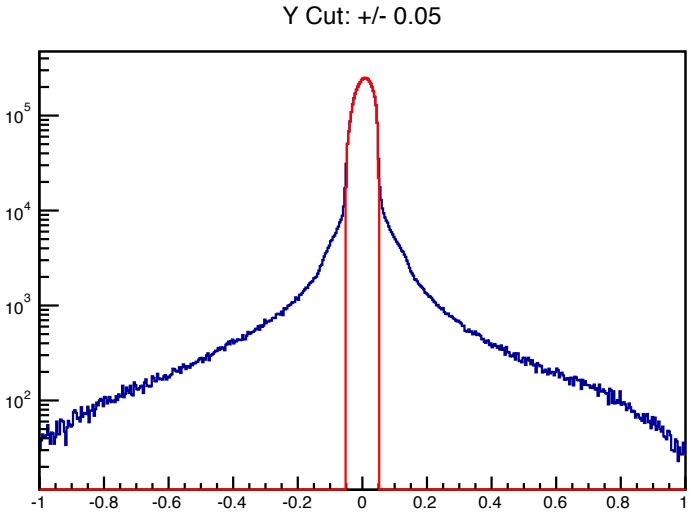
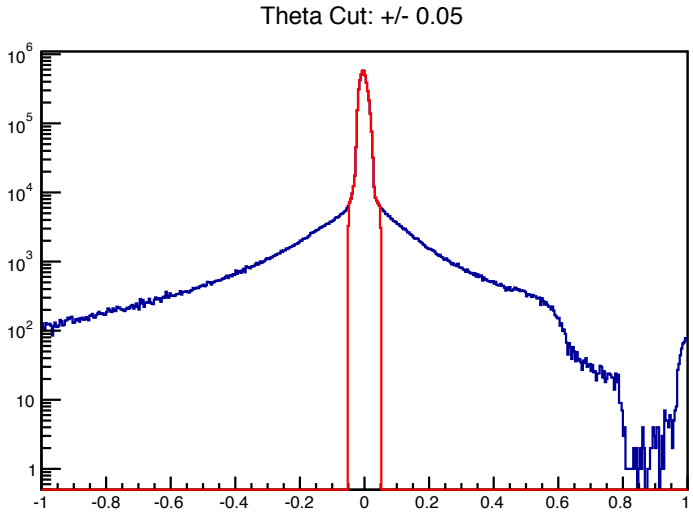
Asymmetries

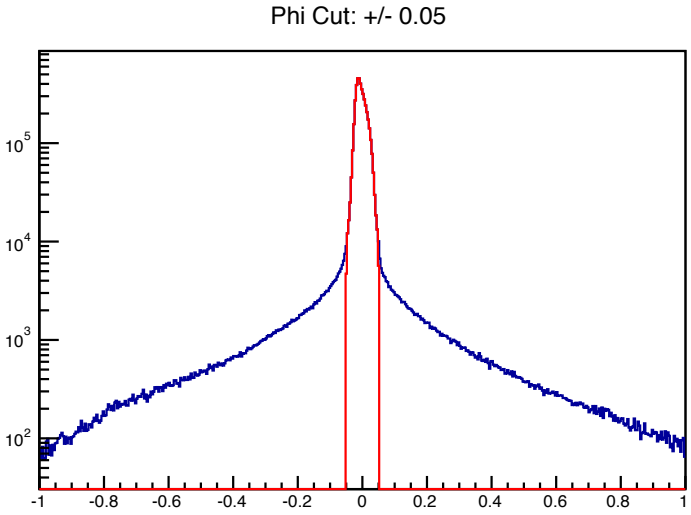
Melissa Cummings

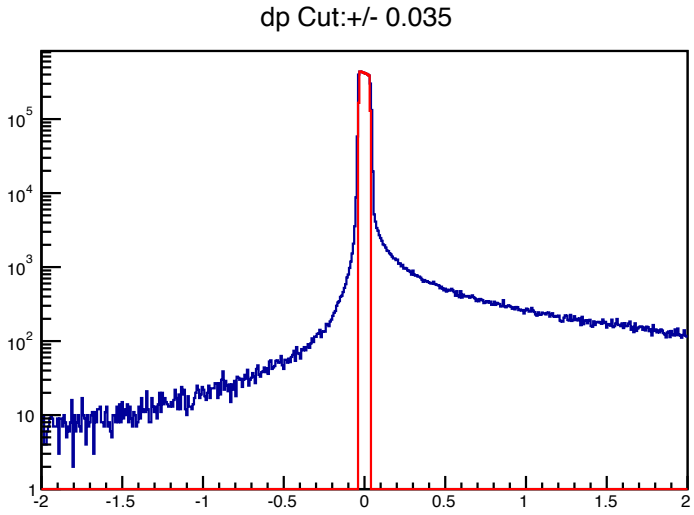
08/21/13

Acceptance Cuts



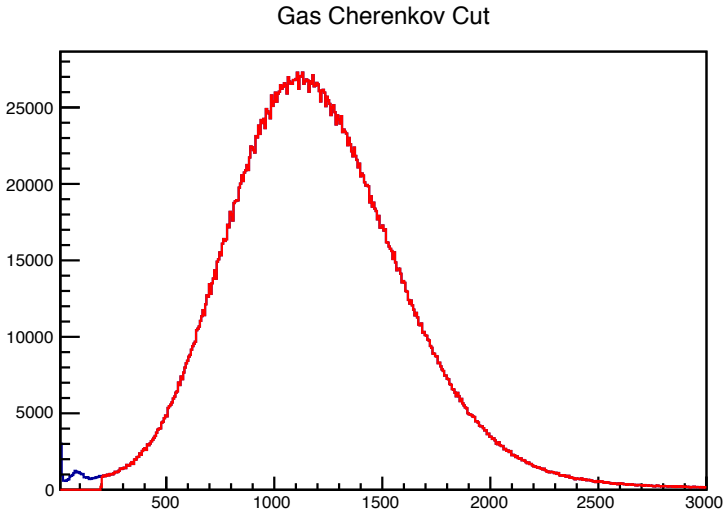


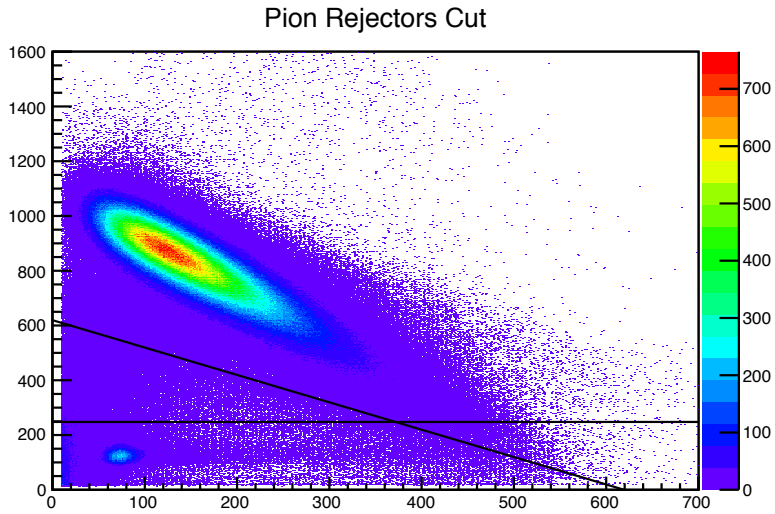




run 3871, p0=1.041 GeV/c

PID Cuts





- Also cut on:
  - Event type: T1(T3) for RHRS (LHRS)
  - Single track events
  - Single cluster in VDC

run 3871, p0=1.041 GeV/c

Method

- Events are sorted into 50 MeV bins in ν

(ν = E-E'), Asymmetry is calculated for each bin:

$$A_{raw} = \frac{Y_+ - Y_-}{Y_+ + Y_-} \qquad Y_\pm = \frac{N_\pm}{Q_\pm L T_\pm}$$

$$\delta A = \frac{2 Y_+ Y_-}{(Y_+ + Y_-)^2} \sqrt{\frac{S_+^2}{N_+} + \frac{S_-^2}{N_-}}$$

$S_\pm$ is the scaling factor due to prescales – more on next slide

- Runs are summed together using a weighted average:

$$A = \sum_i \frac{A_i / \delta A_i^2}{1/\delta A_i^2} \qquad \delta A = \sum_i \sqrt{\frac{1}{1/\delta A_i^2}}$$

Scaling Due to Prescales

- See ELOG post 170 for more details

$$S = \sqrt{1 - Lf(1 - \frac{1}{p})}$$

$$L = livetime$$

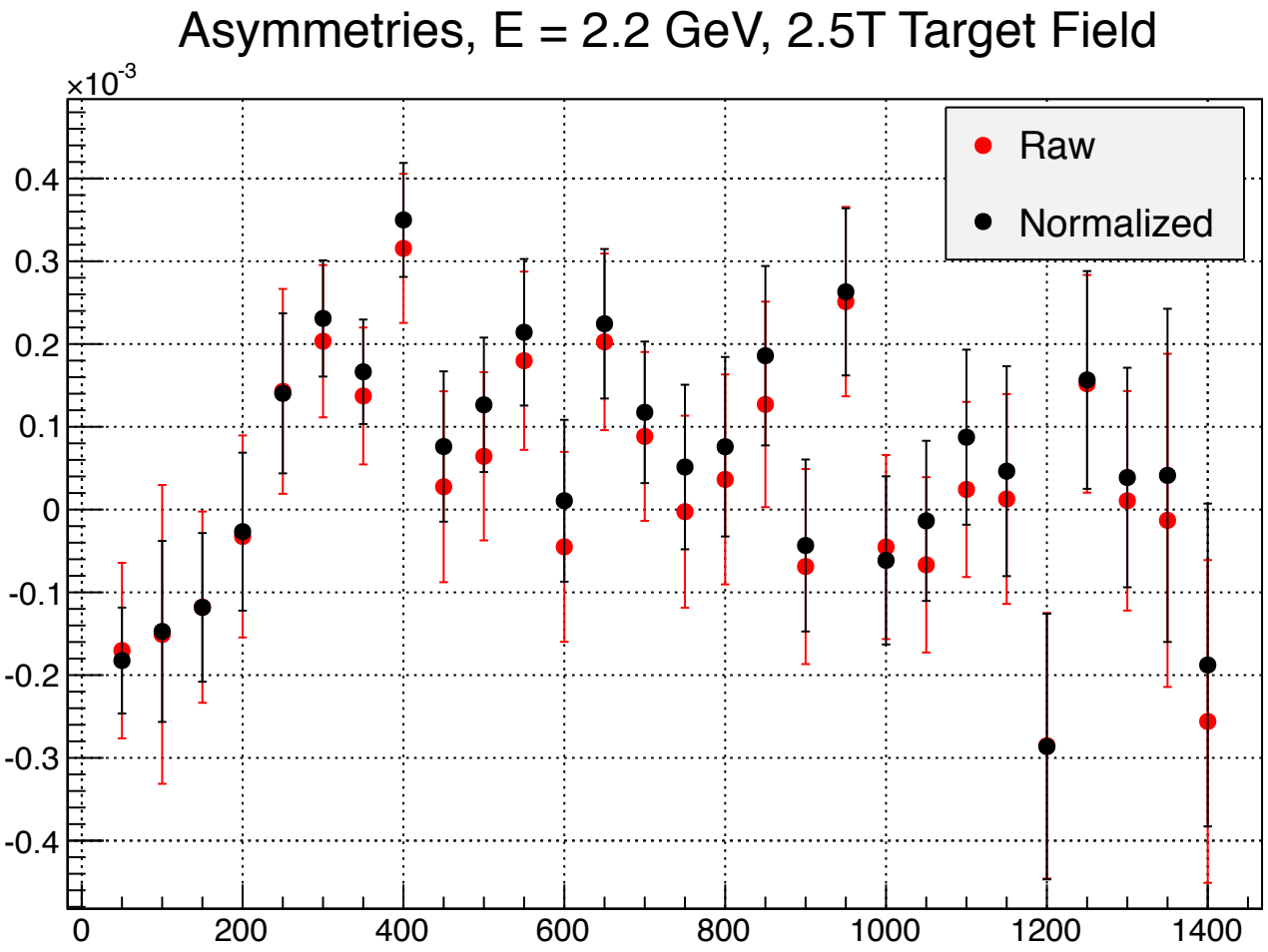
$$p = prescale$$

$$f = \frac{N_{accepted}}{N_{recorded}}$$

- This goes directly into the yield error: $\sigma N_{\pm} = S_{\pm}\sqrt{N_{\pm}}$

- Examples:
  - run 3524: p = 2, S_+= 0.846
  - run 4232: p = 9, S_+= 0.797

Including Normalization



Method

- Scaling to physics asymmetry:

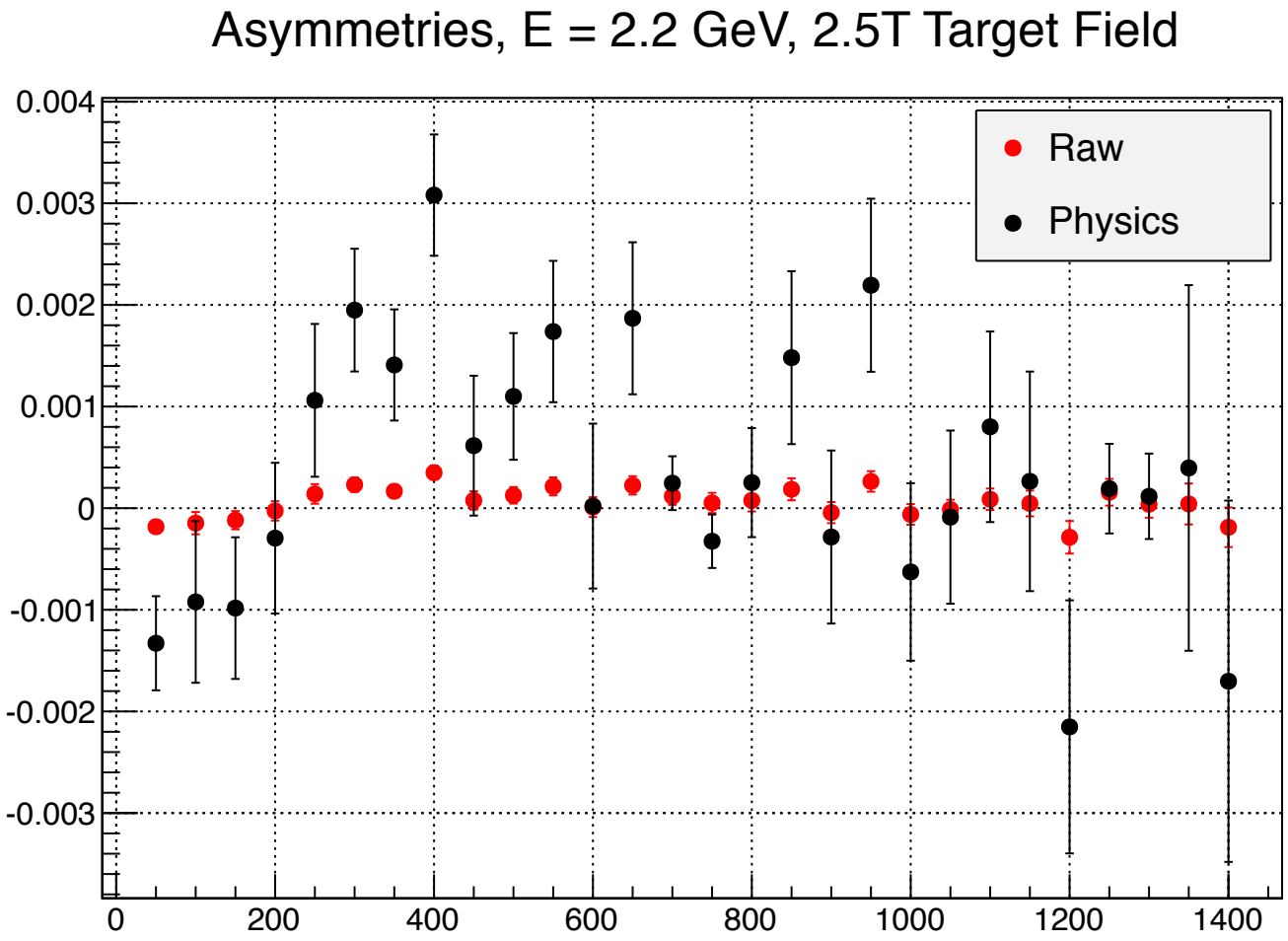
$$A_{phys} = \left(\frac{1}{f P_t P_b}\right) A_{raw} \qquad \delta A_{phys} = \left(\frac{1}{f P_t P_b}\right) \delta A_{raw}$$

$$f = dilution\ factor\ (currently, f = 1)$$

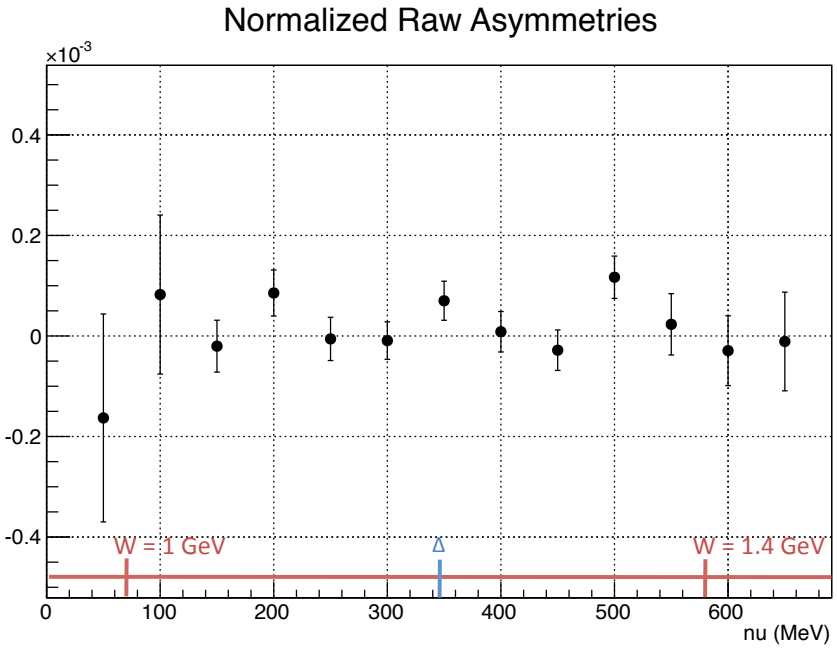
$$P_t = target\ polarization$$

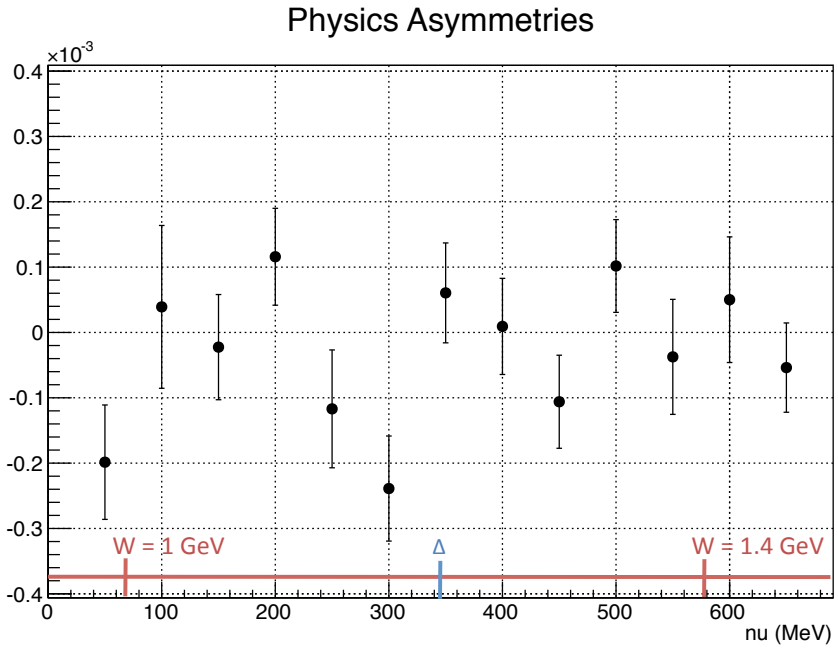
$$P_b = beam\ polarization$$

Scaling to Physics Asymmetry

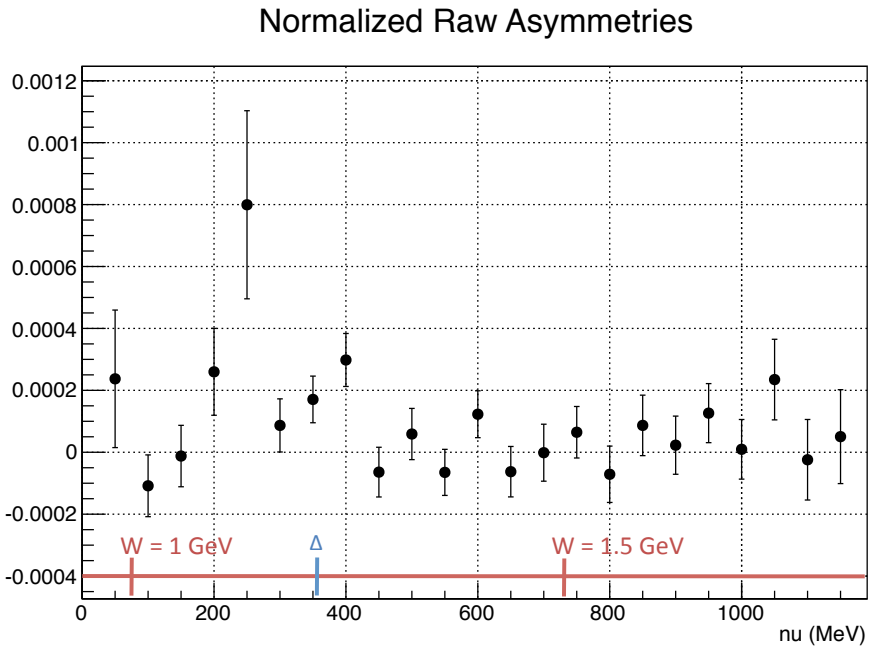


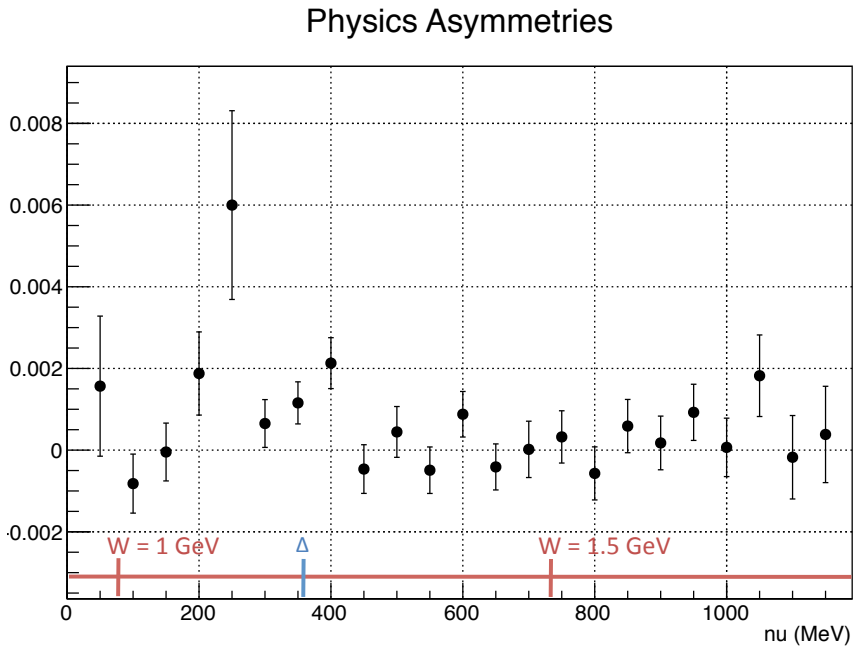
1.1 GeV, 2.5T, Transverse



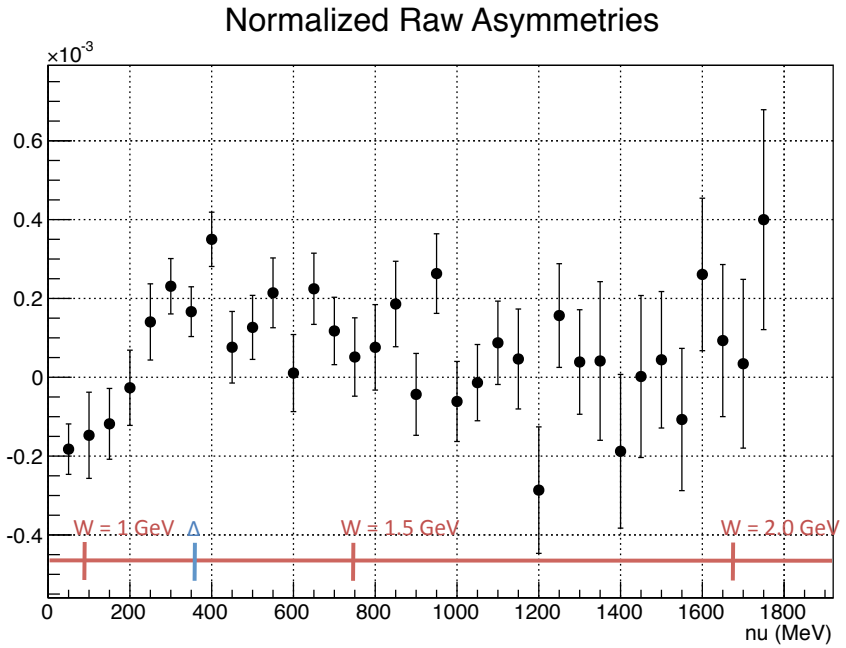


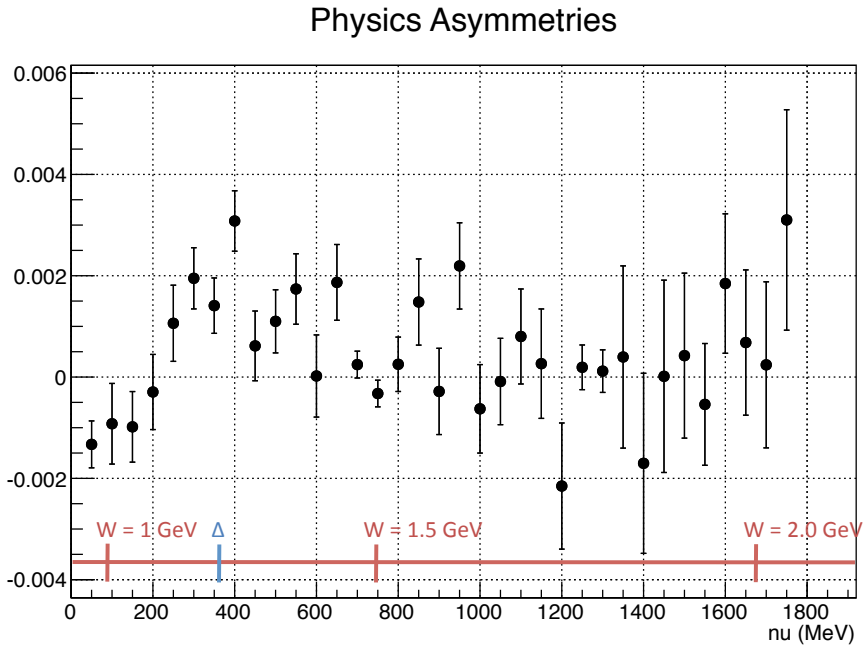
1.7 GeV, 2.5T, Transverse



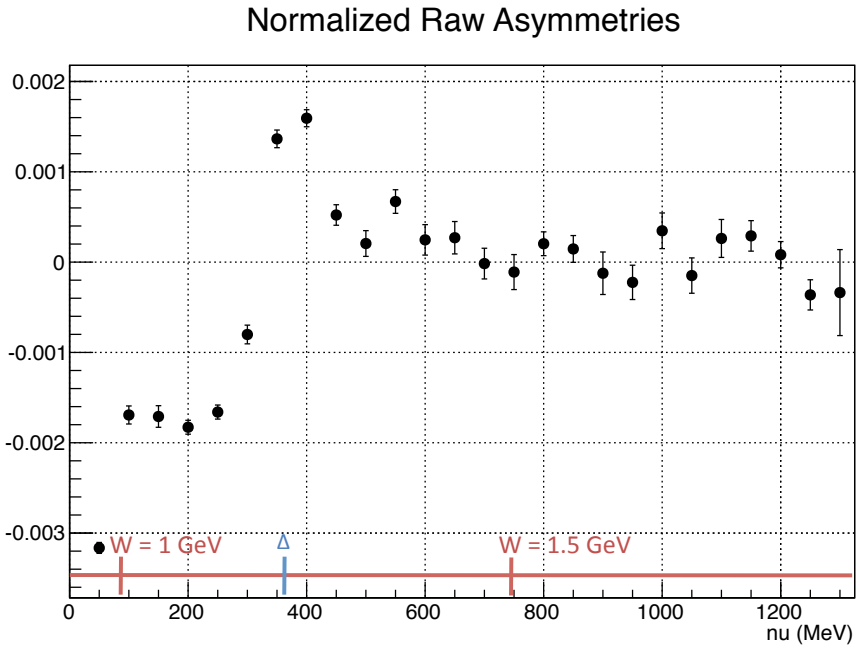


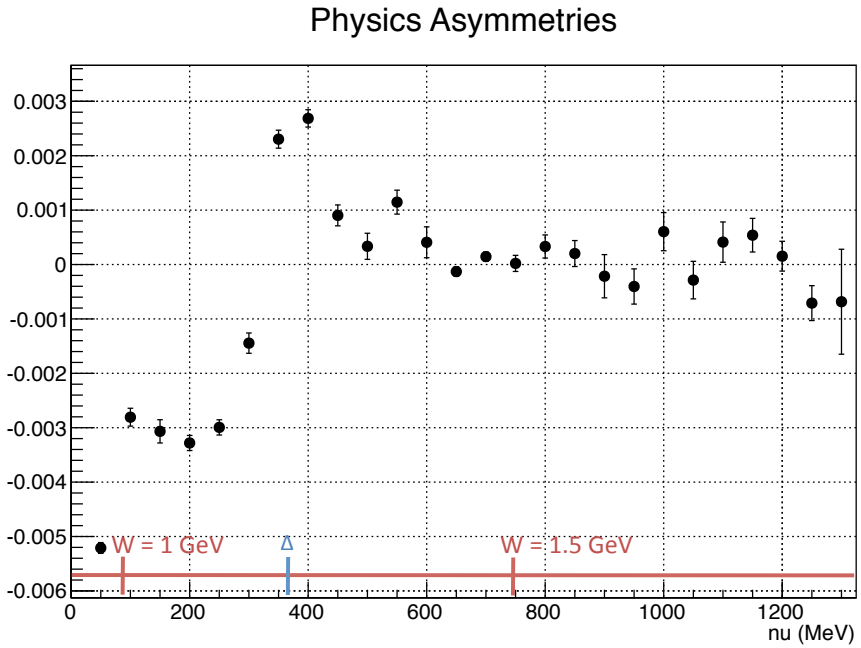
2.2 GeV, 2.5T, Transverse



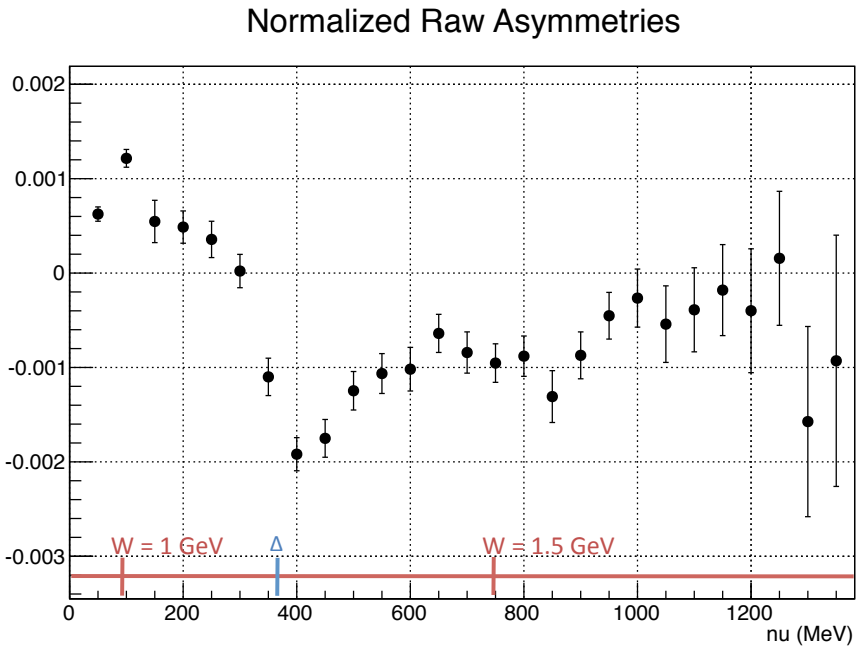


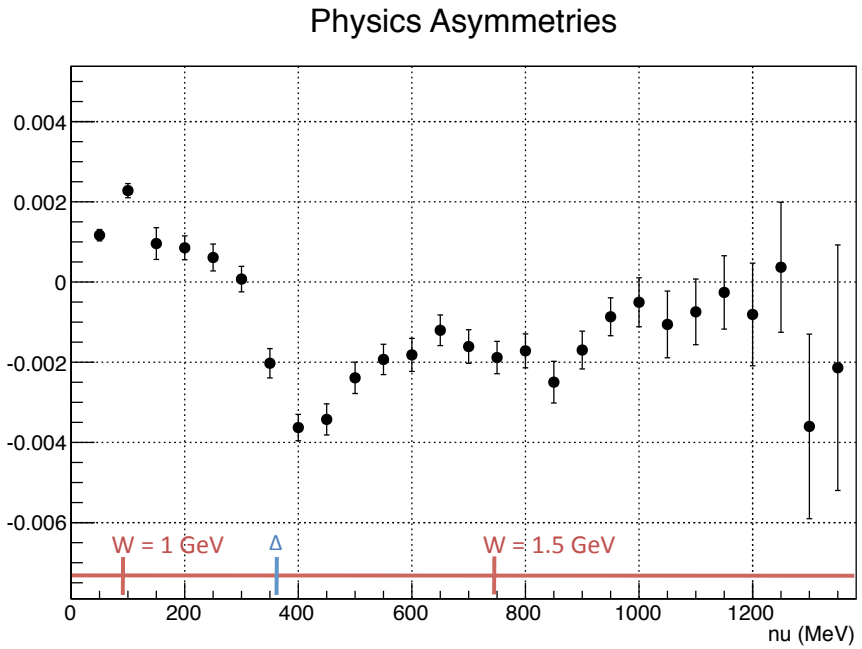
2.2 GeV, 5.0T, Longitudinal



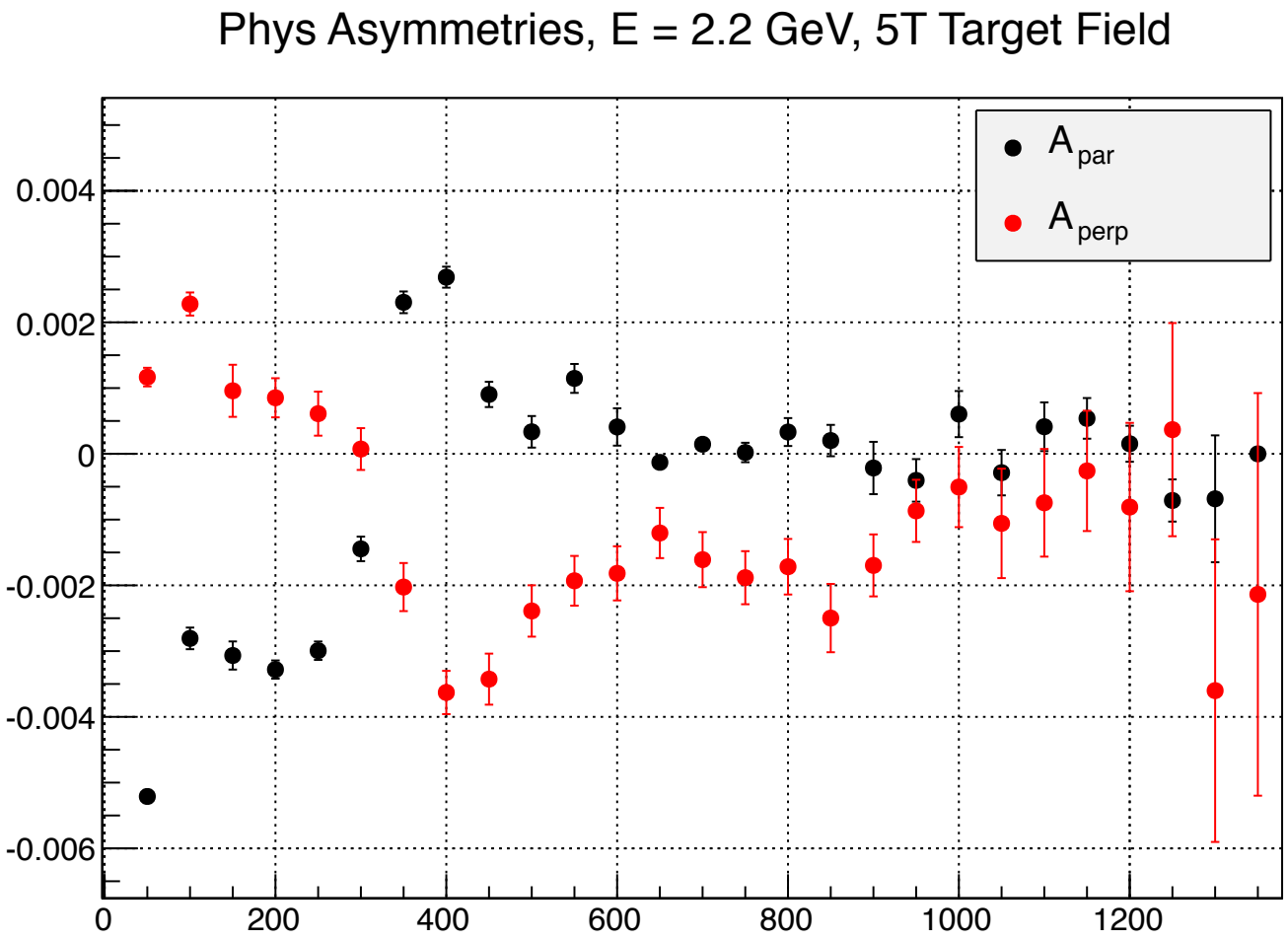


2.2 GeV, 5.0T, Transverse





2.2 GeV, 5.0T, Long. & Trans.



3.3 GeV, 5.0T, Transverse