E6 @ CLAS

$d(e, e'p_s)$

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DWorkshop, Florida International University, Miami, FL
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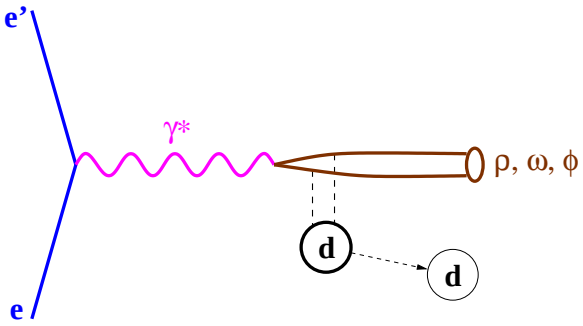
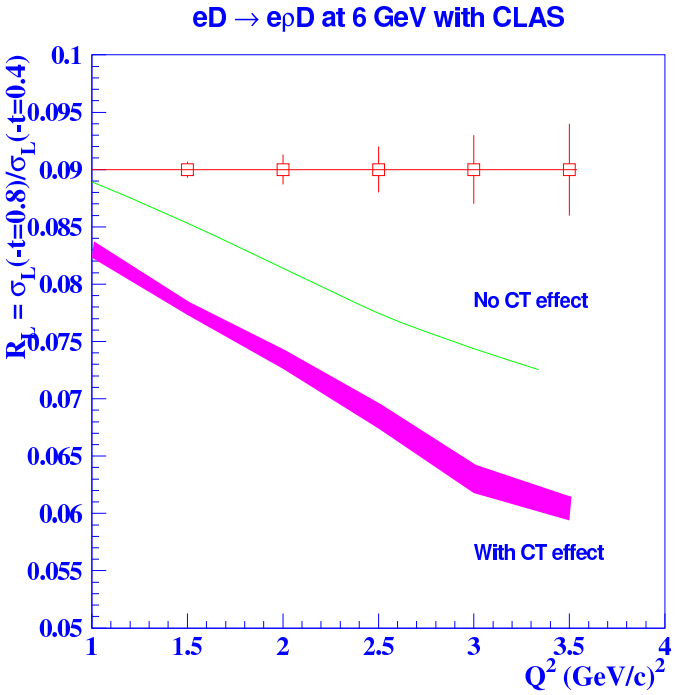
- Introduction
- JLab 94-102
- JLab 94-019
- Outlook

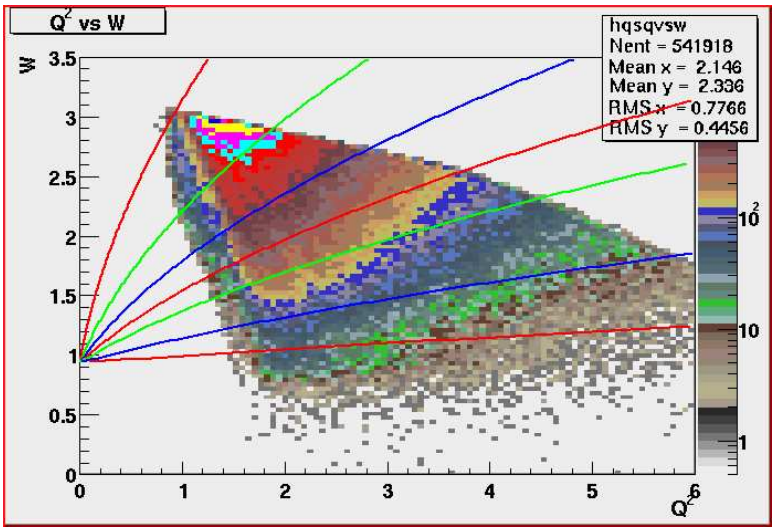
JLab CLAS E02-012

Coherent Vector Meson Production off Deuterium



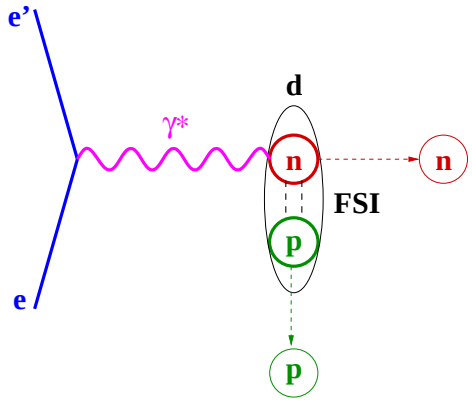


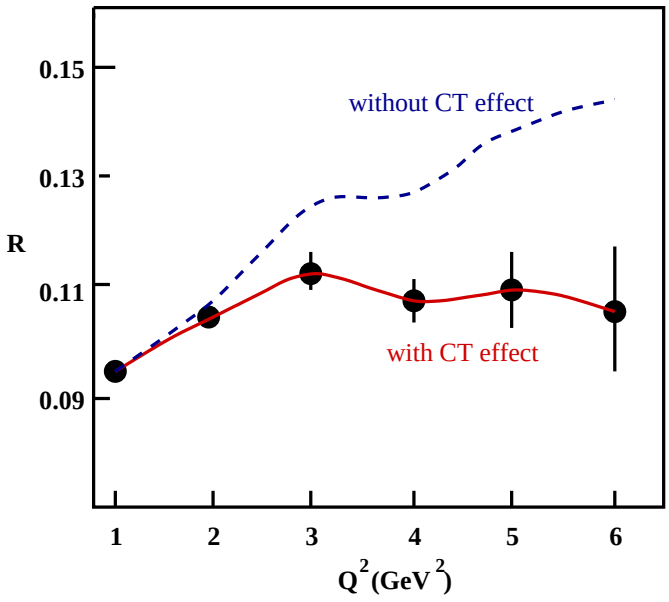
JLab CLAS e6 Run Period



JLab CLAS E94-019

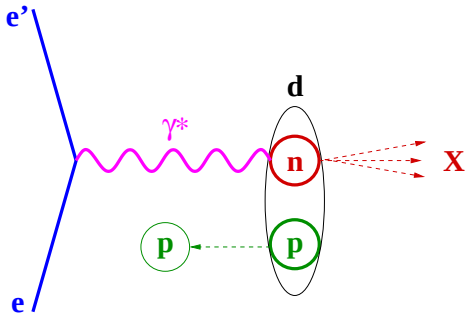
Transparency in Double Rescattering Processes

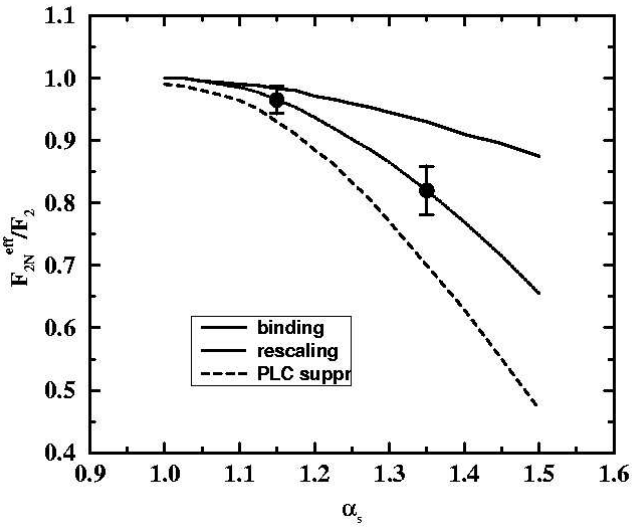




JLab CLAS E94-102

Transparency in Double Rescattering Processes





Models

- Spectator Model (Frankfurt and Strikman):

$$\frac{d\sigma}{dx_{Bj}dQ^2d\alpha dp_\perp} = \frac{d\sigma}{dxdQ^2}\left(\frac{x_{Bj}}{2-\alpha}, Q^2\right)|\psi(\alpha, p_\perp)|^2$$

  - $\frac{d\sigma}{dxdQ^2}$ is the inclusive scattering cross section
  - $\psi(\alpha, p_\perp)$ is the deuteron wave function
  - $\alpha \equiv (\sqrt{m^2+p_s^2} - p_s^{\parallel})/m$ in which $p_s^{\parallel}$ is the projection along $\mathbf{q}$
  - $|\psi_{LC}(\alpha, p_\perp)|^2 d\alpha dp_\perp = |\psi_{NR}(|\mathbf{k}|)|^2 d^3k$, $p_\perp = k_\perp$, and $\alpha = 1 + k_\parallel/\sqrt{m^2+k^2}$; LC=Light Cone; NR=Non-Relativistic.

- 6-Quark Model (Carlson and Lassila):

$$\frac{d\sigma}{dx_{Bj}dQ^2d\alpha dp_\perp} = K F_2^{6q}(x_{Bj}, Q^2)\frac{1}{2-x_{Bj}} D_p^{5q}\left(\frac{\alpha}{2-x_{Bj}}, p_\perp\right)$$

  - K is a kinematic factor
  - F_2^{6q} is the 6-quark structure function
  - D_p^{5q} is the fragmentation function for $5q \to p$

- Off-Shell:

$$\frac{d\sigma}{dxdQ^2}\left(\frac{x_{Bj}}{2-\alpha}, Q^2\right) \to \frac{d\sigma}{dxdQ^2}\left(\frac{x_{Bj}}{2-\alpha}, Q^2, m^*\right)$$

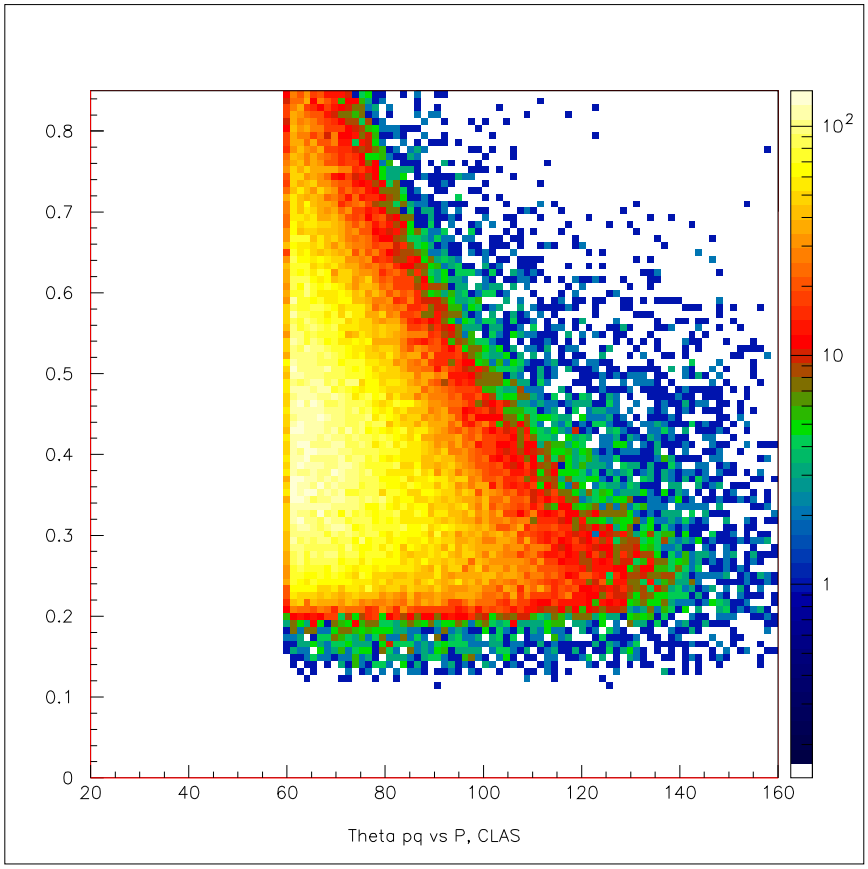
What We Learn from $d(e, e'p_s)$

- Deep-inelastic, high p_s, low $p_\perp$
  - Origins of the EMC effect
  - Nucleon spectral function (off-shell effects)
  - Exotic components of the d wavefunction (*e.g.* 6-quark bags)
- Quasi-elastic, high p_s, high $p_\perp$
  - Final-state interactions
  - Point-like configurations and color transparency
- low p_s
  - d as a neutron target

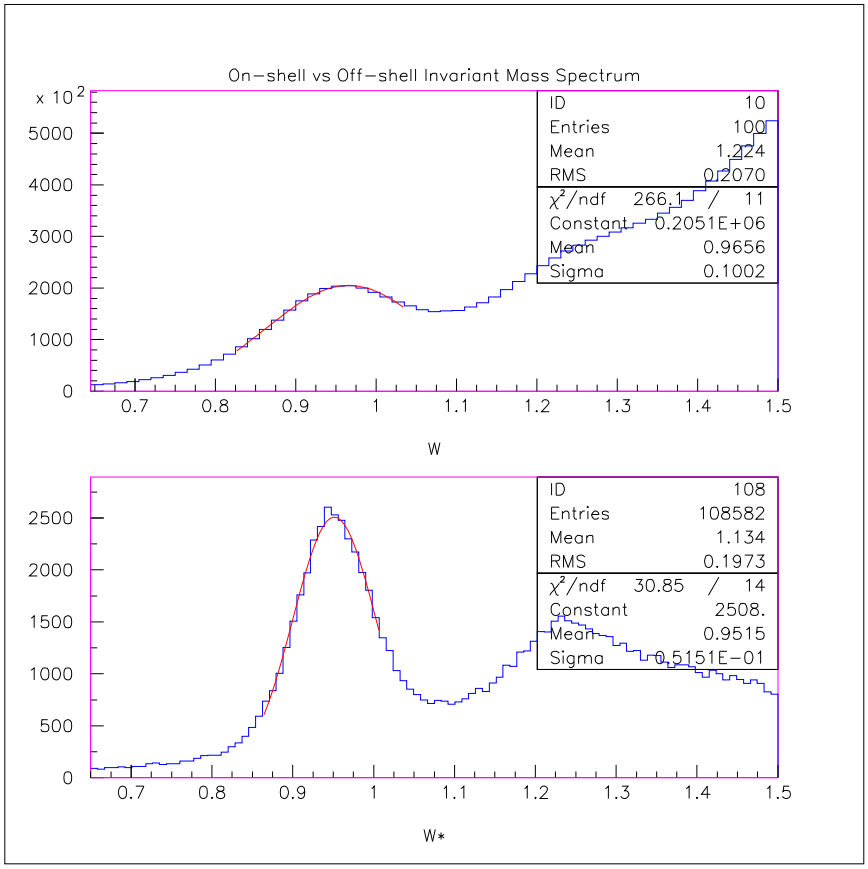
e6 Run Period

- JLab 94-019 Nuclear Transparency in Double Scattering Processes (Egiyan, Griffioen, Strikman)
- JLab 94-102 Electron Scattering from a High Momentum Nucleon in Deuterium (Griffioen, Kuhn)
- Jlab 02-012 Investigation of the Onset of Coherence Phenomena in Production of Vector Mesons off (Polarized) Deuterons (Brooks)
- CLAS characteristics:
  - Luminosity: 10^{34} /cm^2/s
  - Spectrometer: CLAS
  - Trigger: minimal
  - Proton momentum error: 2%
  - Proton angle error: 0.2°
  - Missing mass error: 18 MeV
  - Q^2 error: 2.5%
  - Proton acceptance: $> 50\%$ for $0.25 < p < 0.7$ GeV and $\theta_{pq} < 140°$
  - Background: $< 2 \times 10^{-3}$ accidentals to trues

Backwards Protons from E6



W corrected for moving nucleons



Spectator Protons