G_E^n **Analysis**

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E02-013 Collaboration
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Outline

1. Analysis Changes

2. Analysis Parameters

3. G_E^n

Analysis Changes

- Vertical cuts on neutron arm
  - $-1.8\text{m} < x_{\text{NA}} < 2.2\text{m}$
- Calculation of deadtime and charge reflects beam trips and DC trips

Charge Identification

All clusters potentially caused by quasielastic nucleon in neutron arm within 10ns are combined into single clusters

Each cluster is then attempted to be correlated with veto signal

In space:

$$|\Delta x = x_{\mathrm{NA}} - x_{\mathrm{veto}} - x_0| < 0.5\mathrm{m}$$

In time:

$$\Delta t = t_{\mathrm{veto}} - t_{\mathrm{NA}} + c|y_{\mathrm{NA}} - y_0| + t_0$$

$$\Delta t = t_{\rm veto} - t_{\rm NA} + c|y_{\rm NA} - y_0| + t_0$$

Extra condition due to deadtime must be considered:

1. If hit in charged region, flag cluster as charged
2. If hit in blind region, ignore cluster
3. Otherwise, flag as neutral

Cuts

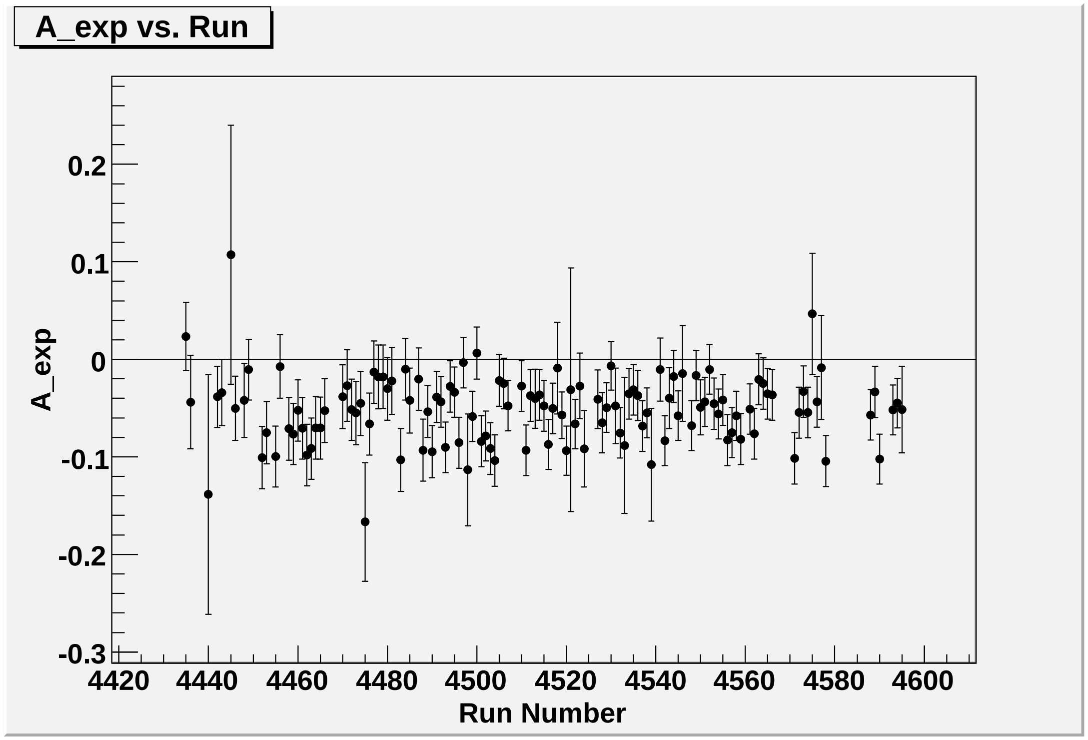
Quasielastic cuts are applied to both charged and uncharged particles

- -0.25 GeV $< p_{\mathrm{miss}\|} <$ 0.25 GeV
- $p_{\mathrm{miss}\perp} <$ 0.15 GeV
- 0.8 GeV $< \mathrm{W} <$ 1.15 GeV

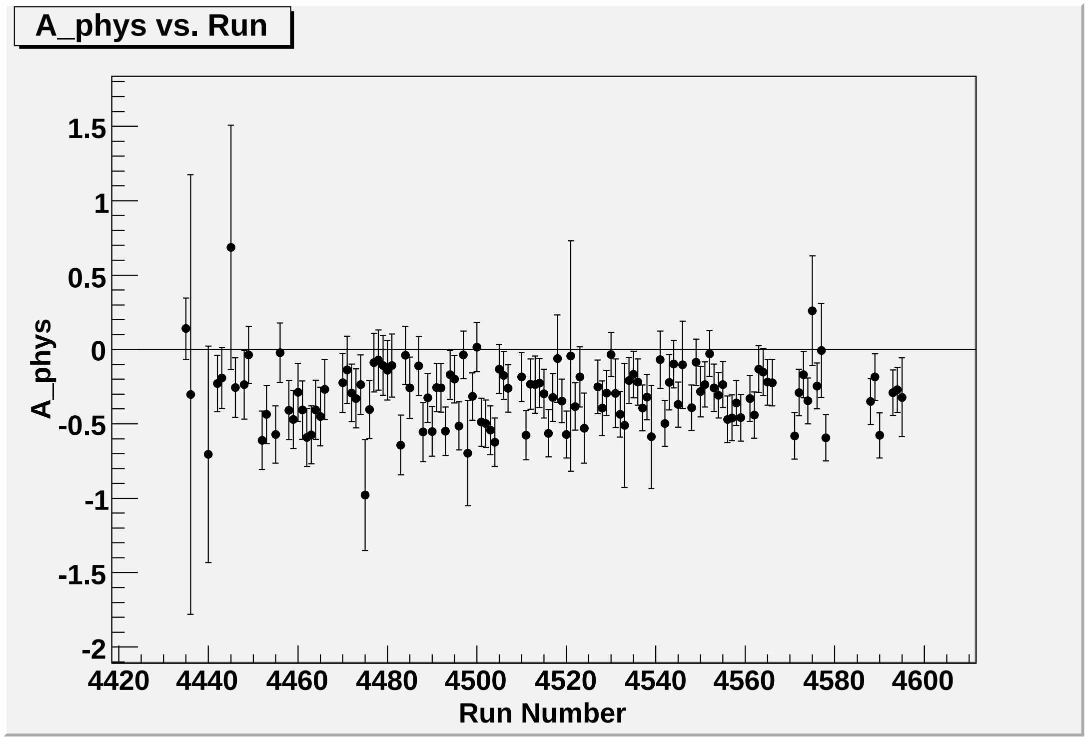
Dilution Calculations

- $D_{\mathrm{back}} = 1 - \frac{N_{\mathrm{back}}}{N} = 0.844 \pm 0.005$
  - Background determined through inverse beta analysis
- $D_{\mathrm{proton}} = 1 - \frac{\mathrm{unch}}{\mathrm{ch}}|_{\mathrm{H}_2} / \frac{\mathrm{unch}}{\mathrm{ch}}|_{^3\mathrm{He}} = 0.605 \pm 0.002$
- $D_{\mathrm{N}_2} = \frac{\mathrm{QERate}(\mathrm{N}_2)}{\mathrm{QERate}(^3\mathrm{He})} \frac{\rho_{^3\mathrm{He}}}{\rho_{\mathrm{N}_2}} = 0.943 \pm 0.077$

$$A_{\rm exp} \quad -0.0523 \pm 0.0026$$



$A_{\mathrm{phys}} \quad -0.308 \pm 0.017$



G_E^n Calculation

Numerically solve for G_E^n given:

$$A_{\rm phys} = \overline{T_0}(\theta^*, \phi^*) + \overline{T_1}(\theta^*, \phi^*)\Lambda + \overline{T_2}(\theta^*, \phi^*)\Lambda^2 + ... \quad (1)$$

where $\Lambda = \frac{G_E^n}{G_M^n}$ $\qquad G_M^n = \mu_n G_D$

and

$$Q^2 = \frac{\overline{T_1 Q^2}}{T_1} \quad (2)$$

$$G_E^n(Q^2 = 1.68\text{GeV}) = 0.0459 \pm 0.0162$$