Plan for PVDIS at EIC

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Polarized electron, unpolarized nuclei

$$A_{\rm PV}^{\rm electron} = \frac{\sigma^R - \sigma^L}{\sigma^R + \sigma^L} = \frac{G_F Q^2}{2\sqrt{2}\pi\alpha}[g_A^e \frac{F_1^{\gamma Z}}{F_1^\gamma} + g_V^e \frac{Y_-}{2Y_+} \frac{F_3^{\gamma Z}}{F_1^\gamma}],$$

Polarized nuclei, unpolarized electron

$$A_{\rm PV}^{\rm hadron} = \frac{\sigma^{(+)} - \sigma^{(-)}}{\sigma^{(+)} + \sigma^{(-)}} = \frac{G_F Q^2}{2\sqrt{2}\pi\alpha}[g_V^e \frac{g_5^{\gamma Z}}{F_1^\gamma} + g_A^e \frac{Y_-}{Y_+} \frac{g_1^{\gamma Z}}{F_1^\gamma}].$$

Questions for theorists:

1. What are the physics goals to be extracted from Apv?

e.g $F_1^{\gamma Z}$, $F_3^{\gamma Z}$, $g_1^{\gamma Z}$, $g_5^{\gamma Z}$ or C_{1q}, C_{2q} or $\sin^2\theta_W$

will different kinematics be sensitive to different physics goals?

2. What kinematic regions (x, Q2) will EIC focus on?
3. What are the uncertainties needed on Apv to make an impact ?
4. Is the theory side going to study the statistical uncertainty on Apv or …?

Neutral-Current Weak Interaction at an EIC (arXiv:1612.06927)

Systematic uncertainties plan:

1. E, E’, theta resolution -> x, Q2 resolution: using EIC smear
2. beam polarization: get from detector group
3. beam transverse polarization: get from detector group, but the effect on the asymmetry might need extra measurement.
4. luminosity: get from detector group
5. pair production background: use numbers from HERA
6. pion- background: pythia + pion rejection from detector group
7. radiative correction: get from theorists (EM radiative correction, EW radiative correction)