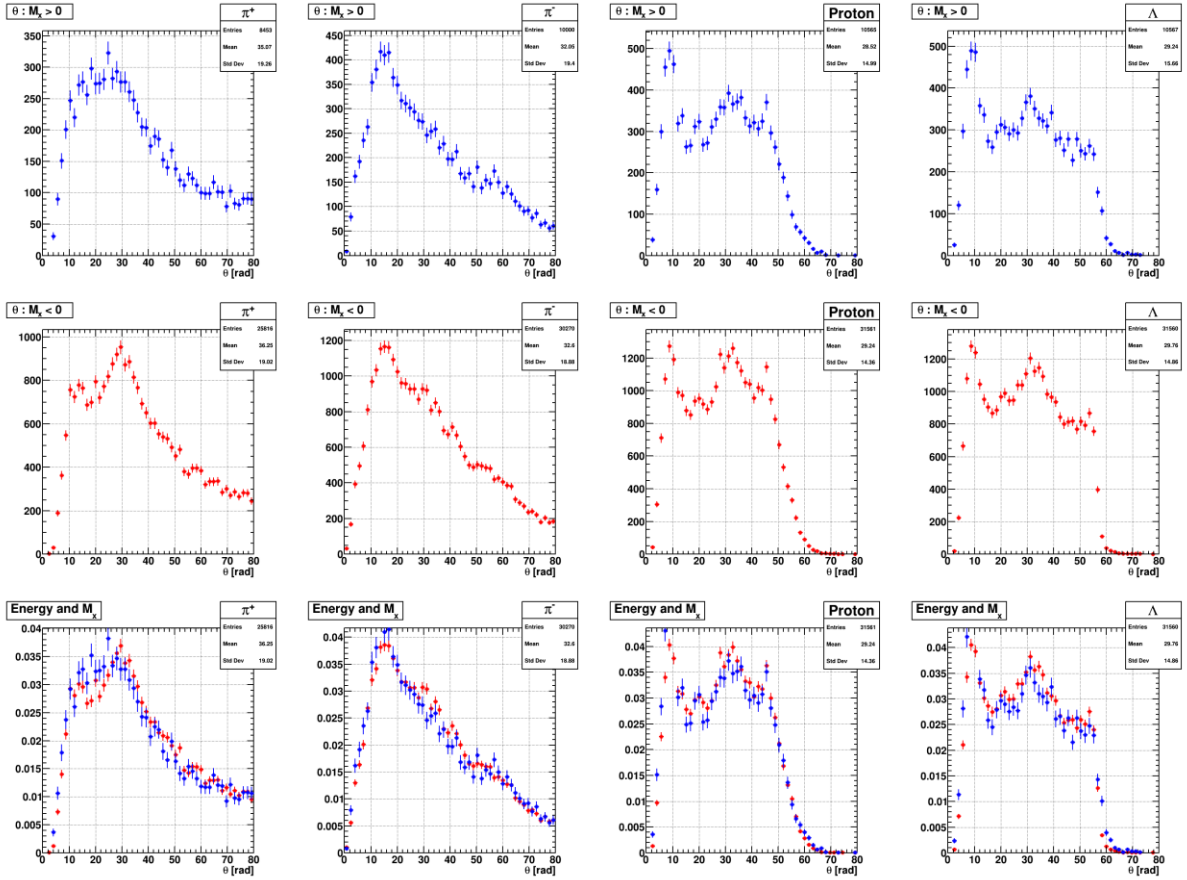


PARTICLES : THETA VS M_X

Theta for each particle.

Red(Blue) denote M_x>0(M_x<0)

Last row is normalized



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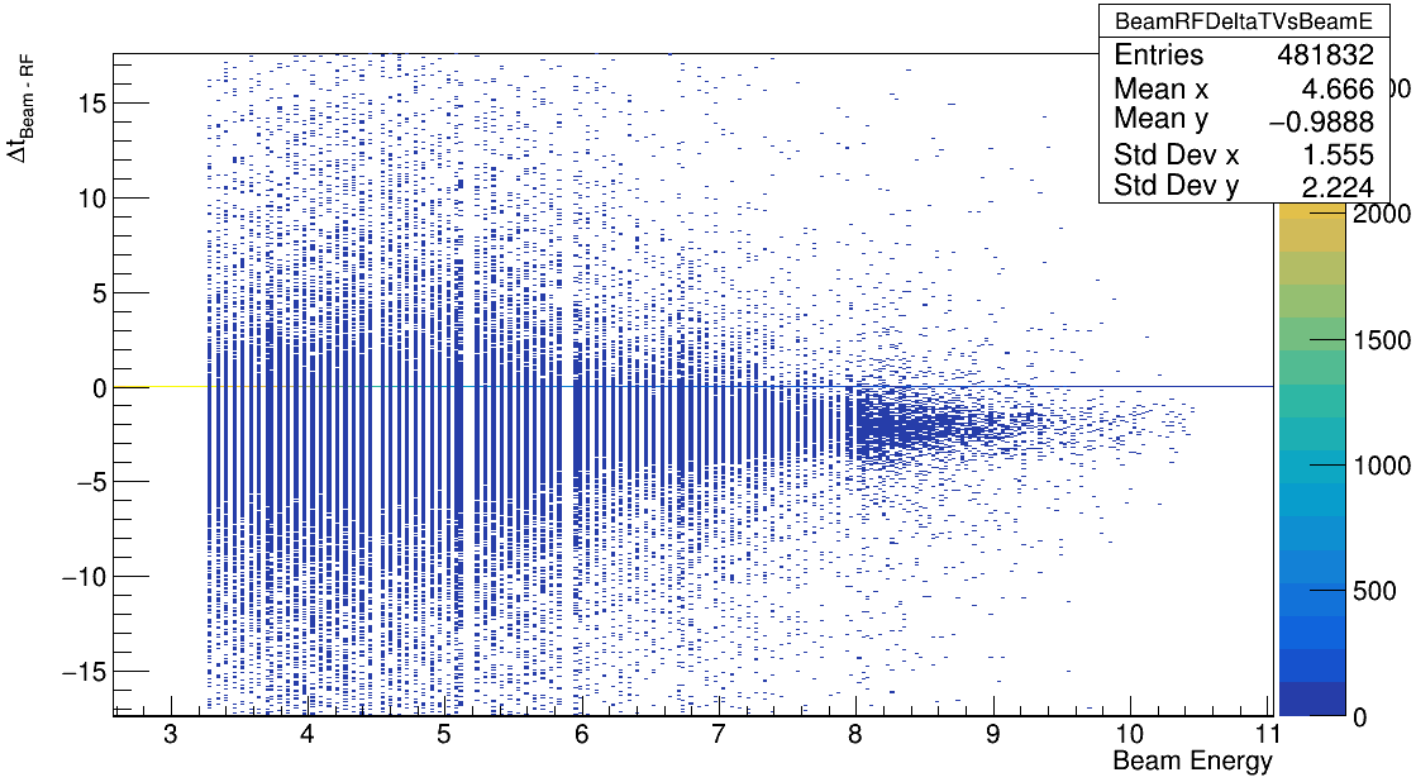
BeamRFDeltaTVsBeamE
Entries 481832
Mean x 4.666
Mean y −0.9888
Std Dev x 1.555
Std Dev y 2.224
Δt Beam - RF
15
10
5
0
−5
−10
−15
3
4
5
6
7
8
9
10
11
Beam Energy
2000
1500
1000
500
0