Run 13 W Production Request for Period 1 (Day 74 -Day 128)

Run 13 W Analysis Group

General Strategy of Production and Embedding Request (1)

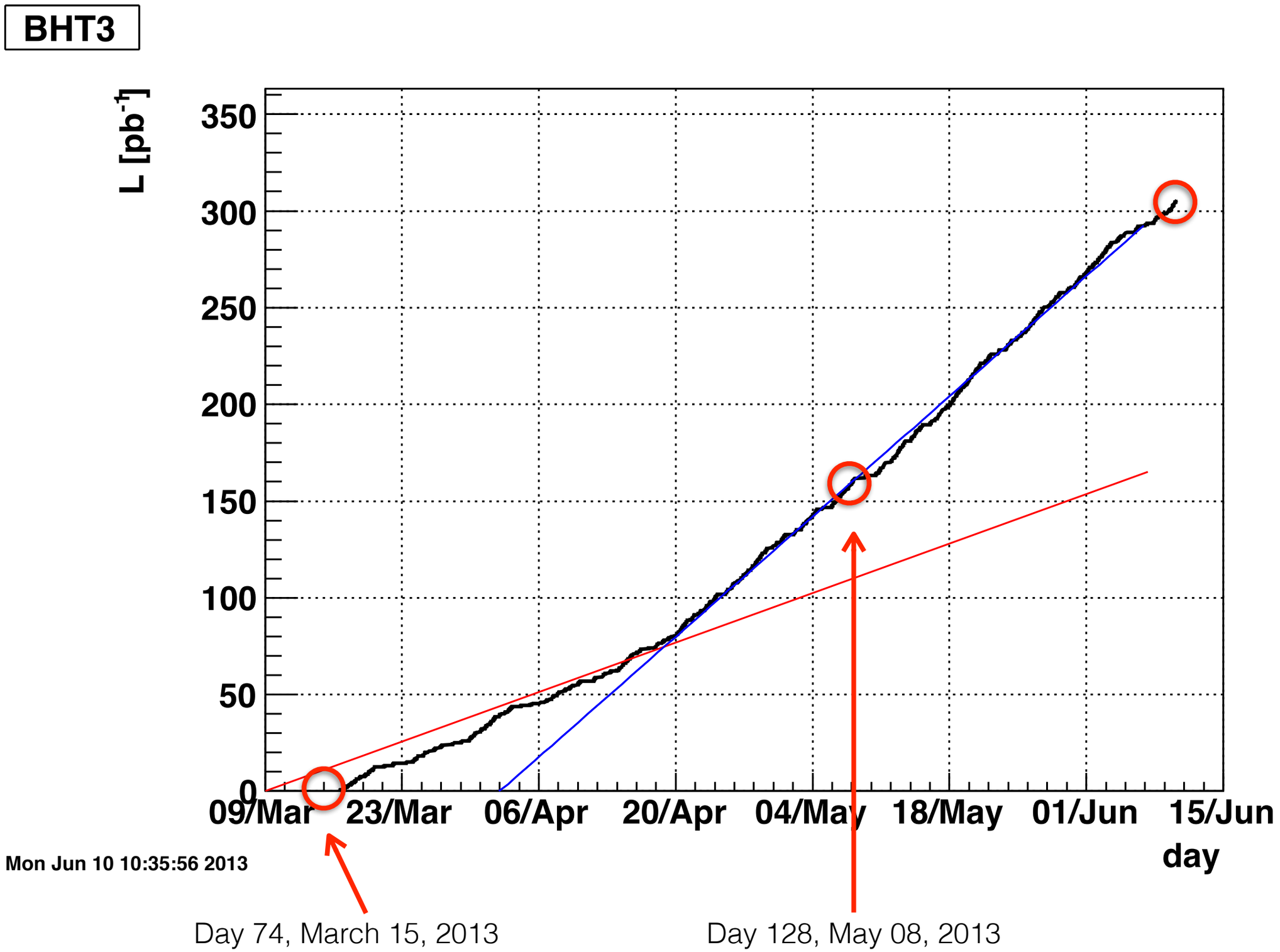
- The production and embedding request of the Run 13 W analysis at mid-rapidity will need to be dealt with in two separate steps referring to two run-range periods:
  - Period 1: Day <=128
  - Period 2: Day > 128

- Offline Run QA has been completed as reported earlier for Period 1 and Period 2, i.e. for the whole Run 13 run range.
- However, the TPC calibration has been so far completed only for Period 1!
- The HFT prototype installation occurred around day 128 and introduced changes to the dead material distribution which have so far not been modeled yet. Proper dead material modeling is needed for both the actual TPC calibration and the GEANT modeling of STAR for day > 128.
- No time estimate has been provided by the HFT group as to when the dead material modeling of the HFT is completed. Only then can we start with the TPC calibration for day > 128.
- In the meantime, a test production has been completed for Period 1 which will be presented here.

General Strategy of Production and Embedding Request (2)

- Taking all these constraints together, the W Run 13 analysis group decided to proceed as follows:
  - Presentation of ‘Run 13 Test production in comparison to Run 12 results’
  - Production request for Period 1 followed by Embedding request for Period 1
  - Develop and refine analysis (Period 1) by Devika and Jinlong
  - TPC calibration for Period 2 once HFT dead material implementation is complete
  - Test production for Period 2
  - Production request for Period 2 followed by Embedding request for Period 2
  - Continue and complete analysis (Period 1+2) by Devika and Jinlong
  - Preparation of prelim. result for Fall 2014: DNP 2014 / SPIN 2014

Run 13 Luminosity - BHT3



Run List

Run List of period 1

- # of runs (in period 1) / (total) : 1366 / 2398
  - First priority runs: 1055 / 1846 ; “pp500_production_2013” && “successful”
  - Second priority runs: 30 / 63 ; “pp500_production_2013_noendcap” && “successful”
  - Third priority runs: 281 / 489 ; “pp500_production_2013/_noendcap” && “questionable”
- Runs NOT worth producing (runs with issues) :
  - Runs 14120013-14120016 have issues with luminosity scalers - 4 runs
  - Runs 14126017- 14129019 have TPC issues - 78 runs
  - Runs with 0 or <10 BHT3*L2W trigger counts - 24 runs (5 in period 1)
- TOTAL runs to be produced for period 1 and 2 : 2292
- Final list **of runs to be produced in period 1 : 1366 - 87 = 1279**

Calibration Status

- TPC Calibration
  - For the period 1: Done
  - For the period 2: Not Completed (Modeling of the HFT dead material is needed!)
- BEMC
  - BEMC status tables: Uploaded to DB
- EEMC
  - EEMC status tables: Uploaded to DB

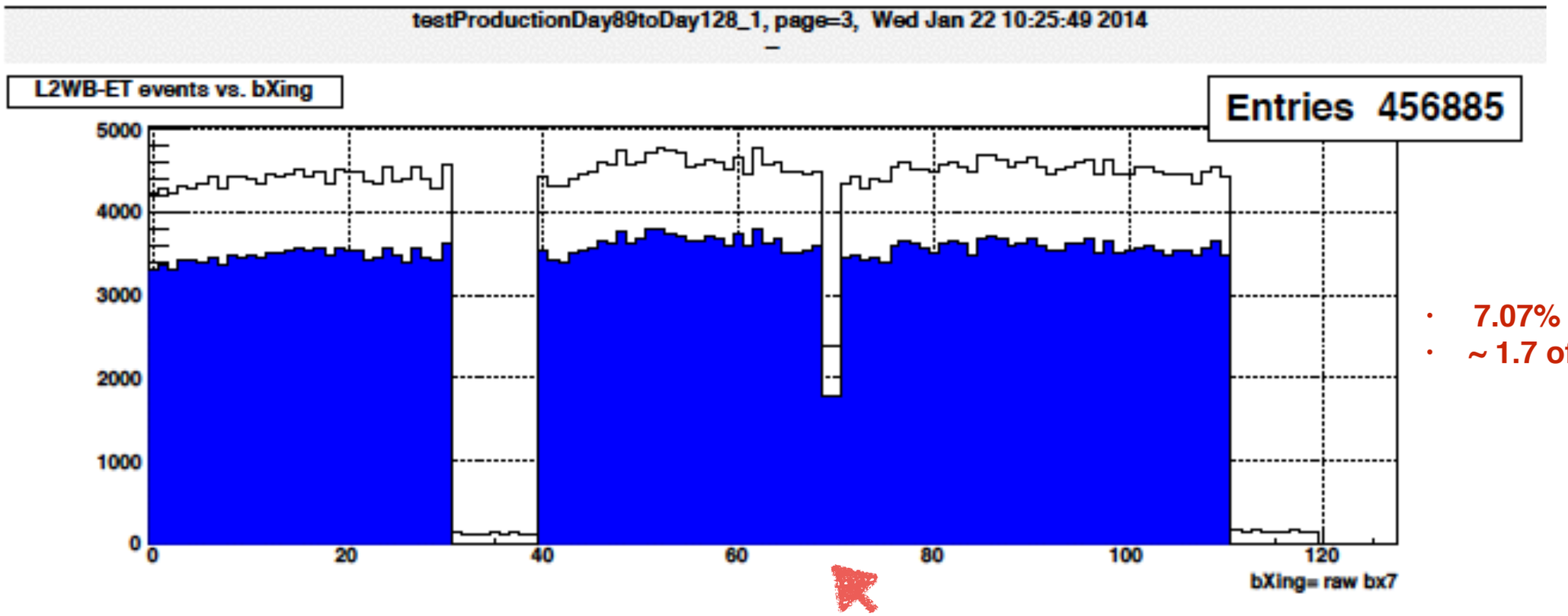
Test Production

- A test production for period 1 (day 82- Day 128) has been completed:
    - Total # of runs used: 474
      (run selection criteria: https://drupal.star.bnl.gov/STAR/blog/devika/2013/nov/18/testproductionrunlistselectioncriteria)
    - Total # of daq files pulled from HPSS: 508 (most with 1000 events and some < 1000 events) , integrated Luminosity : ~ 5.14 pb^{-1}
    - Total # of MuDsts produced and used in analysis: 506
    - Total # of Events (L2W): 456885 ~ 1.7% (total : 27741915)
    - Thanks to various STAR colleagues for providing institutional disk space!

Run 13 Test Production (~5 pb^{-1}) vs. Run 12 Complete (~72 pb^{-1}) W analysis characteristic plots

of L2W events

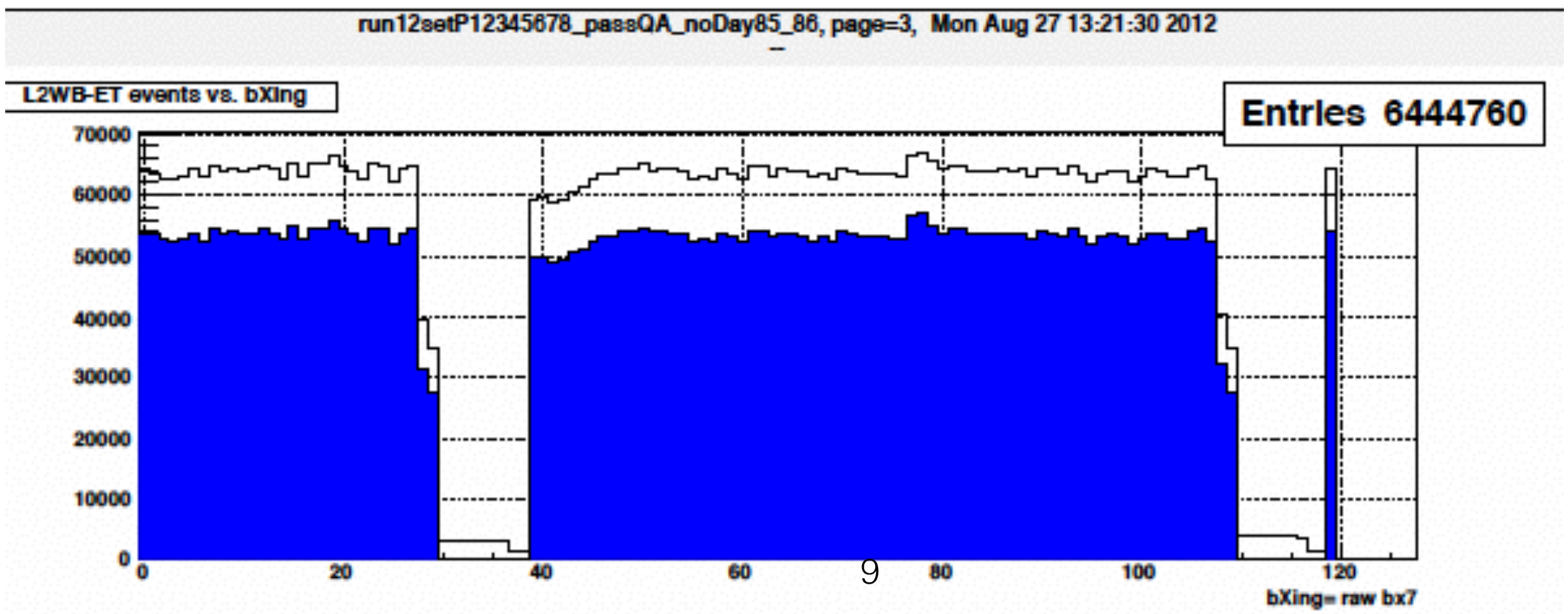
run13-test



- 7.07% compare to run 12
- ~ 1.7 of run 13 total

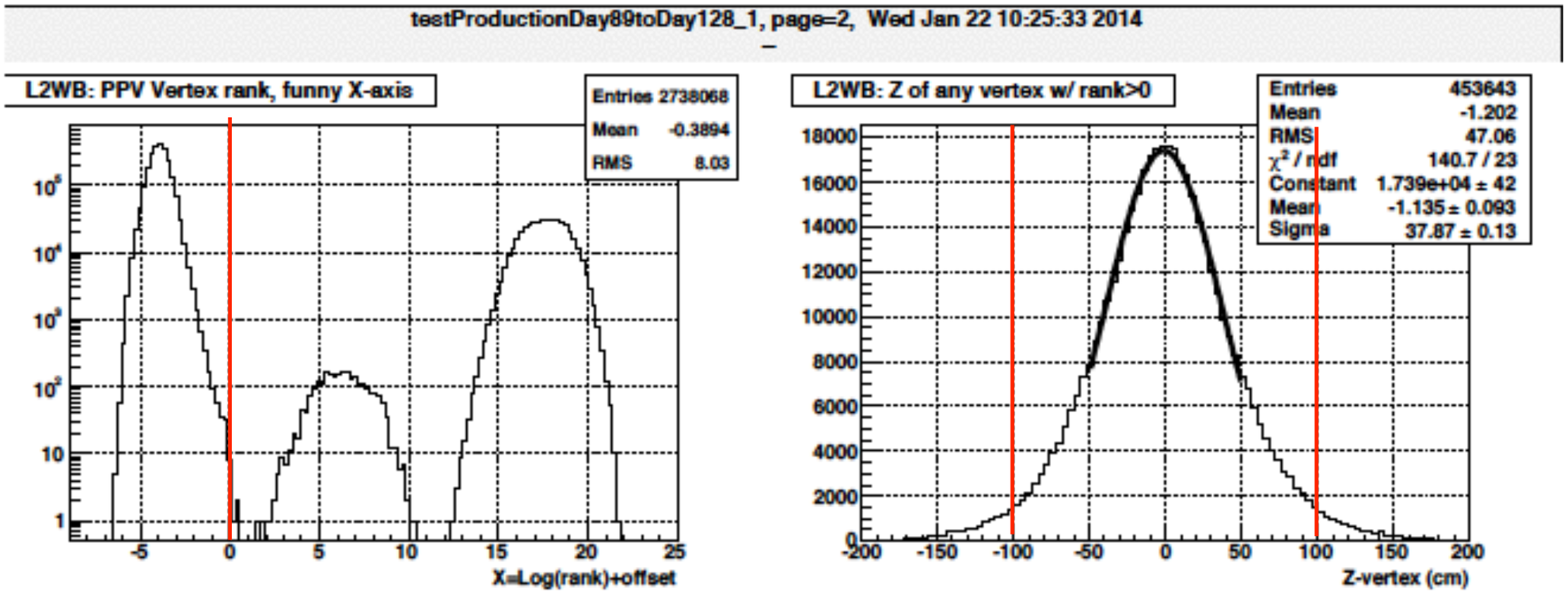
until Apr 20 B bunches 69,70 and Y bunches 29,30 were empty

run12-full

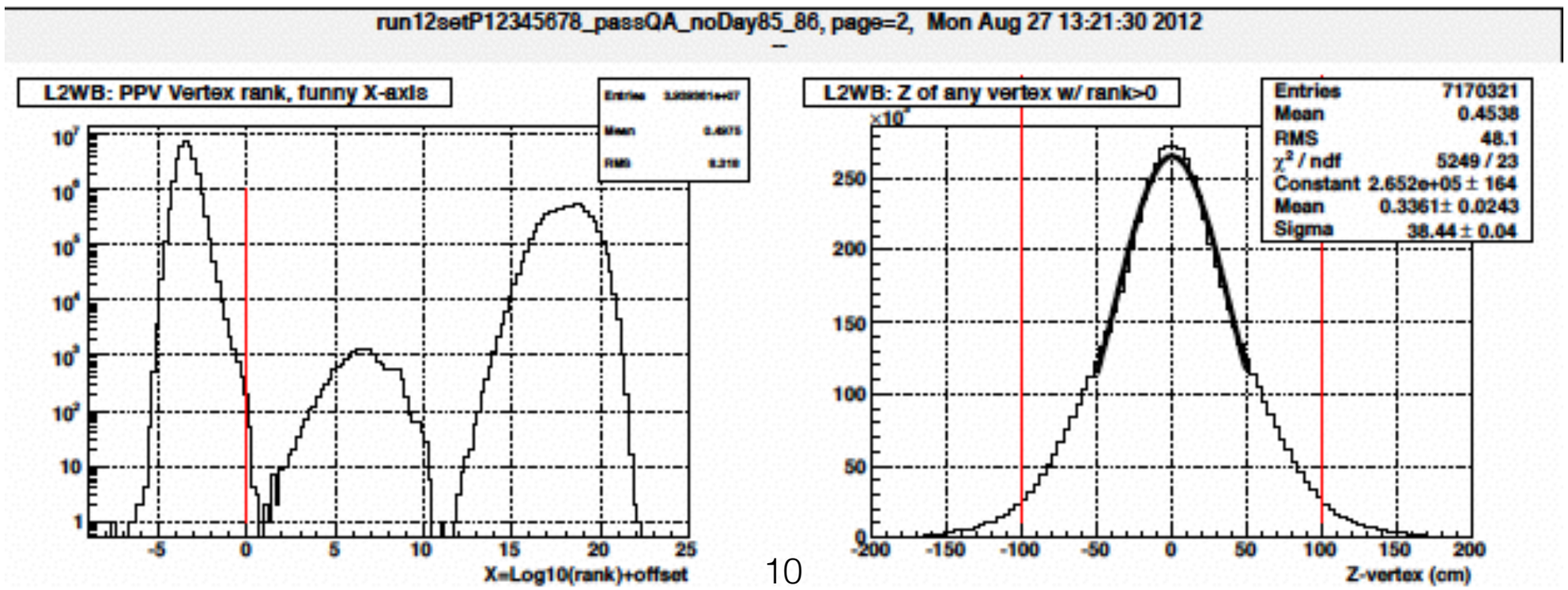


Vertex Ranking

run13-test

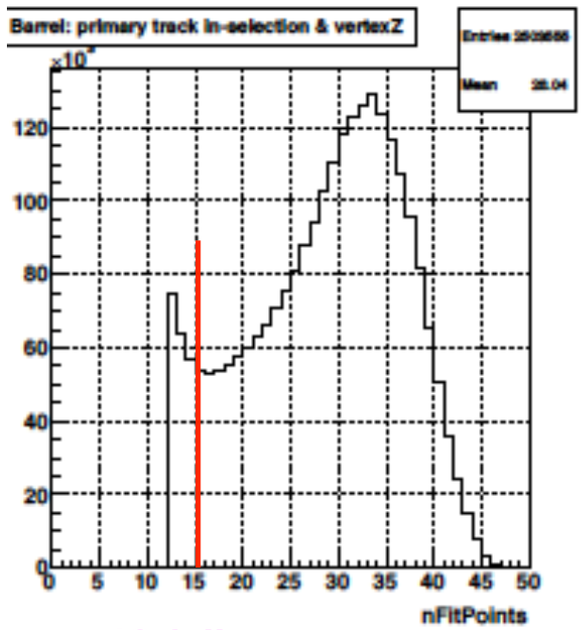


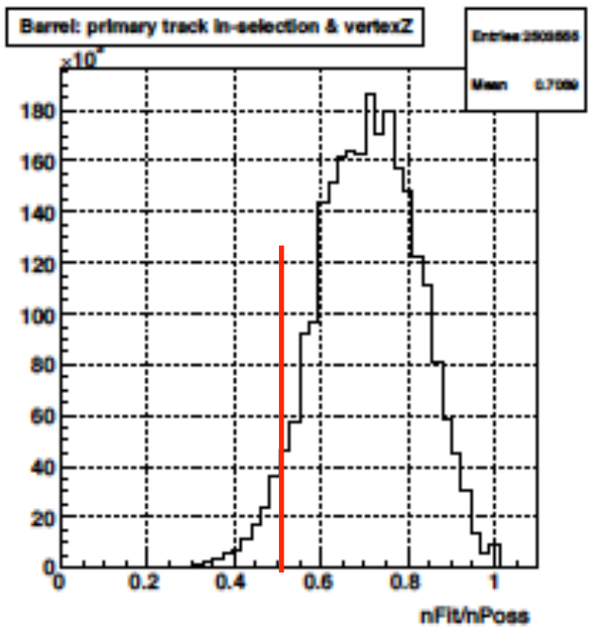
run12-full

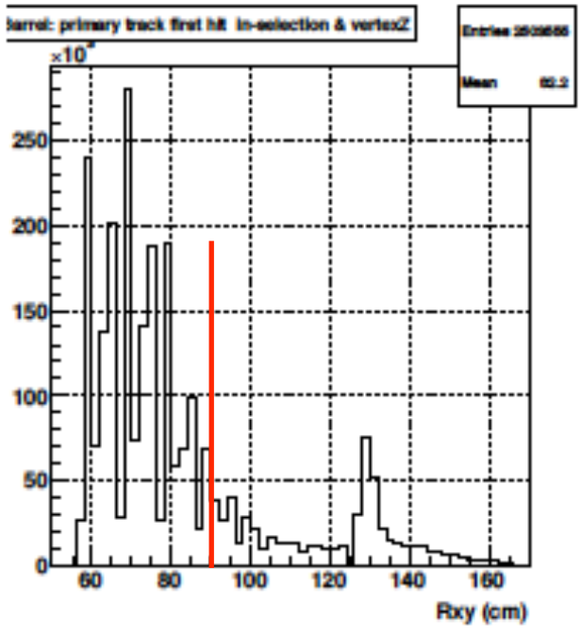


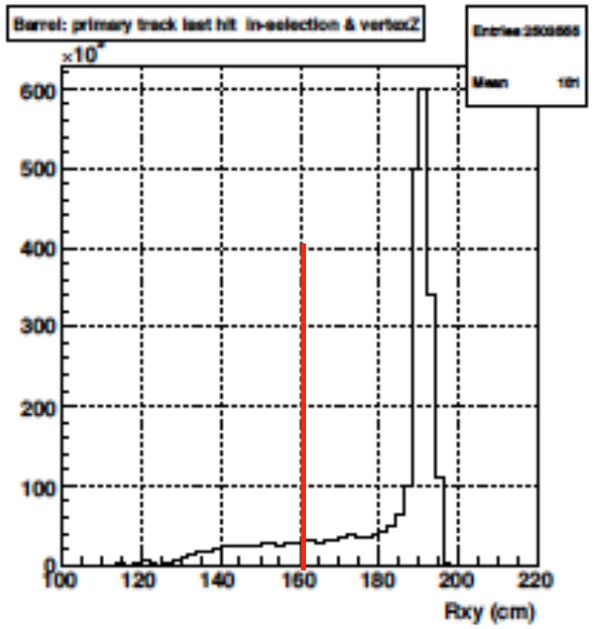
Track Selection Cuts

run13-test

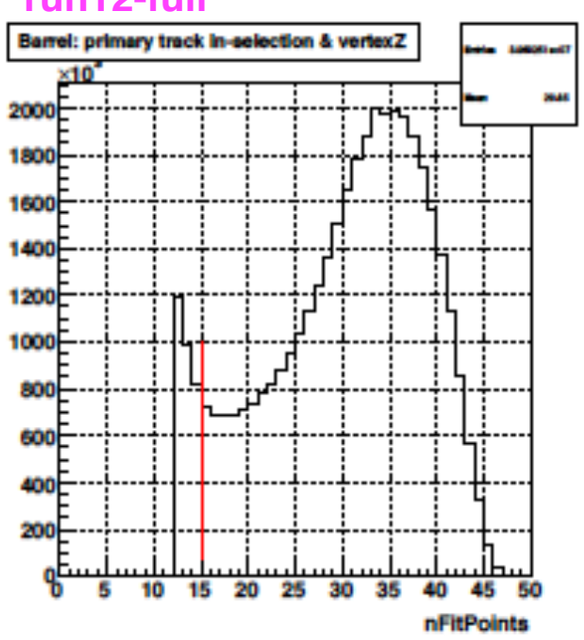


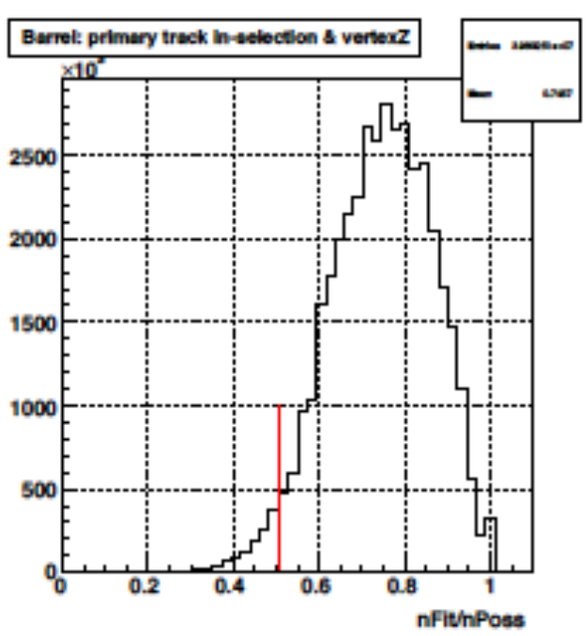


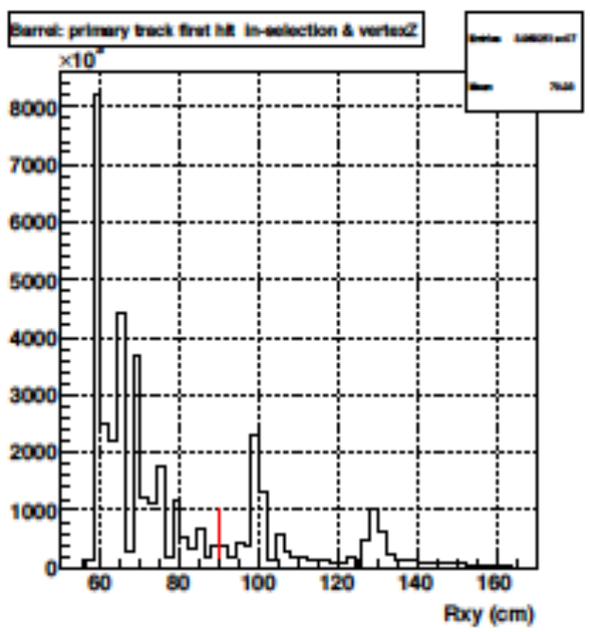


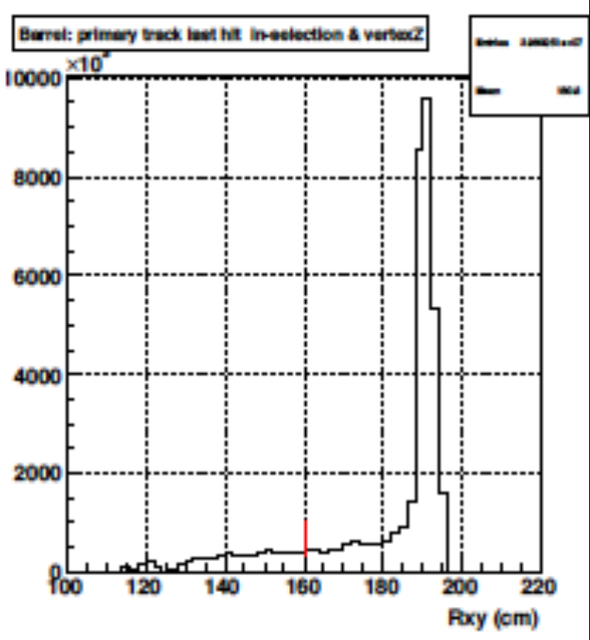


run12-full







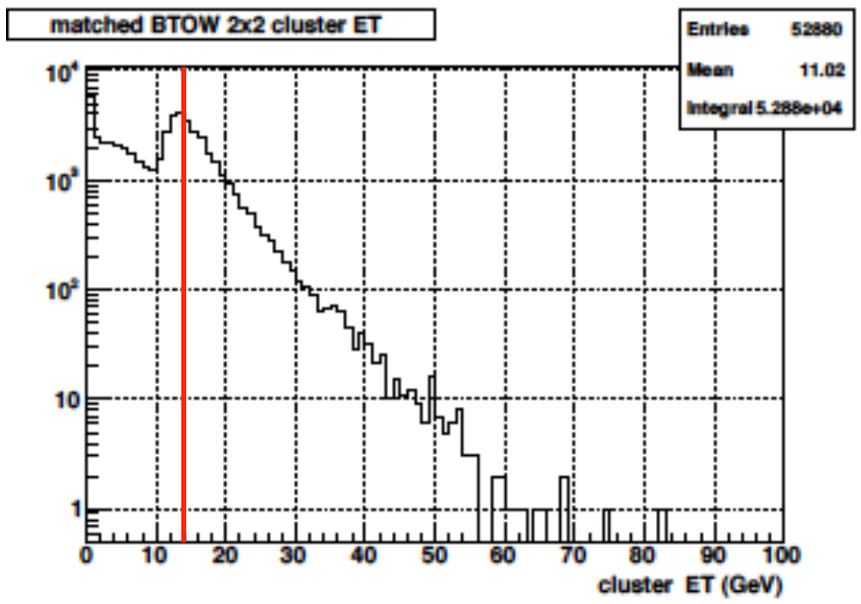


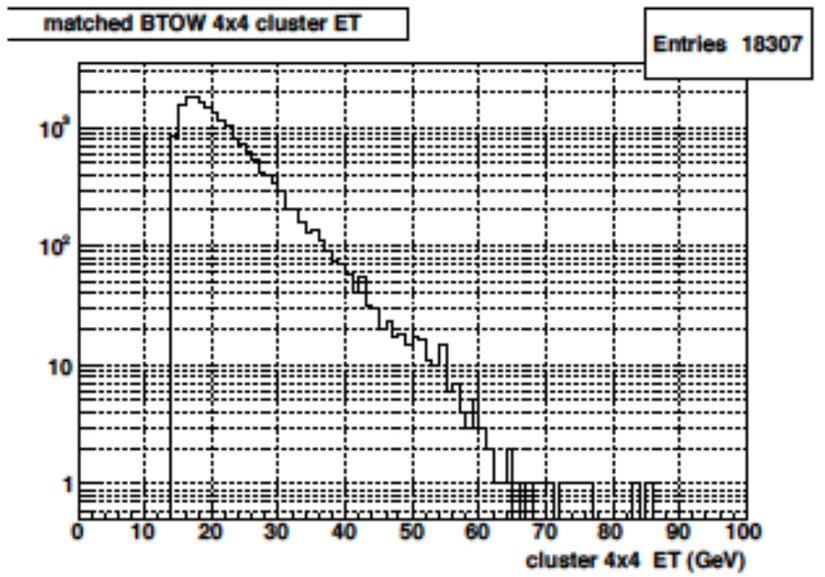
✳ **Primary Tracks**

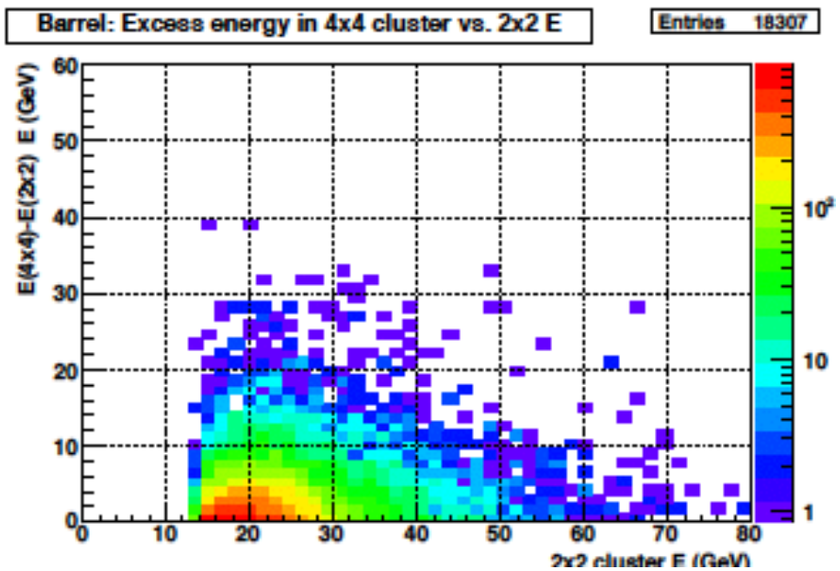
- minimum TPC points = 15 - left
- maximum number of TPC points >= 51% - middle left
- radius of the first track hit < 90 cm - middle right
- radius of the last track hit > 160 cm - right
- primary tracks have P_T > 10 GeV - tracks above does not show this cut

Cluster Energy

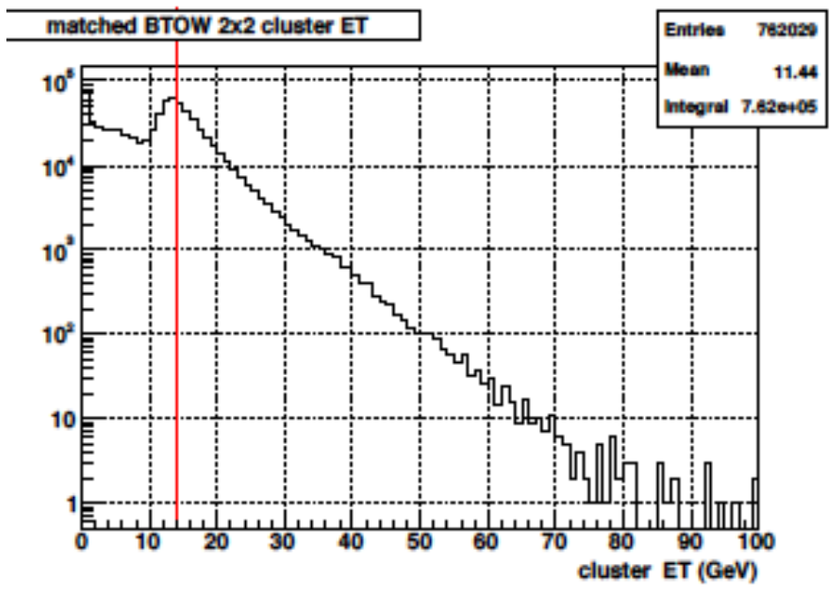
run13-test

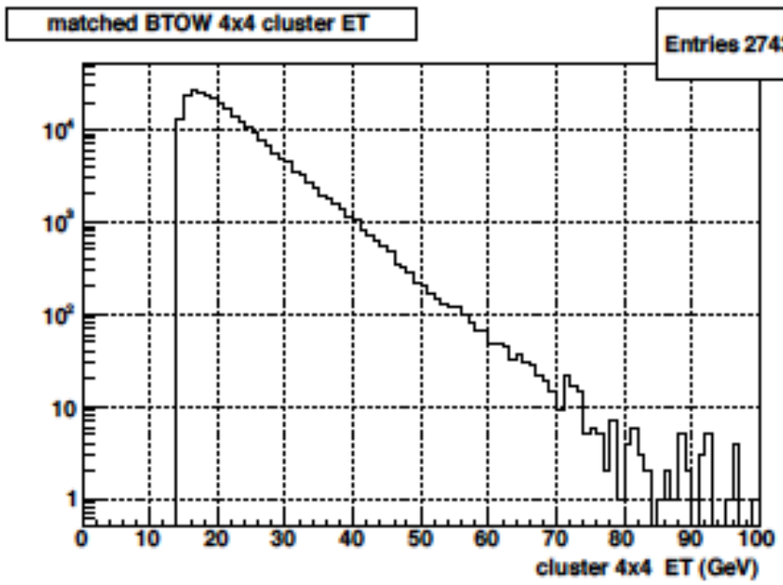


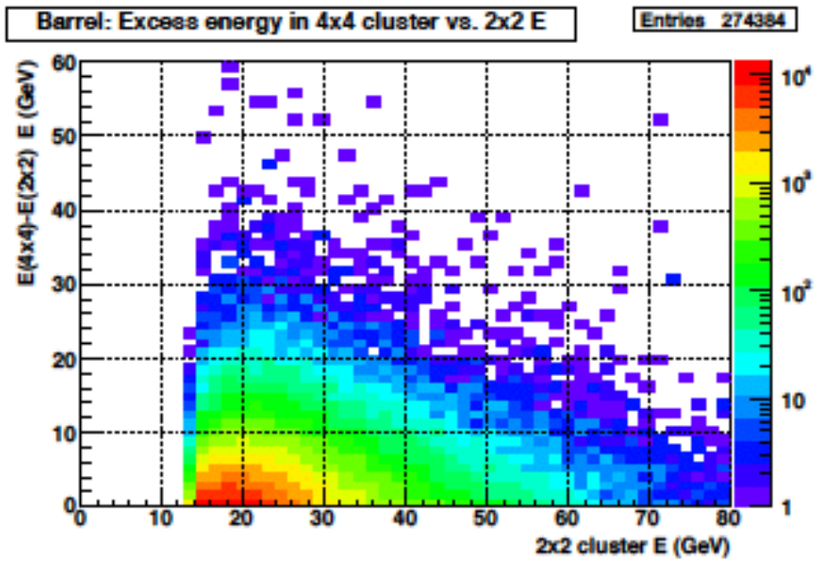




run12-full





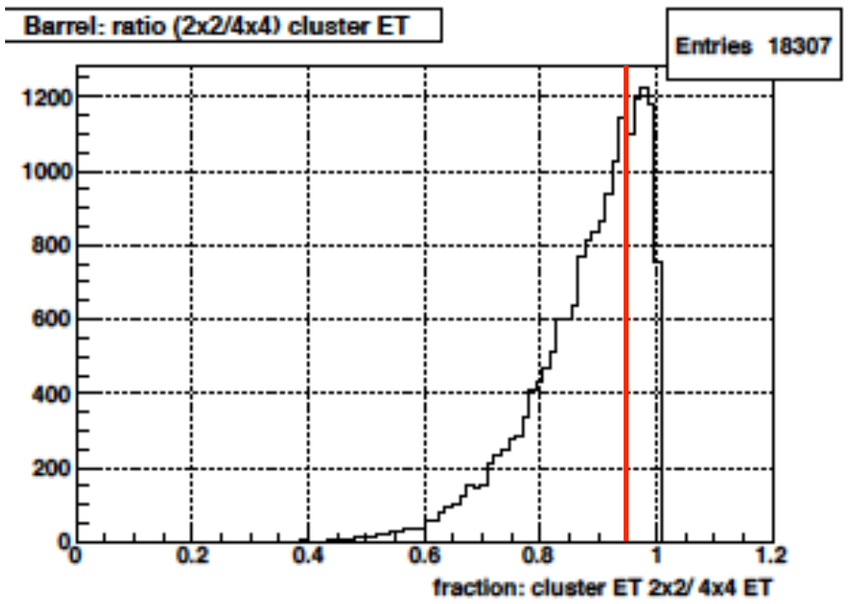


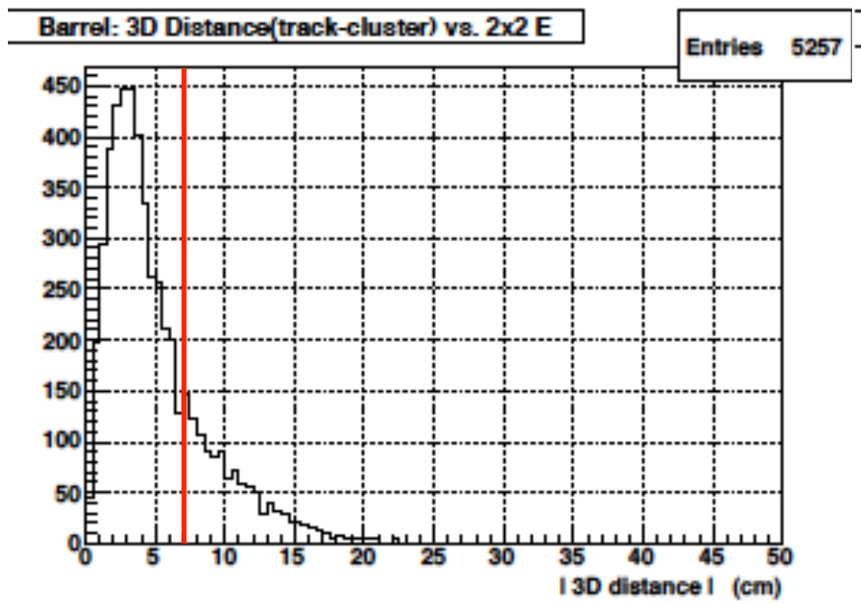
✳ **Most energetic tower cluster**

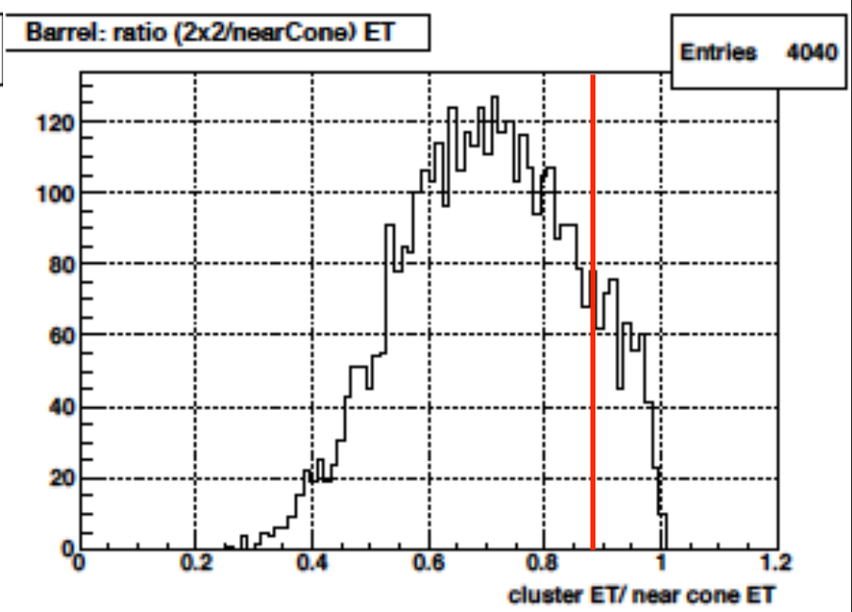
- cluster E^e_T > 14 GeV

Cluster Isolation Cuts

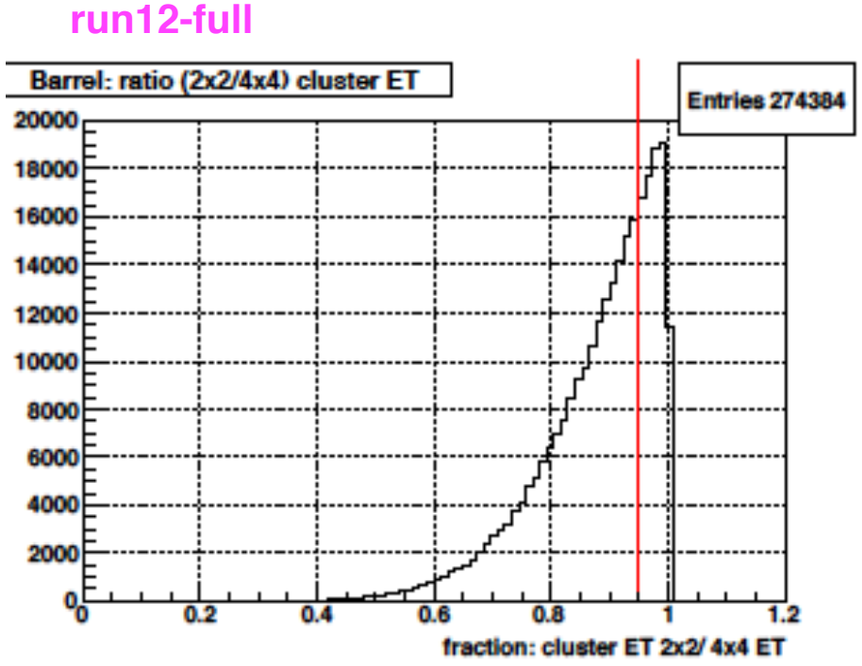
run13-test

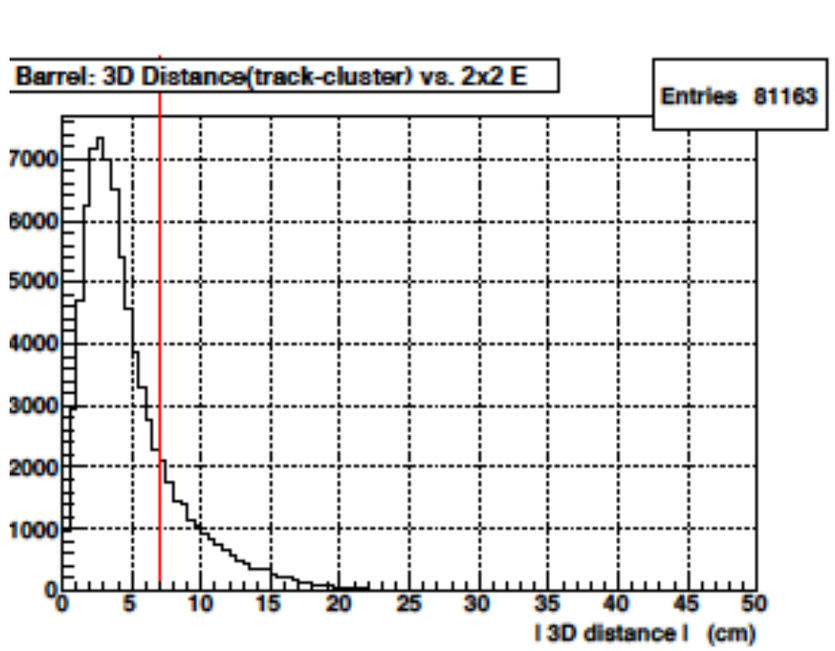


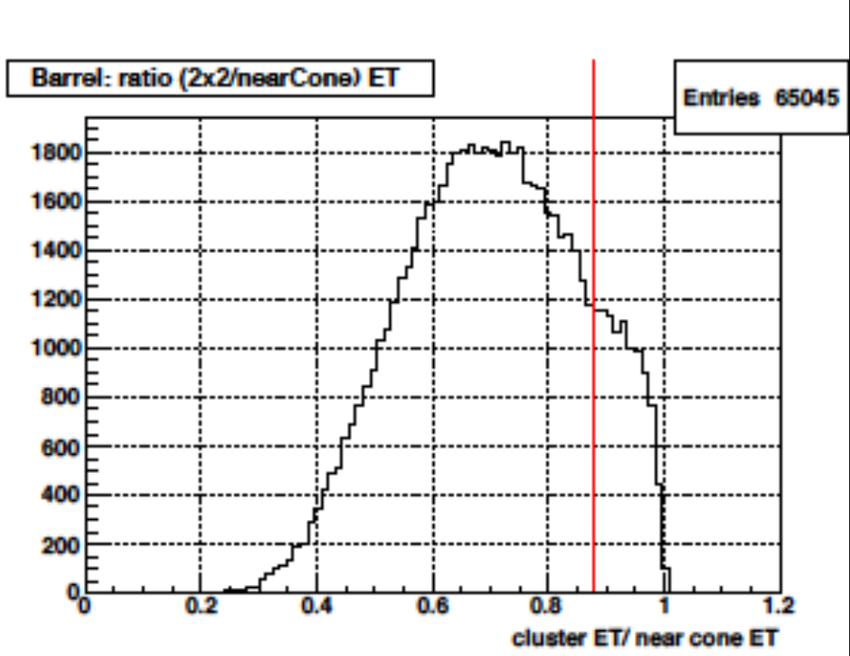




run12-full





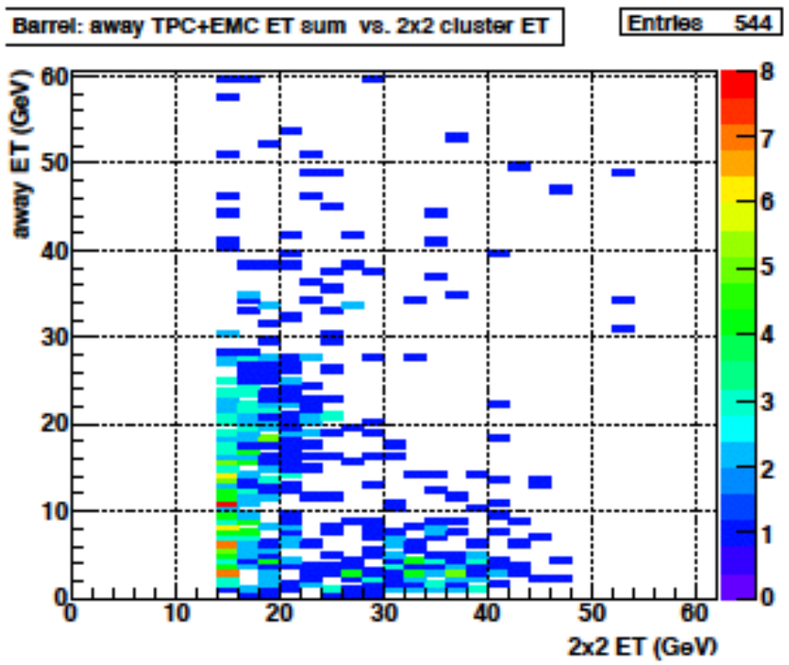


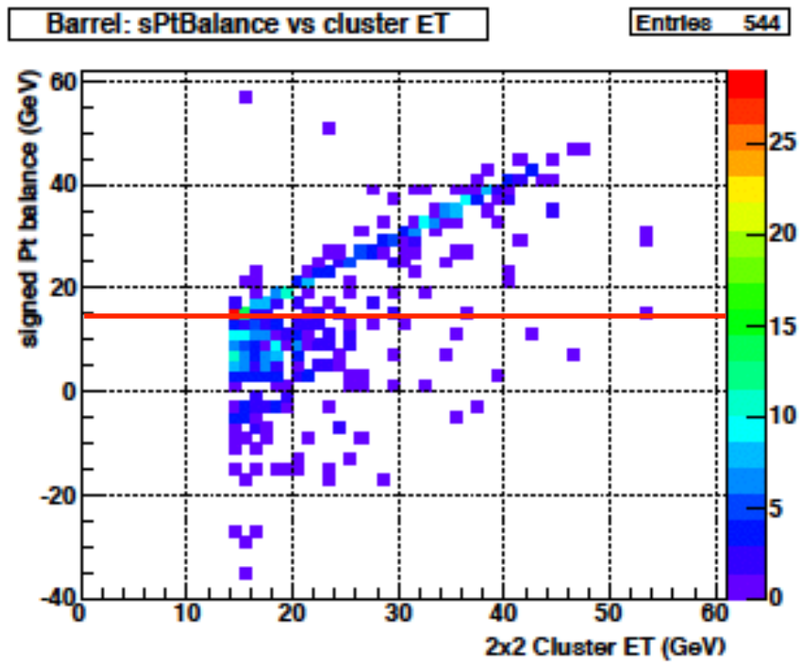
✳ **Candidate leptons in the tower cluster**

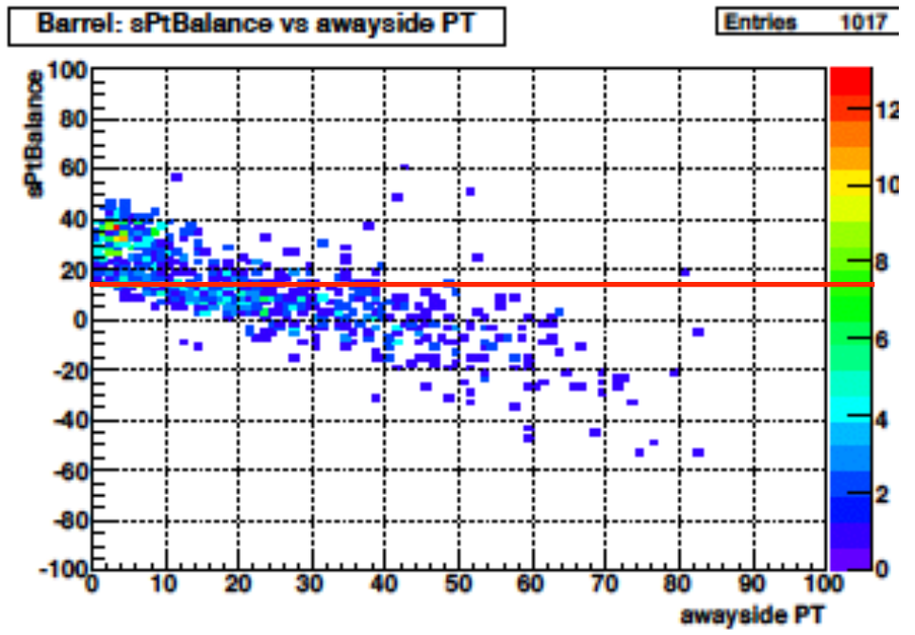
- $E^{e}_{T} / E^{4x4}_{T} > 0.95$ – left
- $E^{e}_{T} / E^{\Delta R<0.7}_{T} > 0.88$ – right
- distance between track and center of tower cluster < 7 cm – middle

Sign PT Balance Cut

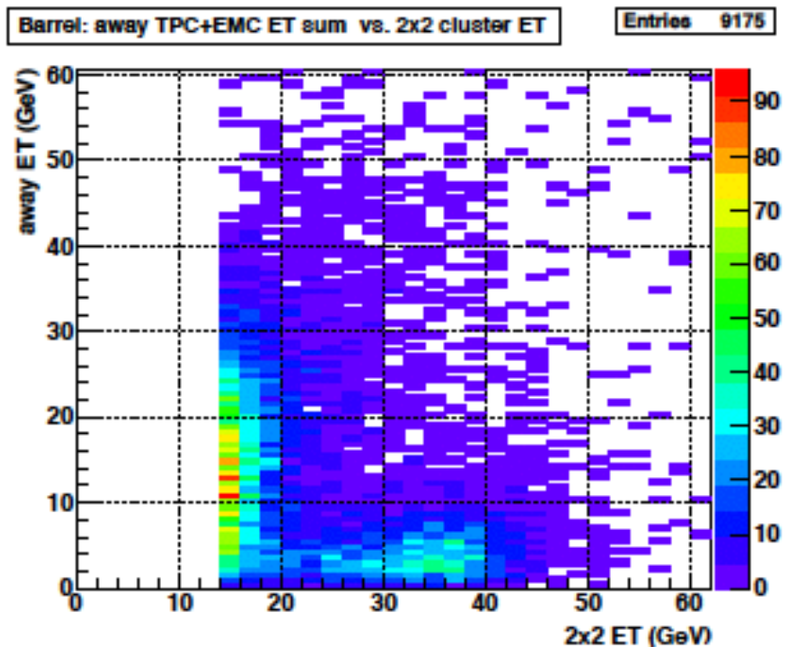
run13-test

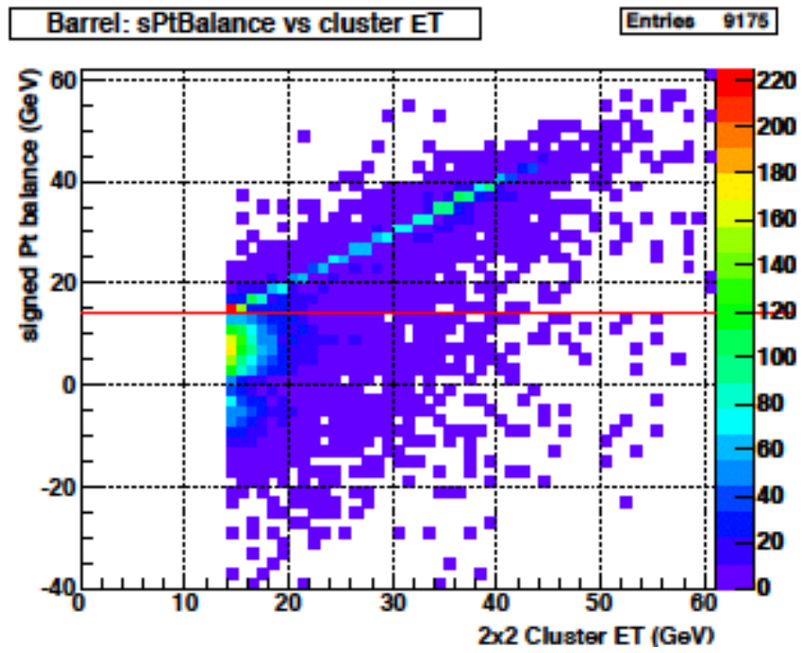


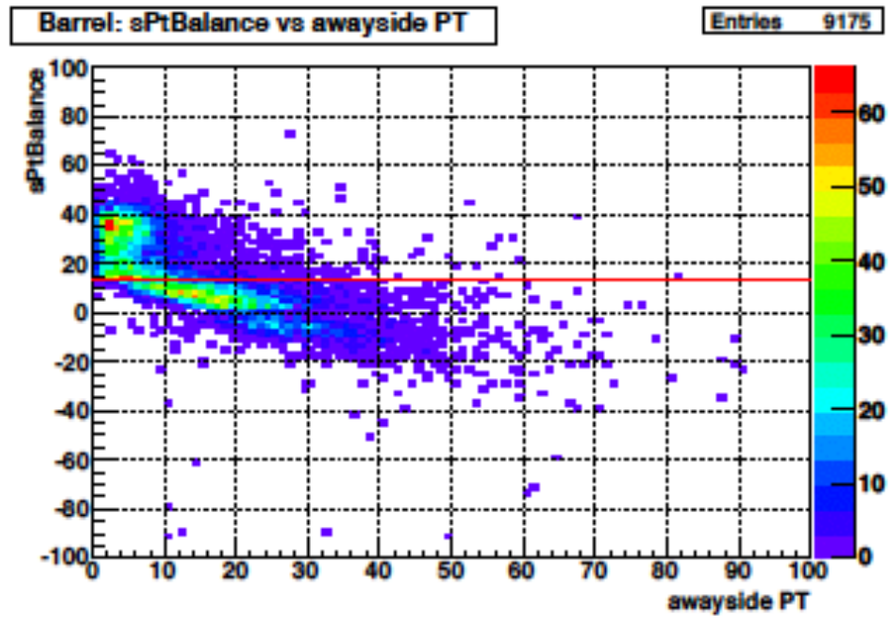




run12-full





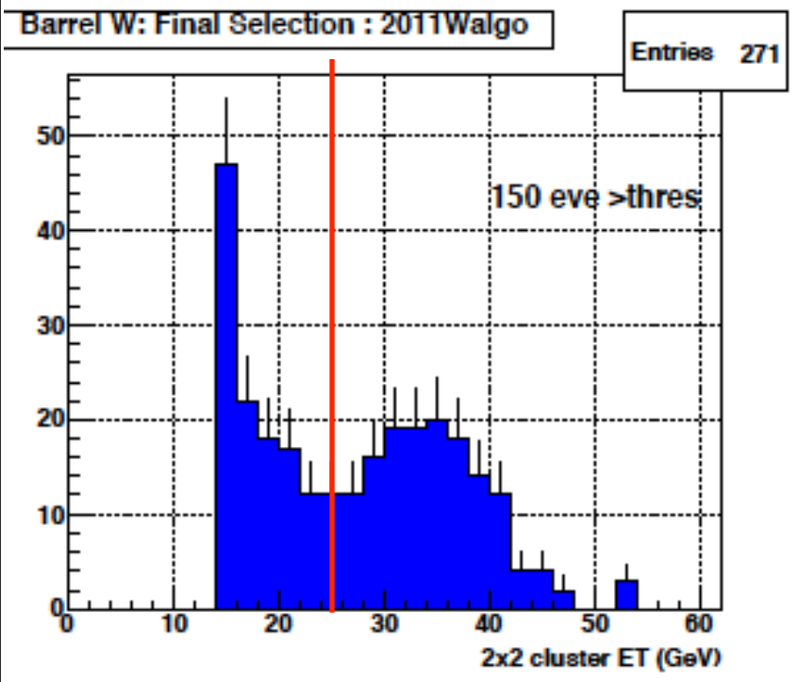


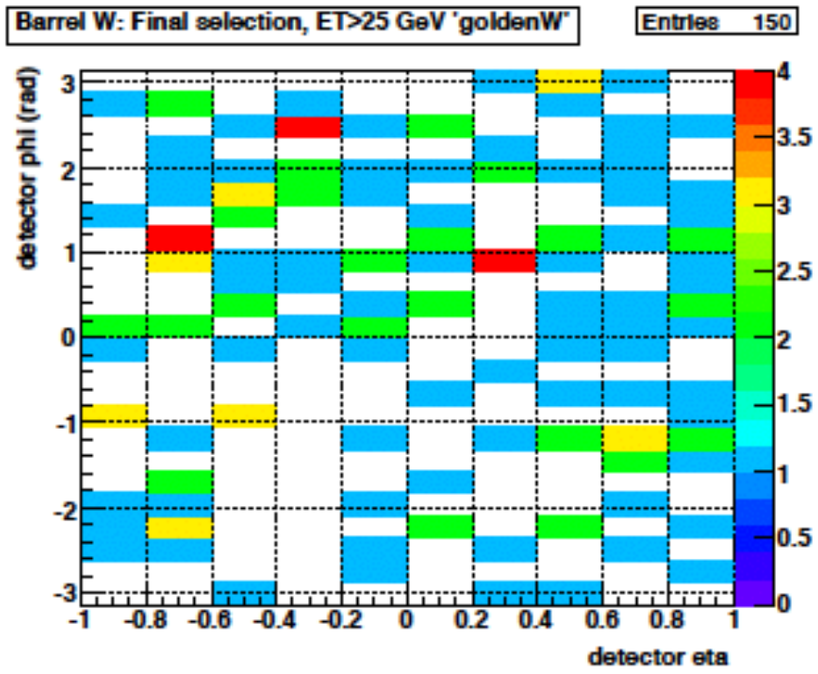
✳ W Event Selection

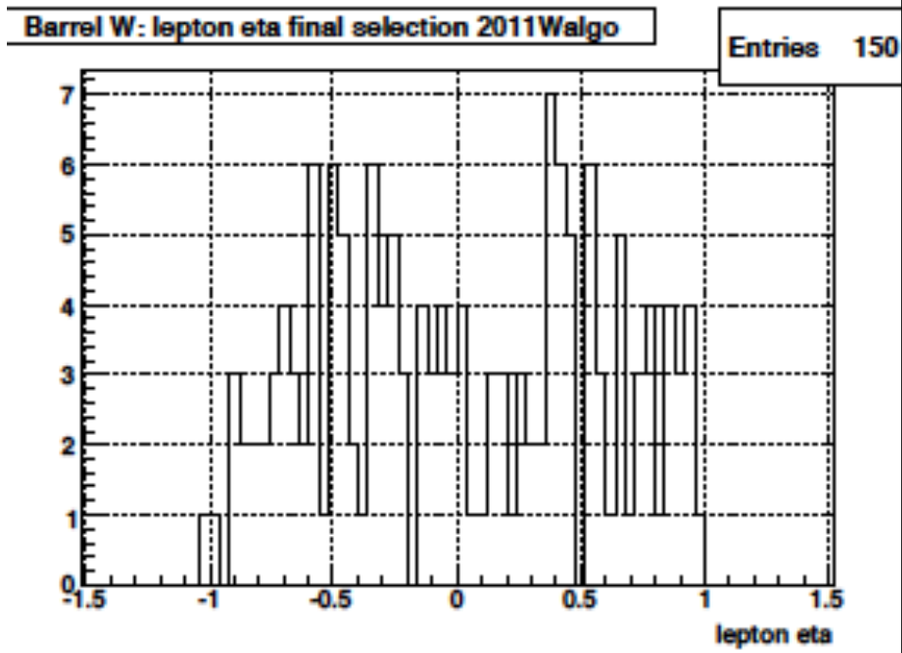
- Signed PT-balance > 14 GeV/c

Final W

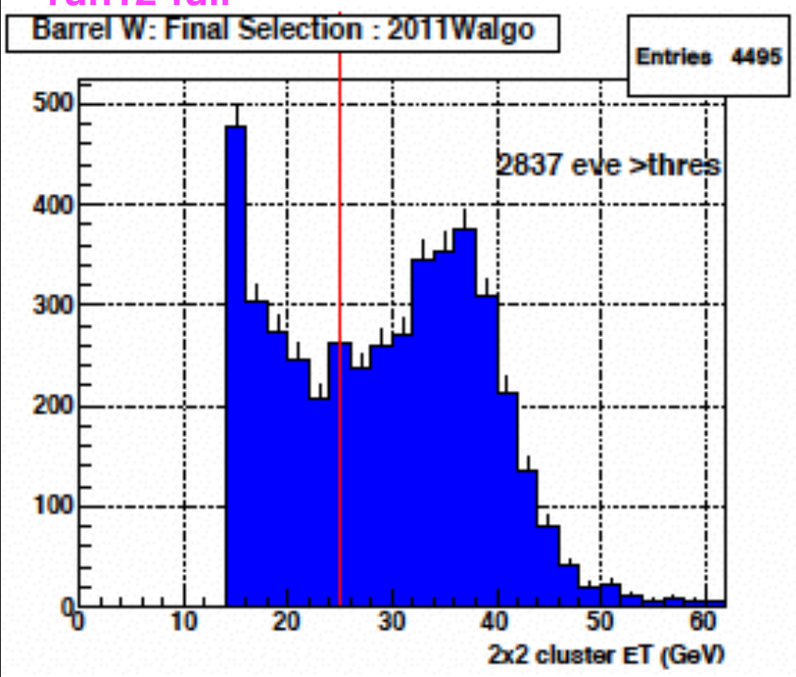
run13-test

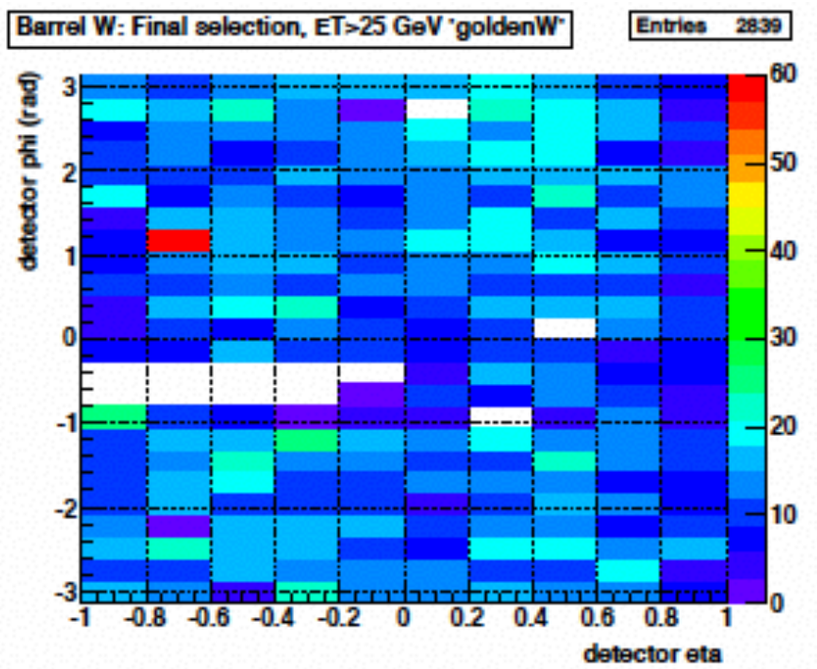


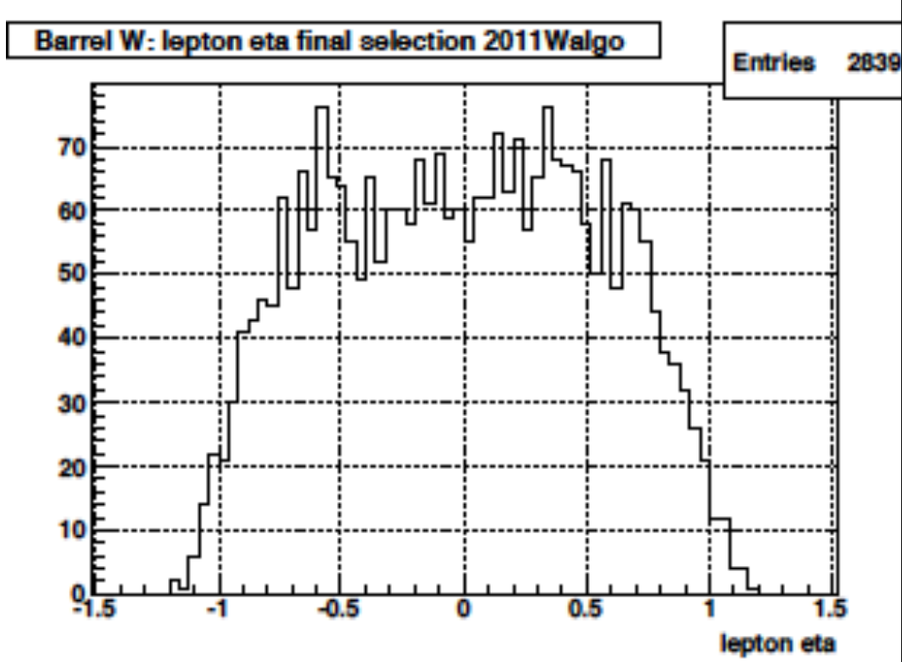




run12-full



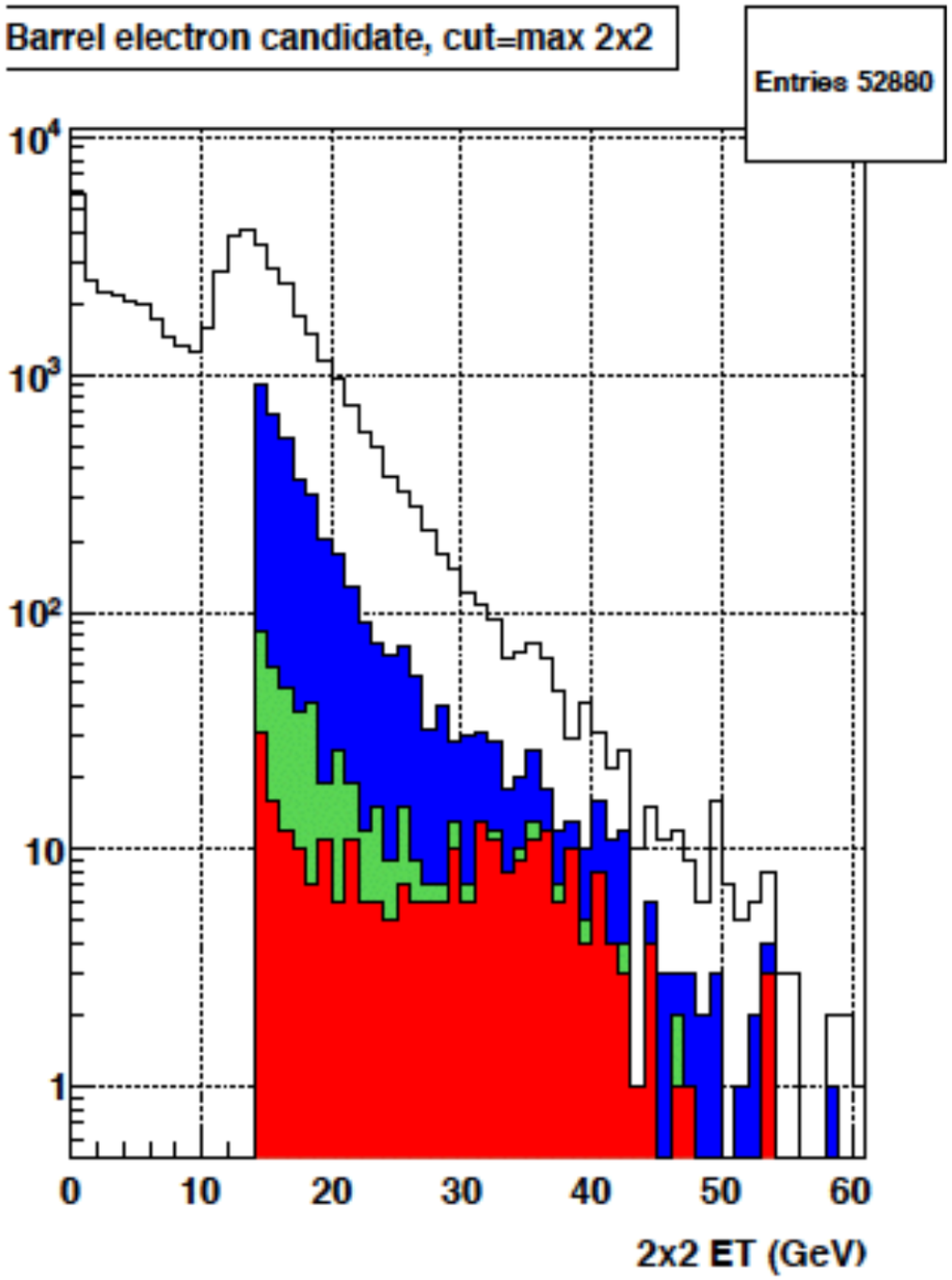




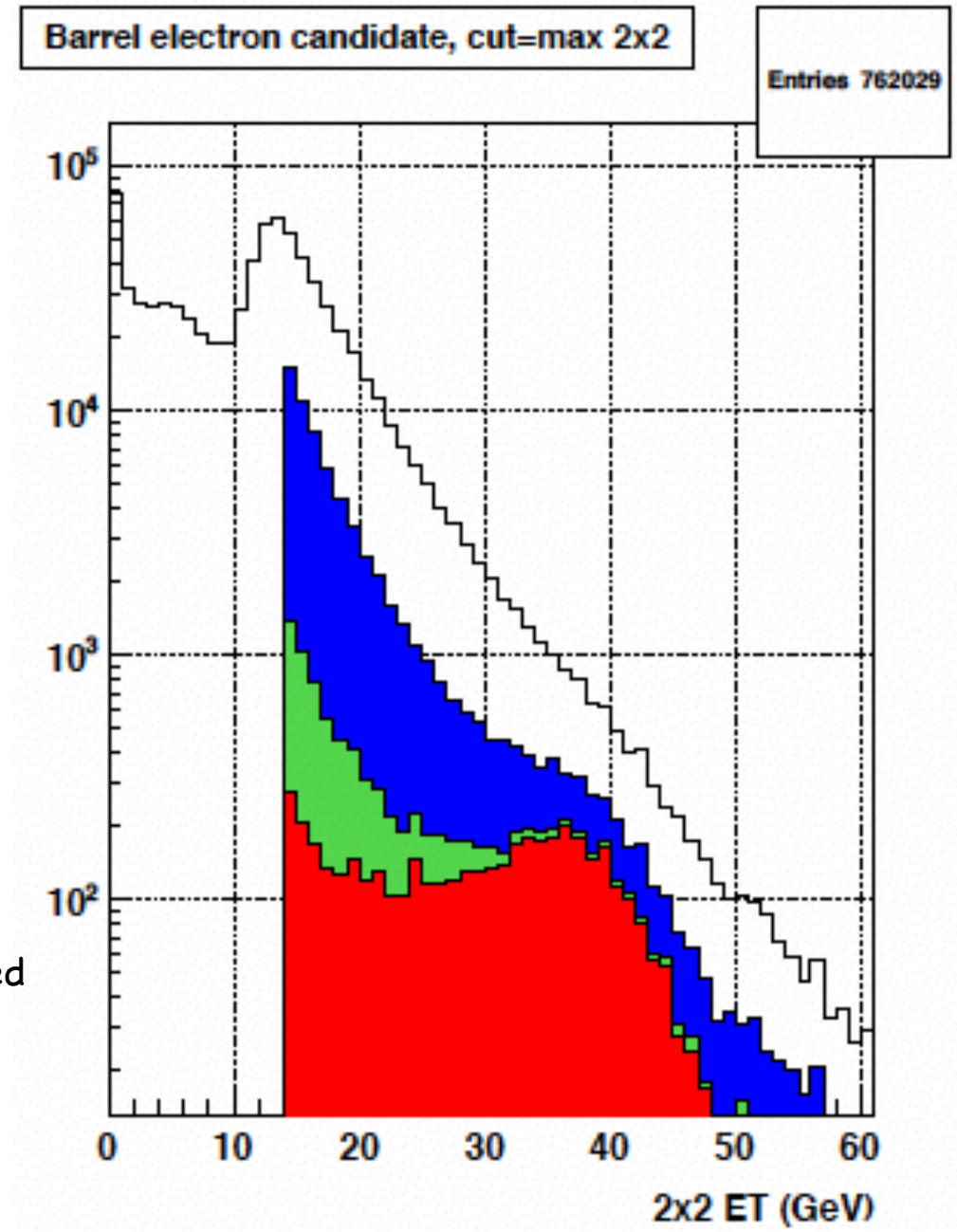
- golden W, ET > 25 GeV

Barrel Lepton Candidate E_T Vs Cuts

run13-test



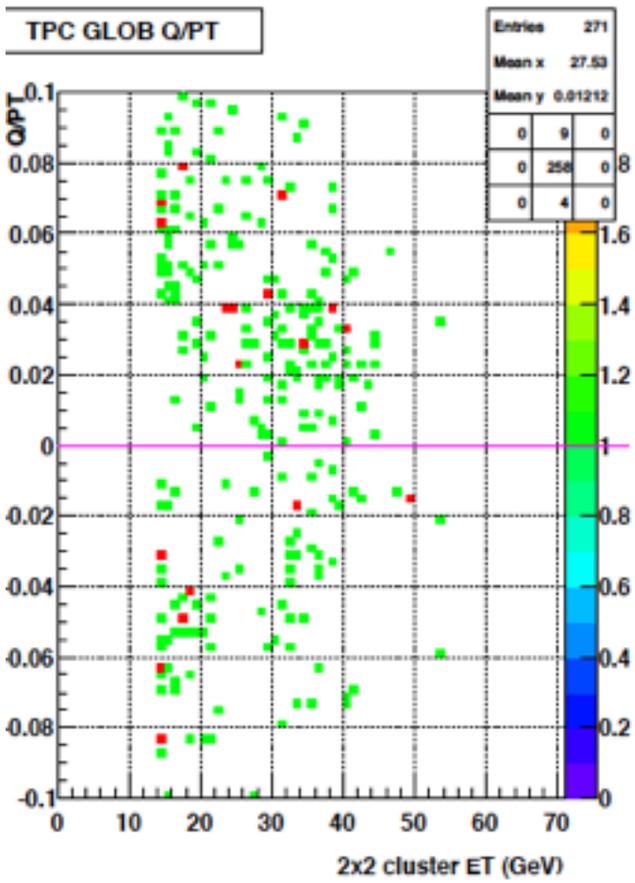
run12-full



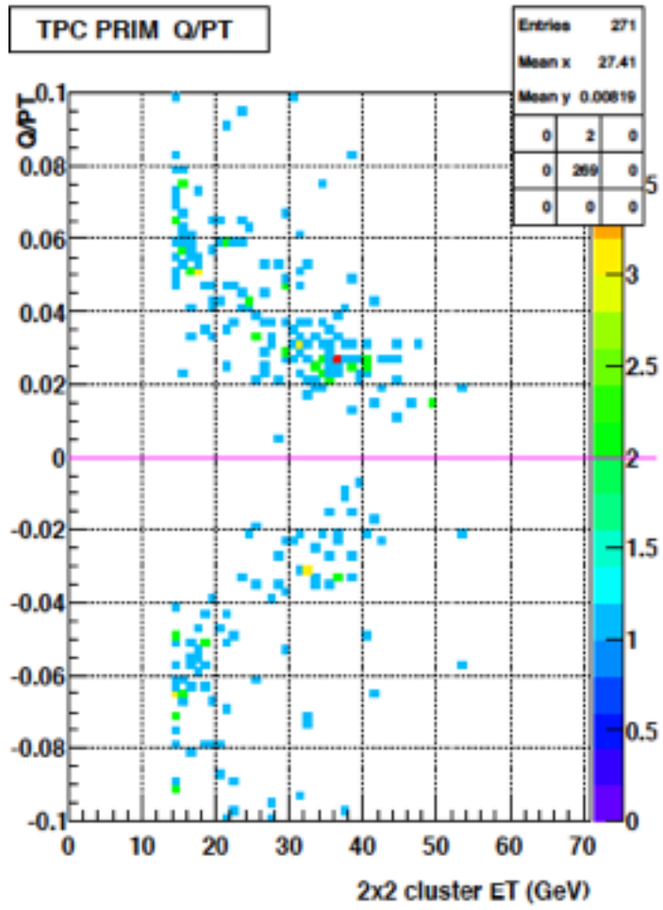
- ——— - Candidate track and BEMC cluster reconstructed
- **BLUE** - E^e_T > 14 GeV and E^e_T / E^{4x4}_T > 0.95
- **Green** - E^e_T / $E^{\Delta R<0.7}_T$ > 0.88
- **Red** - sign PT balance cut > 14 GeV

TPC charge sign separation

run13-test



run13-test



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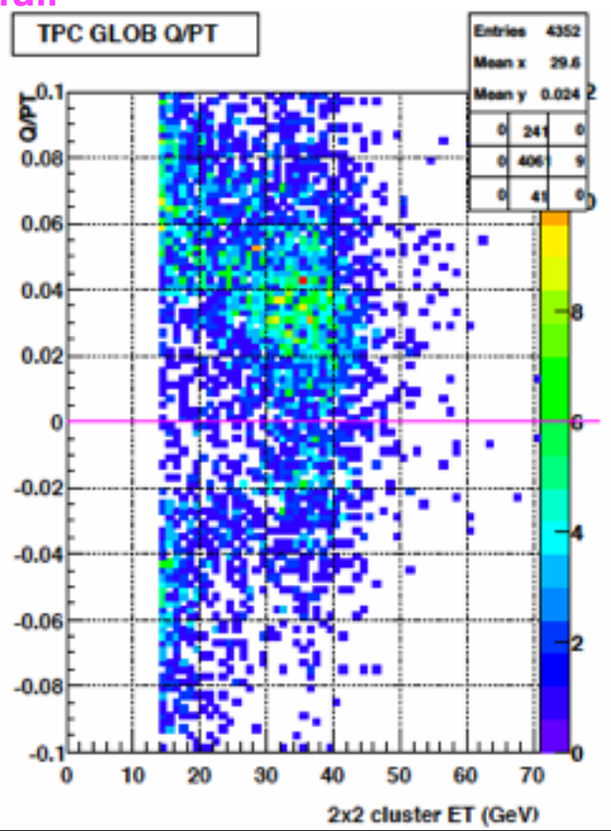
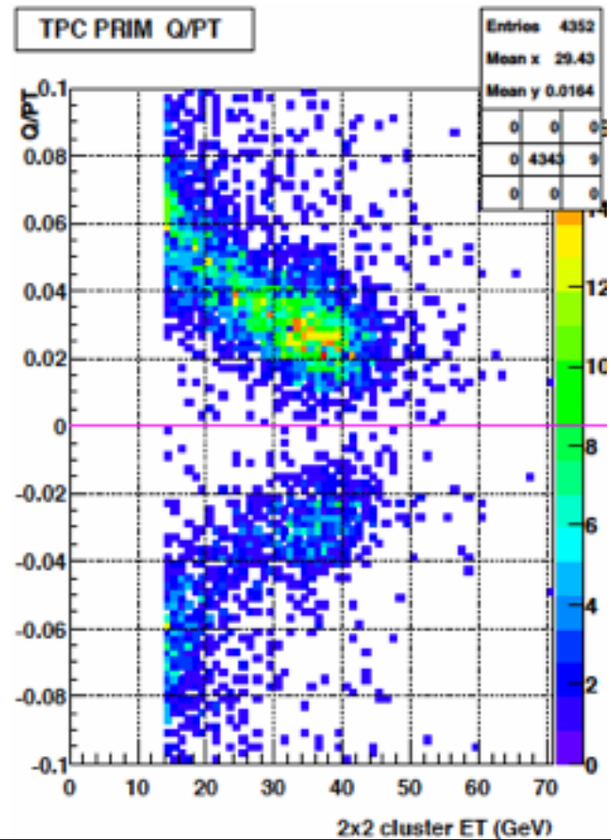
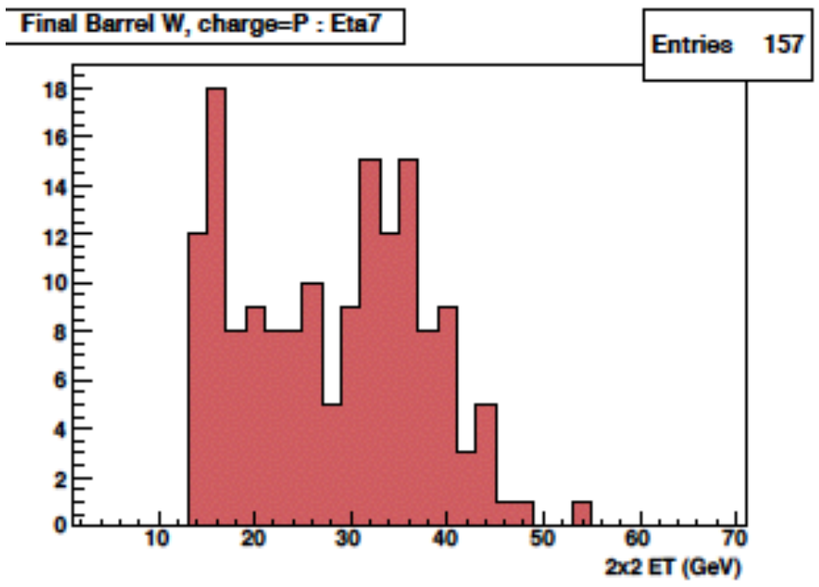


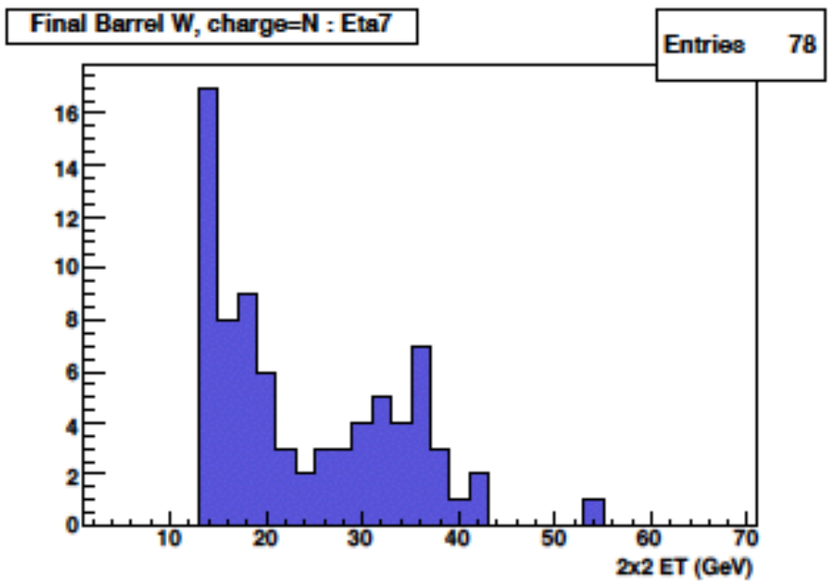
run12-full

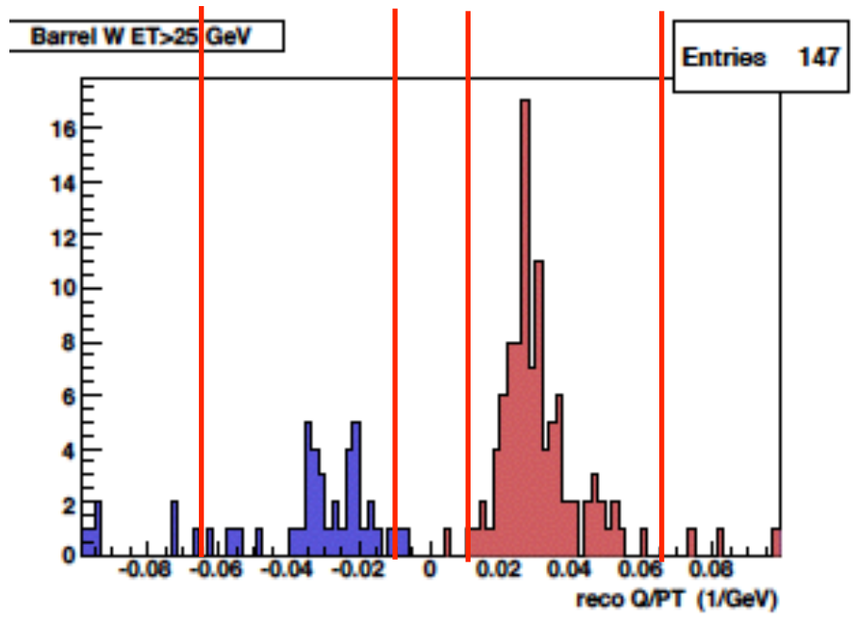


Final Ws for Spin Analysis

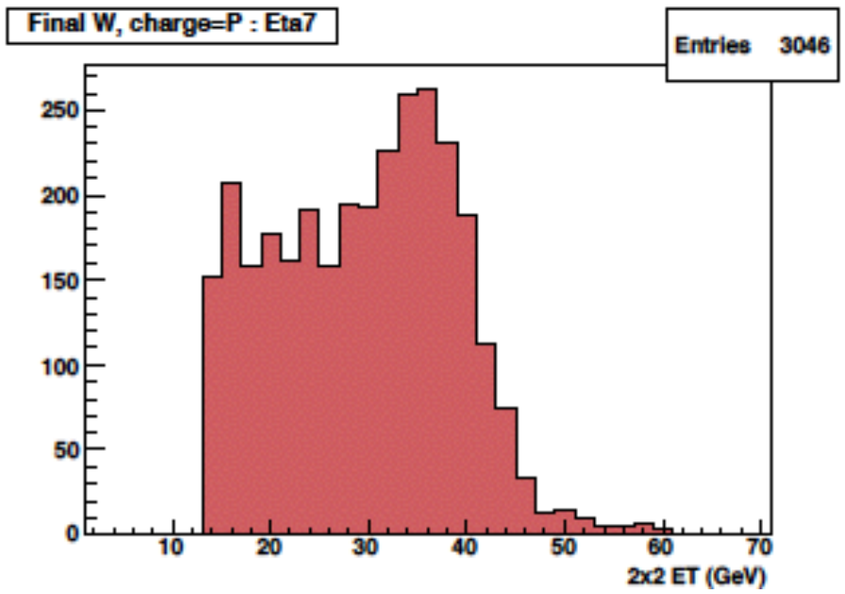
run13-test

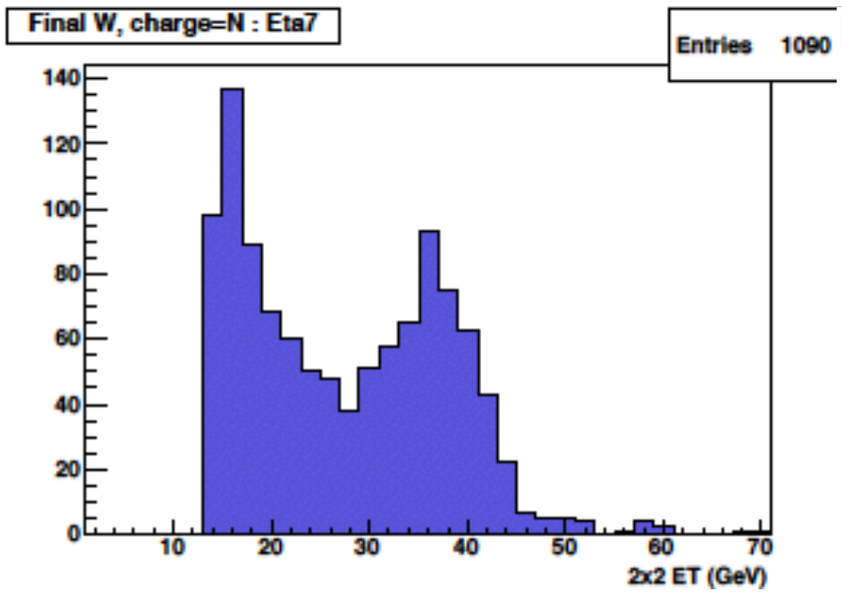


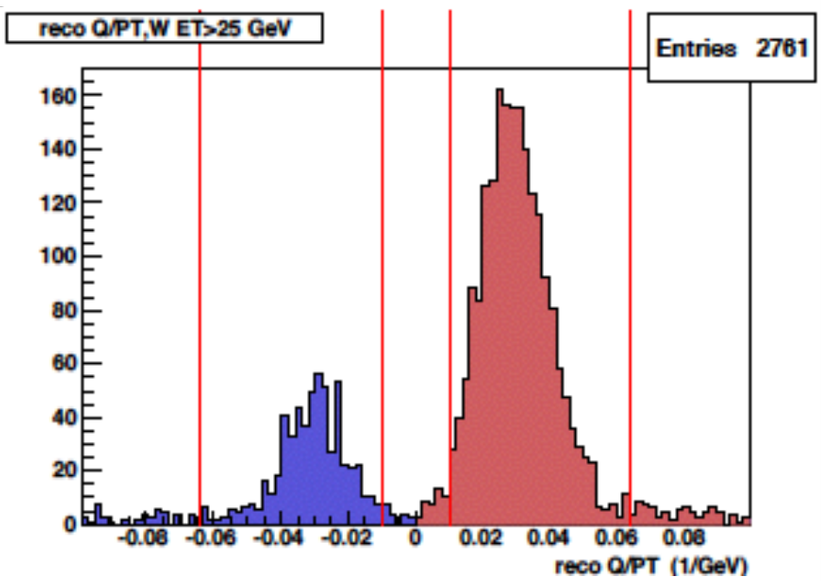




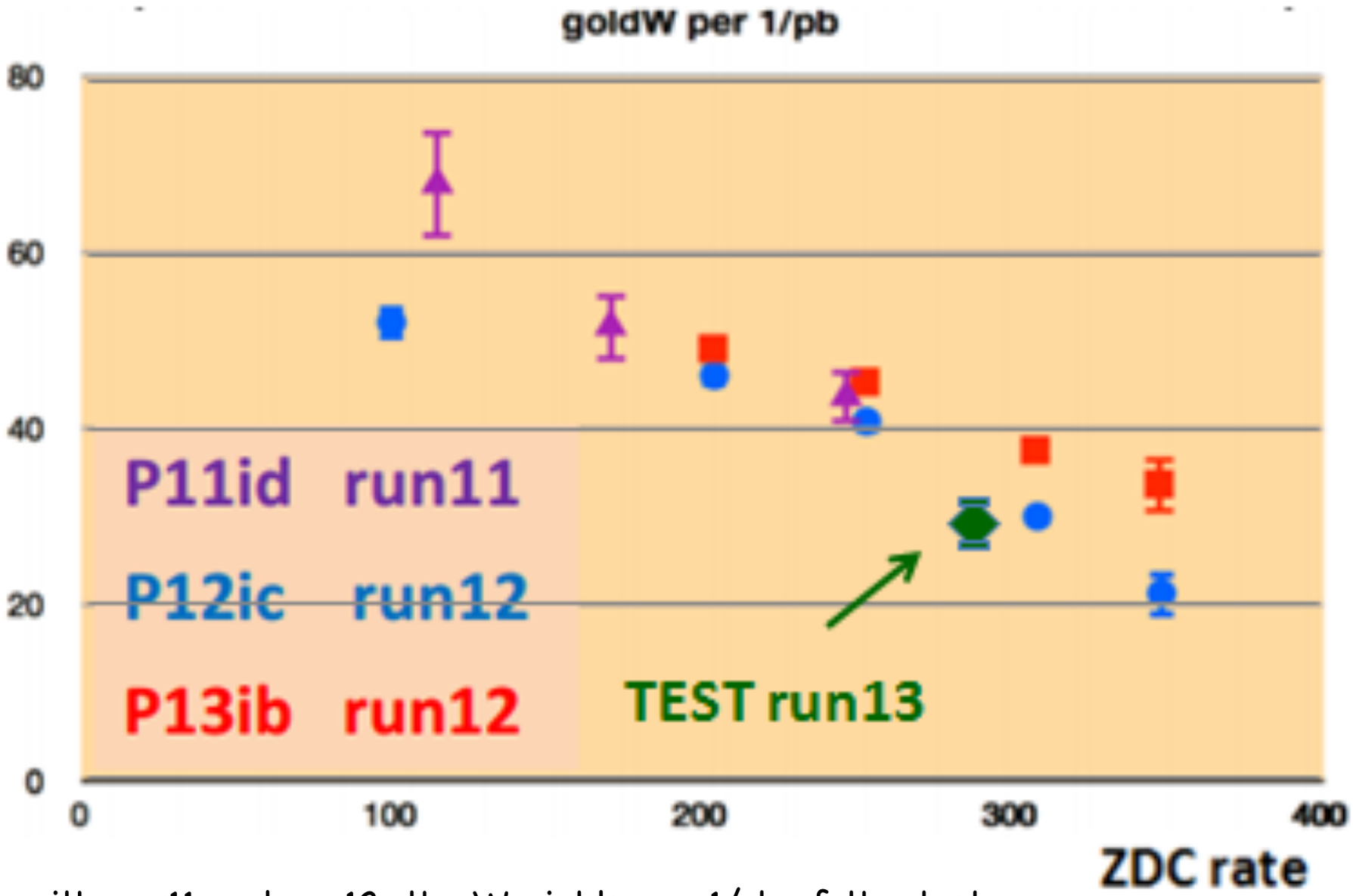
run12-full







Final golden W comparison



- Comparing with run11 and run12, the W yields per 1/pb of the test production looks reasonable.
- Integral luminosity sampled: ~5.14 /pb
- Final selected W counts : 150
- Averaged ZDC rate : ~288 KHZ

Summary

- TPC calibration only completed for Period 1.
- TPC calibration for Period 2 can only be completed once HFT dead material modeling is complete.
- Impact on TPC charge-sign discrimination with changes to STAR after day 128 not clear.
- Very encouraging results of W analysis of test production in comparison to Run 12 results, i.e. before day 128.
- Request today: **Production of Period 1 (Day <=128).**
- Subsequent embedding request concerning Period 1 will follow shortly!

Back up

- Estimating the intreated Luminosity
- Formula used

  - L_i = L_i_jamie* (N_sampled/N_BHT3*L2BW)* s_zdc

where,

L_i_jamie - integral luminosity of each run from the online webpage,

http://www.star.bnl.gov/protected/common/common2013/trigger2013/lumipp500GeV/

- N_sampled : # of events processed
- N_BHT3*L2BW : total # of level 2 W events

- s_zdc - scale factor relating the luminosity of the events sampled to the luminosity of the run

- s_zdc, s_bbc - ratio of ZDC and BBC coincidence rates for the sampled events vs. all events for each run:

- s_zdc = <zdc>_sampled / <zdc>_all
- s_bbc = <zdc>_sampled / <zdc>_all