

Notes on extracting polarization observables

- 11-14-13
 - Formalism

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Formalism

$$\left(\frac{d\sigma}{dX^{ij}d\phi^j}\right)^h \doteq f^h(X^{ij}, \phi^j) = A^{ij} + B^{ij} \cos \phi^j + C^{ij} \cos 2\phi^j + hPD^{ij} \sin \phi^j$$

where

- ij = index over Varset, Variable (3x5 matrix)
- $R2_{\alpha}^{ij} \doteq [A^{ij}, B^{ij}, C^{ij}, D^{ij}] \equiv [R_T + \epsilon_L R_L, R_{LT}, R_{TT}, R_{LT'}]$
 - $R2_{\alpha}^{ij} = f(Q^2, W, X^{ij})$

Event Selection

R2 Extraction Method

Of the methods listed earlier:

1. Fit $f^h(X^{ij}, \phi^j)$ to extract R2
2. Calculate Asymmetry $\doteq f^{h=+} - f^{h=-}$ and then extract D^{ij}
3. $\int f^h(X^{ij}, \phi^j) * (\cos \phi / \cos 2\phi / \sin \phi) d\phi$ to extract $B^{ij}/C^{ij}/D^{ij}$

Method 3. is used, which even at the level of algorithmic detail is listed below.

For every **q2wbin**:

1. **h5[pol]** where **pol** \in {POS,NEG,UNP,AVG}; **pol** \neq AVG
2. **h5m[pol,pob] = h5[pol] · h5f[pob]**
 - **pob** \in {A,B,C,D}; **pol** \neq AVG
 - **h5f[pob]**:
 - For every bin **i**, **h5f[pob](i) = f[pob](i)**
 - **f[pob]** \in {N.A., $\cos \phi$, $\cos 2\phi$, $\sin \phi$ }
3. **hR2_Xij[pol,pob] = h5m[pol,pob] Project on to X^{ij} ; pol \neq AVG**
4. **hR2_Xij[pol=AVG,pob] = (hR2_Xij[pol=POS,pob] + hR2_Xij[pol=NEG,pob])/2**

Notes on current Observations

1. What do R^2 from Simulation Data (**SF**) represent?
 - Study in comparison with Hole-Filled Experimental Data (**EF**)
 - Therefore, is Hole-Filling valid?
2. R^2 from Acceptance Corrected Experimental Data (**EC**)

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Use `printf`