CLAS12 European Workshop
Feb 25-28, 2009
Nuclear Physics Working Group
Current and Recent Reviews* - 1

Dan Protopopescu - Multipole Analysis of the Delta0(1232) in 3He
Committee:Kyungseon Joo (Chair), Mike Vineyard, Mike Wood
ongoing; no change since last meeting.

Hovhannes Baghdasaryan - 3He(e,e'pp)n Analysis
Committee:Mike Vineyard (Chair), Dan Protopopescu, Steffen Strauch
ongoing.

Alex Vlasov – CAN: Source size measurements in the eHe -> e'pΛ X reaction.
Committee: Larry Weinstein (chair), Pavel Degtyarenko, Yordanka Ilieva
ongoing; waiting on response by the authors to the first round of reviewers comments.

Mikhail Osipenko, G. Ricco, S.Simula, M.Battaglieri, R. DeVita, M. Ripani, M. Taiuti, M. Anghinolfi – CAN: Moments of the nucleon structure function F2 with CLAS: Part III – nuclear target.
Committee: Mike Dugger (chair), Tony Forest, Rakhsha Nasseripour
Approved.

* If you want to modify this list send email to gilfoyle@jlab.org

Nuclear Physics Working Group
Current and Recent Reviews* - 2

M.Wood, R. Nasseripour, D.Weygand, C.Djalali - CAN: Absorption of the Omega and Phi Mesons from the g7a data set.
Committee: Maurik Holtrop (chair), Pawel Nadel-Turonski, Igor Strakovsky.
ongoing; second round of reviewers responses nearly complete.

K. Hafidi et al. - CAN:Color Transparency in eg2
Committee: Hovanes Egiyan (chair), Mike Wood, Stepan Stepanyan
ongoing; response to first round of reviewers comments nearly complete.

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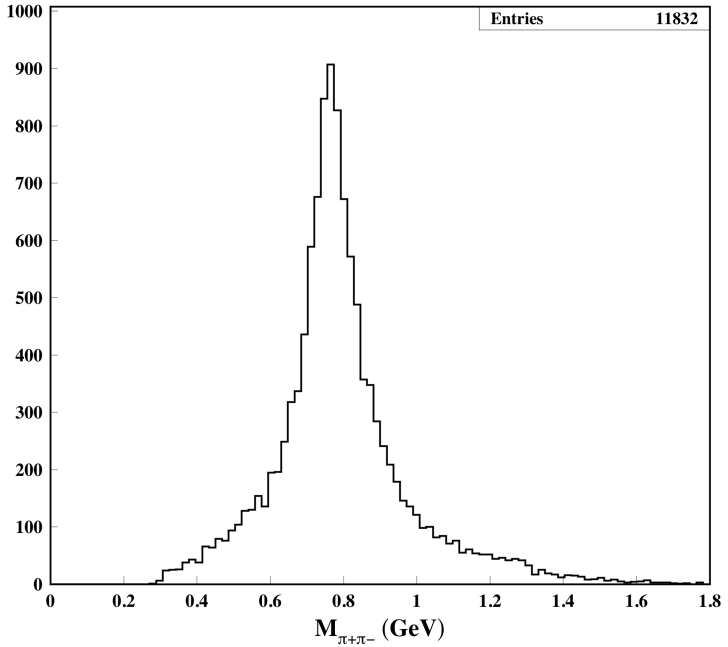
Search for the onset of CT in ρ^0 electroproduction off nuclei

L. El Fassi, K. Hafidi, B. Mustapha

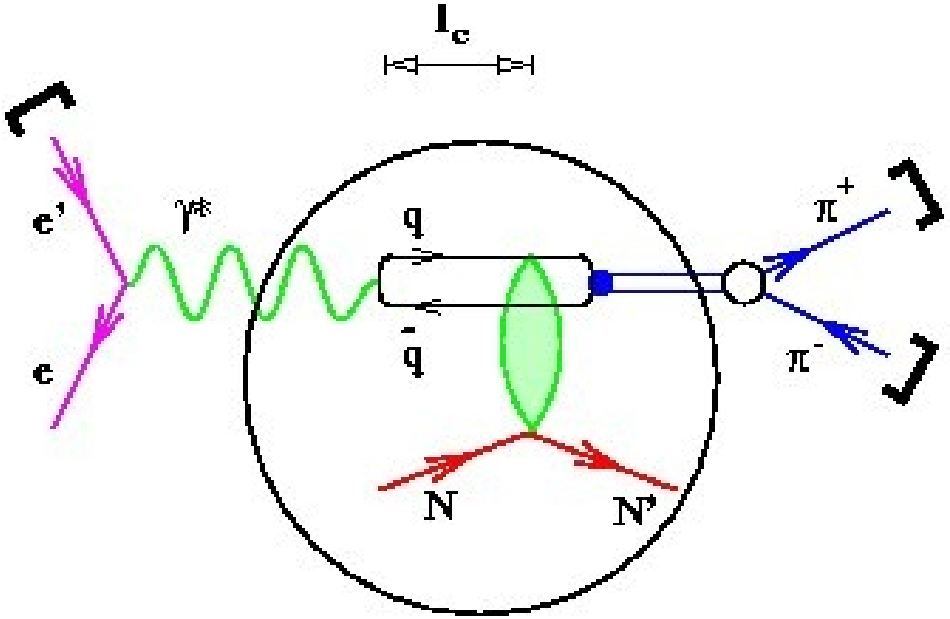
Detected particles are :

scattered electron and the π^+ and π^- from ρ^0 decay

Exclusive diffractive ρ^0 electroproduction Is one of the cleanest processes to directly produce PLC since ρ^0 has the same quantum numbers as the photon



$e + N \rightarrow e' + N + \rho^0$

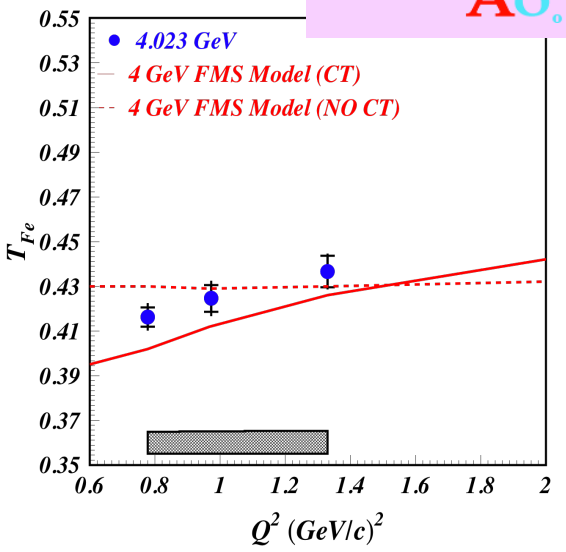


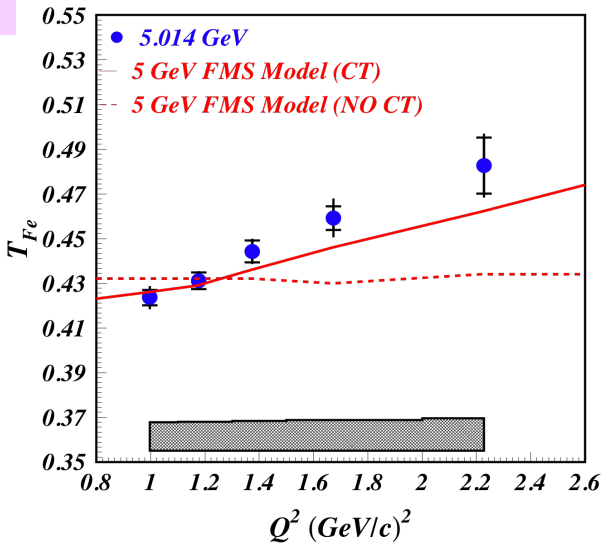
Coherence length $l_c = 2\nu/(M^2 + Q^2)$

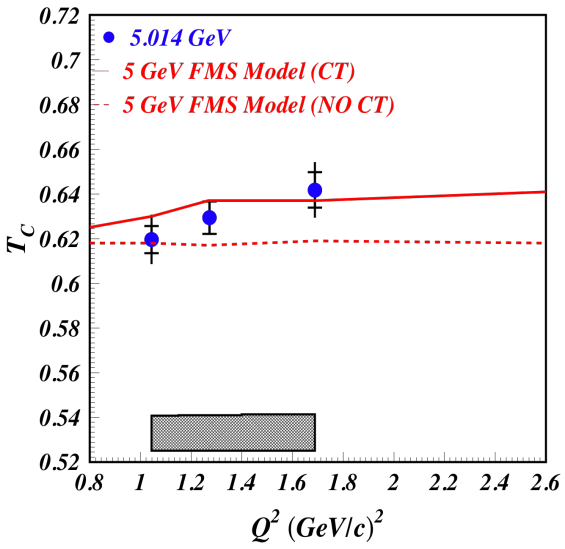
M is the mass of the vector meson

$$T_A = \frac{\sigma_{(A)}}{A\sigma_\circ}$$

$$T_A = \frac{\sigma_{(A)}}{A\sigma_o}$$







L. Frankfurt, G. A. Miller and M. Strikman,
Phys. Rev. C78 (2008) 015208

Q^2 slope for C: (0.034 ±0.025)

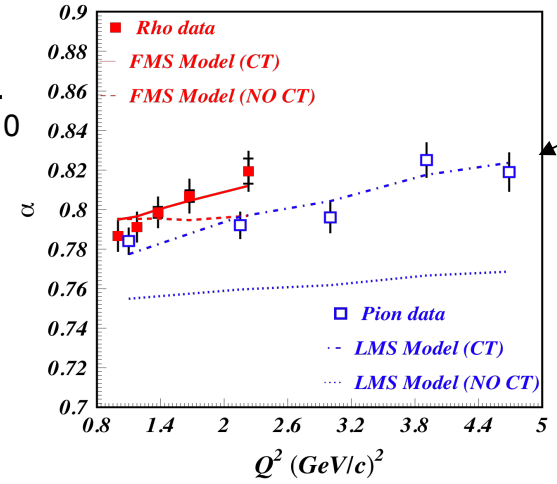
Q^2 slope for N (HERMES)
(0.089 ±0.05)

Kopeliovich model
N (0.048 GeV^{-2})

Q^2 slope for Fe:
0.043 ±0.008GeV^{-2}

Test of the FMS model consistency !!

$T \approx \sigma_0 A^\alpha / A\sigma_0$
$\approx A^{\alpha-1}$



Pion data from Hall C.

Status: Response by authors to first round of reviewers comments is about to be sent out.

Nuclear Structure Function Moments With CLAS

M. Osipenko, G. Ricco, and S. Simula

Goal of this analysis extraction of moments:

$$M_n(Q^2) \equiv \int_0^1 x^{n-2} F_2(x, Q^2)\, dx$$

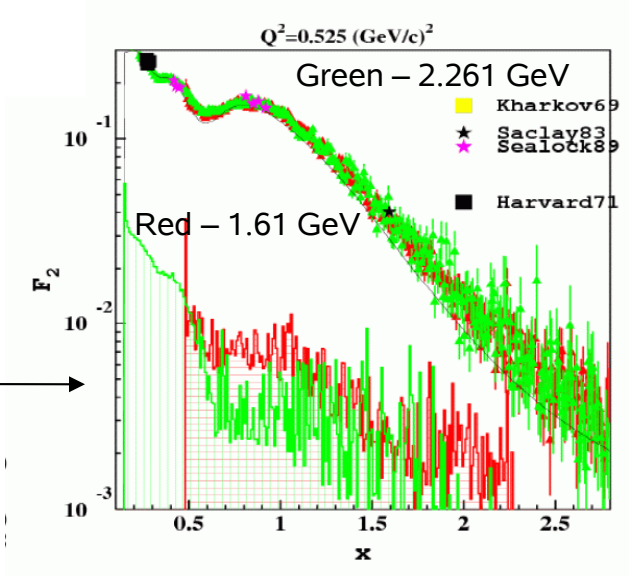
OPE allows to calculate these observables:

$$M_n(Q^2) = A_2^n(\alpha_S) + \sum_\tau a_n^\tau \left(\frac{\alpha_s(Q^2)}{\alpha_s(\mu^2)}\right)^{\gamma_n^\tau} \left[\frac{\mu^2}{Q^2}\right]^{\frac{\tau-2}{2}}$$

Leading twist (LO pQCD):

$$A_2^n(\alpha_S) = M_n(\mu^2)\left[\frac{\alpha_s(Q^2)}{\alpha_s(\mu^2)}\right]^{\gamma_n}$$

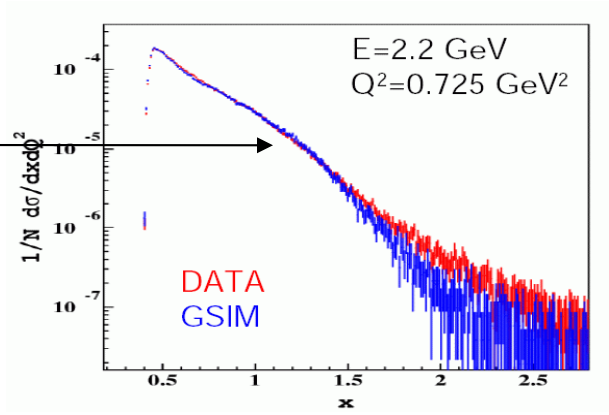
Structure functions agree with world data and at different beam energies. CLAS data dramatically increase kinematical coverage.



Carbon target

F_2 Extraction

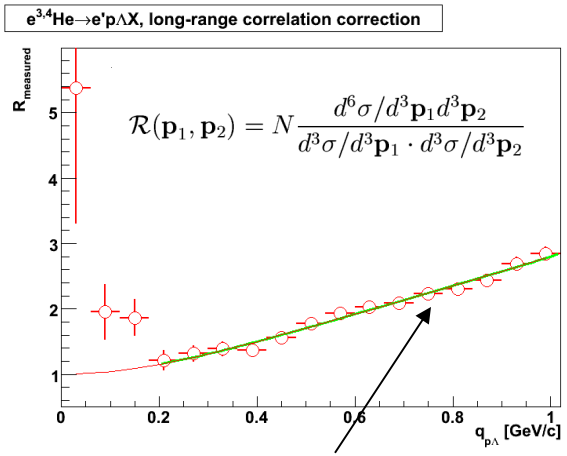
- GSIM simulation has been performed using a model of the nuclear inclusive cross section (S.Simula) including radiative effects
- Generated yields are in good agreement with raw data (within fiducial cuts) over entire covered region

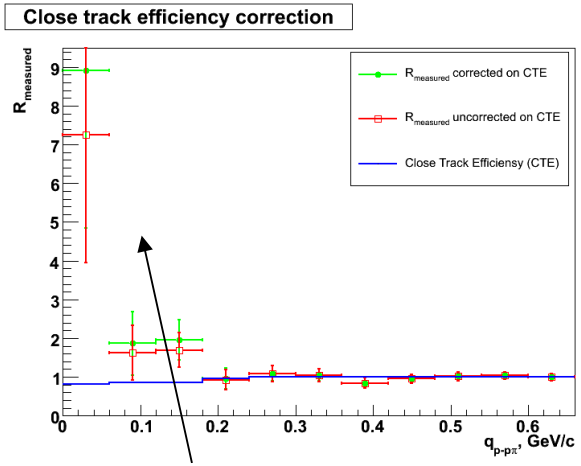


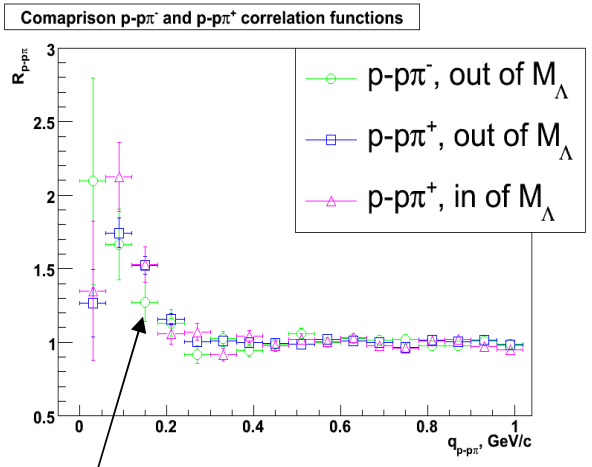
Status: Review completed and going to the ad hoc phase.

Source Size Measurements in the $e^{3,4}He \rightarrow e'p\Lambda X$ Reaction

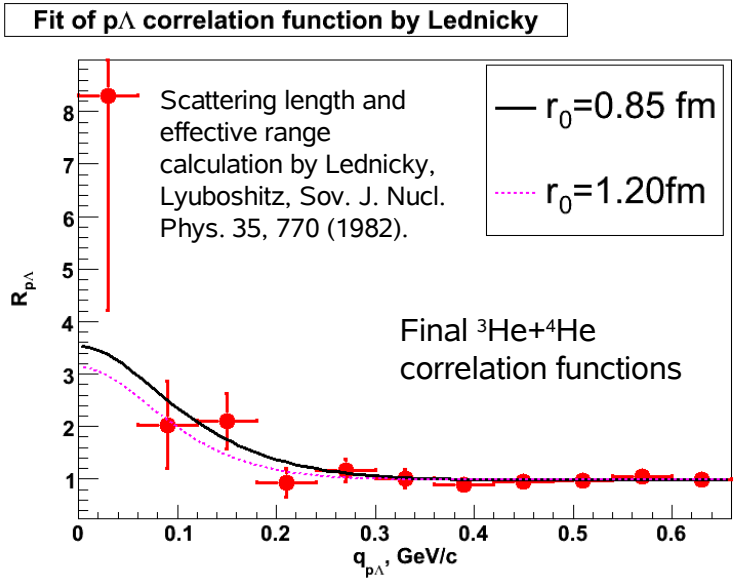
A.V. Stavinsky, B. Kerbikov, R. Lednicky, K.Mikhailov, A.Vlassov







Corrected for (1) long-range correlations, (2) close-track efficiencies, and (3) direct components.



- narrow structure in the correlation function at small relative momenta.
- p-π^- pairs in the region $M_{p\pi^-} = M_\Lambda$ are correlated.
- source size for strangeness production is consistent semi-inclusive two-proton production reaction.
- proton-lambda correlation function is compatible with P-matrix fit of the hyperon-nucleon data.
- small relative momentum correlations for electroproduction on He targets was studied for the first time.

Status: Authors are working on response to first round of reviewers comments.

Absorption of the ω and ϕ Mesons in Nuclei

M. Wood, R. Nasseripour, C. Dijali, and D. Weygand

By plotting the nuclear forward production σ vs A, one can determine

1. Normalization => single nucleon forward cross sections.
2. Shape or A-dependence => forward V-N scattering amplitude f_{VN}

Mined the g7a data:

1. Experiment E01-112.
2. Photon beam with energy from threshold to 3.8 GeV.
3. Segmented target with ^{2}H, ^{12}C, ^{48}Ti, ^{56}Fe, and ^{208}Pb materials.
4. Detected the e+e- decay of ρ, ω, and ϕ mesons.

Analysis:

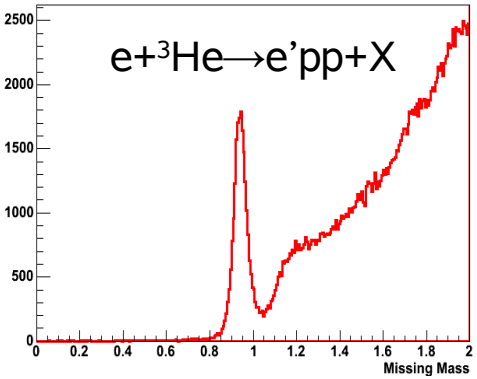
1. Extract yields by global fit to mass spectra with realistic BUU simulations.
2. Check yield extraction with local fit to the ϕ peak.
3. Determine σ_A/σ_D vs target A and fit with theoretical model.
4. Estimate systematic errors.
5. Fit σ_A/σ_D vs A and determine σ_{VN} and f_{VN}.

Status: Reviewers are completing second round response to recent changes by the authors.

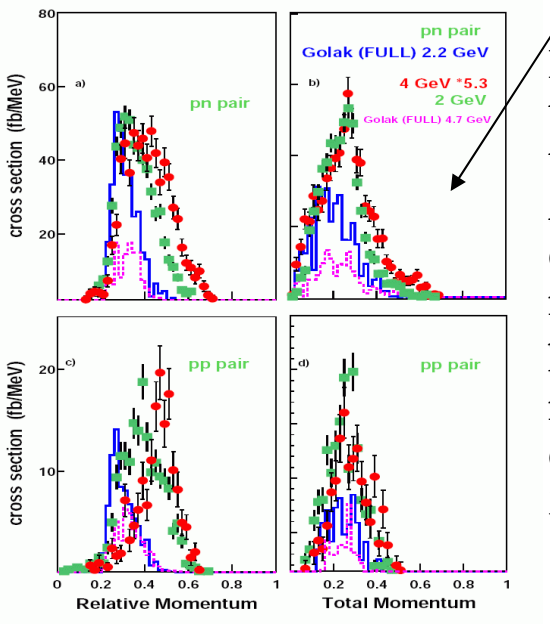
E2b Analysis of Short Range Correlations

H. Baghdasaryan and L. Weinstein

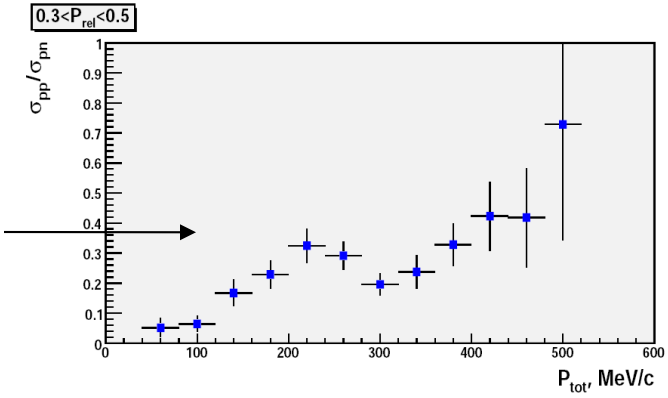
1. NN short-range correlations (SRC) are a valuable tool to study cold, dense nuclear matter.
2. SRC measured in CLAS using the ^{3}He(e, e′pp)n reaction.
3. Two sets of kinematics: (1) two active protons and spectator neutron and (2) one active nucleon and remaining pair are spectators.
4. Measured relative momentum of spectator pp and pn pairs up to p_{rel} = 600 MeV/c.



Laget calculation works well for kinematics (1) when dominated by Final State Interactions.



Ratio of pp to pn pairs is sensitive to total momentum distribution of the spectator pair in kinematics (2). At low total momentum results are consistent with previous measurements, but at high p_{tot} > 200 MeV/c, the increasing ratio indicates the importance of d-wave contributions or possible 3-nucleon SRC.



Status: Ongoing, authors are responding to reviewers comments.

Multipole Analysis of $\Delta^0(1232)$ in ^{3}He

J.Donnelly, D. Protopopescu and D. Ireland

1. Study transitions of quasi-free neutrons to the $\Delta^0(1232)$ using the $^3He(e,e'p\pi^-)2p$ reaction.

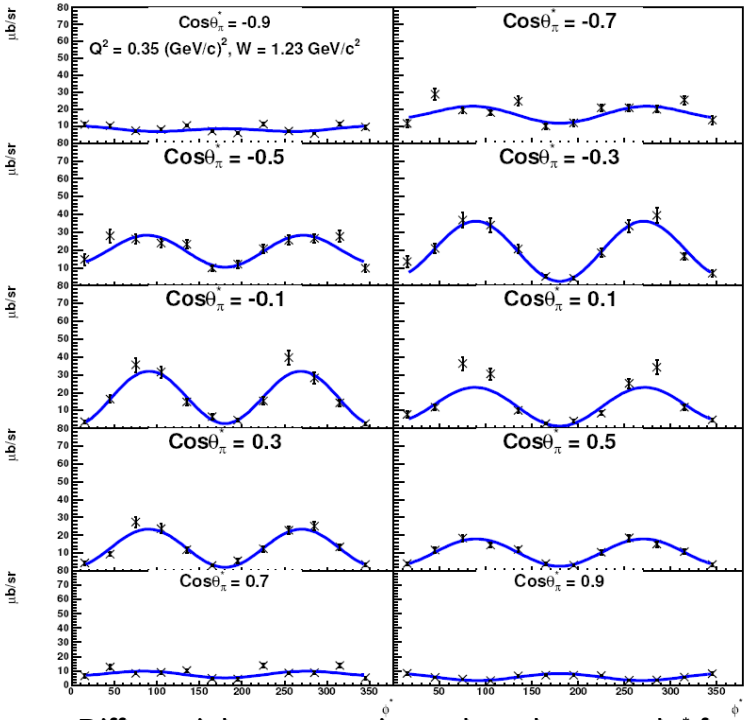
2. Measure the angular distributions of the decay products to extract the multipole moments.

3. Kinematics: 0.1 GeV^2 < Q^2 < 0.4 GeV^2.

4. Extracted magnetic dipole (M1) and the interference from the electric quadrupole (E2) and Coulomb quadrupole (C2).

5. Values of the multipole ratios REM and RSM were determined for the first time on a quasi-free neutron target in a ^{3}He nucleus.

6. Comparisons with existing 'free' neutron theoretical models show large differences between the current models and the data.



Differential cross sections plotted versus ϕ_π^* for Q^2 = 0.35 GeV^2.

Status:

1. Limited progress in the last year.
2. Ambiguities of fitting procedure require more study.
3. Considering resubmitting with final results for cross sections and leave the multipole analysis for later.