Establish baseline for the hadronic model; deuteron an essential testing ground.

Fifth structure function is a little-studied part of the deuteron response function sensitive to final state interaction (FSI) and the $NN$ interaction - imaginary part of the quasielastic LT interference term (fifth structure function) of $^2H(\vec{e}, e'p)n$ at $Q^2 \approx 1 \text{ (GeV/c)}^2$.

The cross section is

$$
\frac{d^3\sigma}{d\omega d\Omega_e d\Omega_p} = \sigma_L + \sigma_T + \sigma_{LT} \cos(\phi_{pq}) + \sigma_{TT} \cos(2\phi_{pq}) + h\sigma'_{LT} \sin(\phi_{pq})
$$

where $h = \pm 1$ for different beam helicities.

Extract the helicity asymmetry from the $\phi_{pq}$-dependent moments in each $\vec{p}_m = \vec{q} - \vec{p}_p$ bin.

$$
\langle \sin \phi_{pq} \rangle_\pm = \frac{\int_{-\pi}^\pi \sigma^\pm \sin \phi_{pq} d\phi_{pq}}{\int_{-\pi}^\pi \sigma^\pm d\phi_{pq}} = \pm \frac{\sigma'_{LT}}{2(\sigma_L + \sigma_T)} = \pm \frac{A'_{LT}}{2}
$$

Get rid of a sinusoidally-varying background by taking the difference of the

$$
\langle \sin \phi_{pq} \rangle_+ - \langle \sin \phi_{pq} \rangle_- = \left( \frac{A'_{LT}}{2} + \alpha_{acc} \right) - \left( -\frac{A'_{LT}}{2} + \alpha_{acc} \right) = A'_{LT}
$$
Analysis and Results

Data from the E5 run period in Hall B: $E = 2.56 \text{ GeV}$ with normal and reversed torus polarity to reach lower $Q^2$. Higher beam energy has low statistics.

- Dual $LH_2 - LD_2$ target; $P_e = 0.74 \pm 0.02$.
- Standard selection cuts and corrections: fiducial cuts, CC photoelectrons, momentum corrections, ...
- Quasielastic (QE) electron selection:
  - Cut on residual $epX$ mass $3\sigma_n$ below pion threshold ($\sigma_n$ is neutron width).
  - Radiative tail cut corrected with EXCLURAD.
- Consistency tests: GSIM, $A_{LT}'$ at $p_m \approx 0$, fits versus $\langle \sin \phi_{pq} \rangle \pm$, beam helicity.
- Systematic uncertainties extracted.
- Similar $A_{LT}'$ for both data sets; Jeschonnek and Van Orden calculation does well at low-$Q^2$, but gets too deep a dip at higher $Q^2$.
- Analysis note nearly done.