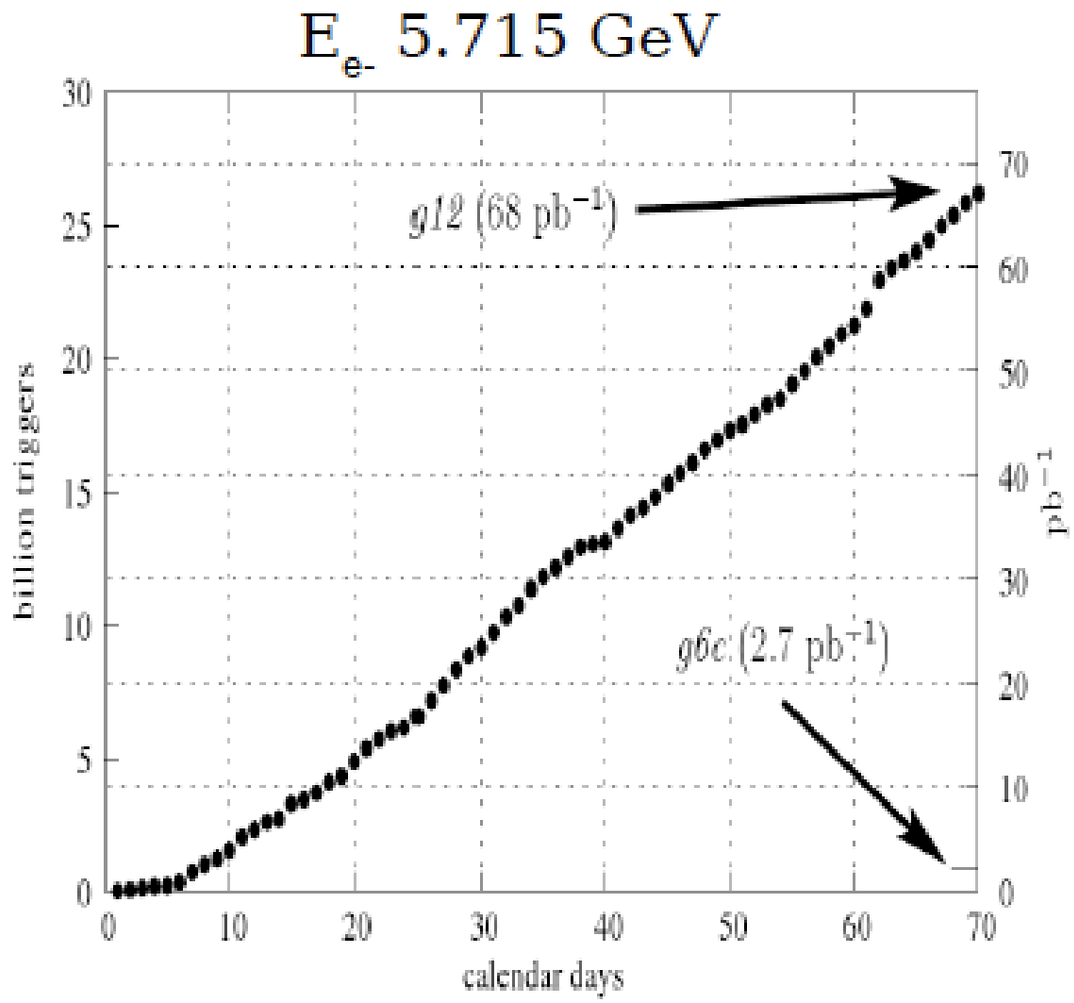
G12 Spectroscopy Update

Diane Schott, FIU

Experiment

- Time frame: started April 1; ended June 9, 2008
- Run Parameters:
  - 44 days of beamtime
    - current: 60 to 65 nA
- Experiments during this run period include: HyCLAS and Super-G



Calibration Status

Finished

Improving

Analysis Coordinator	Lei Guo (LANL)
G12_Cooking	Johann Goetz (UCLA)
Start Calibration	Mukesh Saini (FSU)
Tagger Calibration & RF Calibration	Mukesh Saini (FSU)
Drift Chamber Calibration	Burnham Stokes (GWU) & Diane Schott (FIU)
TOF Calibration	Craig Bookwalter (FSU)
EC Calibration	Michael Wood (USC)
Cherenkov Calibration	Michael Paolone (USC) & Rakhsha Nasseripour (GWU)
IC Hodoscope Calibration	Johann Goetz (UCLA)

Time of Flight: Time Walk

- new TW function and technique have been presented to the OLTWG on May 28, 2009 by Craig B.
  - the old TOF TW uses laser data for calibrations
    - 60% of the paddles have unusable laser data from broken fibers

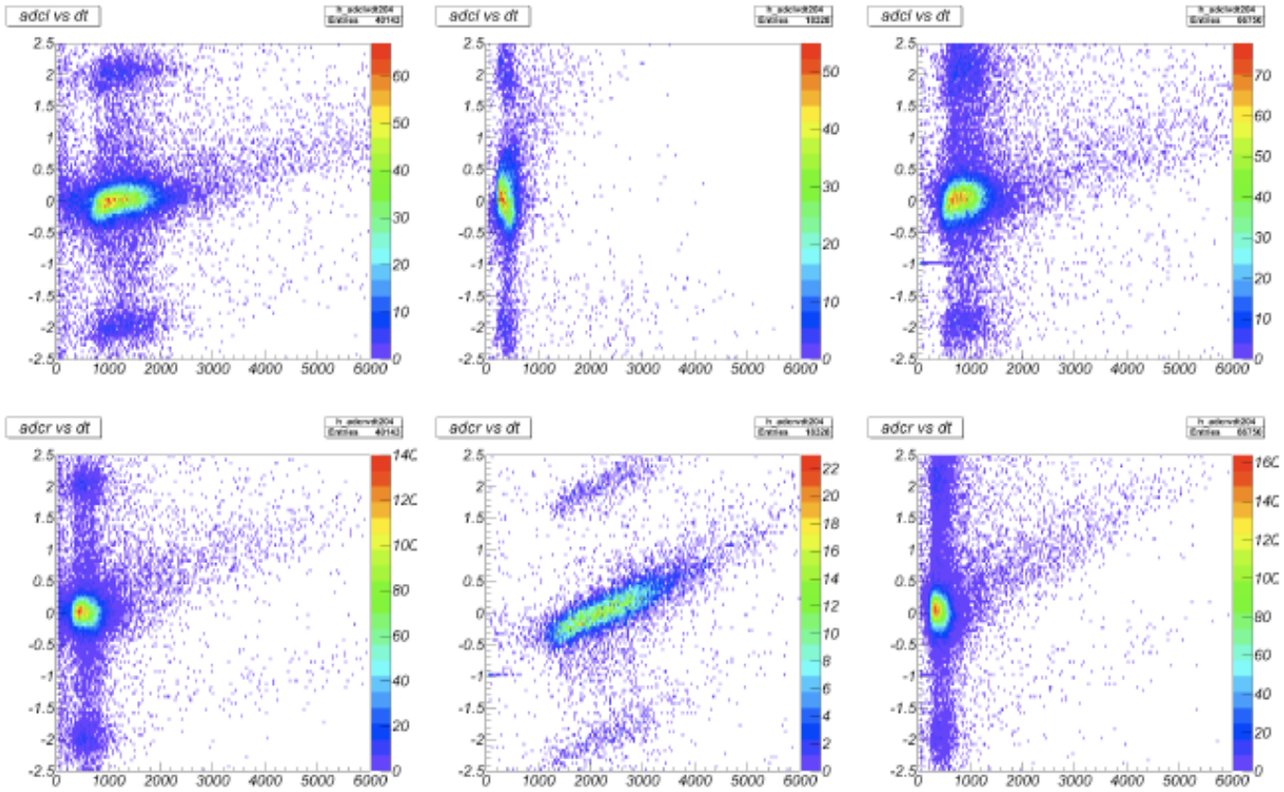
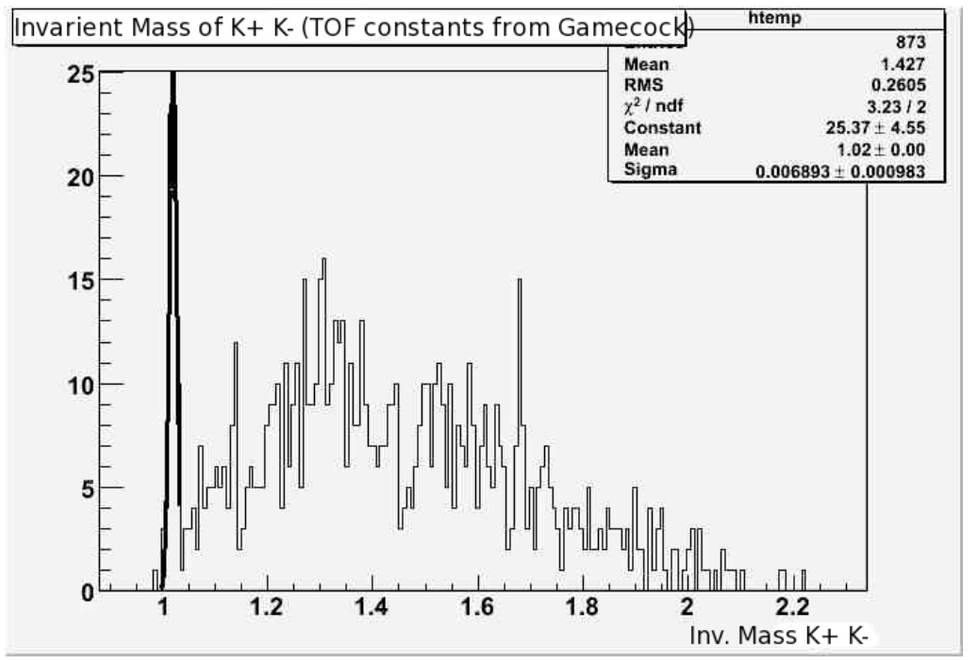


Figure: s2 p4, g12 (left), g9a (middle), g13 (right)

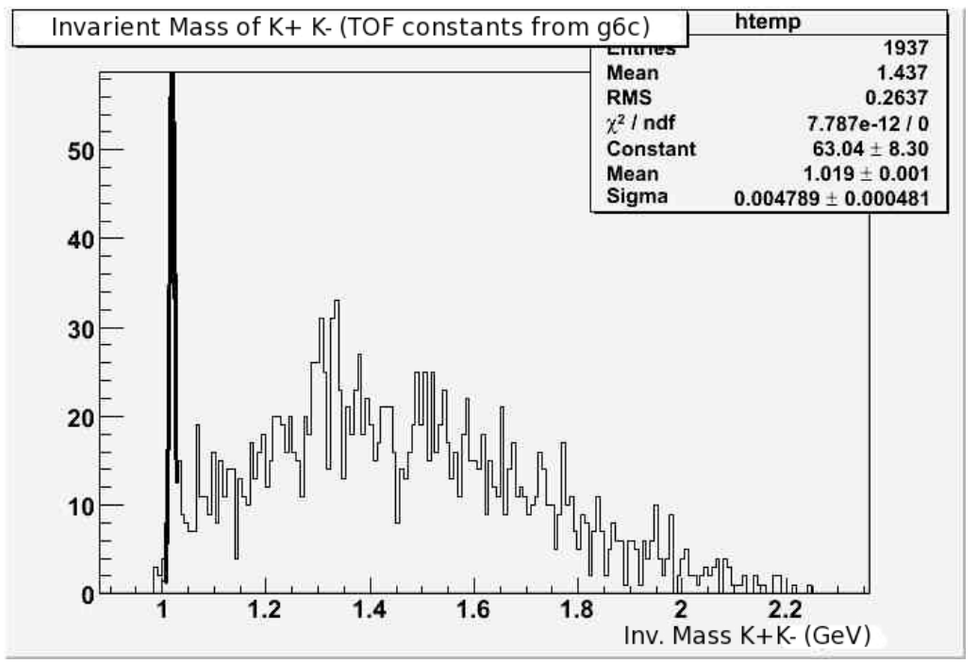
- laser data no longer matches the real data
  - suggested possibility is PMT gain changes

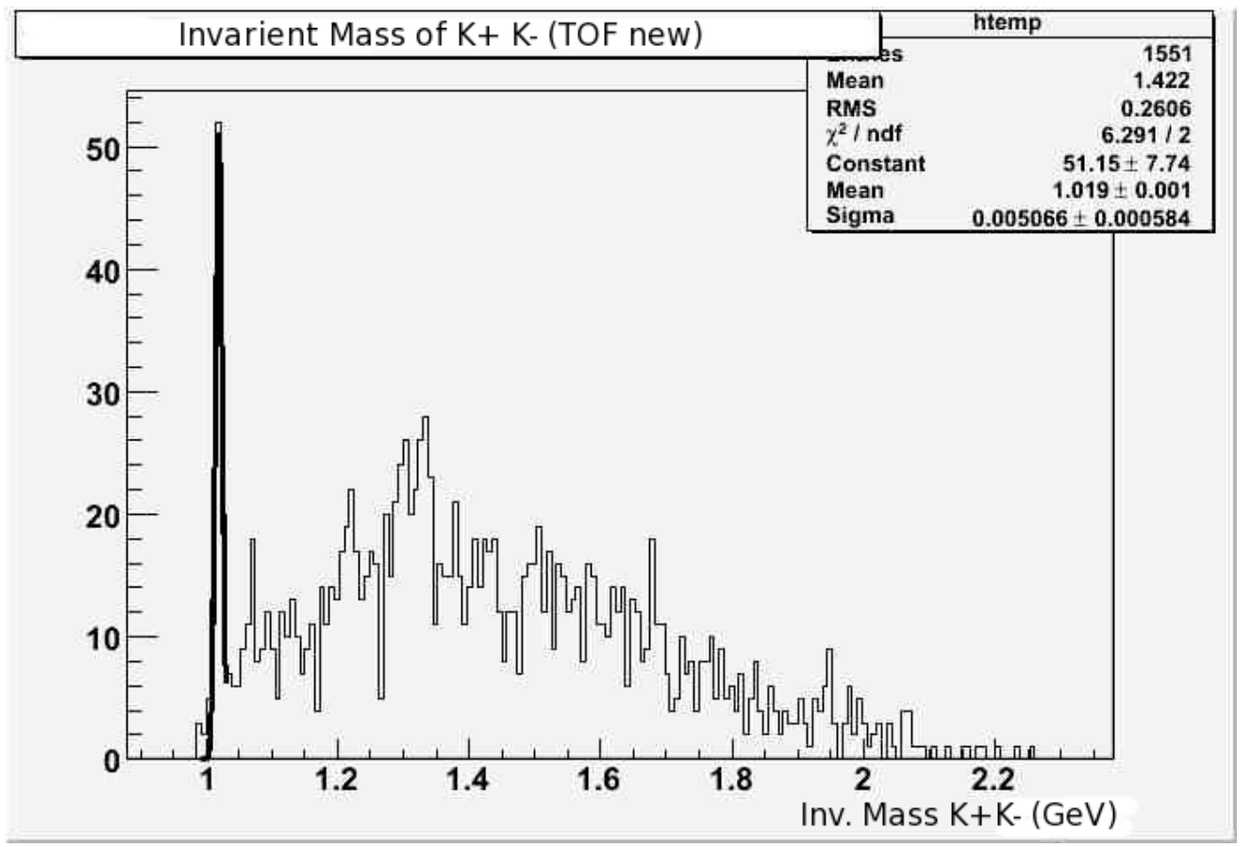
Φ Yields from TOF Time Walk Changes



$$p + \gamma \rightarrow p + \phi \rightarrow p + K^+ + K^-$$

calibration set	pK+K- events	exclusive events	phi
gamecock	58869	873	45
g6c	68041	1937	92
new&aligned	68766	1551	72





Time Walk function

- Multiple functions have been tested, trying to minimize the RMS
- Results: resolutions: g12 = 190 ps, g9a = 197 ps, and g13 = 239 ps

Rungroup Performance Comparison: π^+ resolution

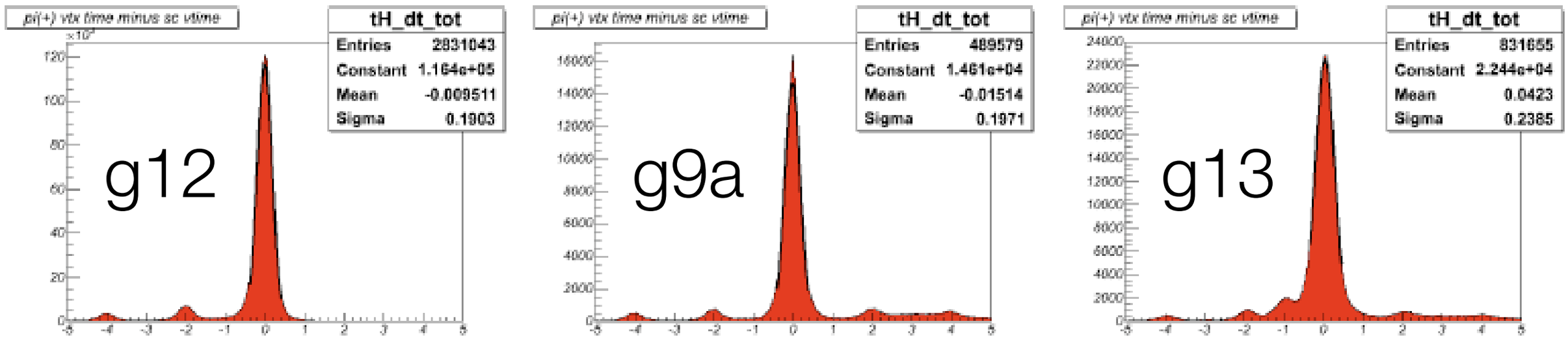
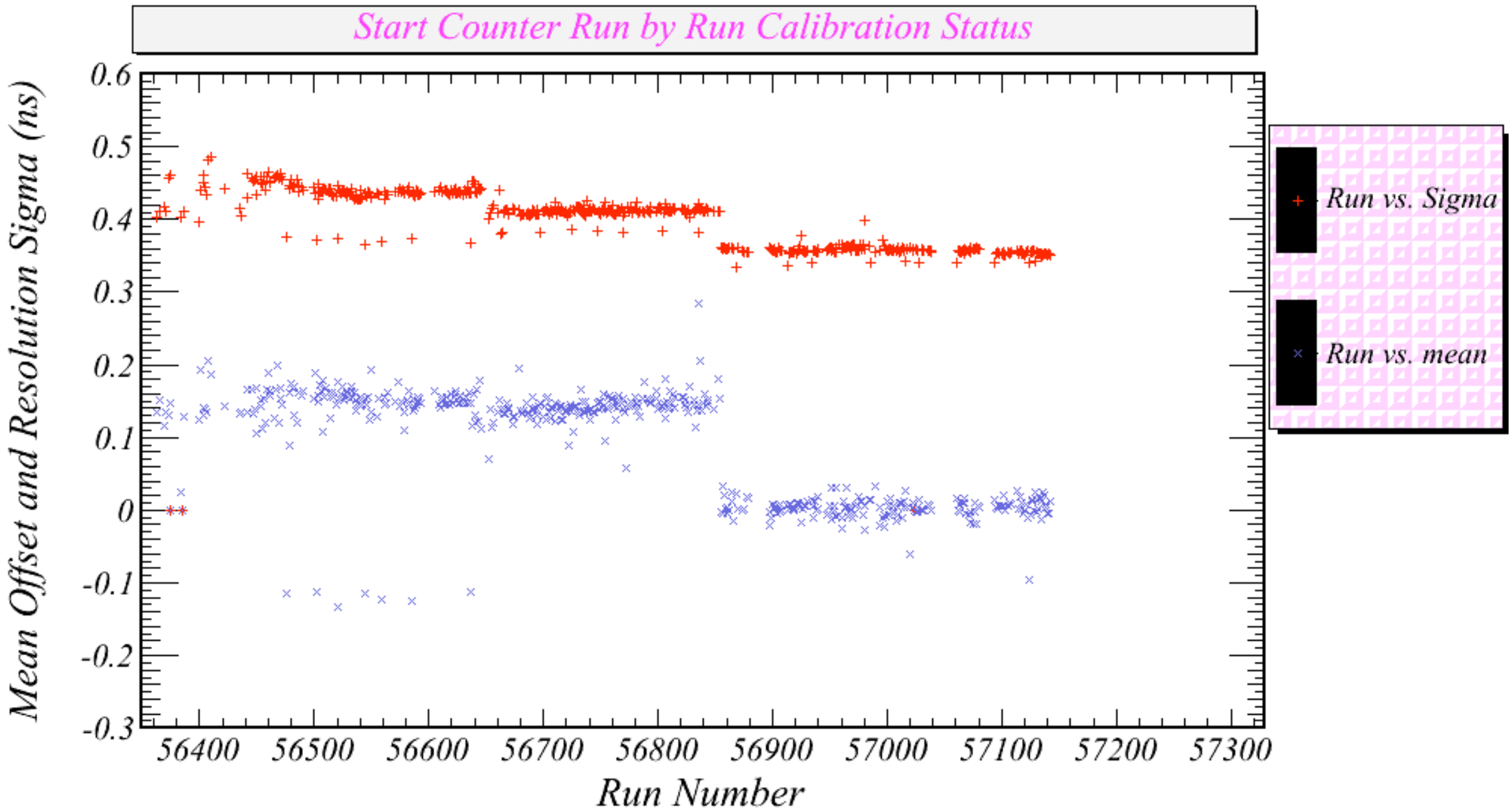


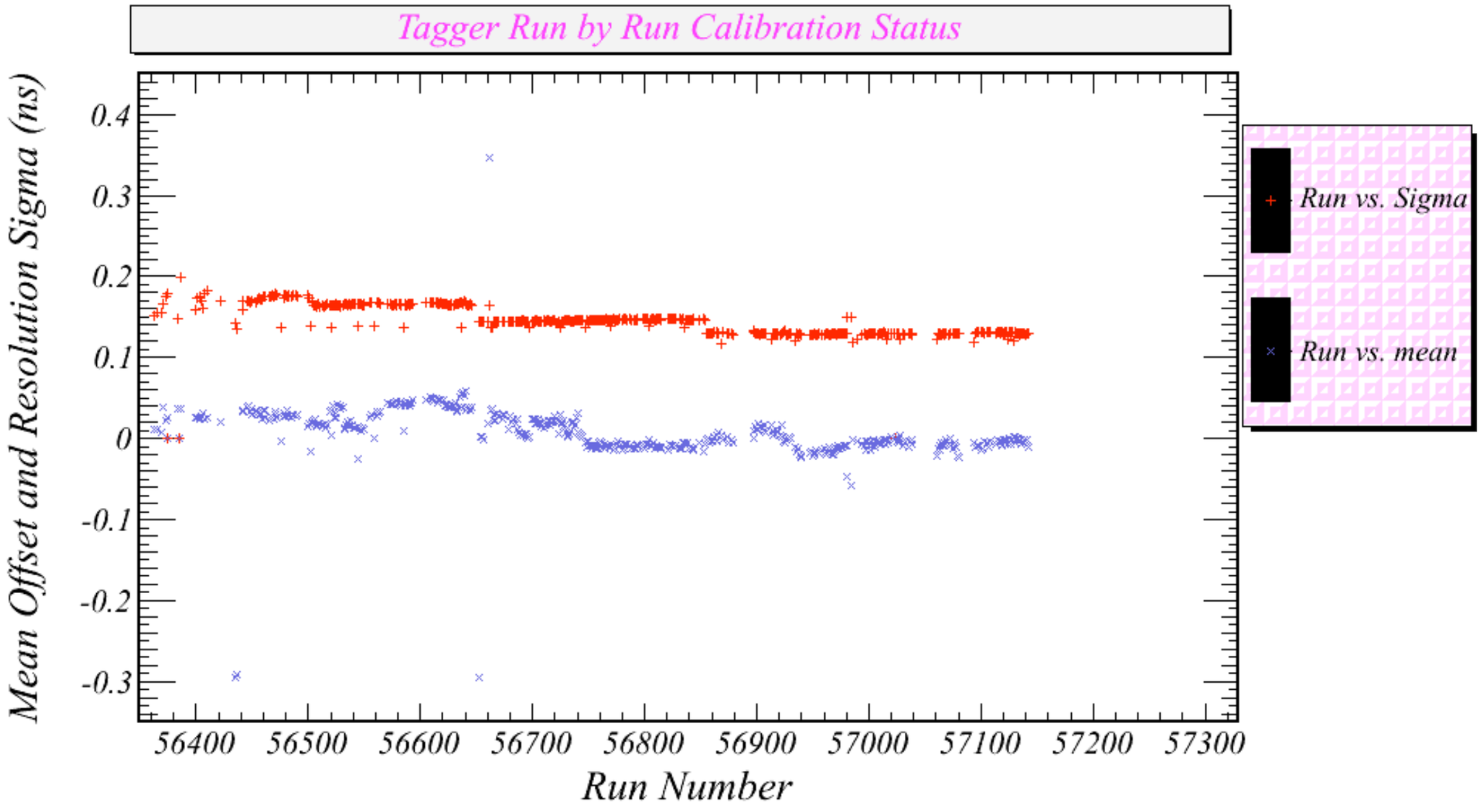
Figure: g12 (left), g9a (center), g13 (right)

Start Counter

- run by run corrections are being tweaked to fix shift around run 56850
- need another pass0 for tweaking the time walk



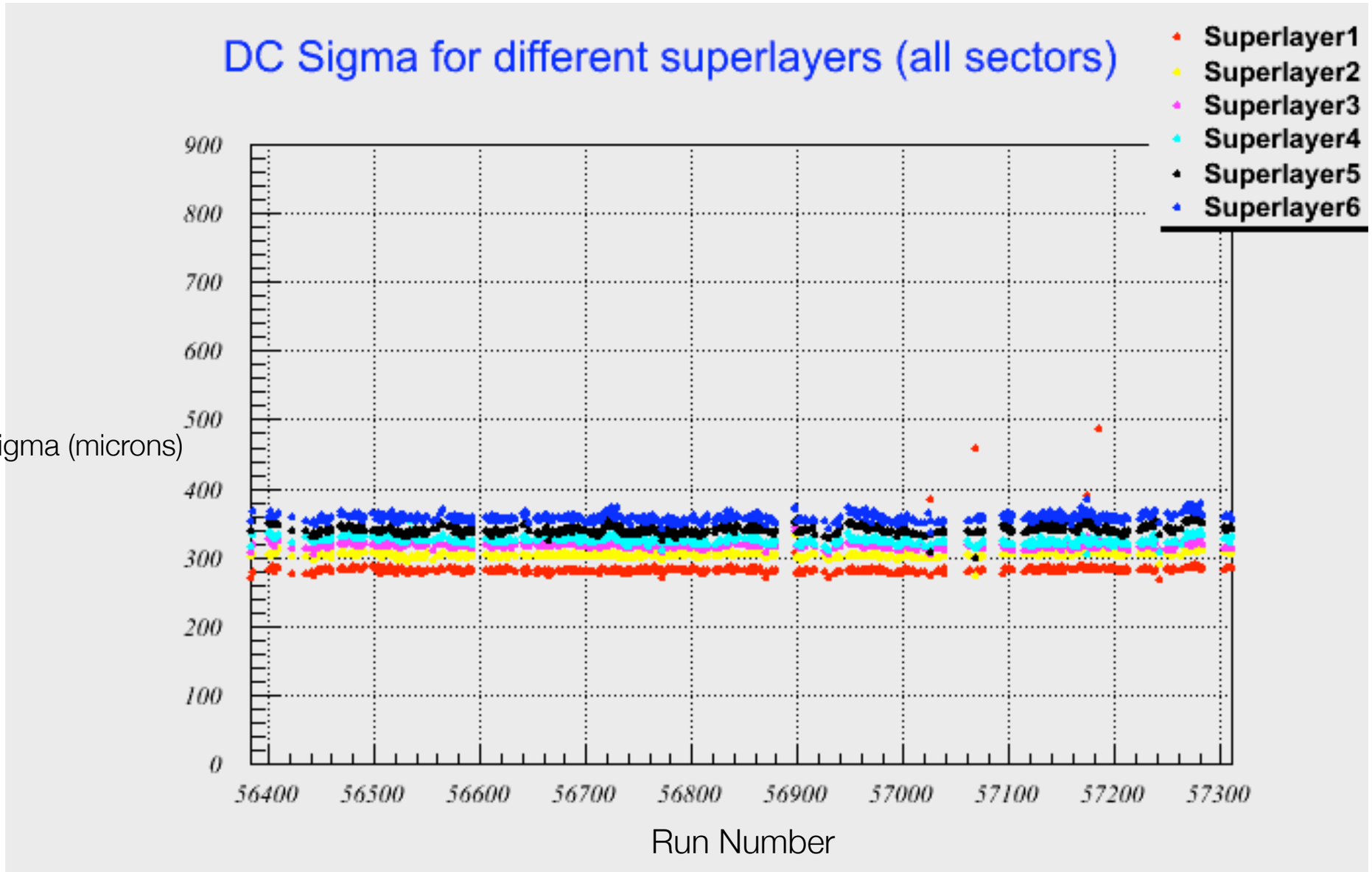
Tagger



- adjustments have been made for the e-counters
- final run to run offsets are in place for next pass0

Drift Chambers

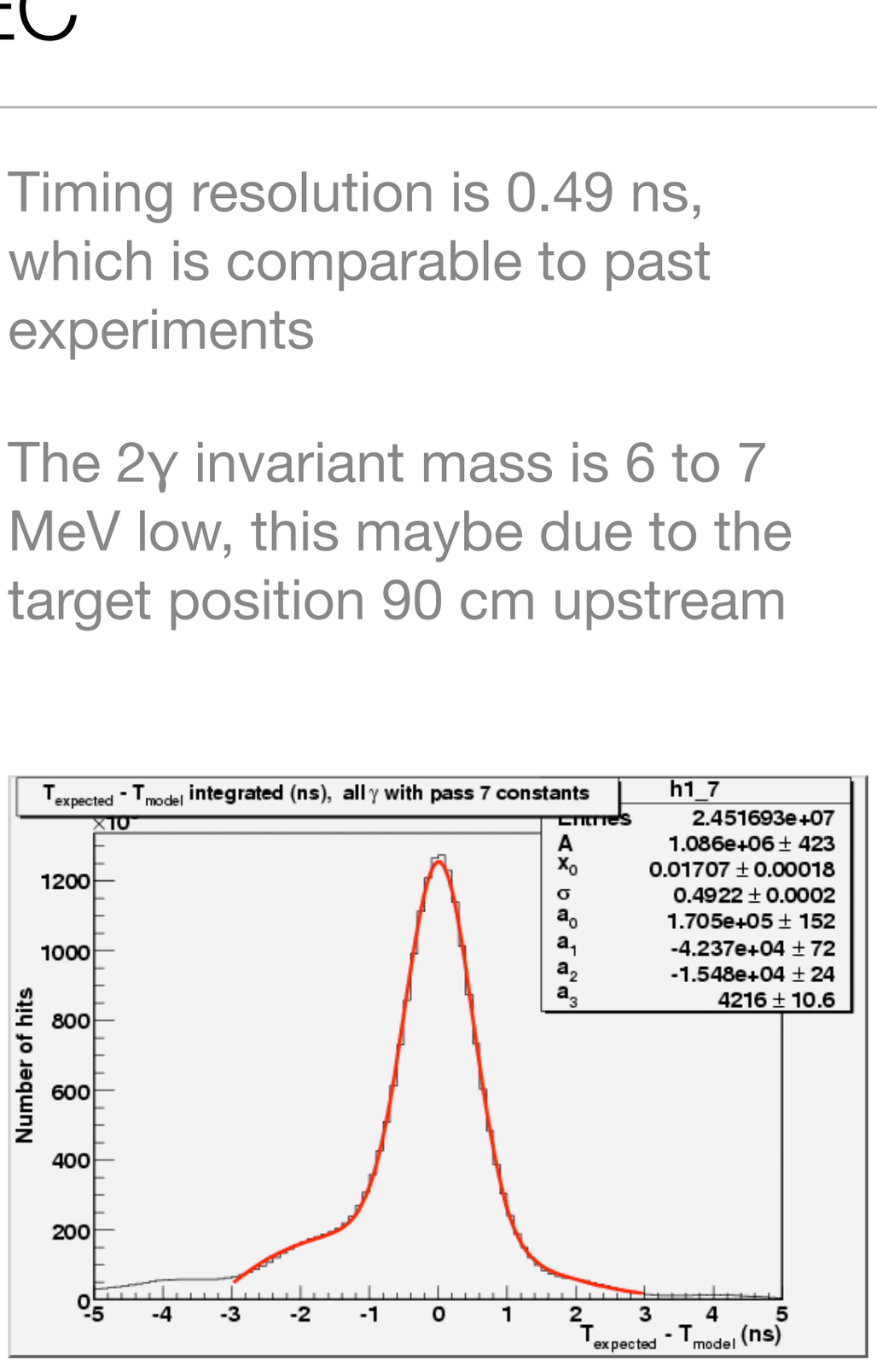
- alignment and calibrations are finished!
- final DC resolution is 275 to 375 microns for SL 1 to 6

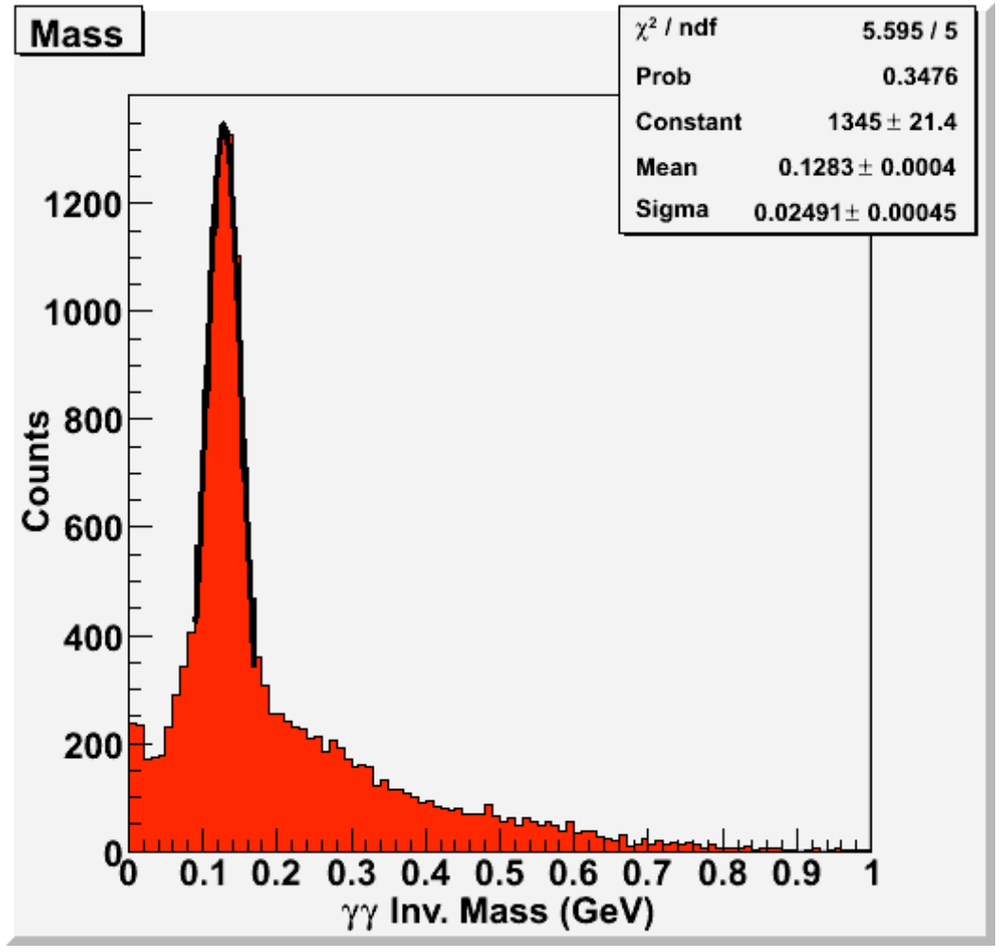


EC

- Timing resolution is 0.49 ns, which is comparable to past experiments

- The 2γ invariant mass is 6 to 7 MeV low, this maybe due to the target position 90 cm upstream





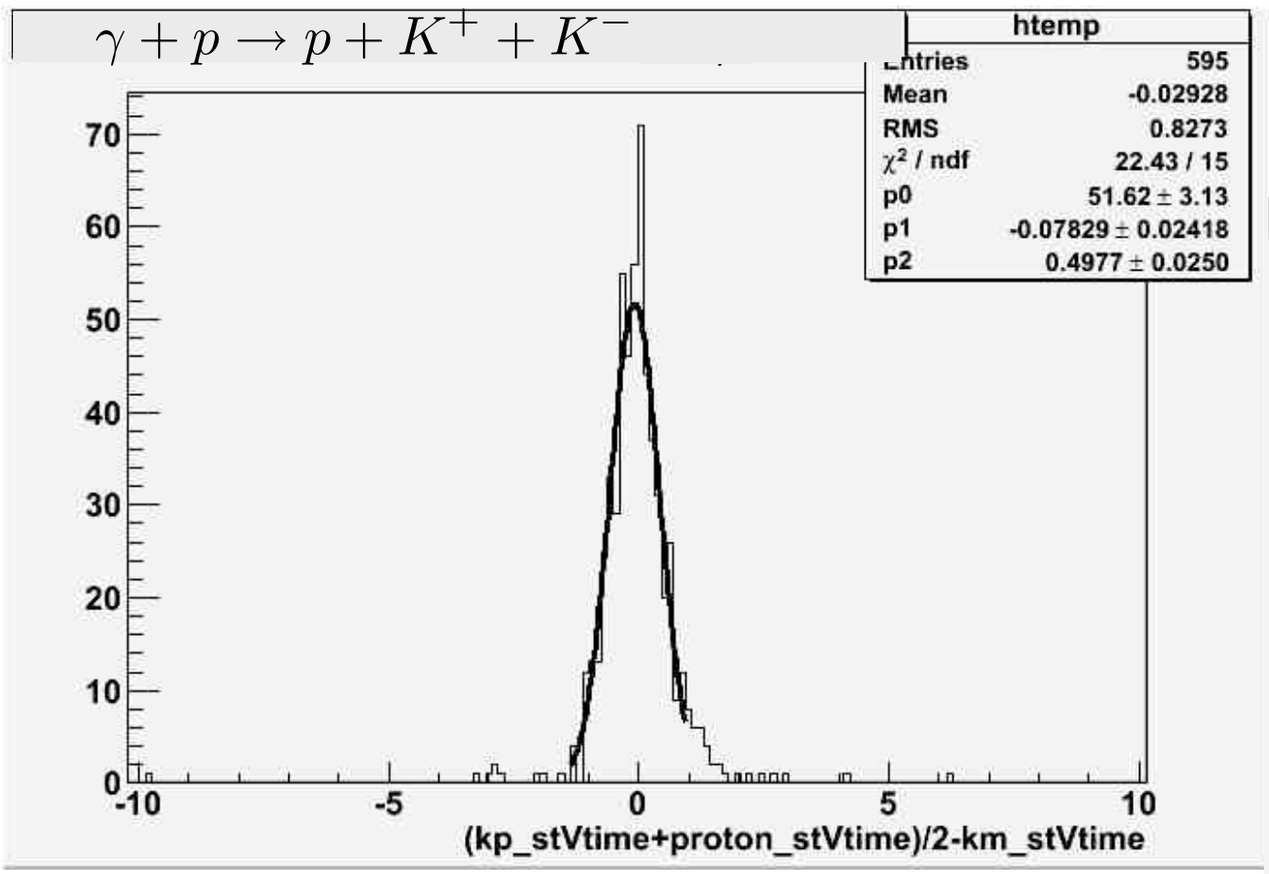
- Need run by run alignment, almost finished

A1c - reconstruction

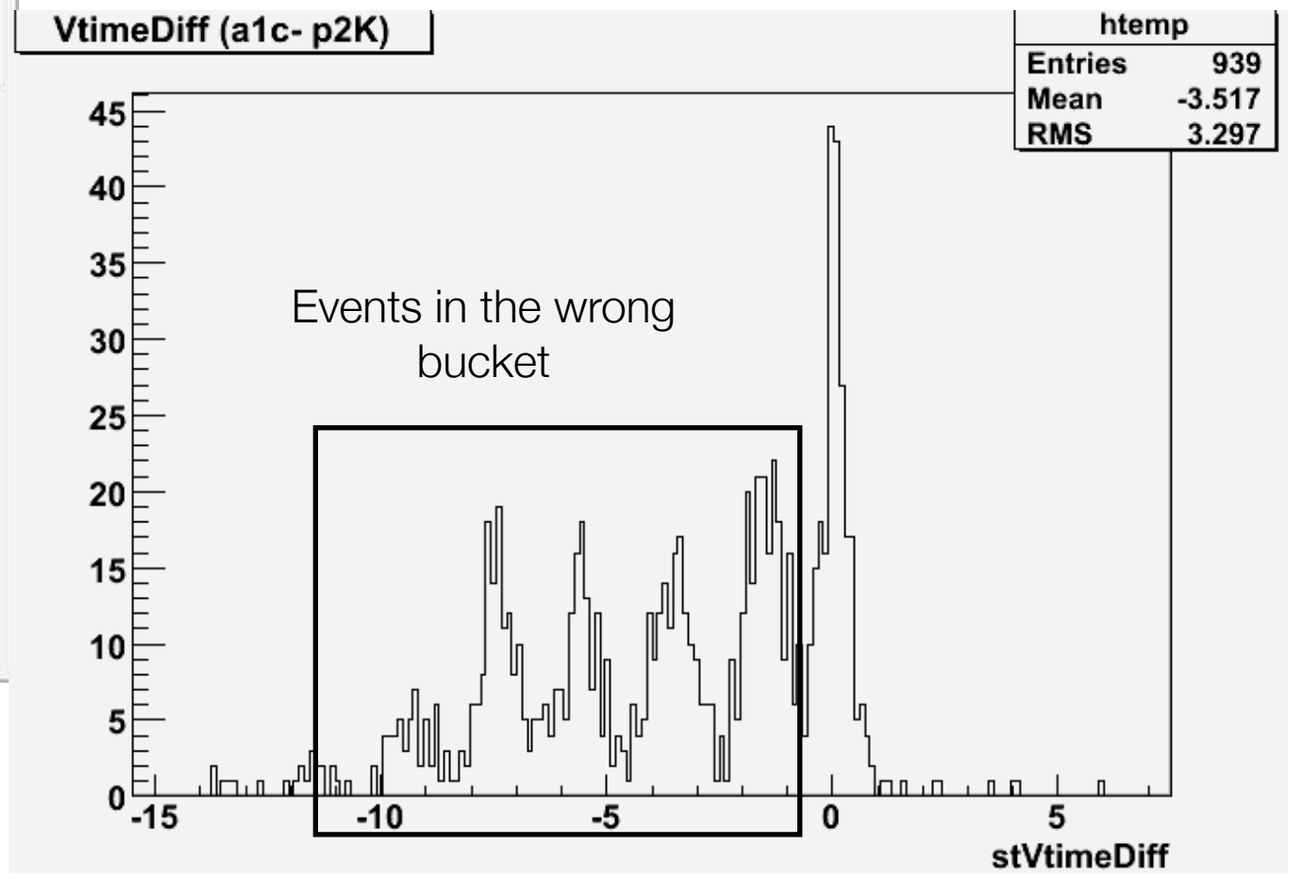
- Original version was compared the RECSIS and there was a sizable difference in particle yields
- TDCs were replaced with MHTDCs
- Start counter reconstruction:
  - wasn’t testing to see if correct raw TDC was chosen when a paddle has multiple TDC signals
  - now test hits as they are read from STN0 and before written to STR bank
- Hit based reconstruction:
  - sometimes the wrong ST TDC was chosen
  - makeHBID, takes SC TDC times that are closest to and smaller than the TOF hit time
  - uses beta from track length from ST to TOF (for the hit-based level) where beta > -.3 and <1.3
- This brings A1c to +1% of RECSIS

Photon Selection

- 3 track events with 2 stVtimes within .4 ns, the third events is within less than 1 ns



- use ST for photon selection - independent of PID
  - will help improve photon selection



Future Plans

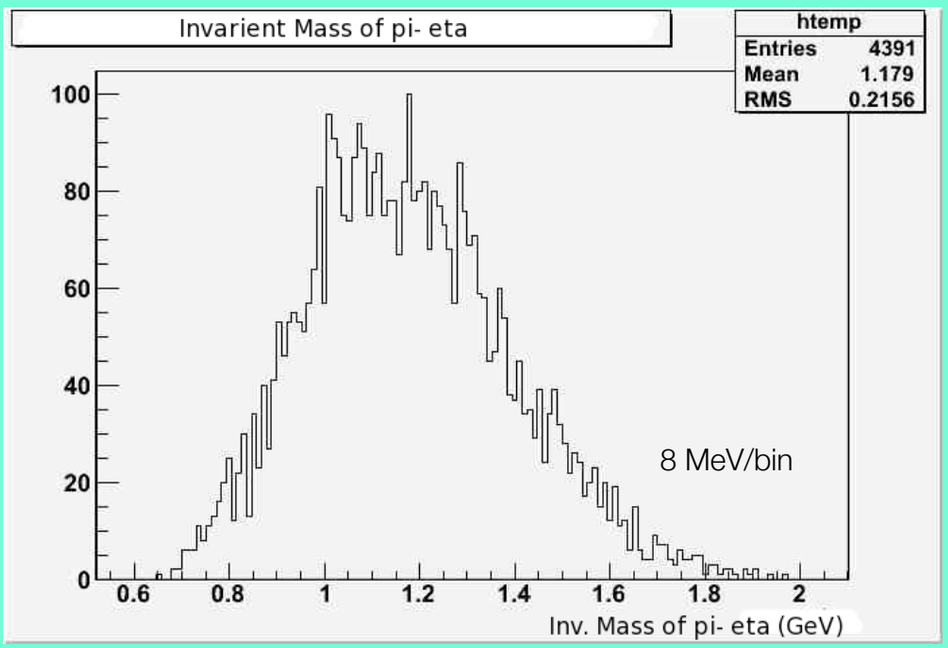
- Before pass0 v5:
    - finalize TOF TW changes
    - EC run-by-run calibrations
        - refine Tagger run-by-run calibrations
- Pass0 v5 to finish up all calibrations next week
- Pass1 planned for second week of July!!!

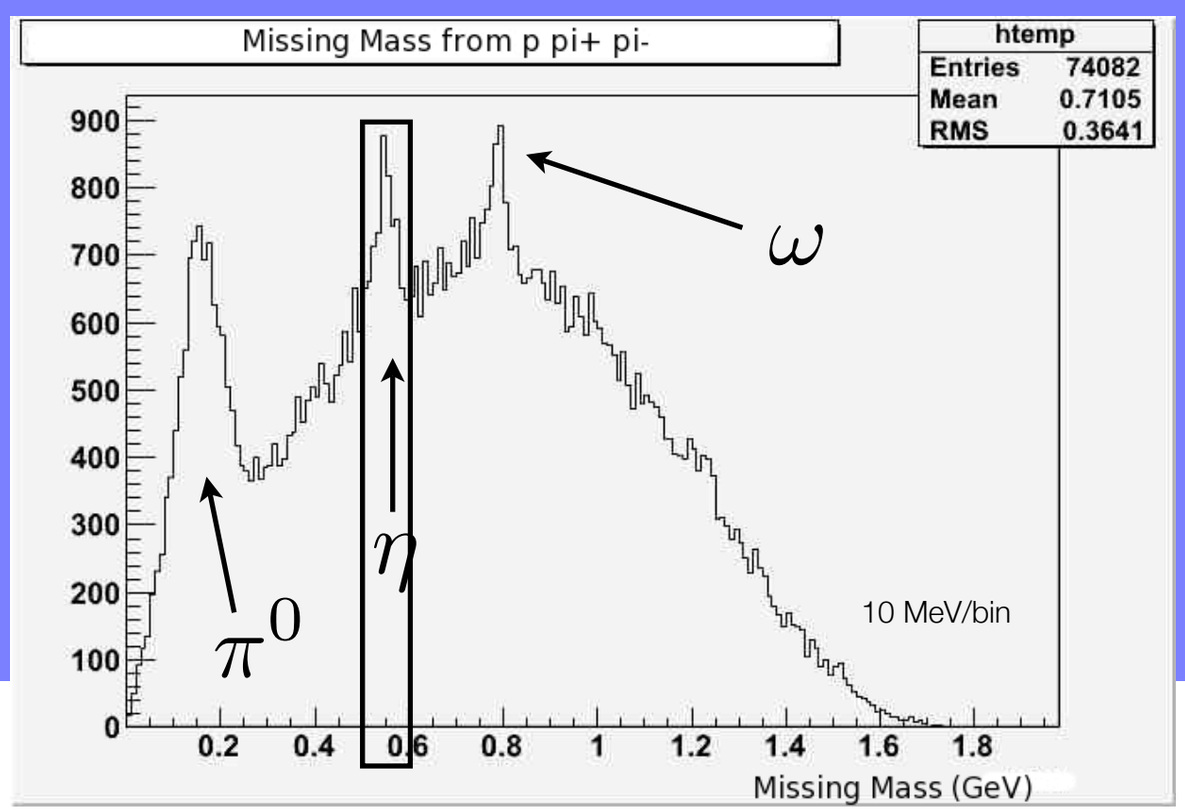
$$\gamma + p \rightarrow \Delta^{++} + \pi^- + \eta$$

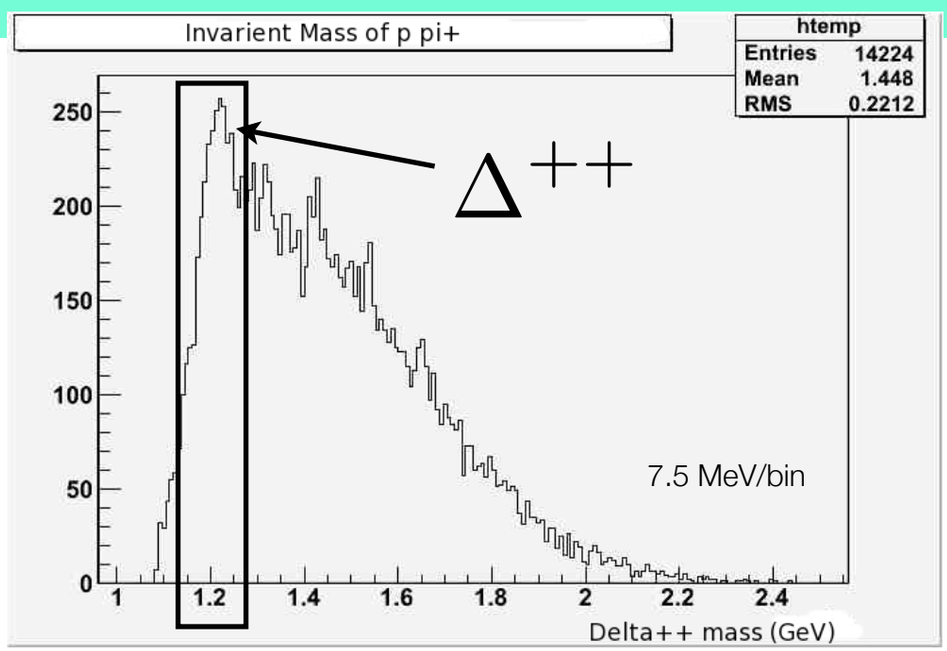
(Diane Schott)

- the π- η invariant mass is thought to include a π(1400) and a2(1320)
  - large amounts of background

$$p\pi^+\pi^-(\eta)$$



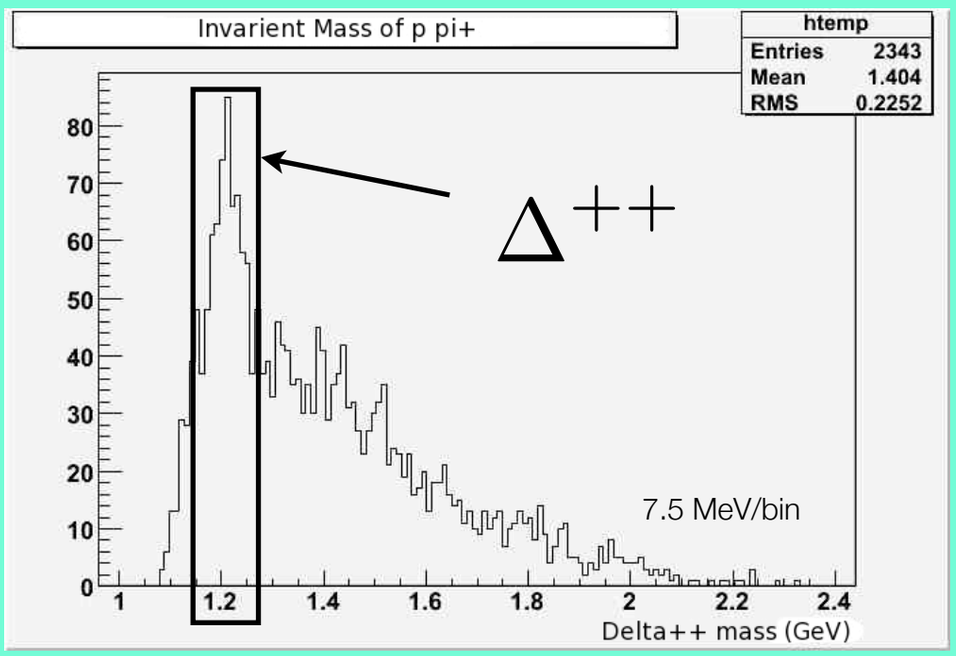


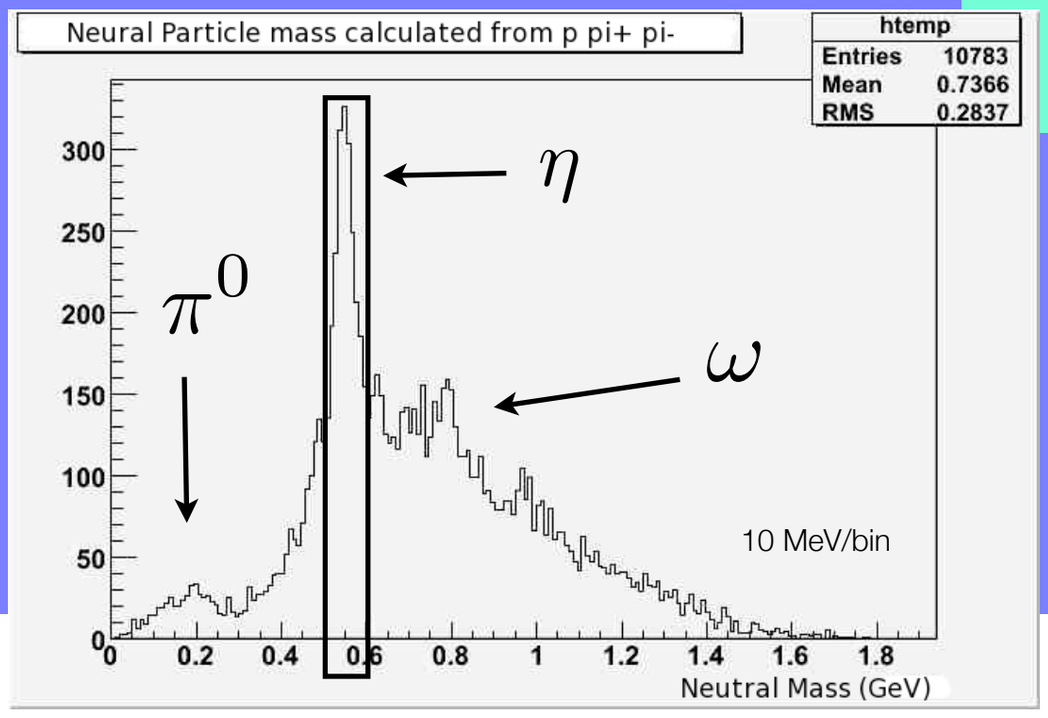


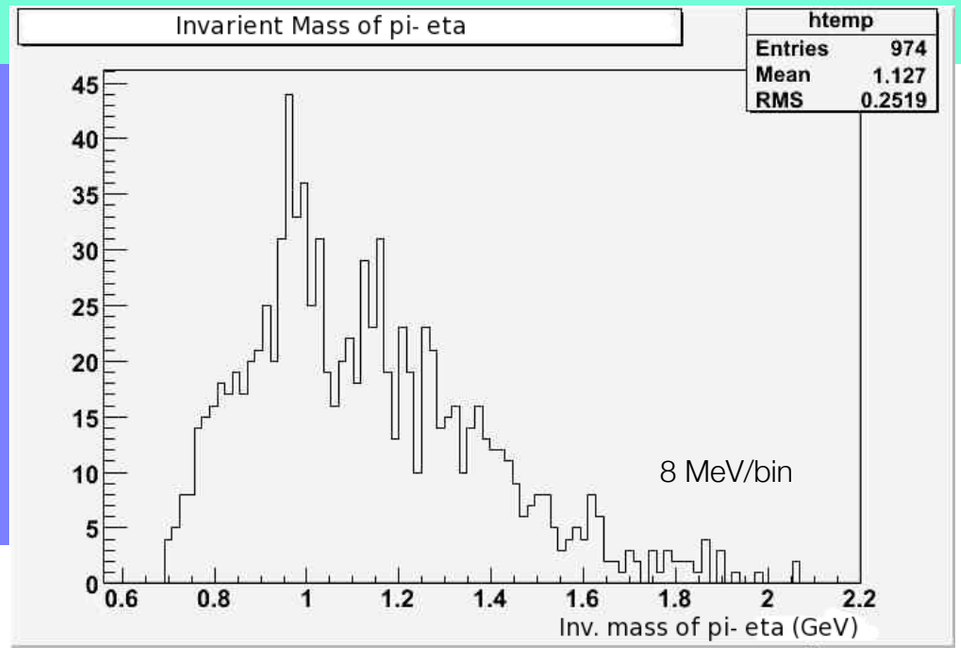
$$\gamma + p \rightarrow \Delta^{++} + \pi^- + \eta$$

- new cuts:
  - invariant 2γ mass
  - compare angles of neutral to 2γ

$$p\pi^+\pi^-2\gamma$$



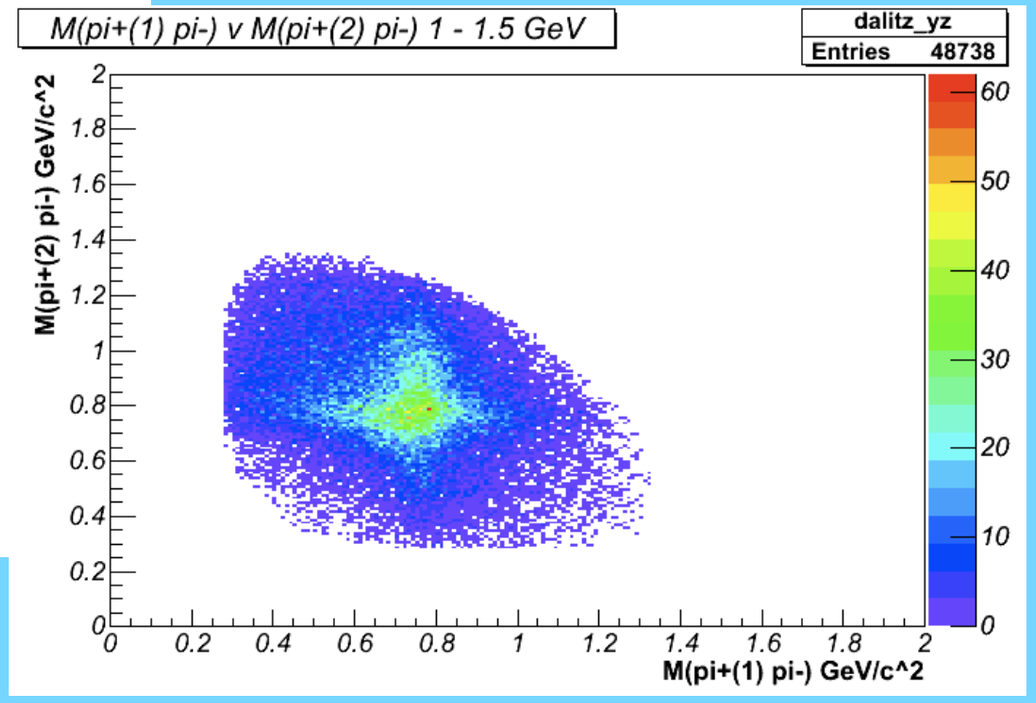


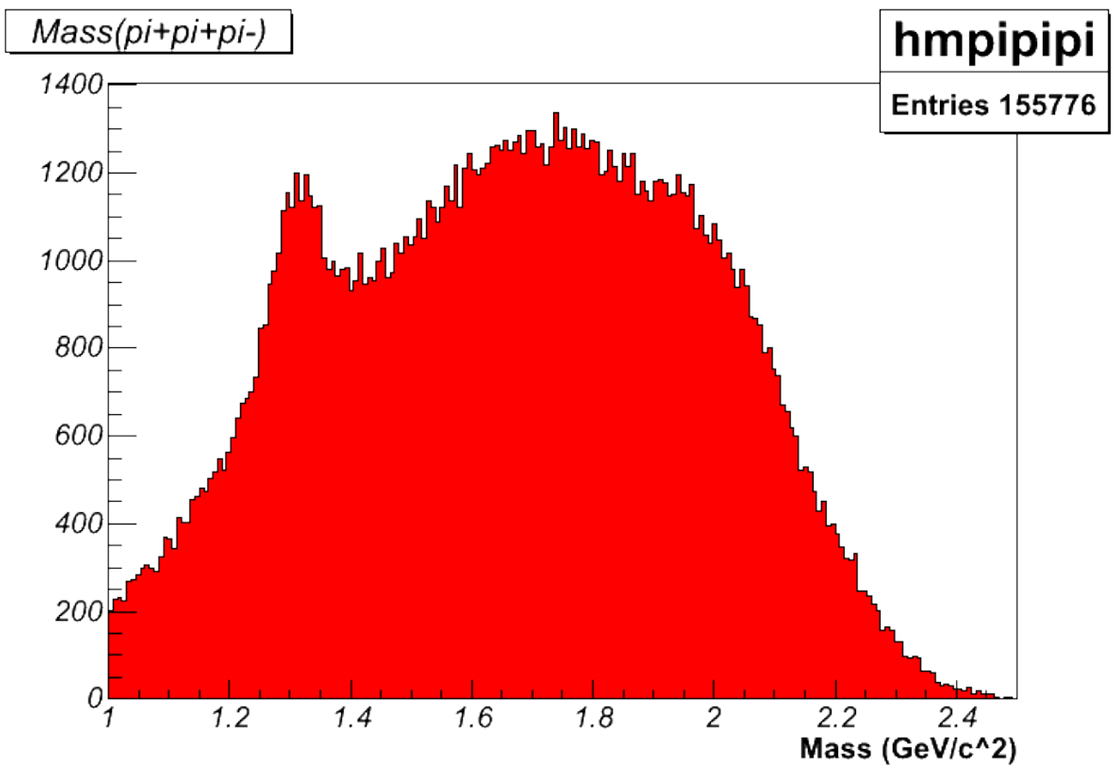


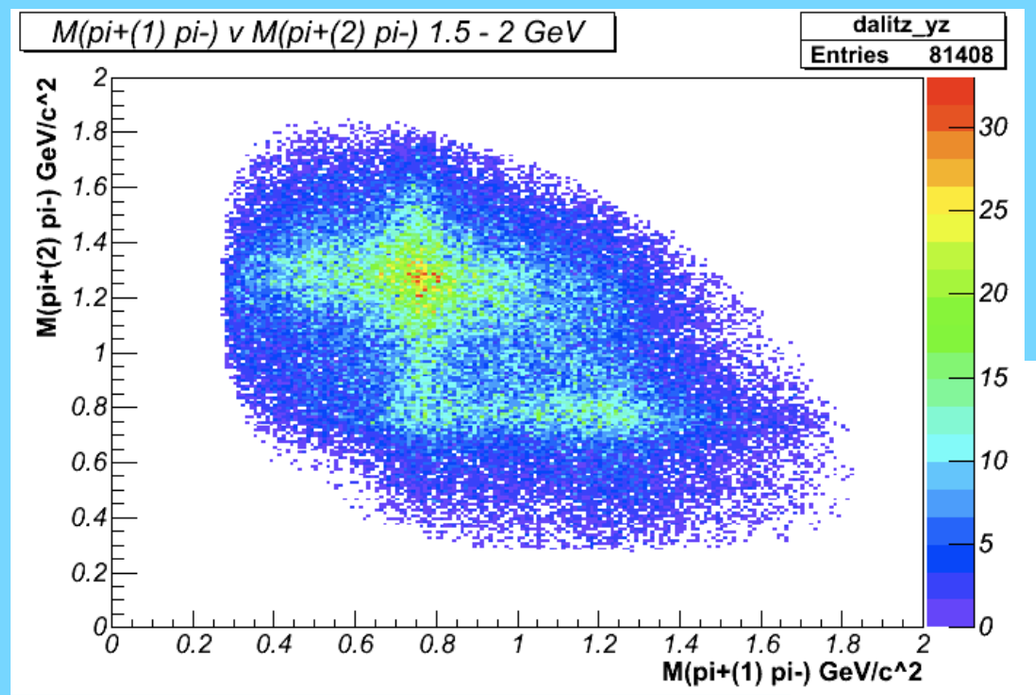
$\gamma + p \rightarrow n + \pi^+ + \pi^+ + \pi-$

(Craig Bookwalker)

- top plot shows ρ(770) isobar
- bottom right shows both ρ(770) and f2(1270)
- bottom left shows a2(1320)

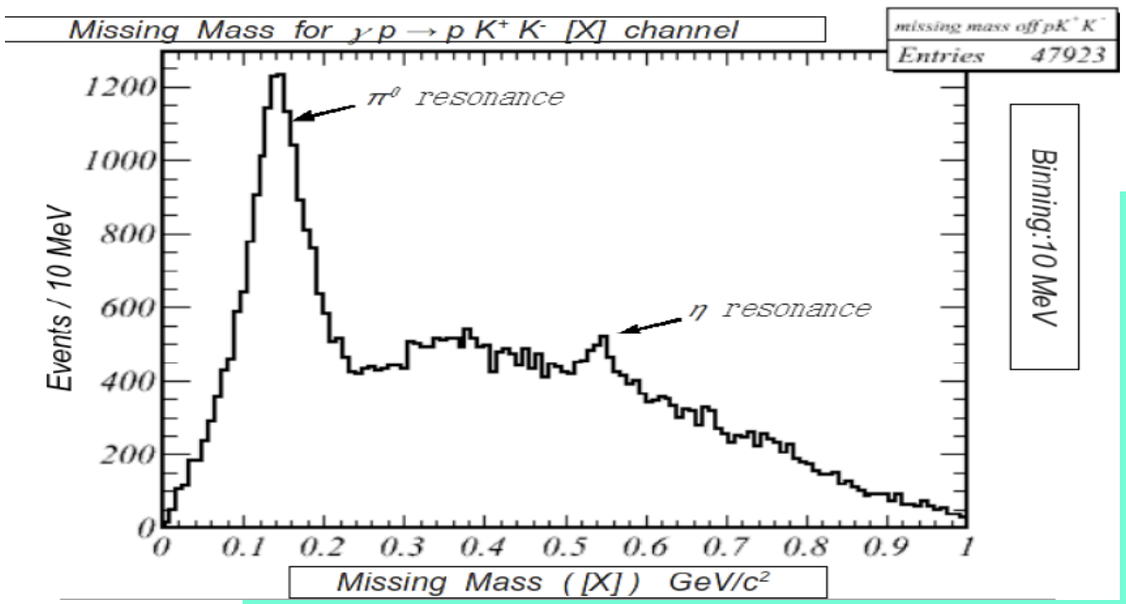


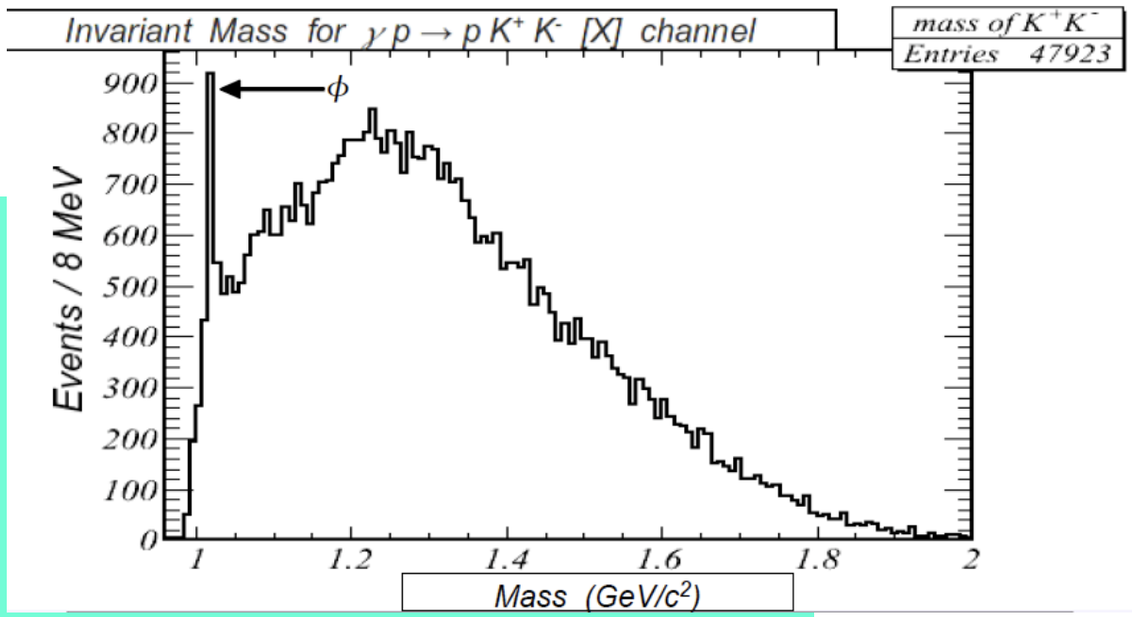




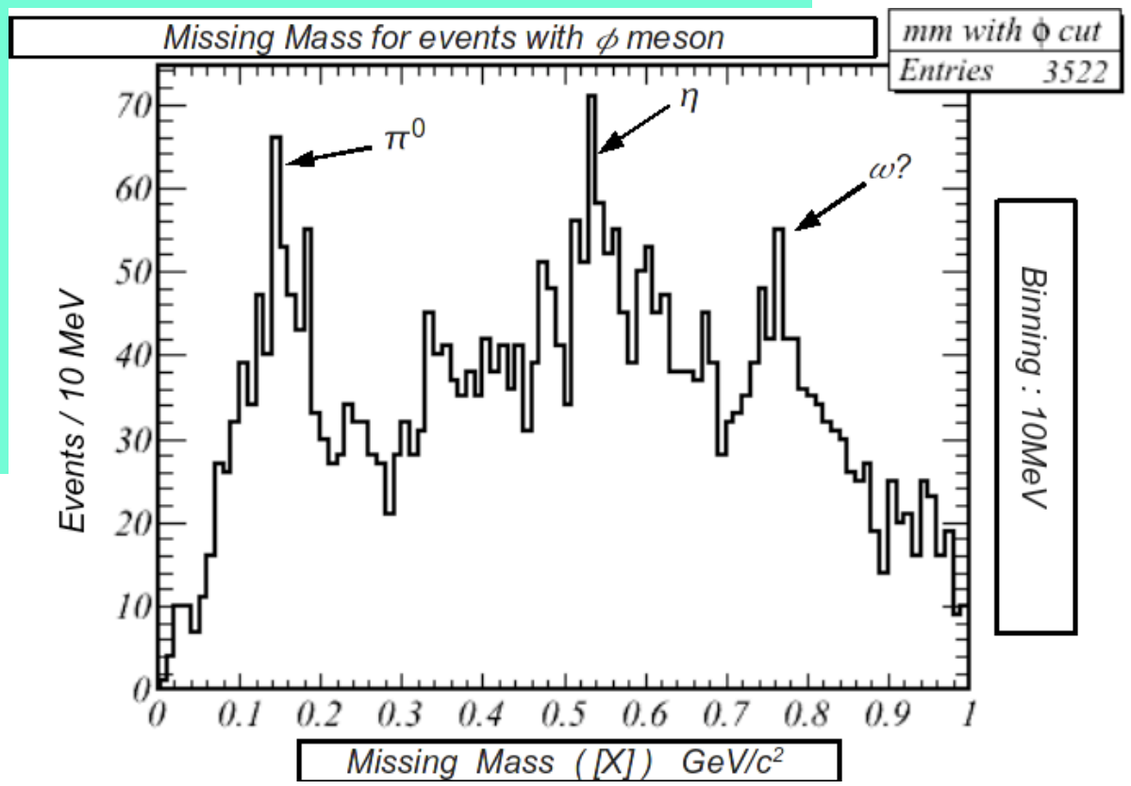
$\gamma + p \rightarrow p + K^+ + K^- + \eta$

(Mukesh Saini)





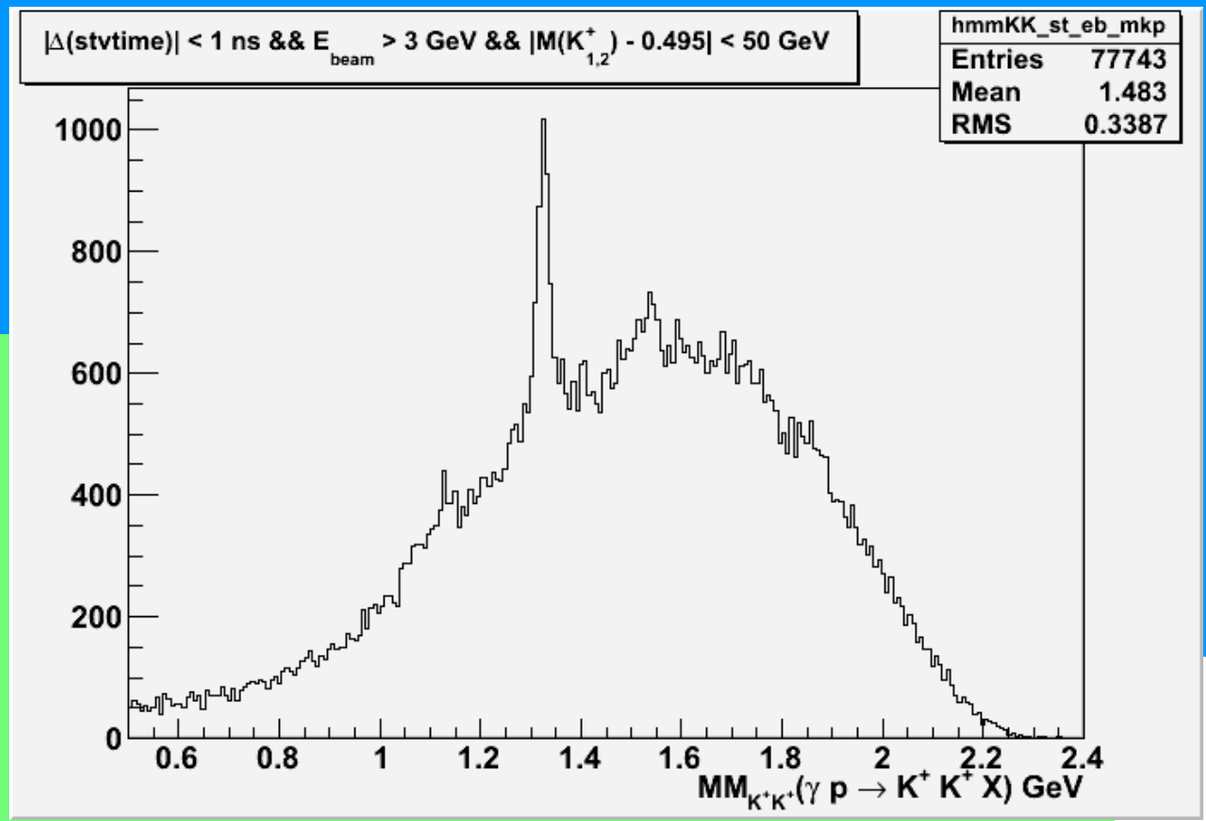
- the Φ η channel is the signature decay mode for initial strangeonium states
- the Φ π0 channel is exotic due to OZI suppression



$\gamma + p \rightarrow \Xi^* + K^+ + K^+$

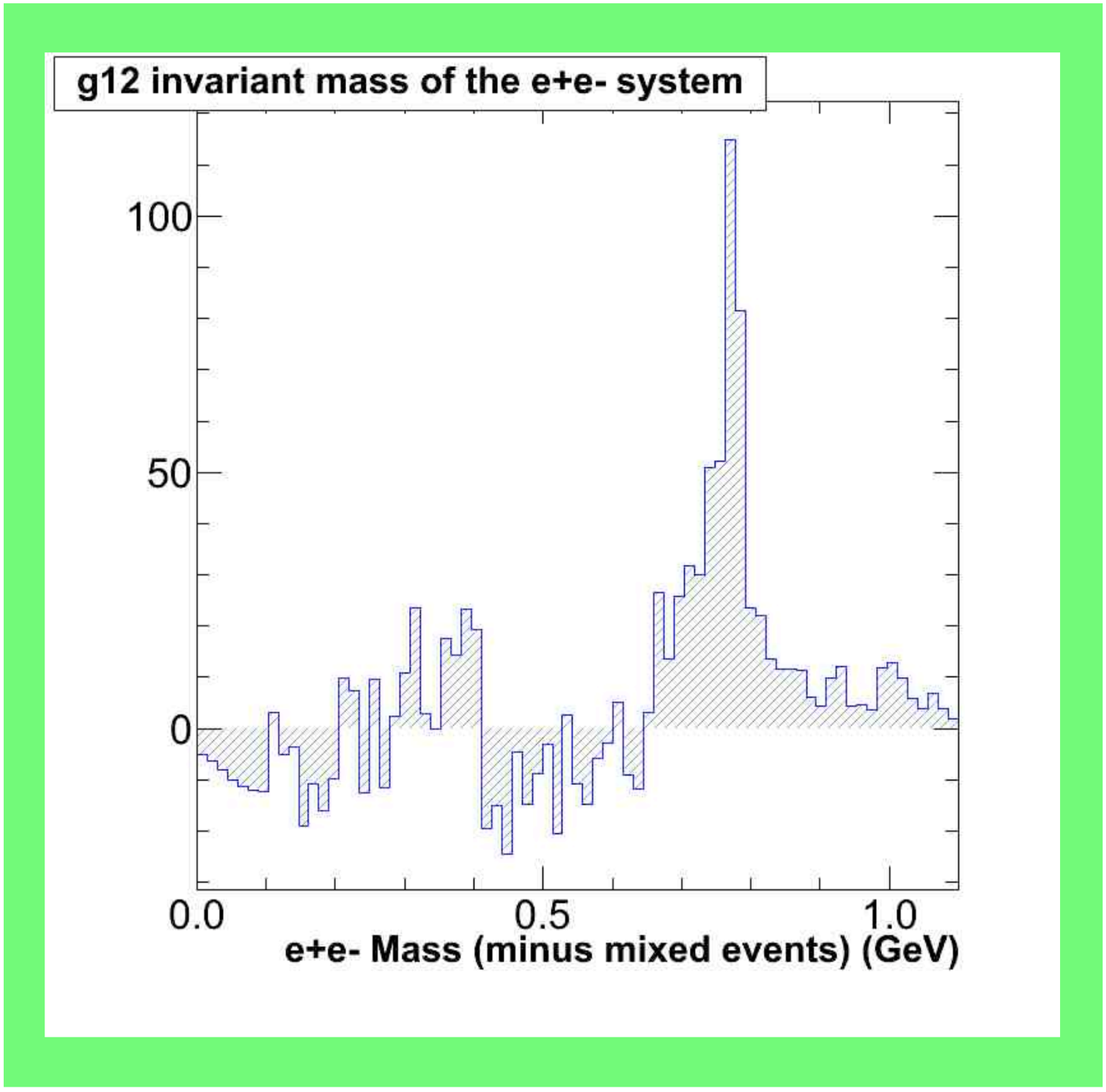
(Johann Goetz)

- Ξ(1320)
  - events:1200 +/- 100 events
  - mass/width: 1324/13 MeV
- Ξ(1530)
  - events: 400 +/- 100
  - mass/width: 1534/16
- plot includes 4% of data



$$\gamma + p \rightarrow p + e^+ + e^-$$

(Mike Paolone)



- CC and EC work and are reasonably calibrated
- looking into ρ - ω interference
- PDG Masses:
  - ω: 782 MeV (narrow)
  - ρ: 770 MeV (wide)
  - Φ: 1020 MeV