Run 22 FCS Pi0 TSSA Update

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Cold QCD Meeting

February 12, 2025

Recap and Outline

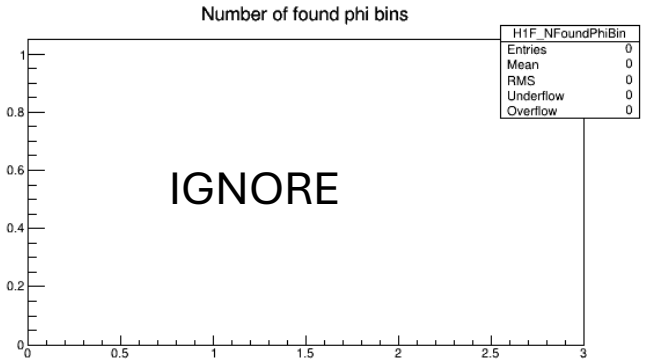
- Looking at Run 22 fwd_stream production
  - Request page: https://drupal.star.bnl.gov/STAR/blog/dkap7827/Run-22-Data-Production-Request
  - Used whatever files I could find from fill 33115 (day 52)
  - Spin database cross check finished
  - Polarization taken from https://wiki.bnl.gov/rhicspin/Run_22_polarization
- Last update: Showed a rough run by run QA for Run 22 where everything looked ok. There were spikes in the triggers that could be explained by my choice of dataset (looked at single files)
- This update: First A_N results using cross ratio method

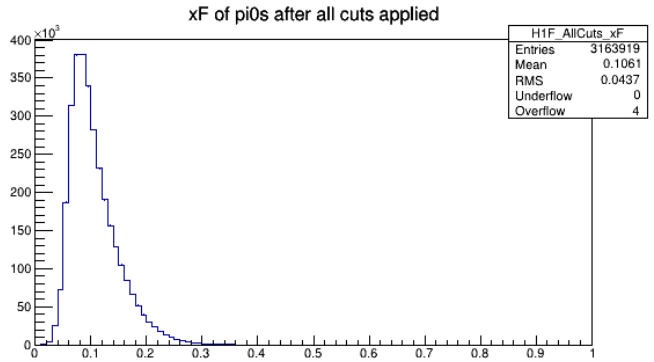
$$Raw\ A_N = \frac{\sqrt{N_\uparrow(\varphi)N_\downarrow(\varphi+\pi)} - \sqrt{N_\downarrow(\varphi)N_\uparrow(\varphi+\pi)}}{\sqrt{N_\uparrow(\varphi)N_\downarrow(\varphi+\pi)} + \sqrt{N_\downarrow(\varphi)N_\uparrow(\varphi+\pi)}}$$

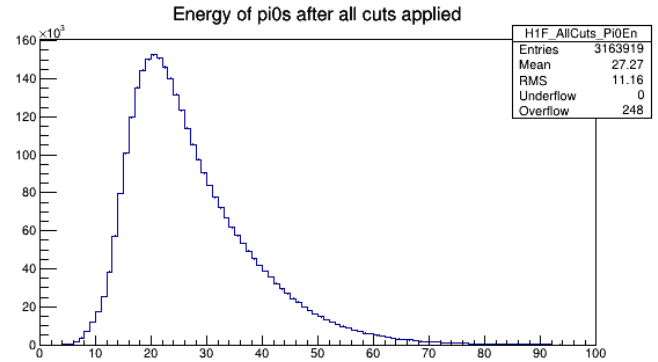
Pi0 Criteria

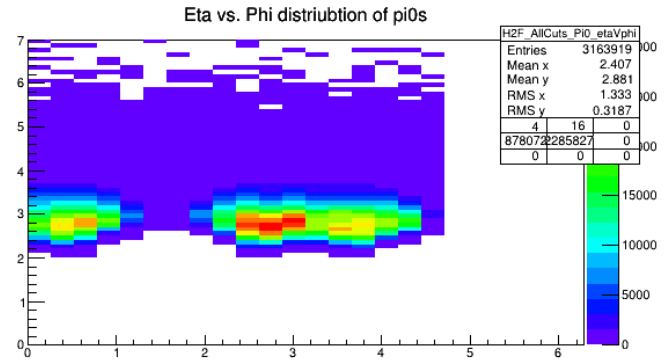
- |Vertex| <= 150 cm
- Zgg<0.7
- Only use Fcs Points
  - Both points satisfy EPD nmip cut of 0.7 (i.e. nmip<0.7)
- Only looking at FCS EM triggers (0,1,2,3 and corresponding “_tpc”)
  - Cut on pT of pi0 to match trigger (inclusive pions)
- Mass cut: $0.1<=m_{inv}<=0.2$
- 12 equal phi bins
- 6 energy bins GeV (0-15, 15-20, 20-25, 25-30, 30-40, 55-70, 70-100)
  - This was based on the energy distribution

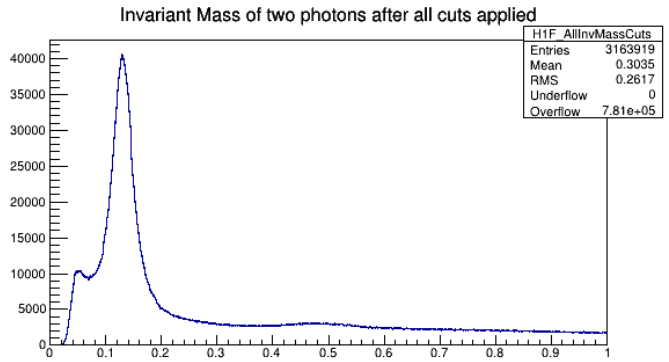
Some QA plots after cuts

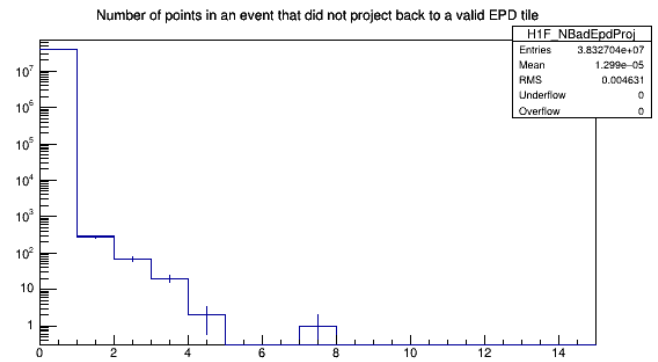


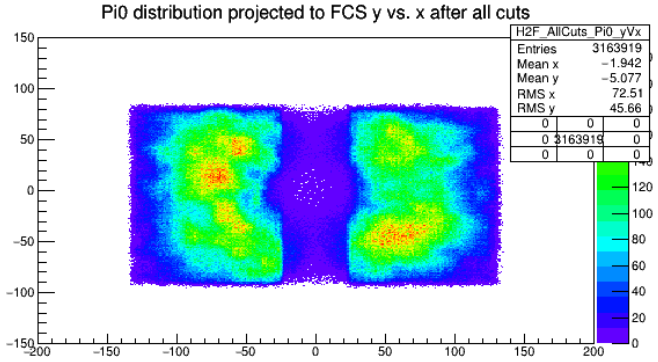


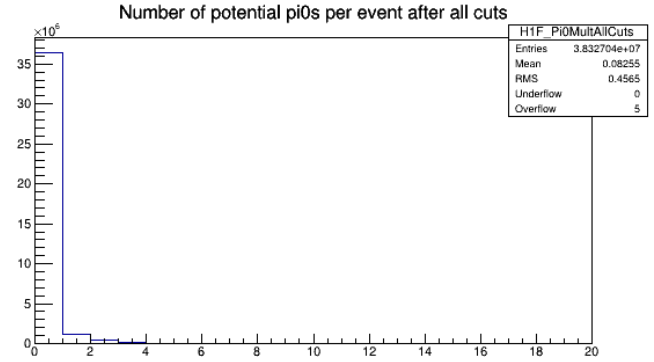


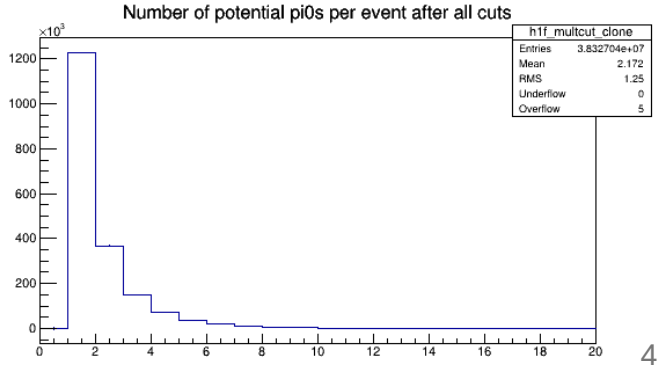






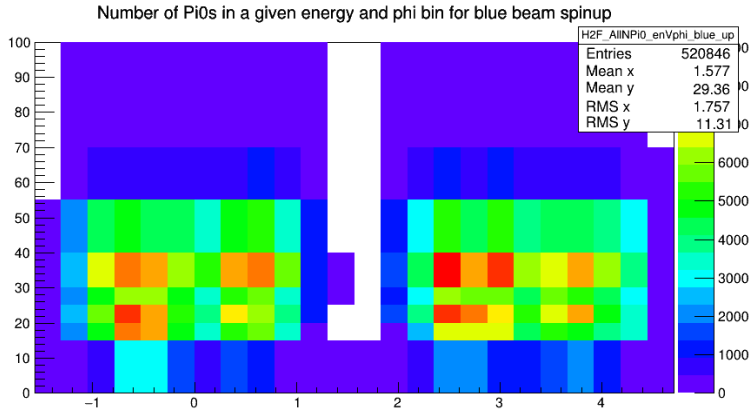


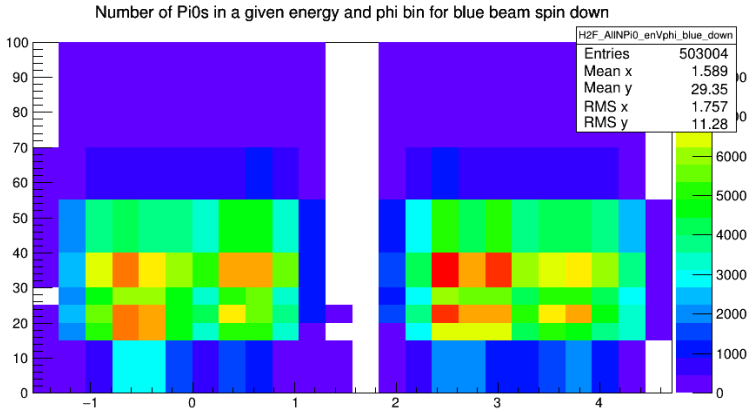


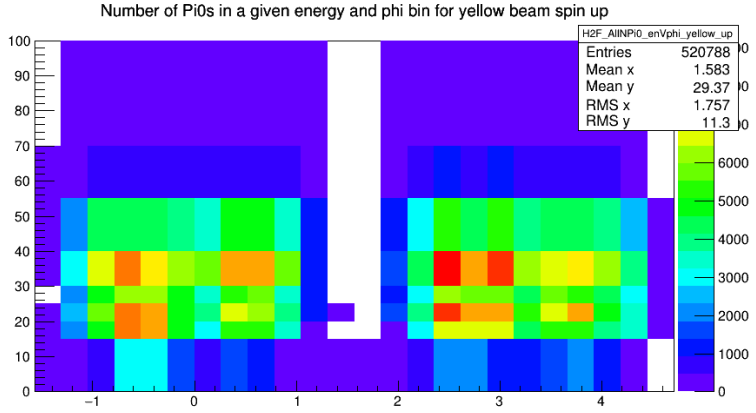


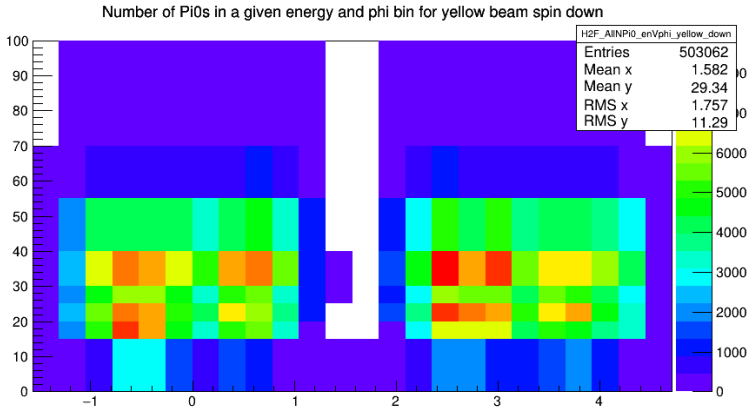
Plots <u>do not</u> include the invariant mass cut!

Number of Pi0s by energy and phi bins

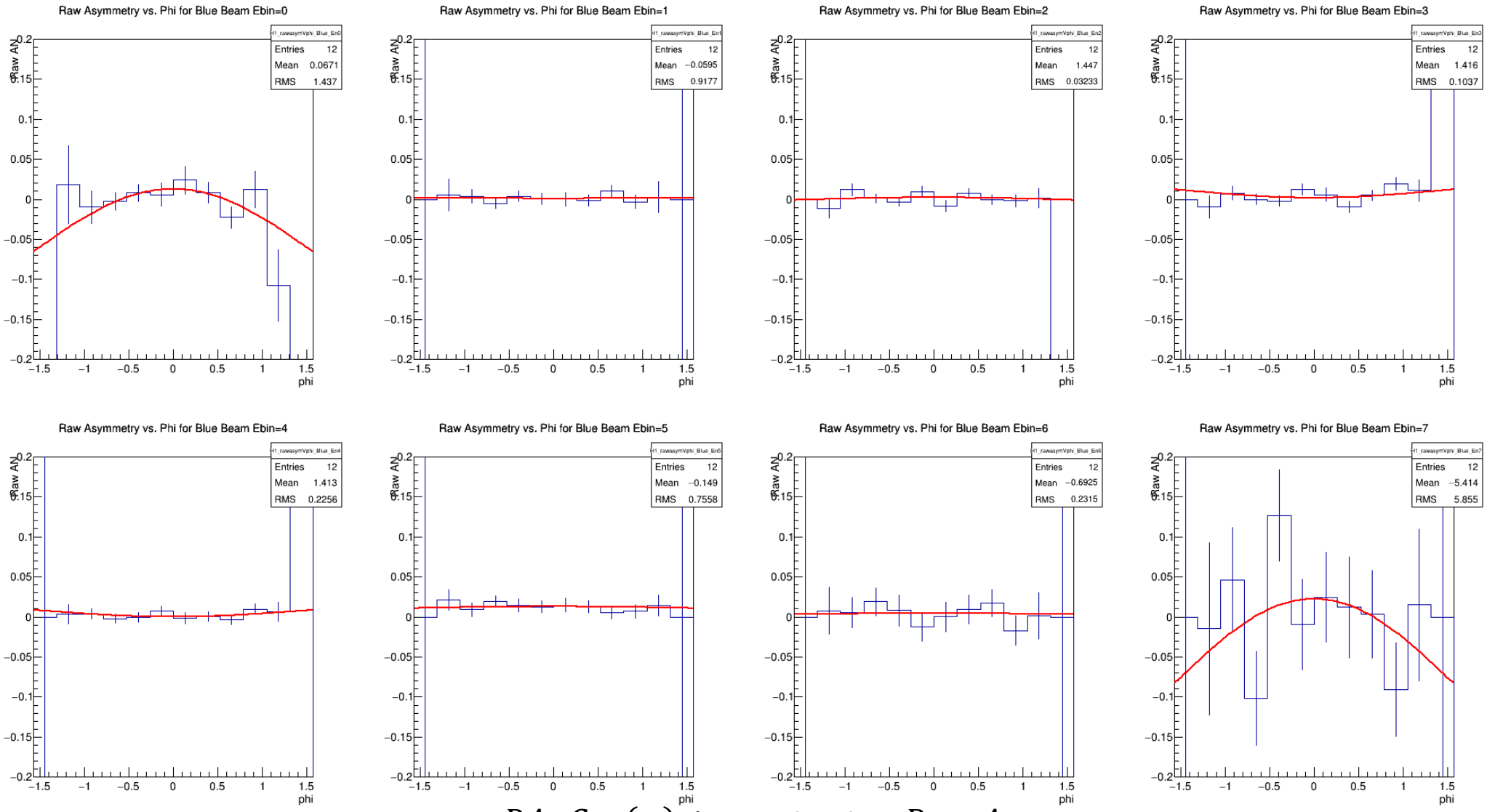






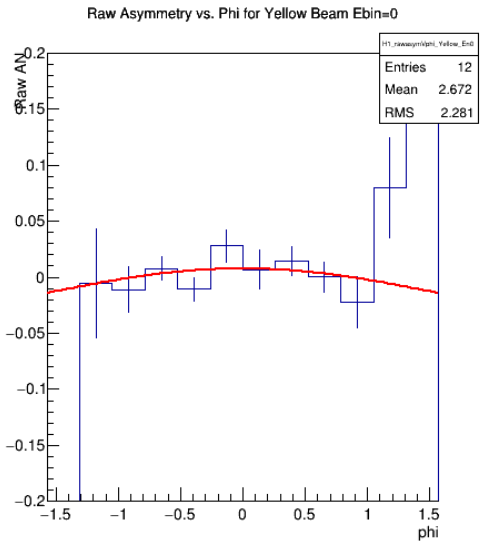


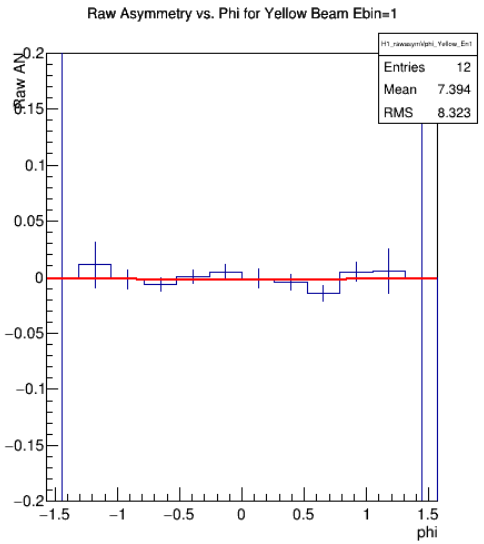
Raw Asymmetry Fitted Blue

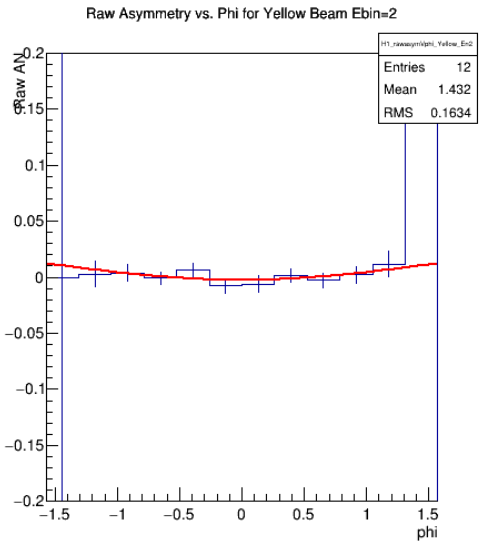


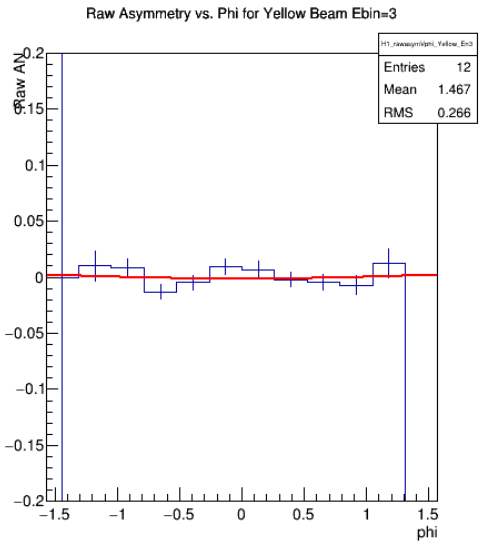
$$PA_N Cos(\varphi) + constant = Raw\ A_N$$

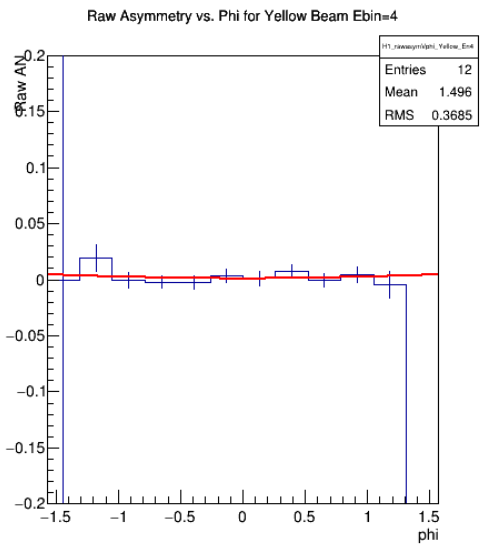
Raw Asymmetry Fitted Yellow

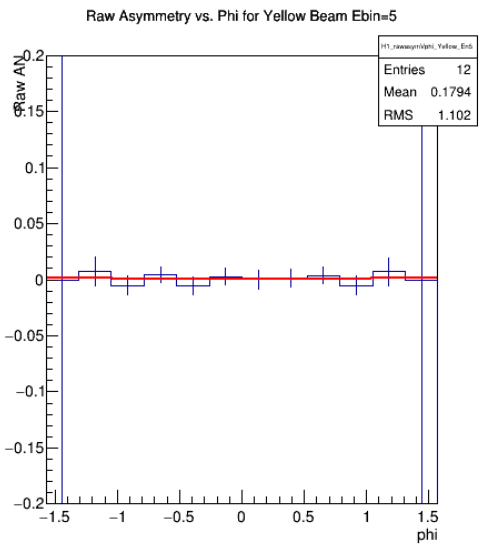


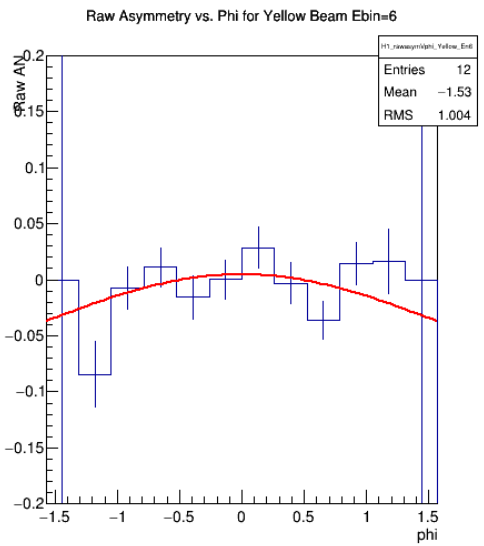


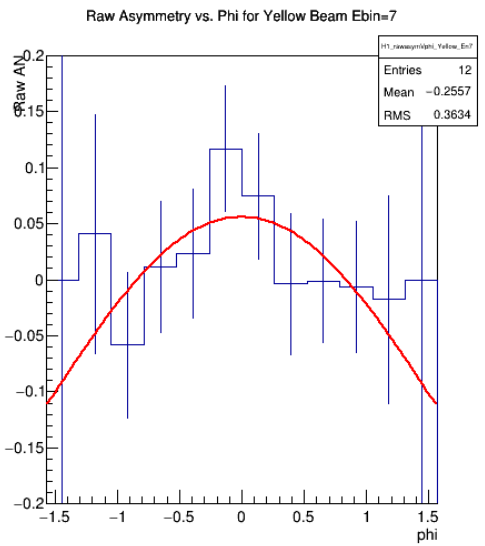




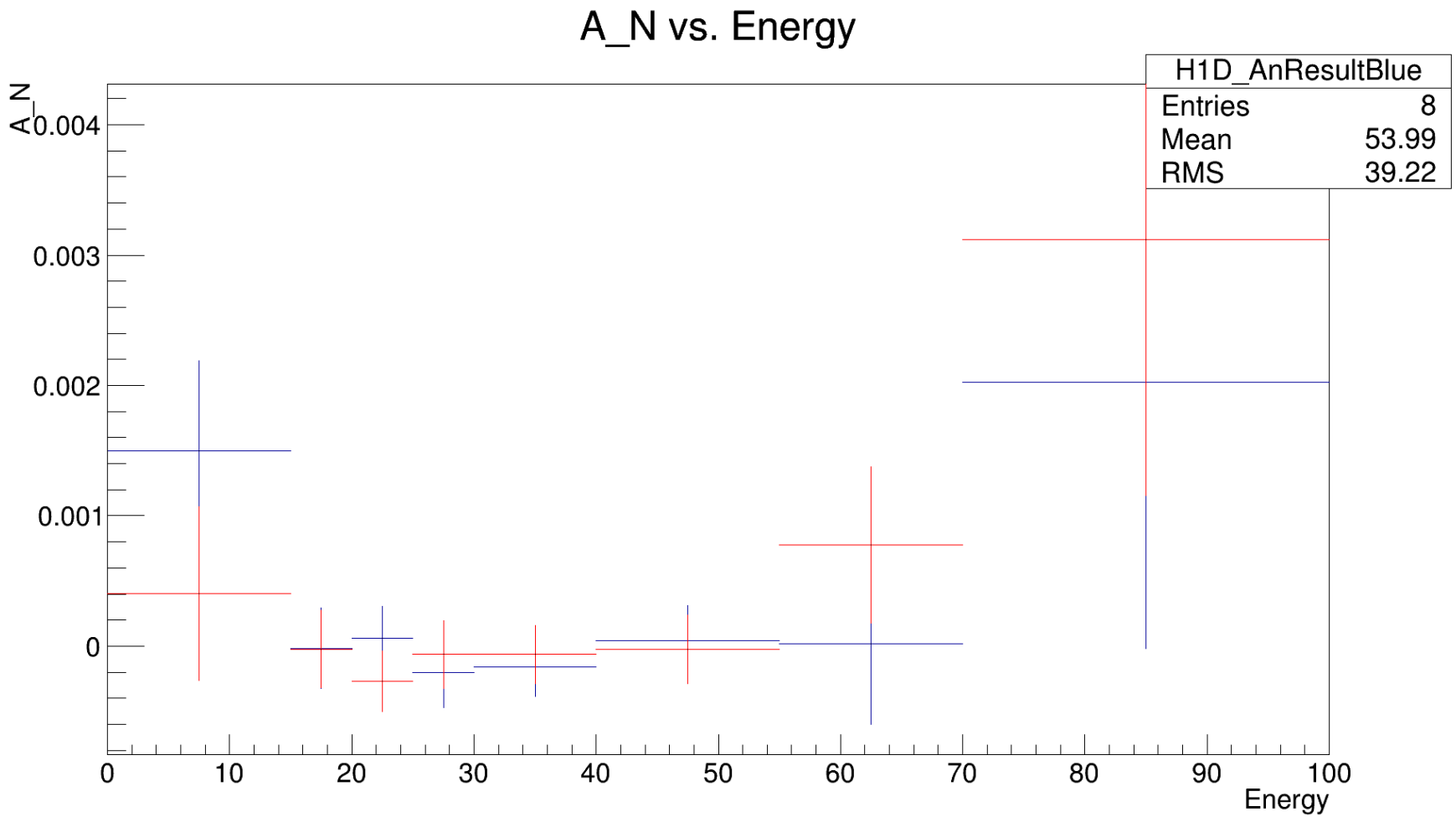








A_N Result


A_N vs. Energy
H1D_AnResultBlue
Entries 8
Mean 53.99
RMS 39.22
A_N
0.004
0.003
0.002
0.001
0
0
10
20
30
40
50
60
70
80
90
100
Energy

Conclusions

- First A_N result shown and behaves as expected
  - Errors are large as only looking at one fill
- Processing all Run 22 data now
  - Taking some time because of condor
- Thoughts? Comments?