

Analysis Progress

for the d_2^n analysis meeting

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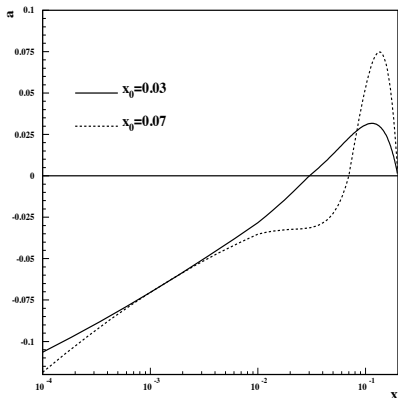
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Neutron Extraction: Shadowing and Antishadowing

- Summary of explanation from Bissey, Guzey, Strikman and Thomas (PRC **65** 064317 (2002)):
- At small x ($10^{-4} \leq x \leq 0.2$, “the virtual photon can interact coherently with several nucleons in the nuclear target”)
- The effect is a change in the ratio $2F_2^A/(AF_2^D)$
- $0.0035 \leq x \leq 0.03 - 0.07$ is the **nuclear shadowing** region:
 $2F_2^A/(AF_2^D) < 1$
- $0.03 - 0.07 \leq x \leq 0.2$ is the **nuclear anti-shadowing** region:
 $2F_2^A/(AF_2^D) > 1$
- We have some data at $x < 0.2$ (bin center: $x = 0.175$).

Shadowing and Antishadowing: Parameterization

- Bissey *et al.* model these effects using two functions $a(x)$ and $b(x)$
- In antishadowing region, $a(x) = 57b(x)$
- Functional form depends on transition point x_0 between shadowing and anti-shadowing regimes.
- Here's Fig. 3 from Bissey *et al.*:



Neutron Extraction at Low x

- For most of our DIS points, $x > 0.2$ and the Bissey model is a good approximation:

$$\frac{g_1^n}{F_1^n} = \frac{F_2^{3\text{He}}}{P_n F_2^n \left(1 + \frac{0.056}{P_n}\right)} \left(\frac{g_1^{3\text{He}}}{F_1^{3\text{He}}} - 2 \frac{F_2^p}{F_2^{3\text{He}}} P_p \frac{g_1^p}{F_1^p} \left(1 - \frac{0.014}{2P_p}\right) \right) \quad (1)$$

- For our lowest x point, we can't drop $a(x)$ and $b(x)$ in the derivation of Equation 1
- We end up with:

$$\frac{g_1^n}{F_1^n} = \frac{F_2^{3\text{He}}}{P_n F_2^n \left(1 + \frac{0.056+a(x)}{P_n}\right)} \left(\frac{g_1^{3\text{He}}}{F_1^{3\text{He}}} - 2 \frac{F_2^p}{F_2^{3\text{He}}} P_p \frac{g_1^p}{F_1^p} \left(1 - \frac{0.014 - b(x)}{2P_p}\right) \right) \quad (2)$$

What's Next?

- Neutron extraction
 - ▶ Practical parameterization of $a(x)$, $b(x)$
 - ▶ Practical parameterization of EMC effect from Hall C data
 - ▶ Code for extraction of neutron values in DIS region
- Radiative corrections
- Data
 - ▶ Test 64-bit skim
 - ▶ Sign-sorted 5-pass runlist (beam helicity/target spin)