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1.1 Formalism

Using the form of the double-differential Cross-section for single-pion Electroproduction(2 d.o.f.), we can formalize the following for double-charged-pion Electroproduction:

$$\left(\frac{d\sigma}{dX^{ij}d\phi^j}\right)^h = A^{ij} + B^{ij} \cos \phi^j + C^{ij} \cos 2\phi^j + hPD^{ij} \sin \phi^j \quad (1.1.1)$$

where

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

For convenience, I define the following:

$$f^h(X^{ij}, \phi^j) \doteq \left(\frac{d\sigma}{dX^{ij}d\phi^j}\right)^h \quad (1.1.2)$$

1.2 Event selection

1. `eid`
2. `efid`
3. `momcorr`
4. `MM Cuts`

1.3 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.

NOTE that when multiplying by $\sin \phi$, the sign of the polarization is explicitly used

For every q2wbin:

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

1.4 Observations

Focussed only on $\langle B/C/D \rangle_{1THETA}$

- **Consistencies(C):**
 1. $\langle B/C \rangle[pos] = \langle B/C \rangle[neg] = \langle B/C \rangle[unp]$
 2. $EF-C[unp] \approx SF-C[unp]$
- **Inconsistencies(I):**
 1. $EF-D[unp] \neq 0$
 - (a) $D[pos] = -D[neg]$
 - (b) $D[unp] = D[pos]$
 2. $SF-D[unp] \neq 0$
 - (a) $SF-D[unp] \neq EF-D[unp]$
 3. $SF-B[unp] \neq EF-B[unp]$