List of things this talk will discuss:

- Copying the Fall 2017 rest files here
- Creating an Event Driven analysis
- QValue Study with Event Driven Analysis
- Preliminary results of Event Driven analysis

Data Transfer:

- We are copying the newly reconstructed Fall 2017 REST files here
- 3,684 files, 10TB
- The data is being copied by means of Globus
  - FROM: /cache/halld/RunPeriod-2017-01/recon/ver03/REST/
  - TO: /d/grid13/bcannon/RunPeriod-2017-01/recon/REST/
- One problem is that grid13 only has ~5TB of open space available so I have to transfer the data in chunks, then move them to grid12 where there is plenty of space (~13TB)

- As of today, 11/28 directories have been added to grid12 (4.06 TB)
- Another 11 directories have been added to grid13 via Globus (4.67 TB)
- Currently working on moving those file now, should be completed by the end of the day
- All of the data should be on grid12 by the end of the week

Creating an Event Driven Analysis:

- For a given event, loop over all combos and:
- Make cuts:
  - PID Delta T Cuts for all final state particles
  - Beam Energy Cut
  - Beam Timing Cut (allow for 3 bunches to enter for accidental subtraction)
  - Vertex Cuts for all final state particles
  - Fiducial Cuts on low energy photons
  - Proton momentum Cut
  - Only allow Kaons to hit TOF
  - Strangeness Conservation Cut
  - Unused Energy (2 photon) Cut
- For the surviving combos, loop over them again and:
  - Pick the combo with the best MM^2
- This guarantees that only one combo will survive for each event
- Total number of survived events with old reconstruction: ~129k

The Qvalue Approach:

- Idea came from a paper written by Mike Williams and Curtis Meyer "Separating Signals from Non-Interfering Backgrounds using Probabilistic Event Weightings."

- Algorithm:
  - Involves a double loop over all events
  - For a given event, calculate a kinematic distance between that event and all other events
  - Only accept the N nearest neighbors to that event
  - Plot the invariant mass that you are interested in using only the nearest neighbors
  - Fit the invariant mass distribution with a Gaussian plus a polynomial background
  - Estimate the number of signal and background events with the fits
  - Calculate the Qvalue = s / (s+bg)

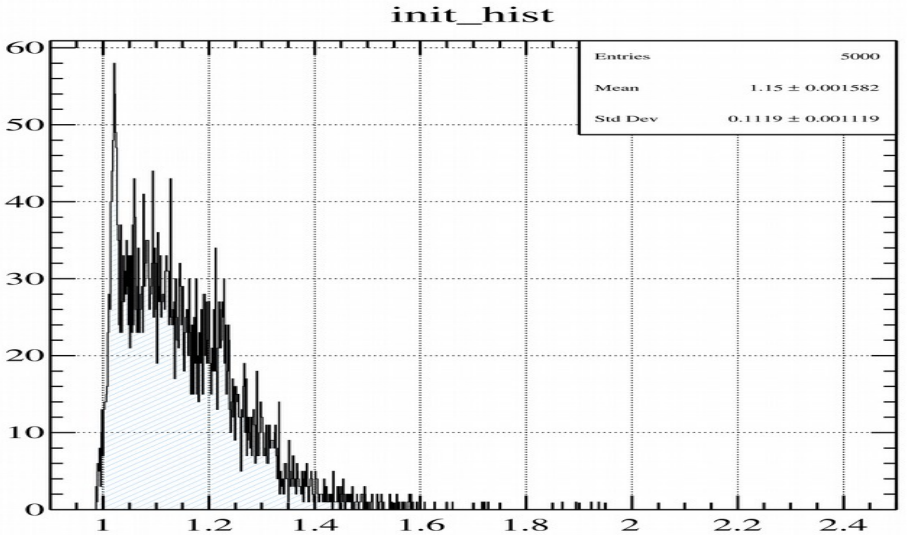
- The idea is if an event close to a resonance, it will have a higher QValue than an event that is farther away

My Qvalue Study:

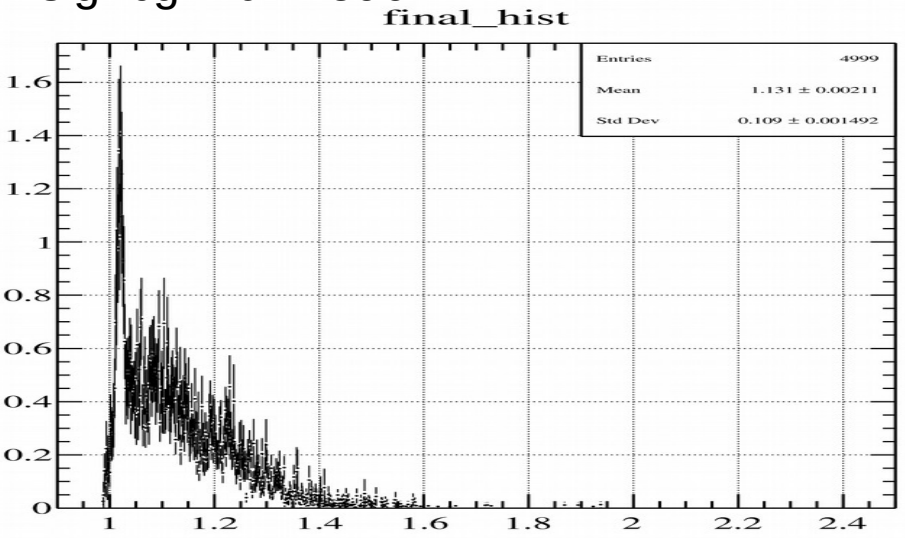
- I tried the study again, only this time I am using the event driven analysis rather than a combo driven analysis
- I am fitting both the phi and eta peaks for each event, then taking the Qvalue from each fit and combining them together to get a final Qvalue = Qval_phi*Qval_eta
- The kinematic distance variables I am using are:
  - K+, cosine and phi in Helicity Frame
  - Photon from Eta, cosine and phi in Helicity Frame
  - Phi Meson, phi and cos in GJ Frame
  - Beam Energy
  - t
  - Missing Energy
  - Missing Mass Squared
- I am using the 3k nearest neighbors
- I only studied the first 5k events because it takes ~5hrs to run the code
- Therefore, it will take ~5.5 days to run over all of the data

Qvalue Results

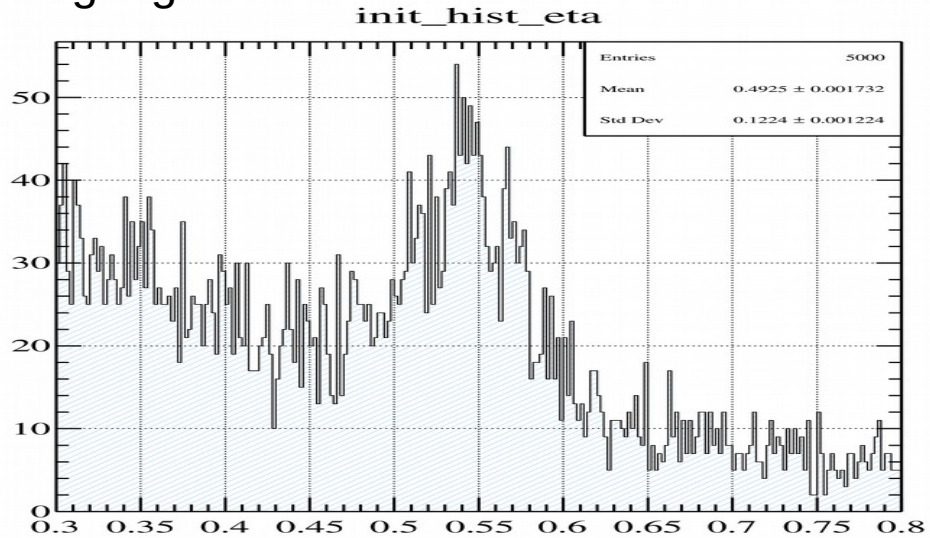
Phi Initial:
Signal = 305.761, Background = 4236.44, sig2bg = 0.0673157



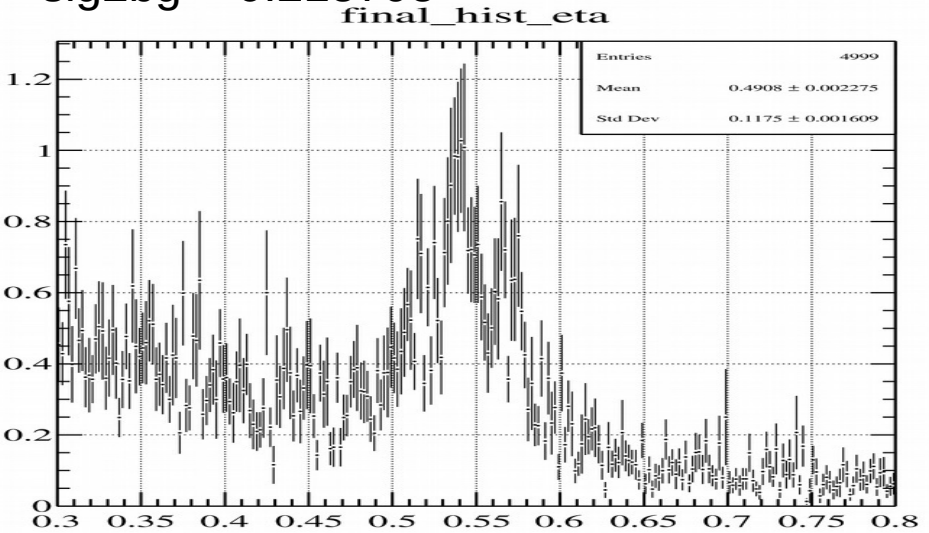
Phi Final:
Signal = 8.03258, Background = 55.735, sig2bg = 0.125967



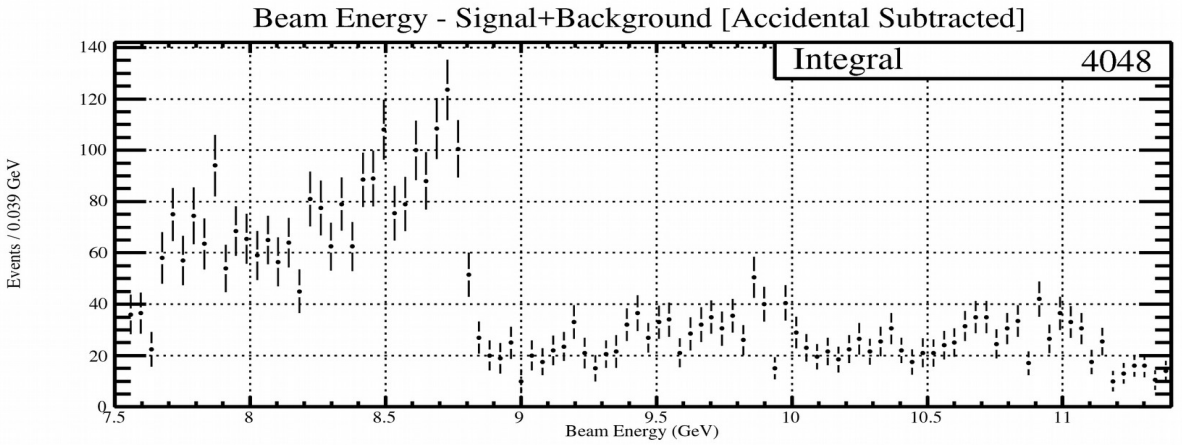
Eta Initial:
Signal = 659.678, Background = 3986.03, sig2bg = 0.141997

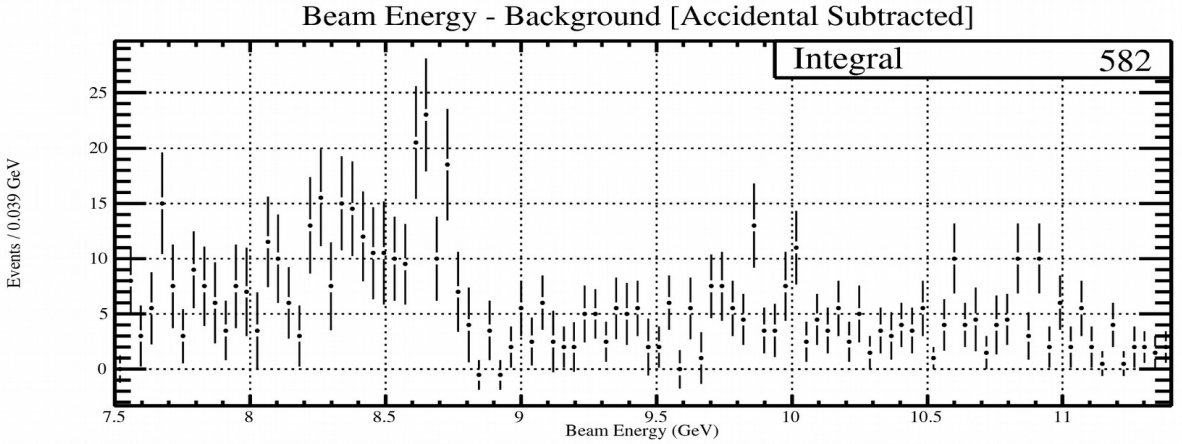


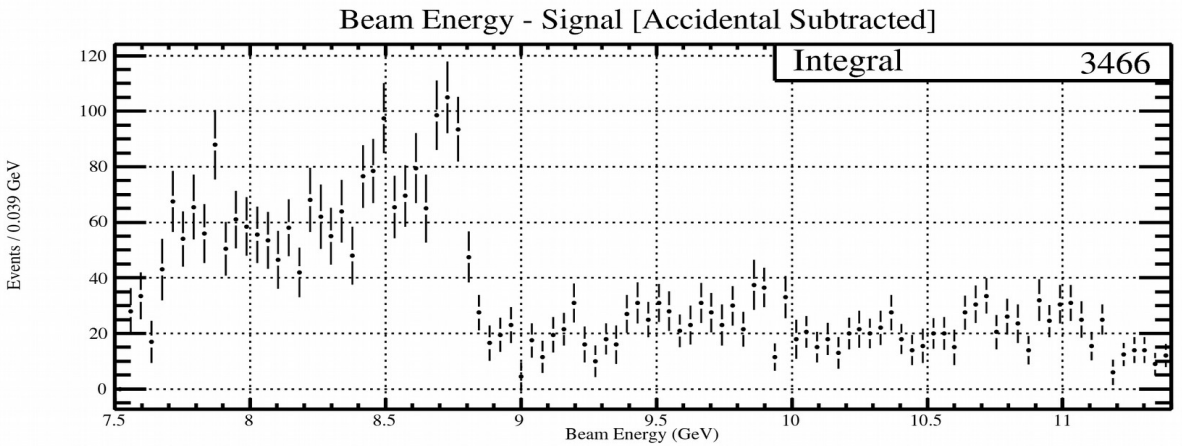
Eta Final:
Signal = 13.4759, Background = 48.9718, sig2bg = 0.215795



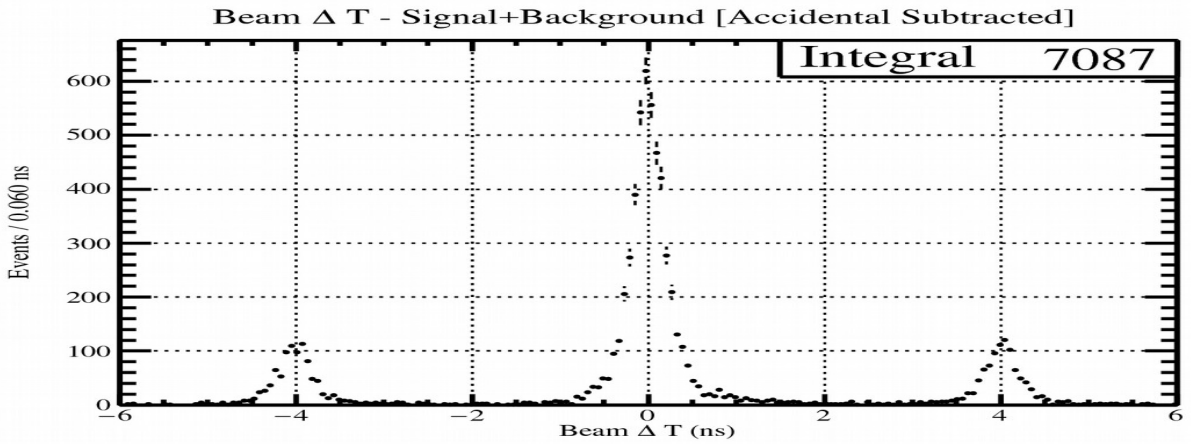
Results for Event Driven Analysis:

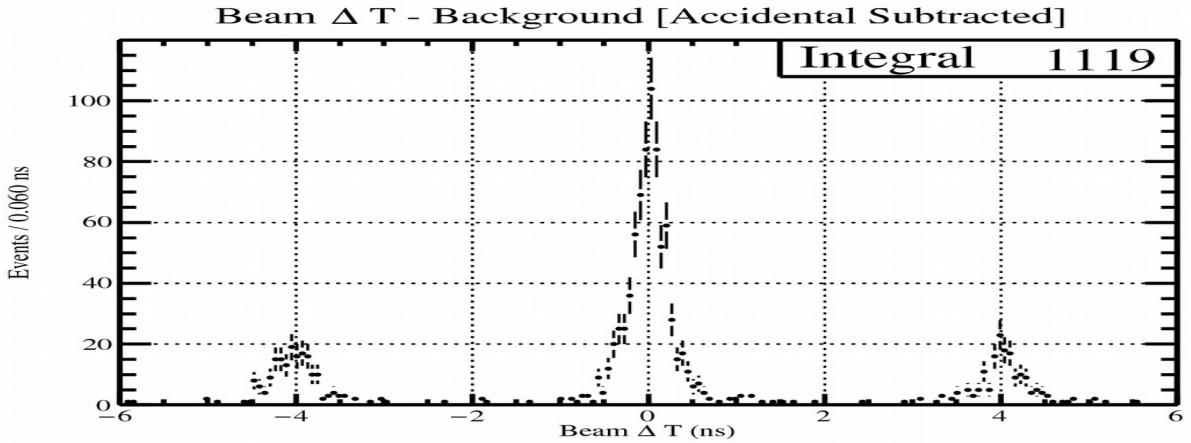


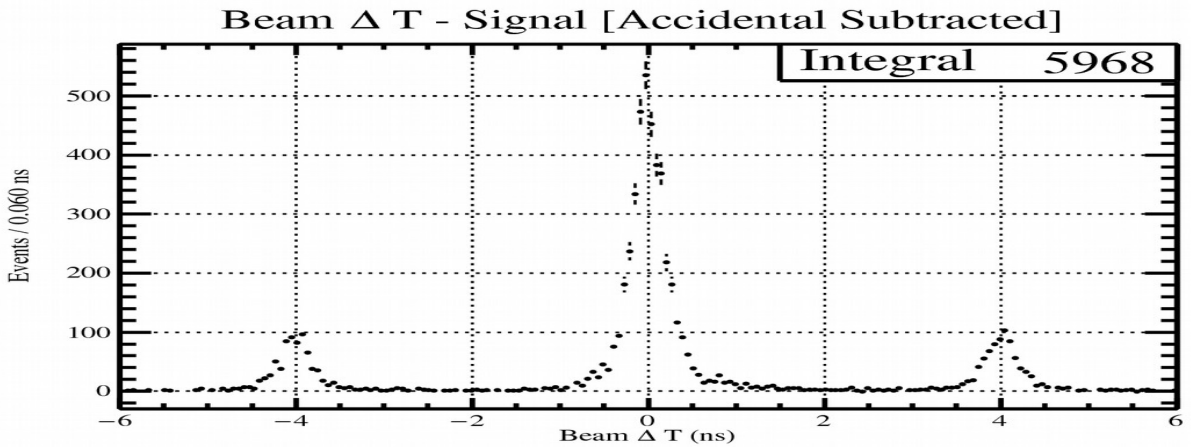




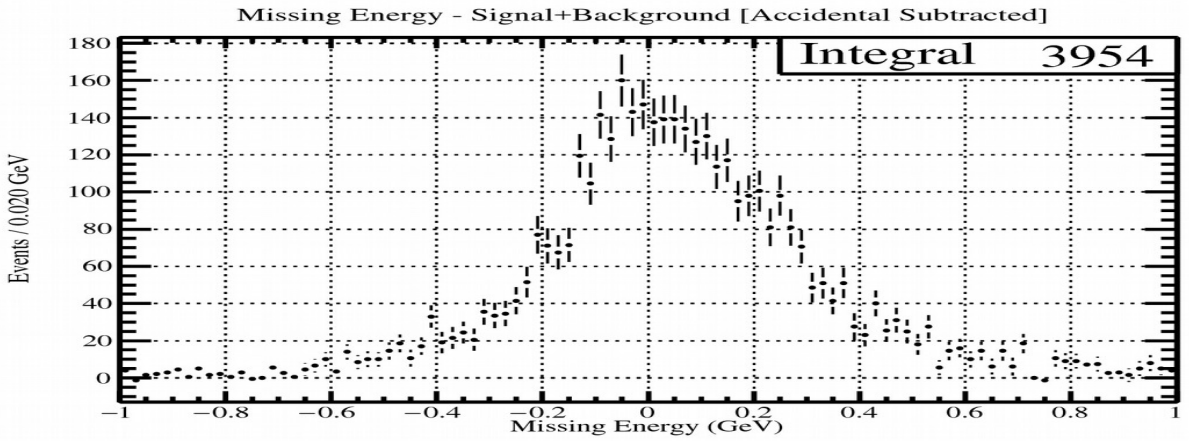
Results for Event Driven Analysis:

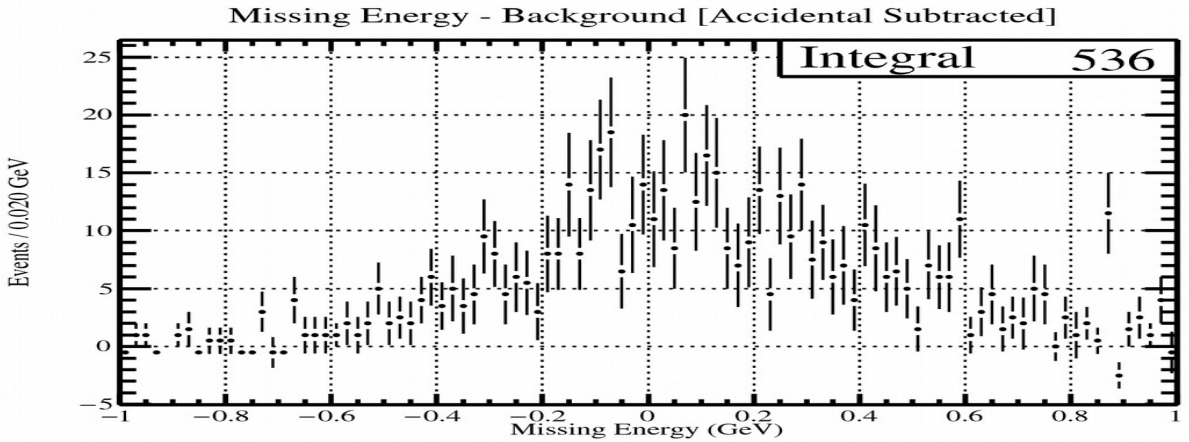


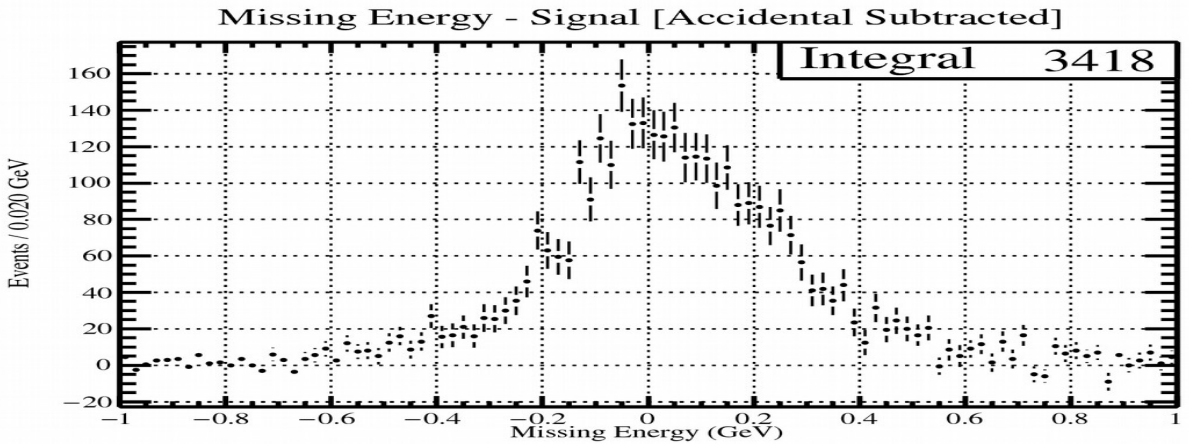




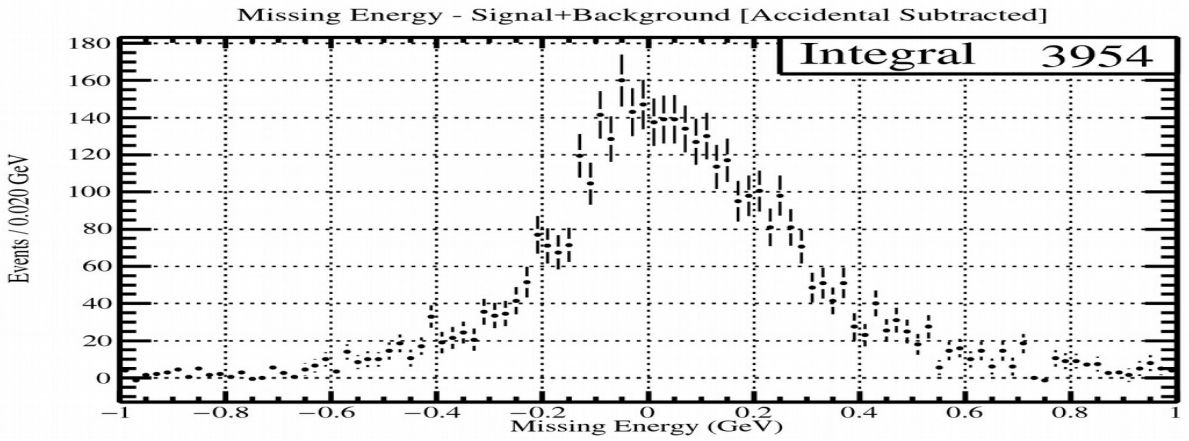
Results for Event Driven Analysis:

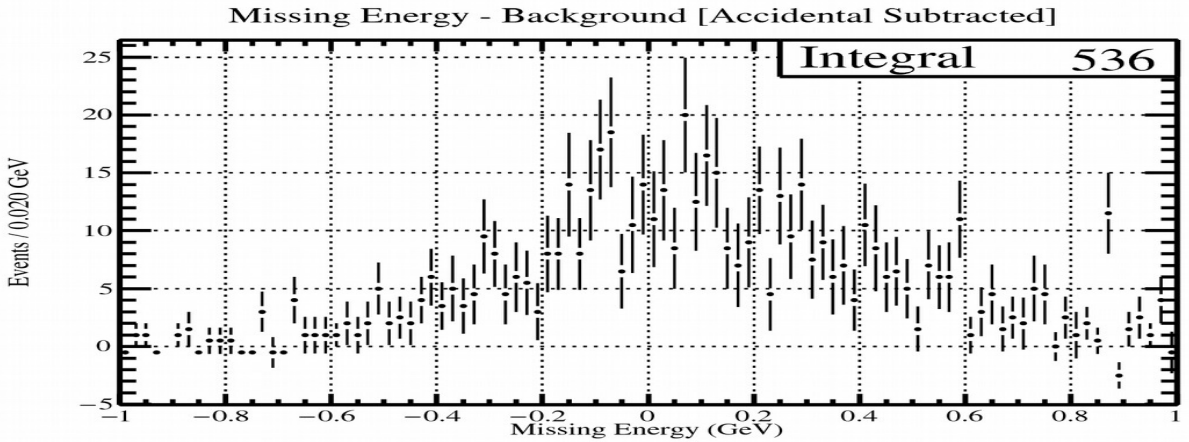


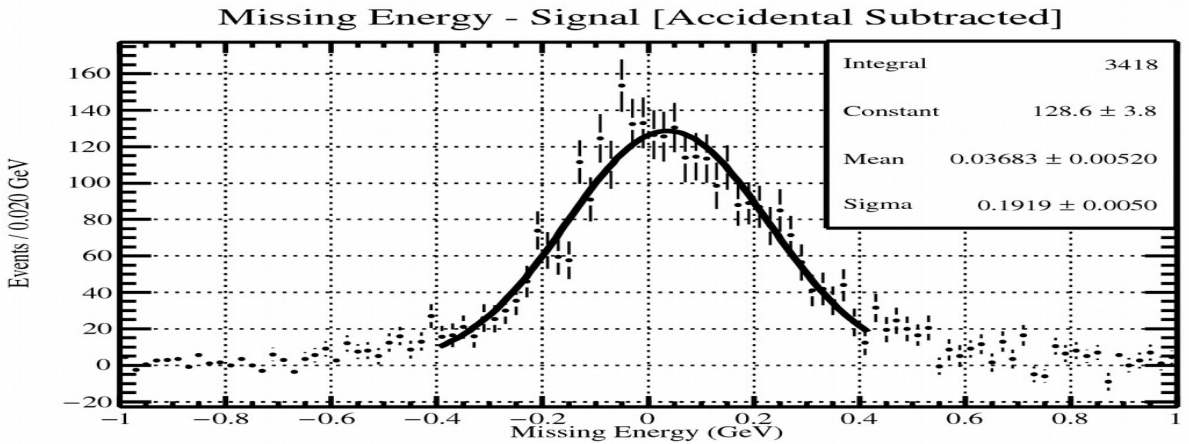




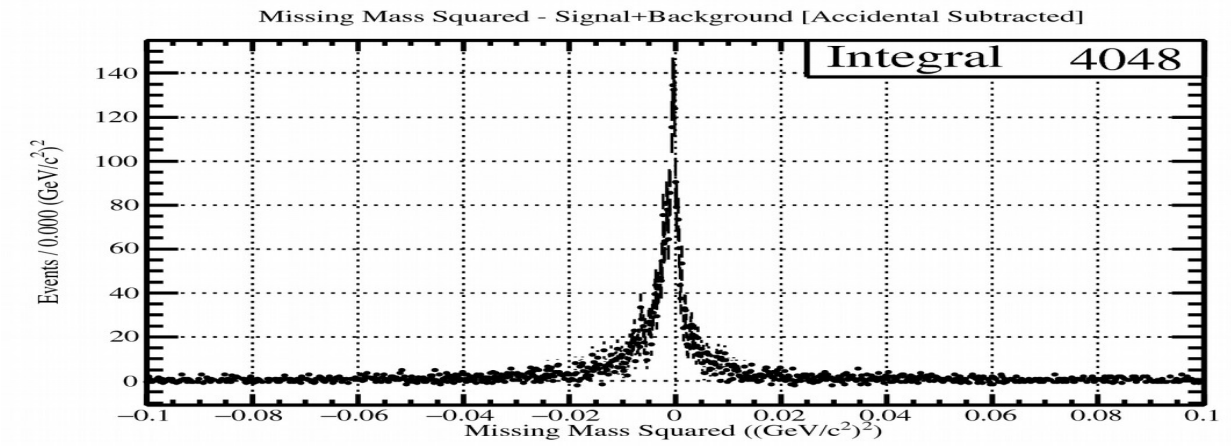
Results for Event Driven Analysis:

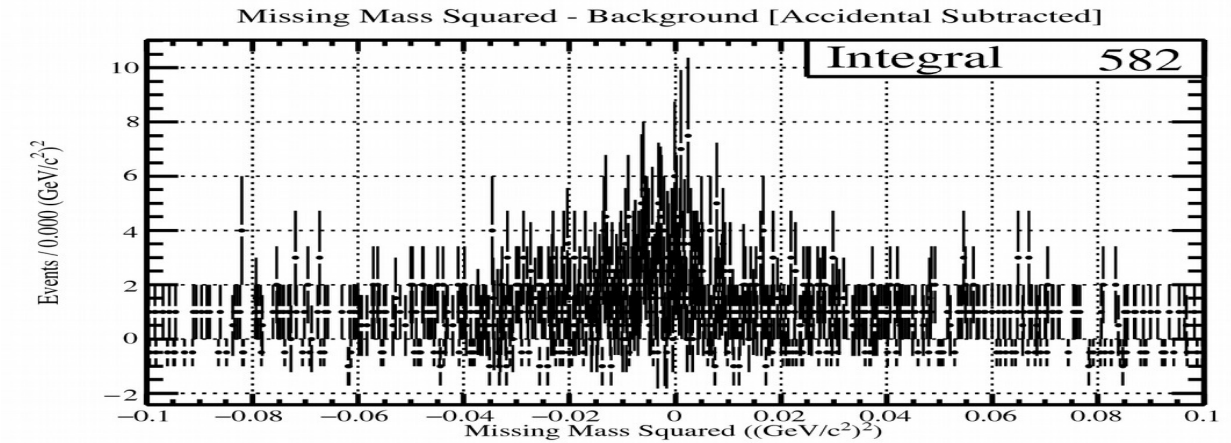


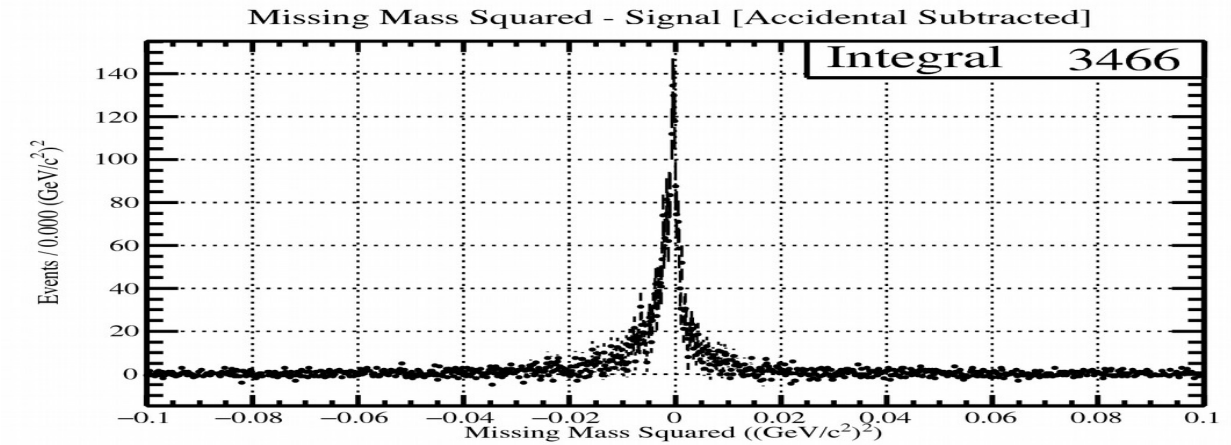




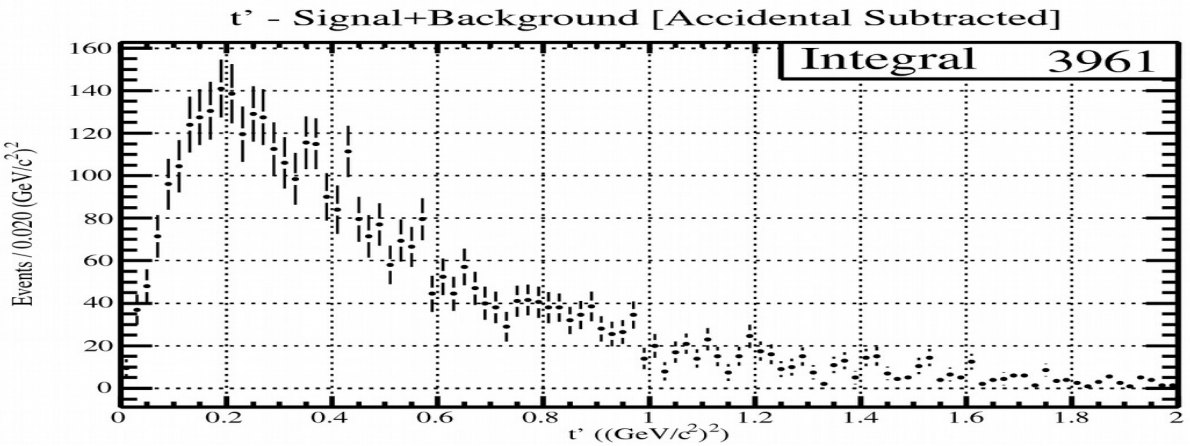
Results for Event Driven Analysis:

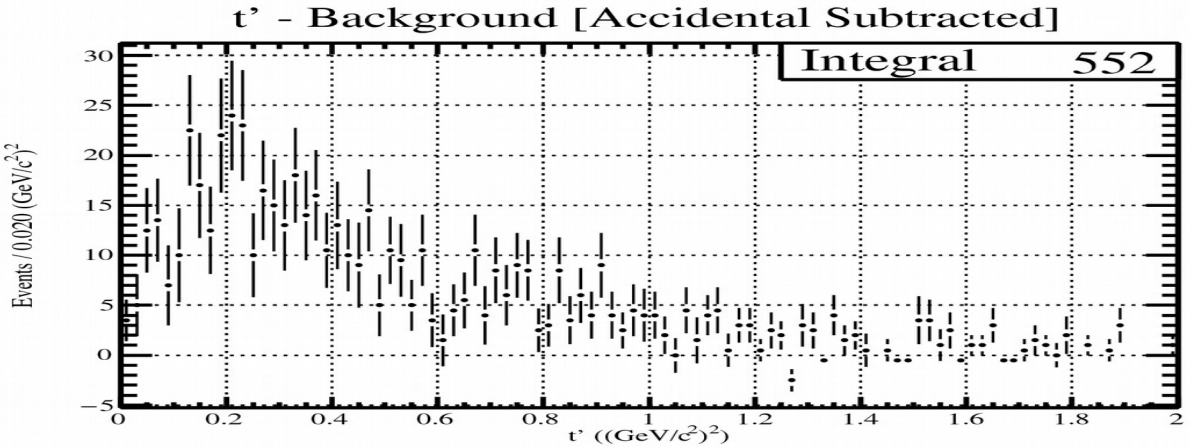


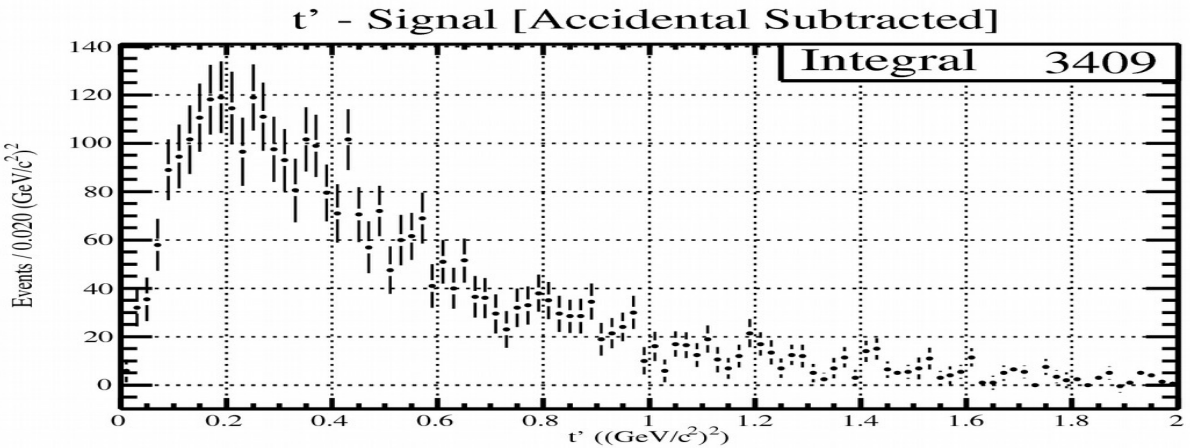




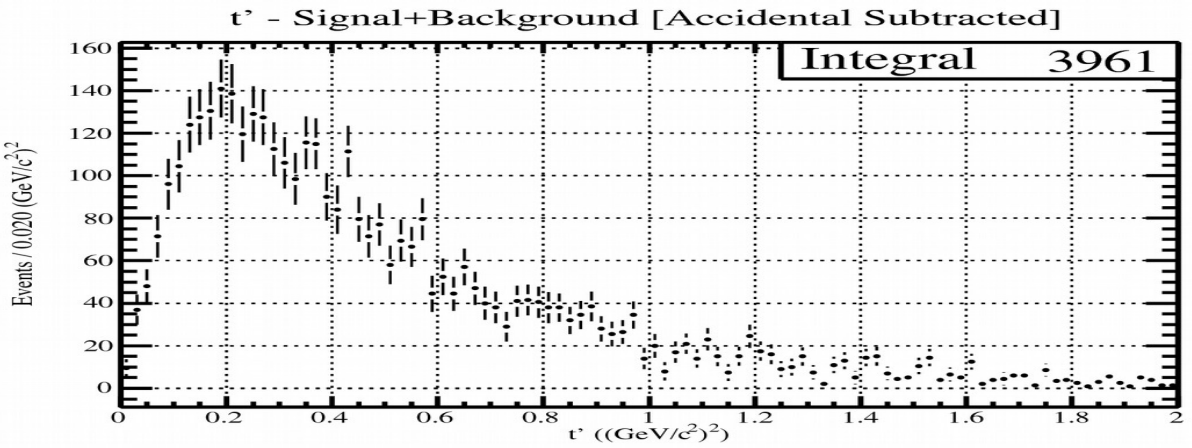
Results for Event Driven Analysis:

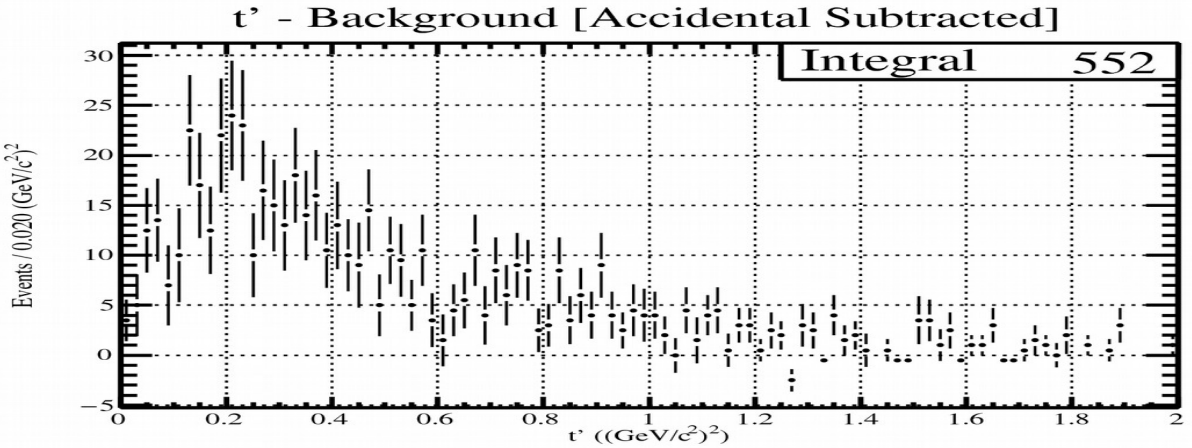


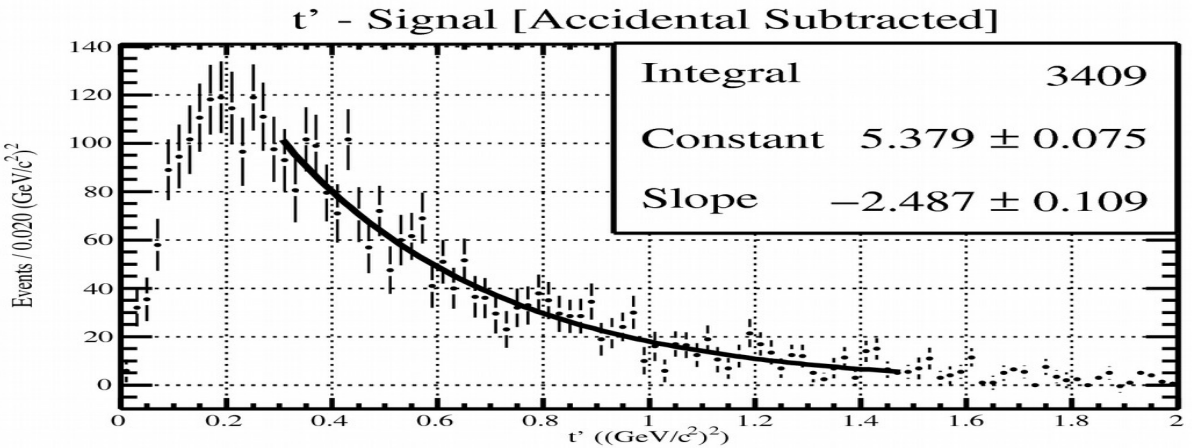




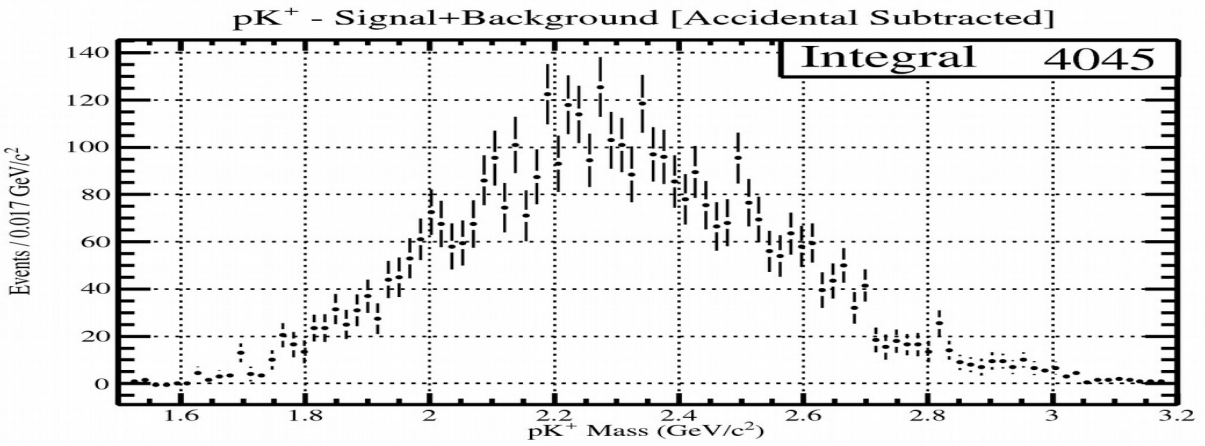
Results for Event Driven Analysis:

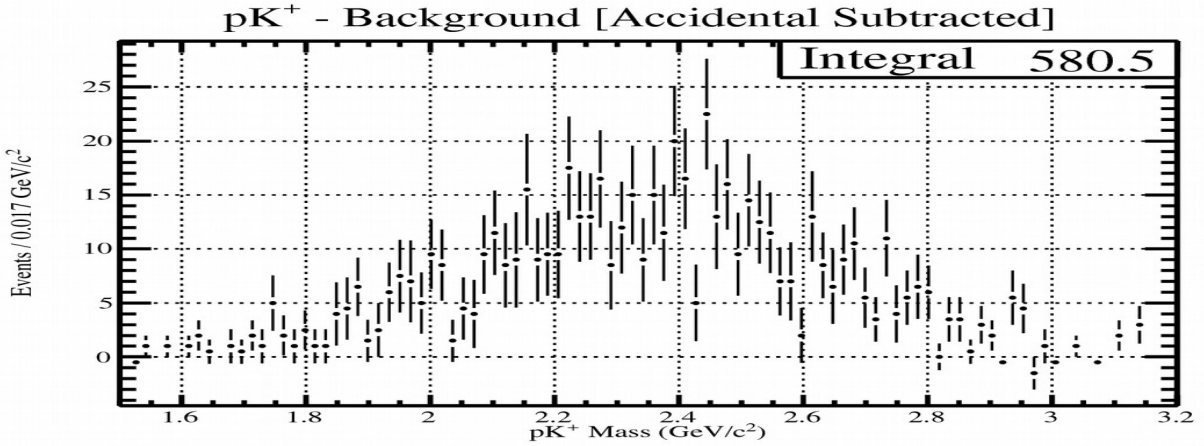


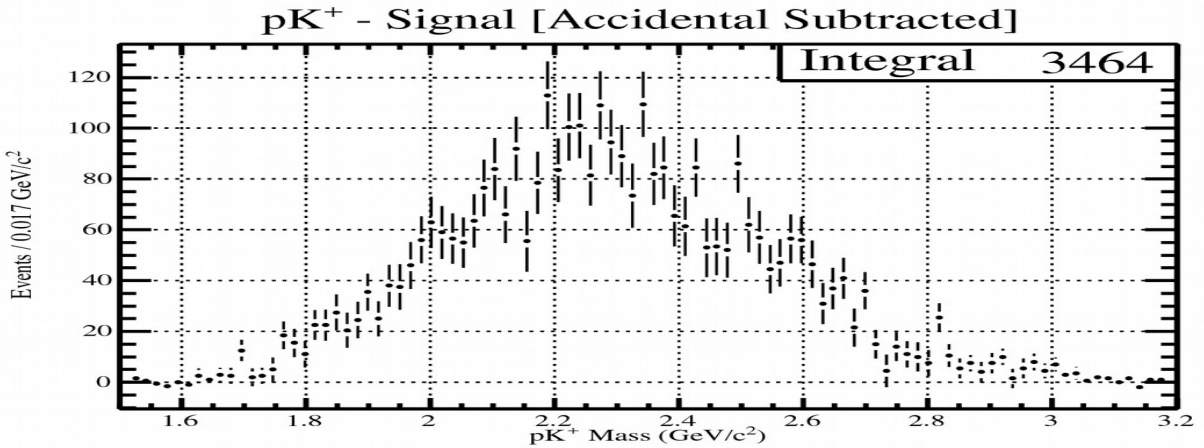




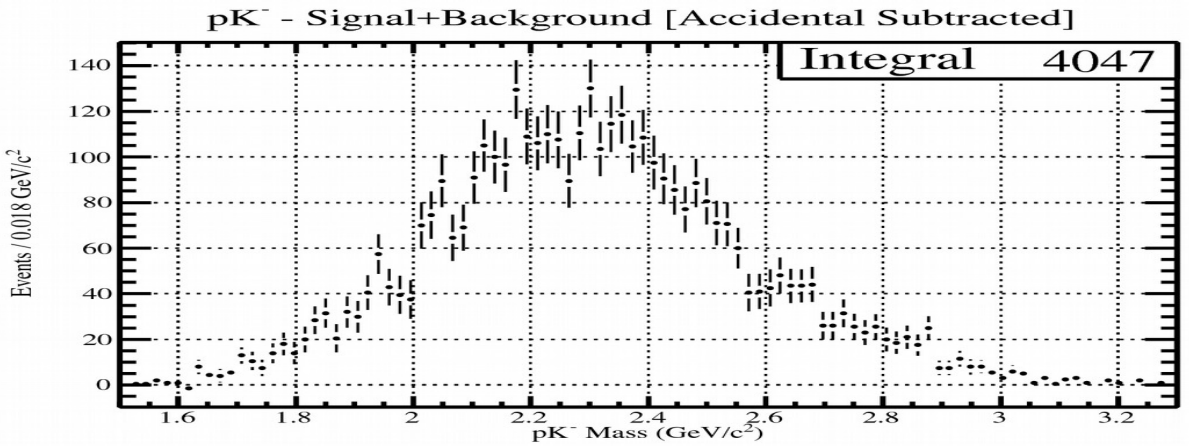
Results for Event Driven Analysis:

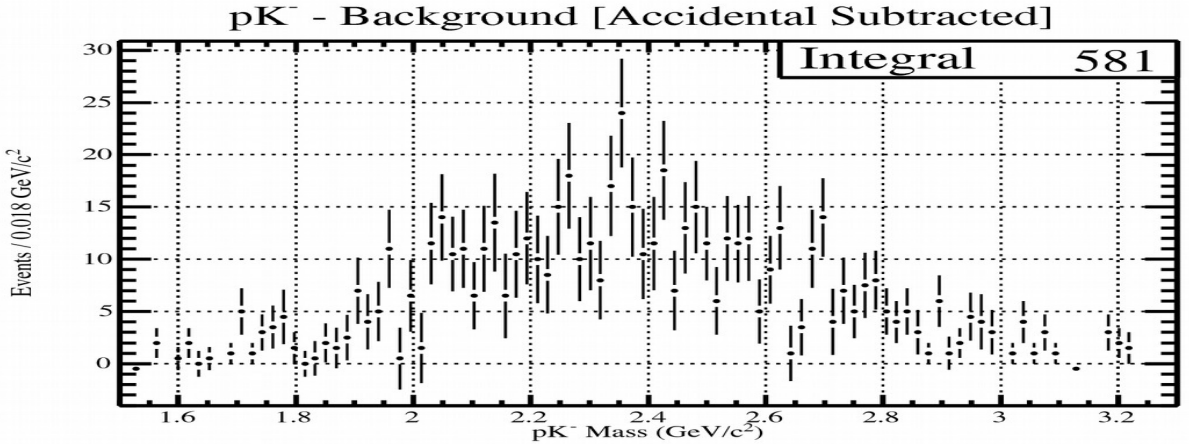


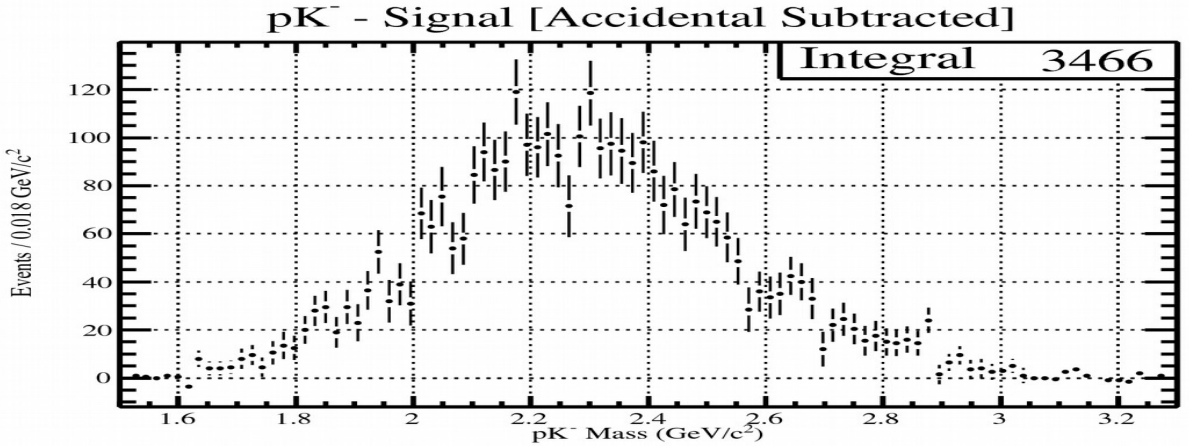




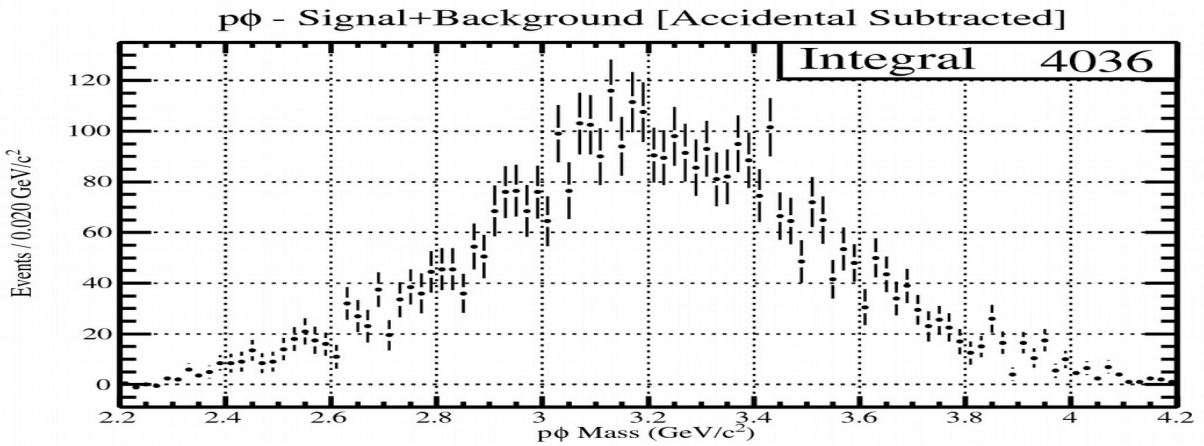
Results for Event Driven Analysis:

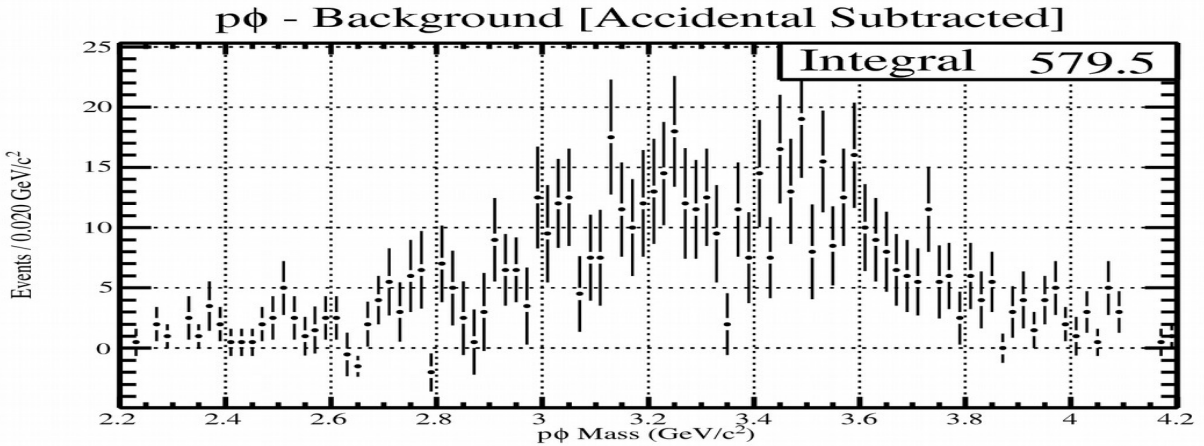


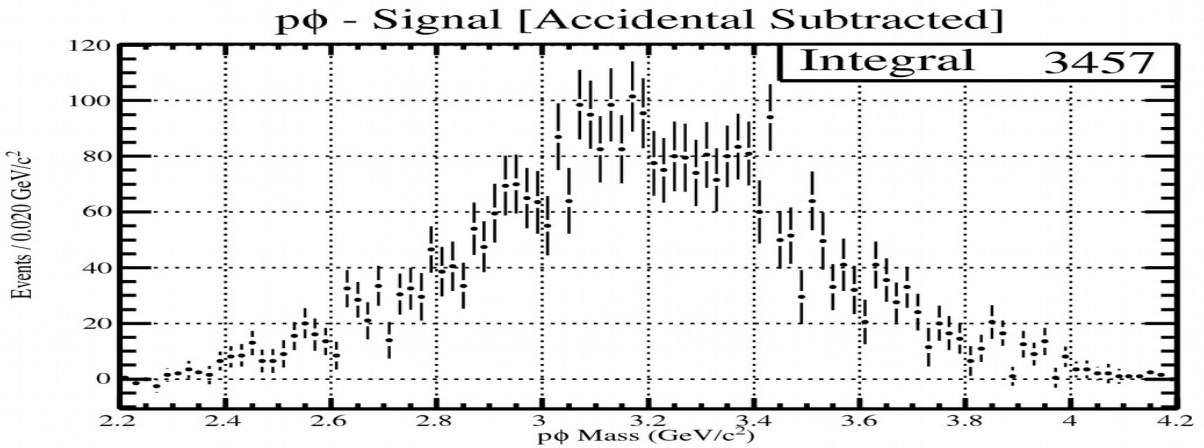




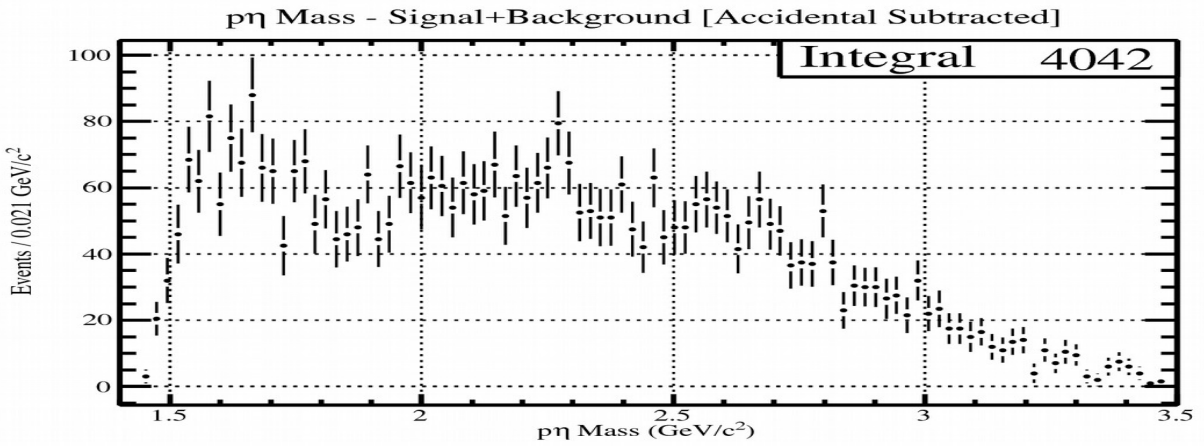
Results for Event Driven Analysis:

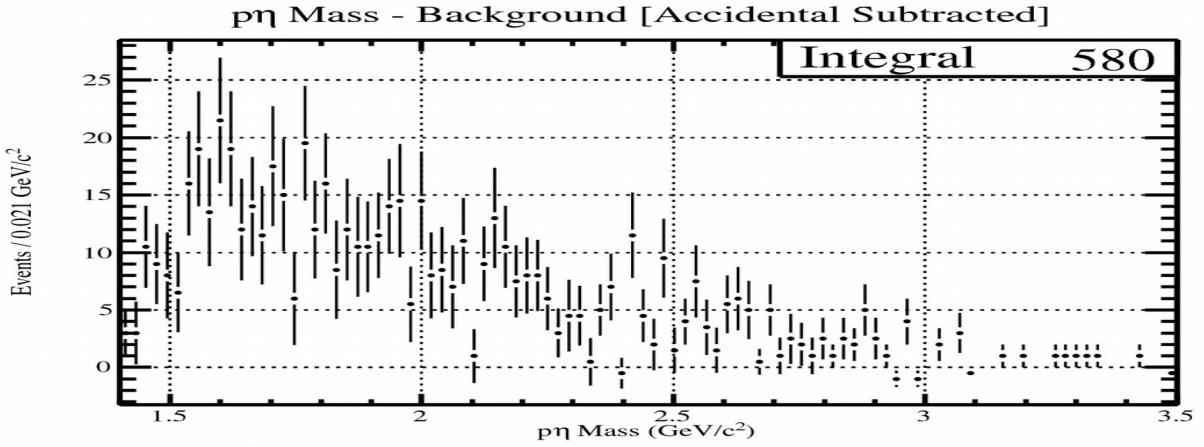


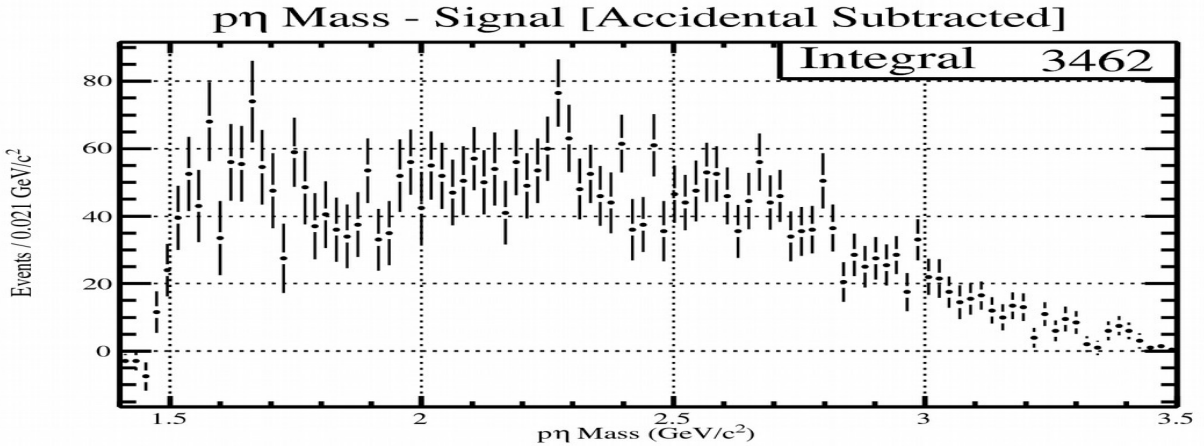




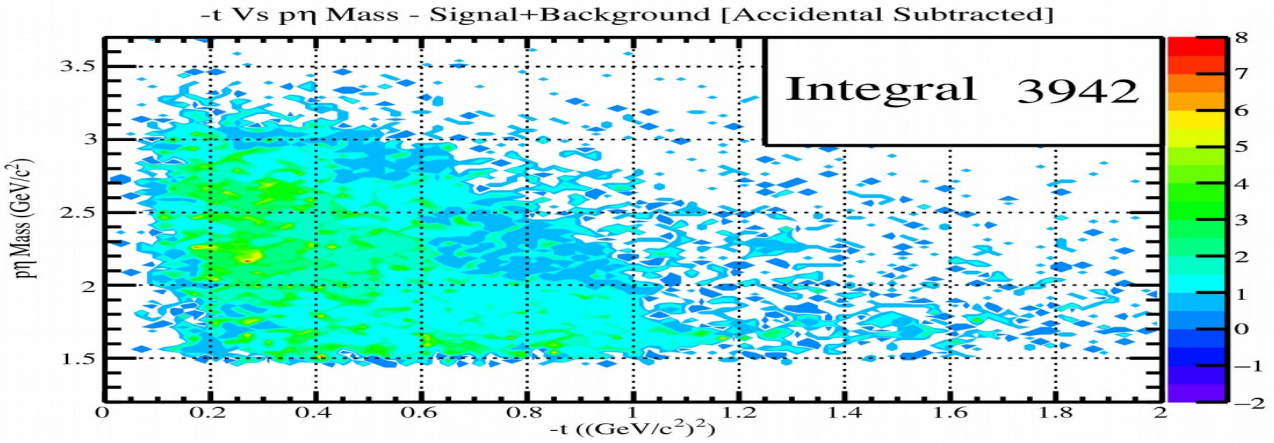
Results for Event Driven Analysis:

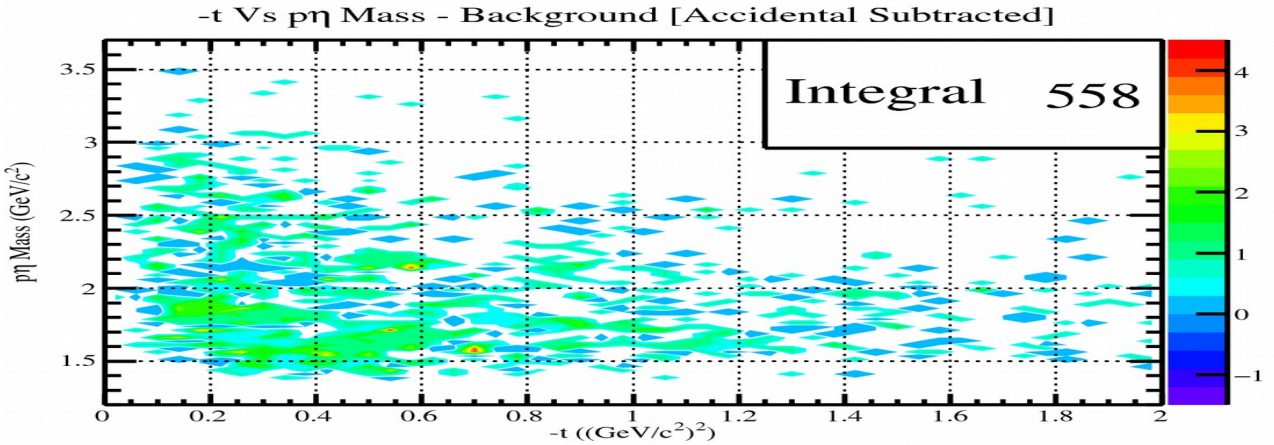


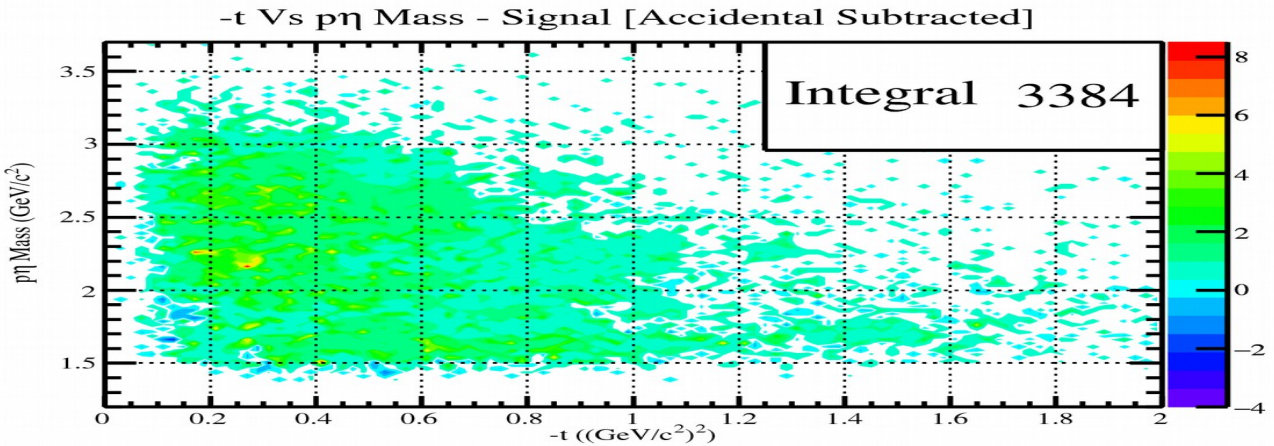




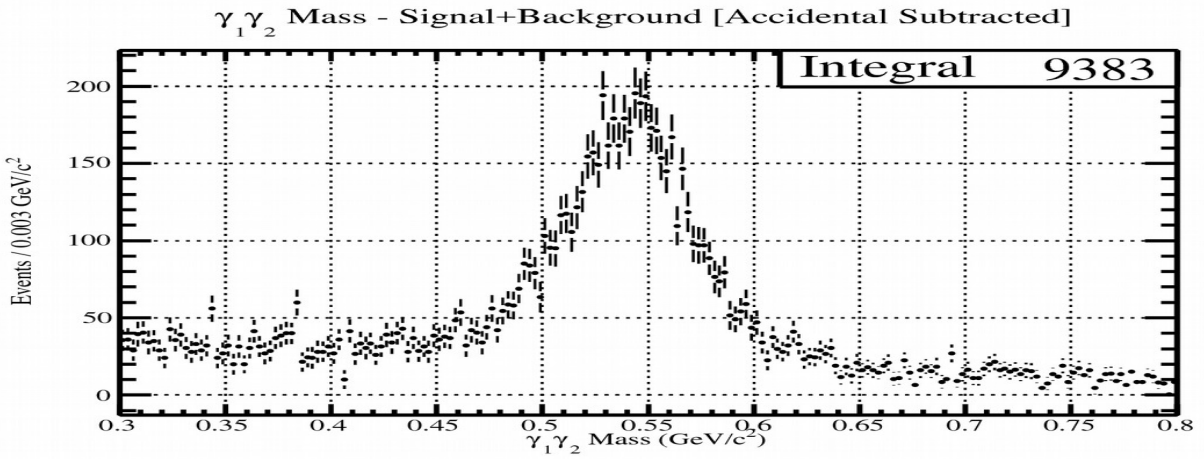
Results for Event Driven Analysis:

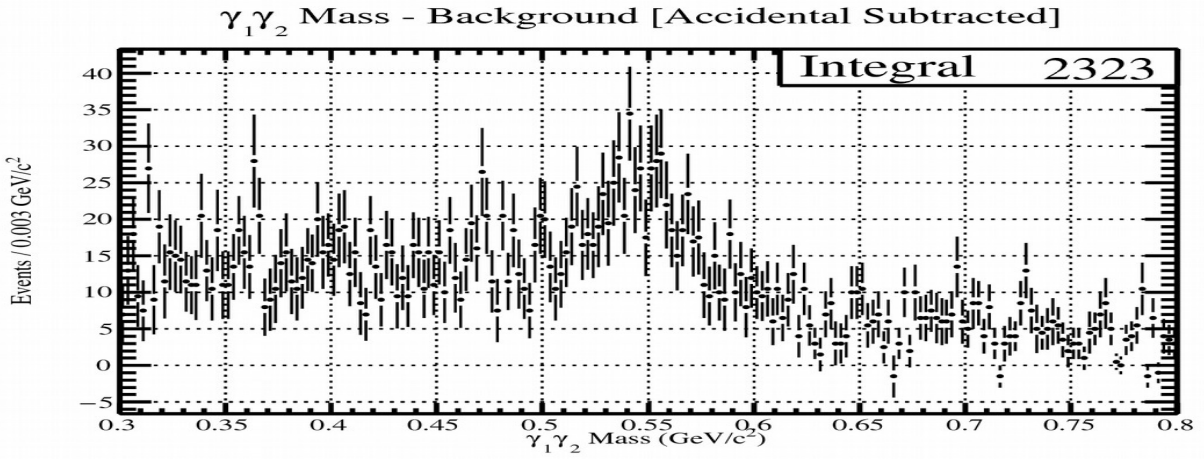


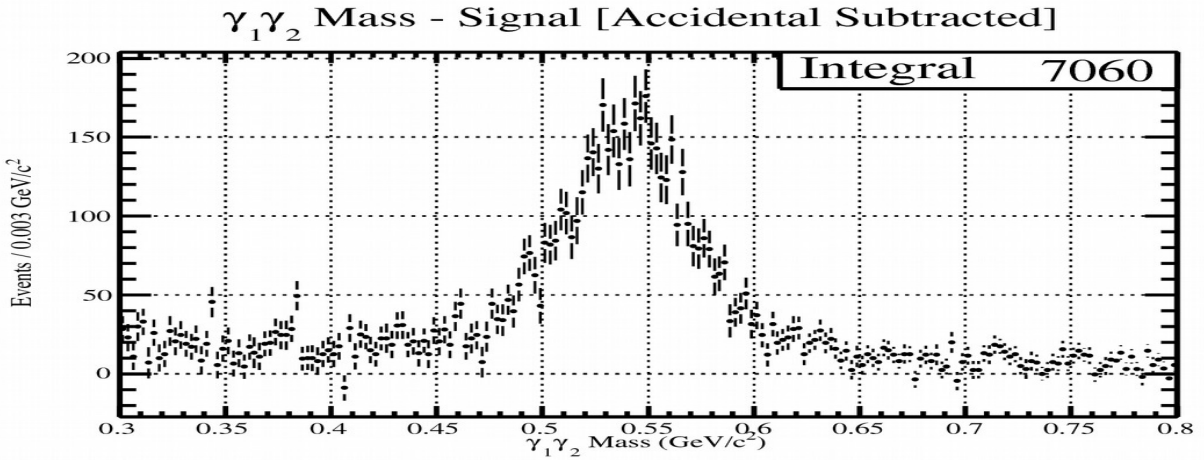




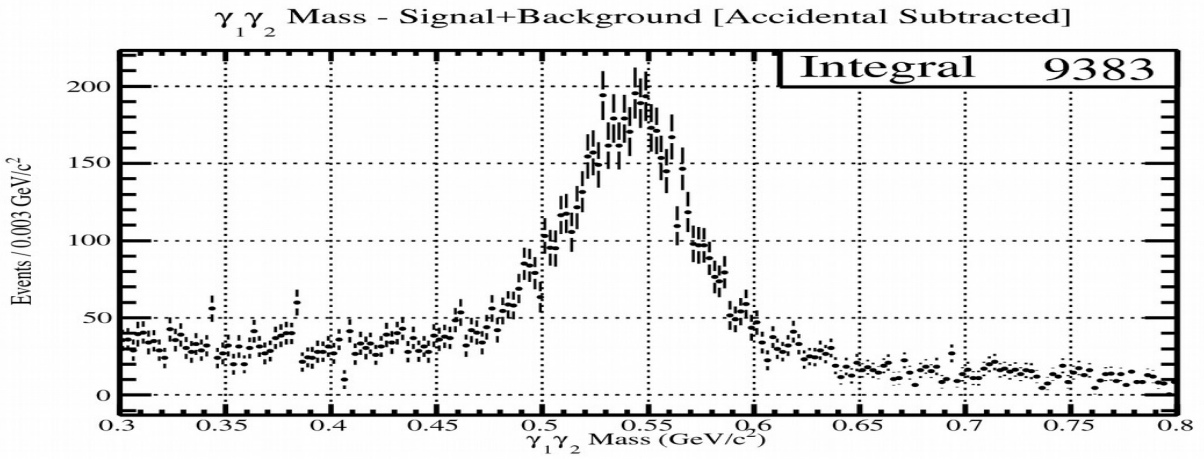
Results for Event Driven Analysis:

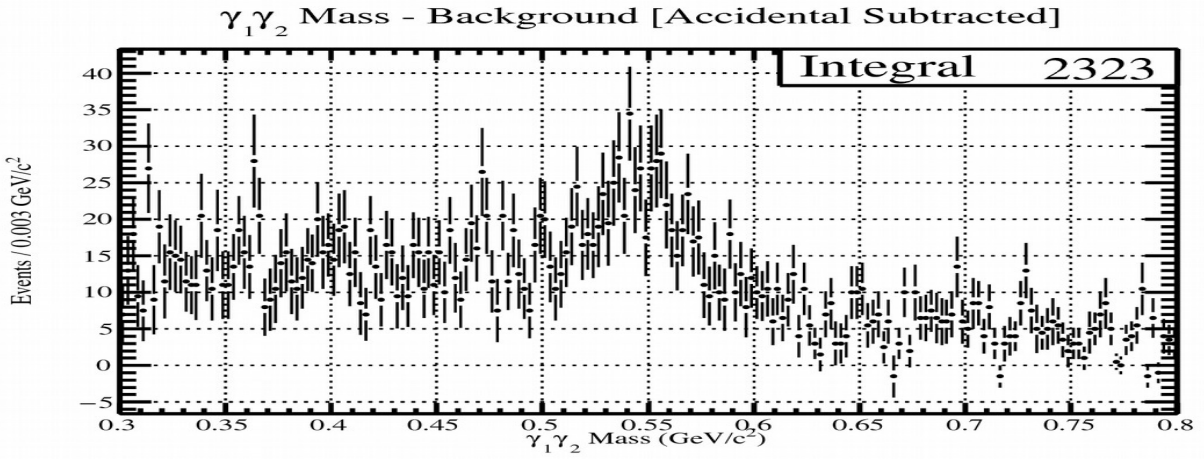


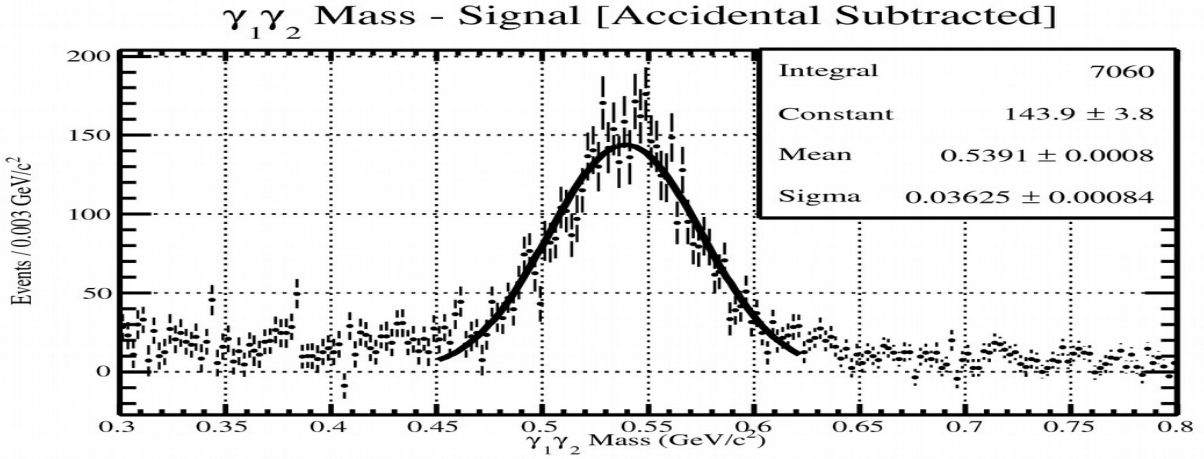




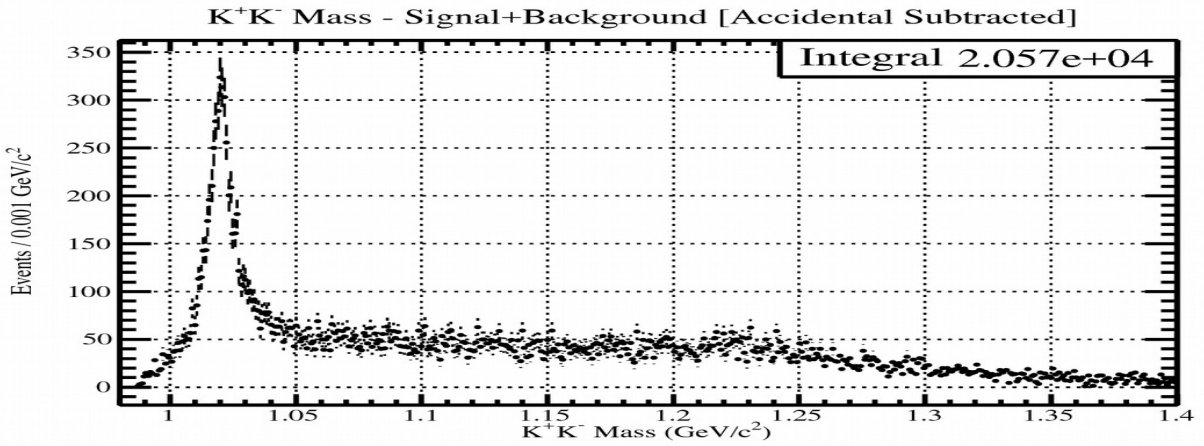
Results for Event Driven Analysis:

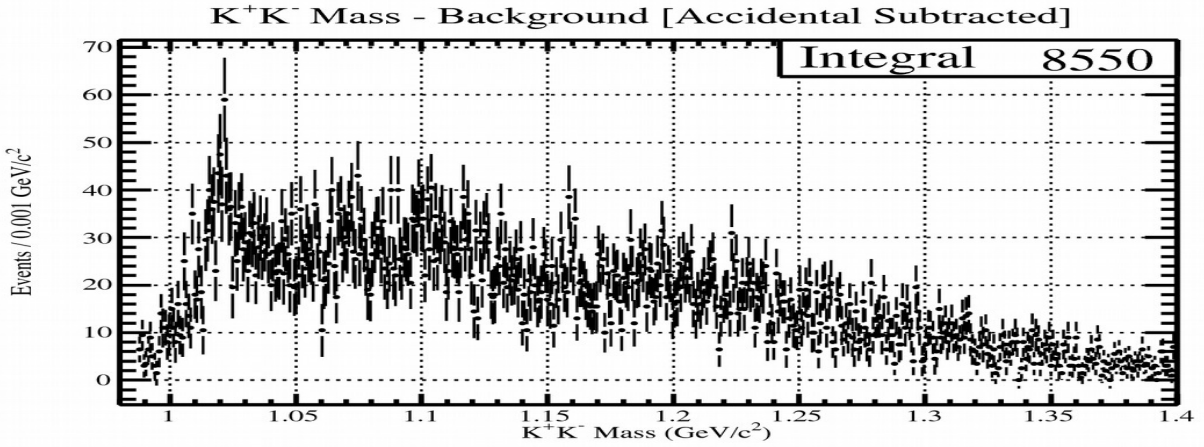


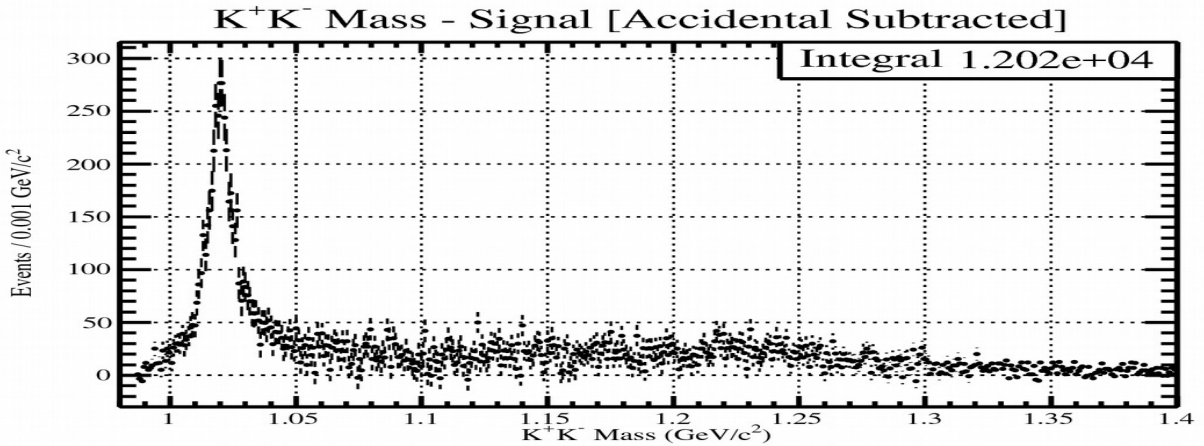




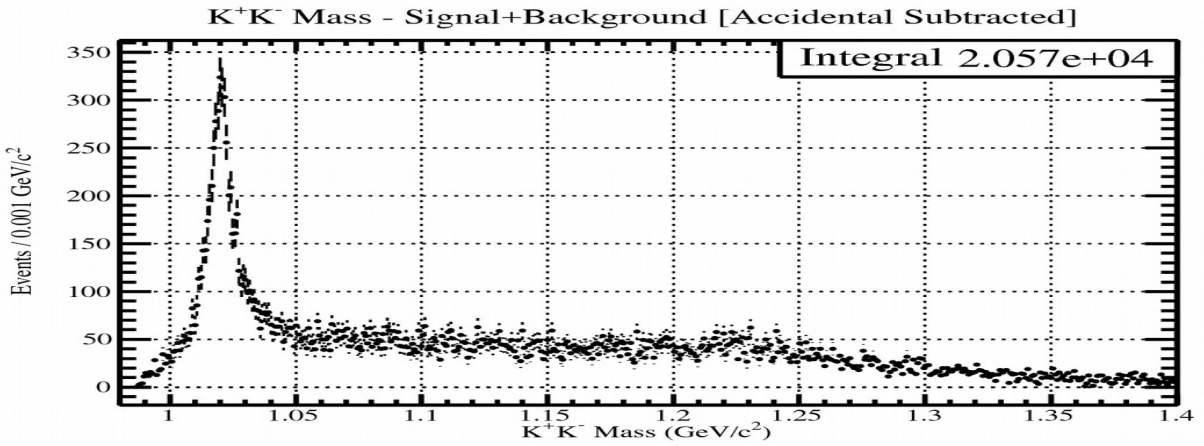
Results for Event Driven Analysis:

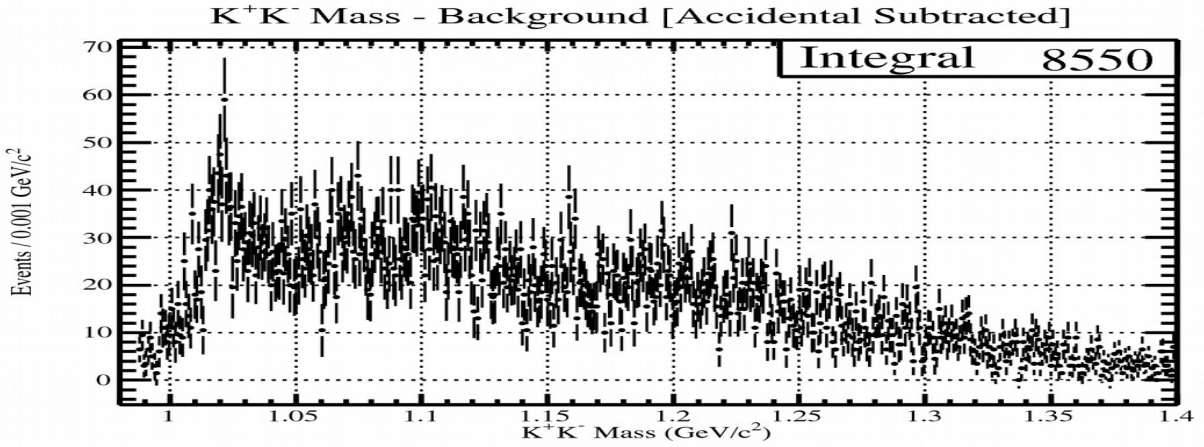


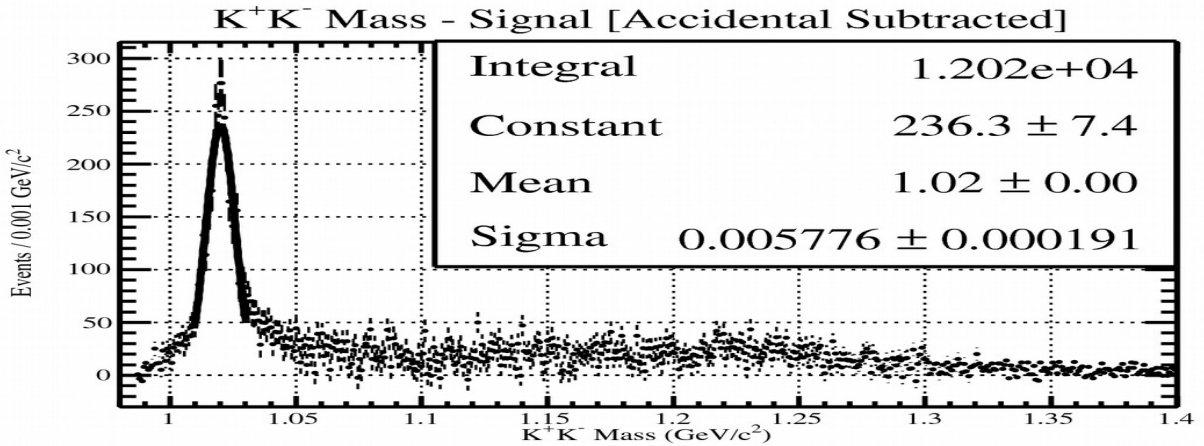




Results for Event Driven Analysis:







Results for Event Driven Analysis: