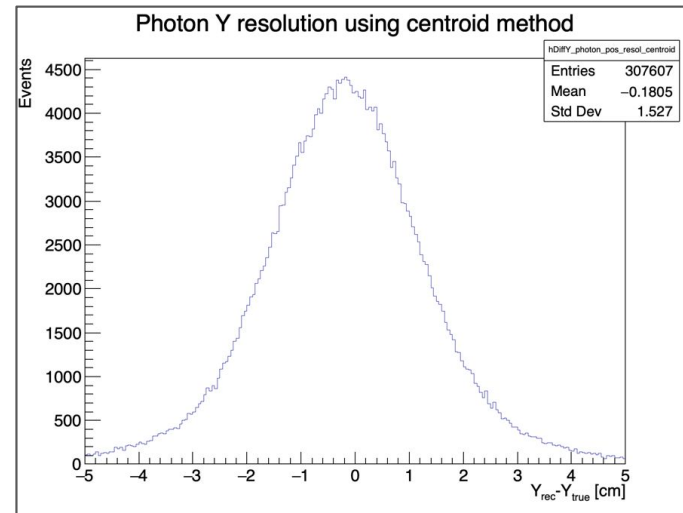
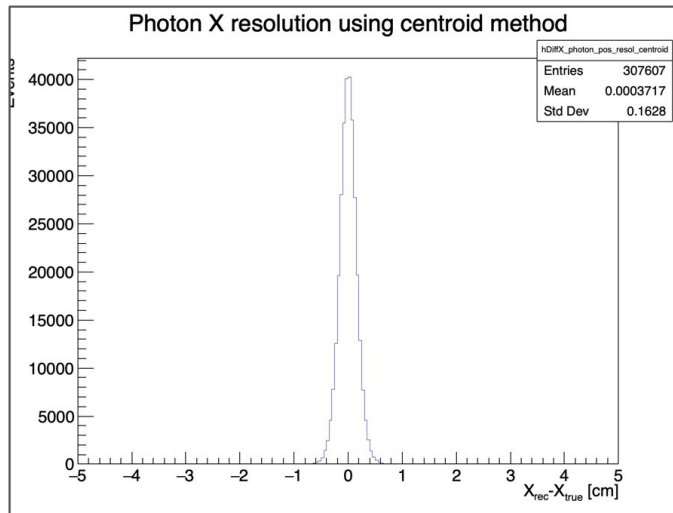


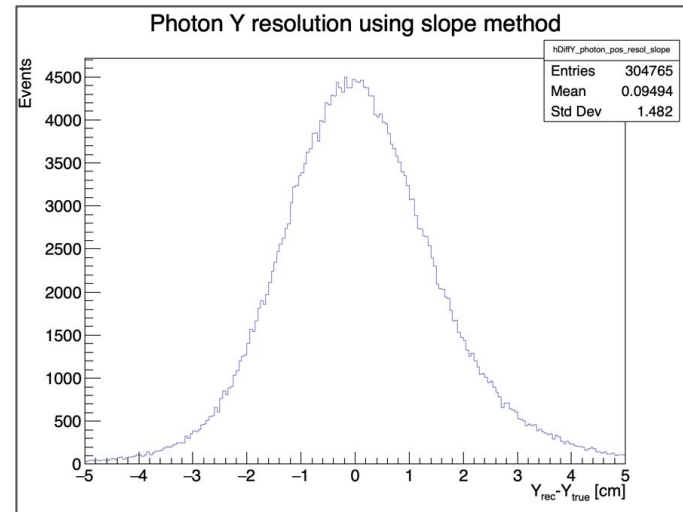
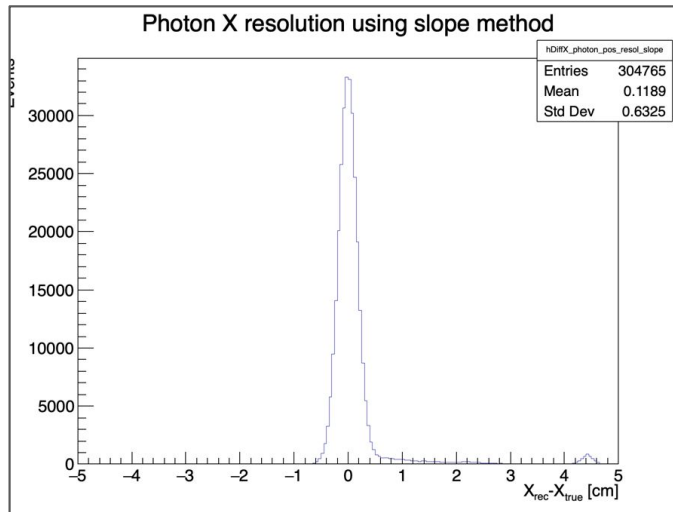
Rec. γ Position Resolution

09-24-26

Photon's Position Resolution Centroid Method

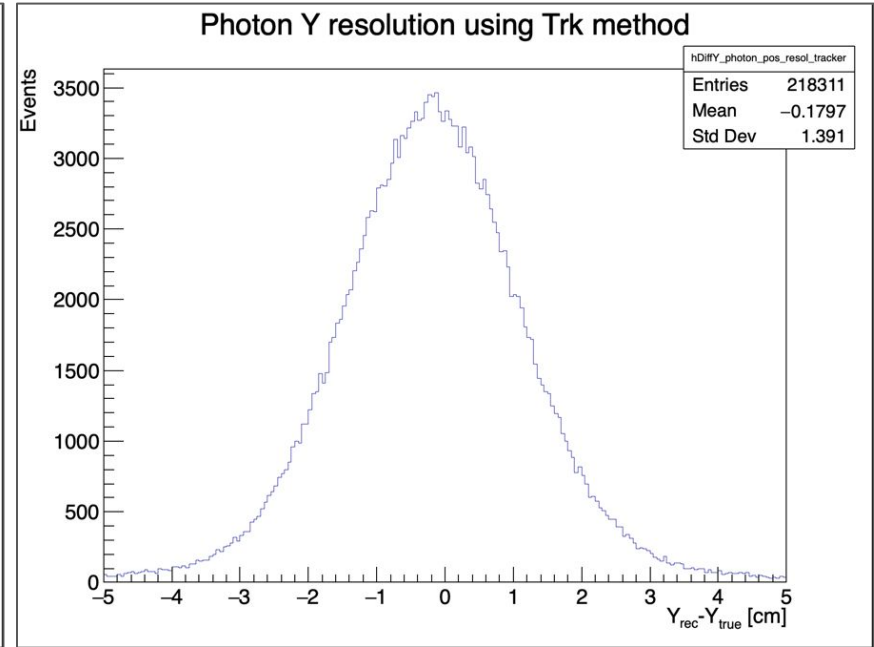
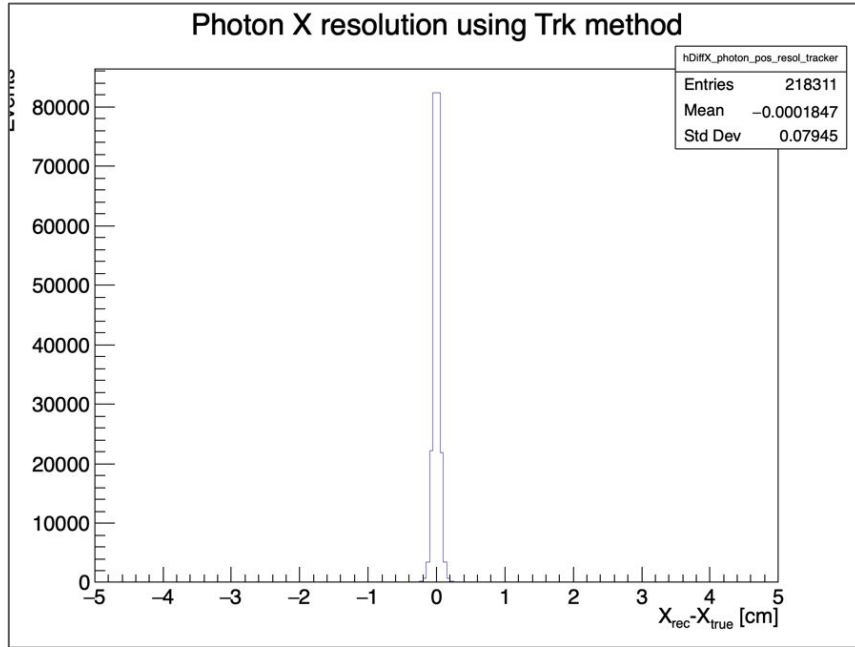


Photon's Position Resolution Slope Method



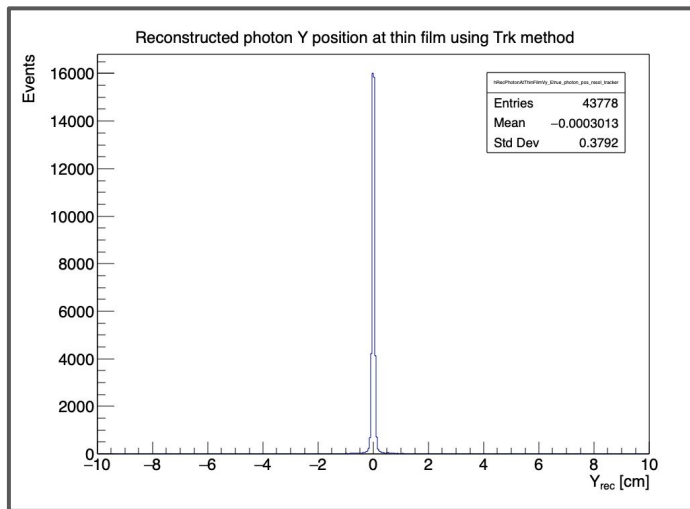
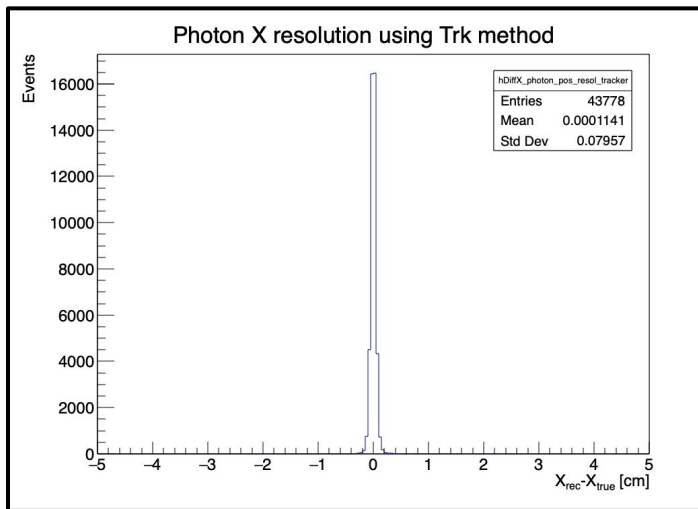
*Energy weighting of e^+e^- position along Y

Cross-Check with Tracker Position

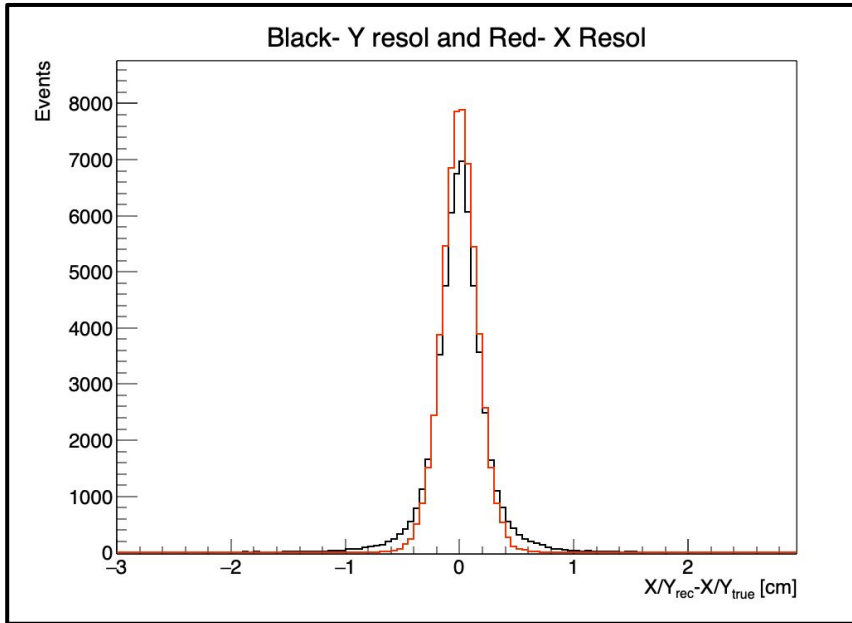


- Tracker's true hit position but energy from CAL.
- Didn't solve the issue.

Using the gen energy of pair produced e^+e^-



Potential Problem



- energy from MC
- Position from CAL
- Problem in X_Y Resol is solved but why it exist ?

The energy of the photon is

$$E_{\gamma} = E_{\text{up}} + E_{\text{dn}}. \quad (5)$$

The transverse x -position of the photon is

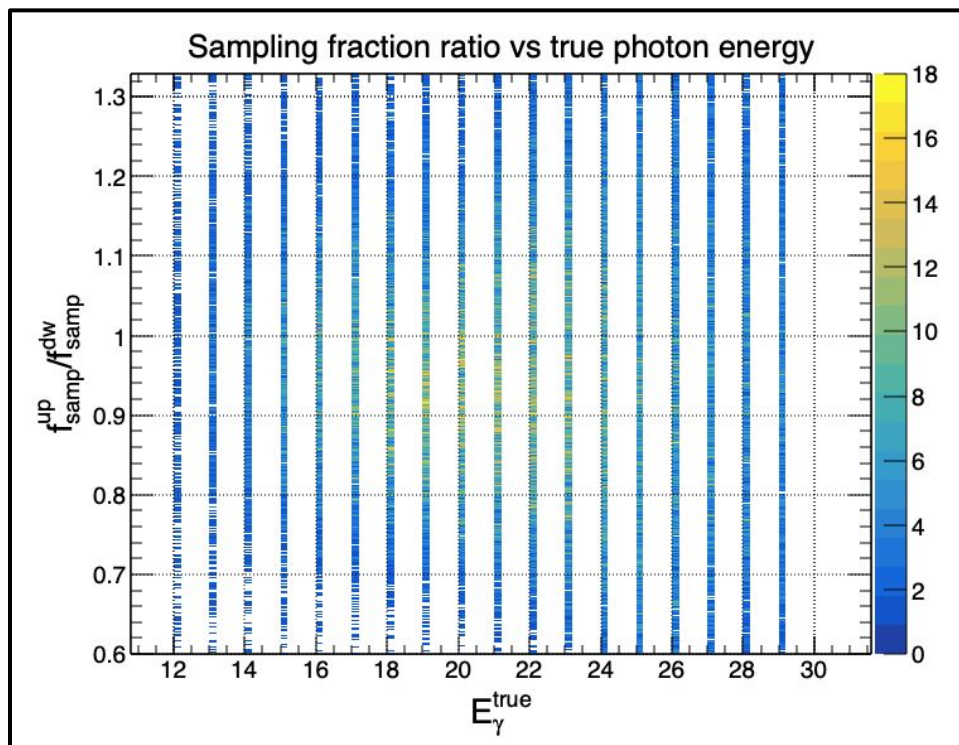
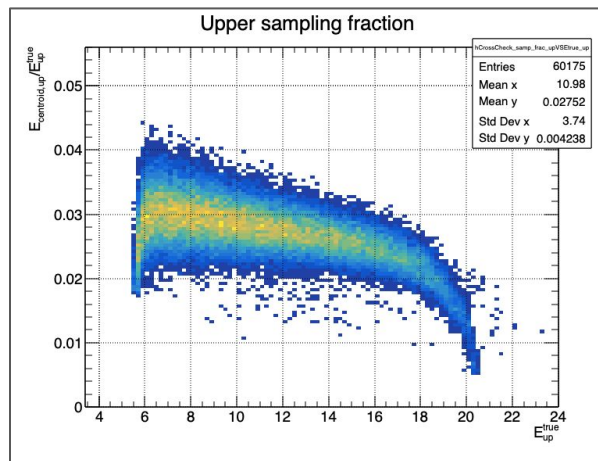
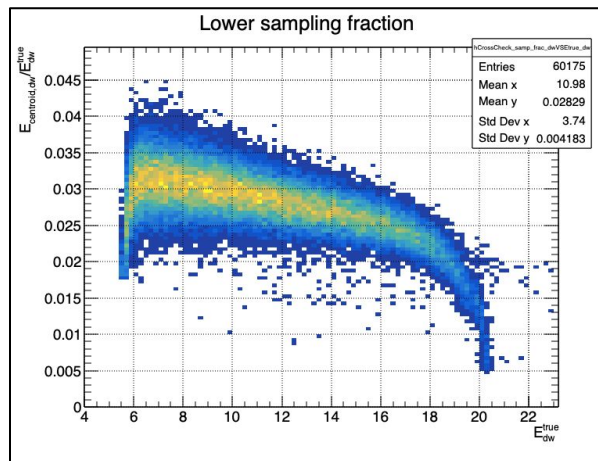
$$x_{\gamma} = \frac{1}{2}[x_{\text{up}} + x_{\text{dn}}] \quad (6)$$

and the transverse y -position (bend plane of magnet) is

$$y_{\gamma} = \frac{E_{\text{up}}y_{\text{up}} + E_{\text{dn}}y_{\text{dn}}}{E_{\text{up}} + E_{\text{dn}}}. \quad (7)$$

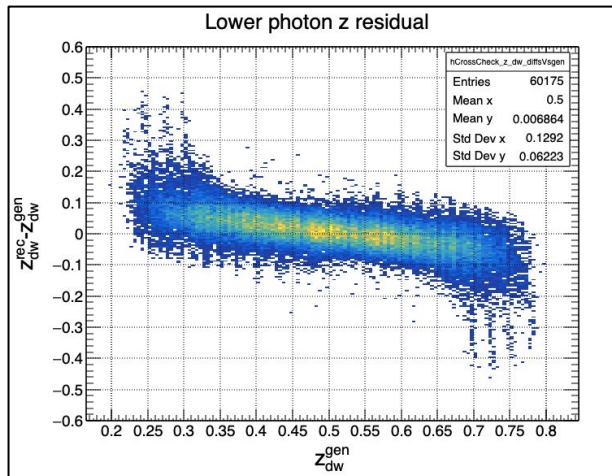
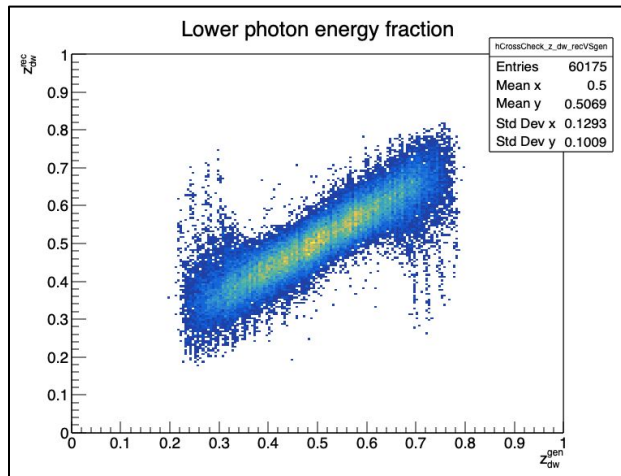
The energy weighting in the last equation arises because the magnet imparts equal transverse momentum to each electron.

Sampling Fraction

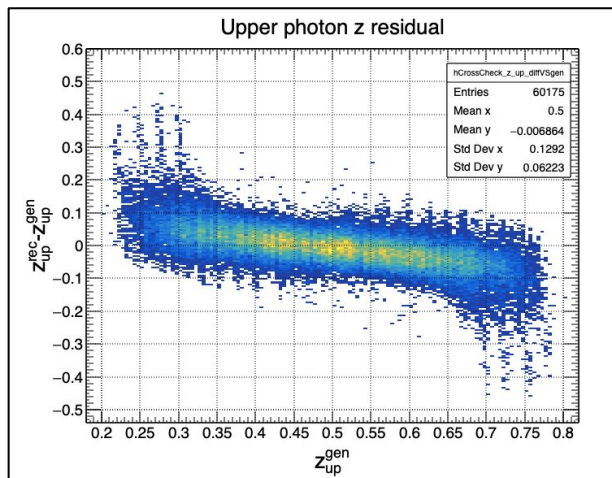
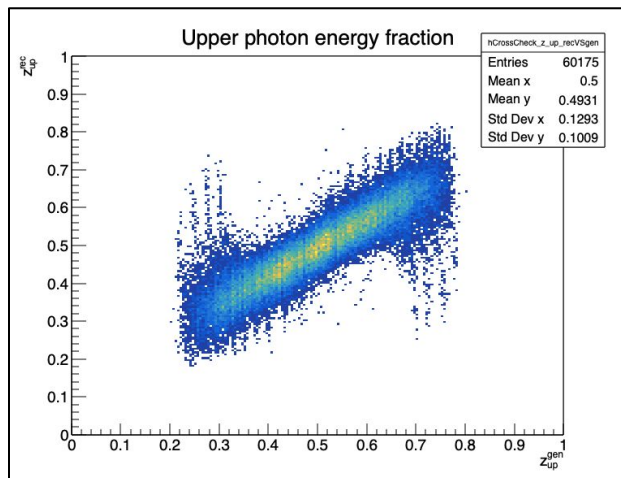


- Samp Frac is function of CAL hit location.
- Samp Frac Ratio for Up/Dw CAL is slightly lower 1 as function of photon energy.

Energy Fraction



$$Z_{up} = E_{up} / E_{up} + E_{dw}$$



- Ideally this should be 0.
- It is when the e^+ and e^- hits the CAL with equal energy i.e., both at the centre of CAL.
- CAL edges might be providing very poor resolution.

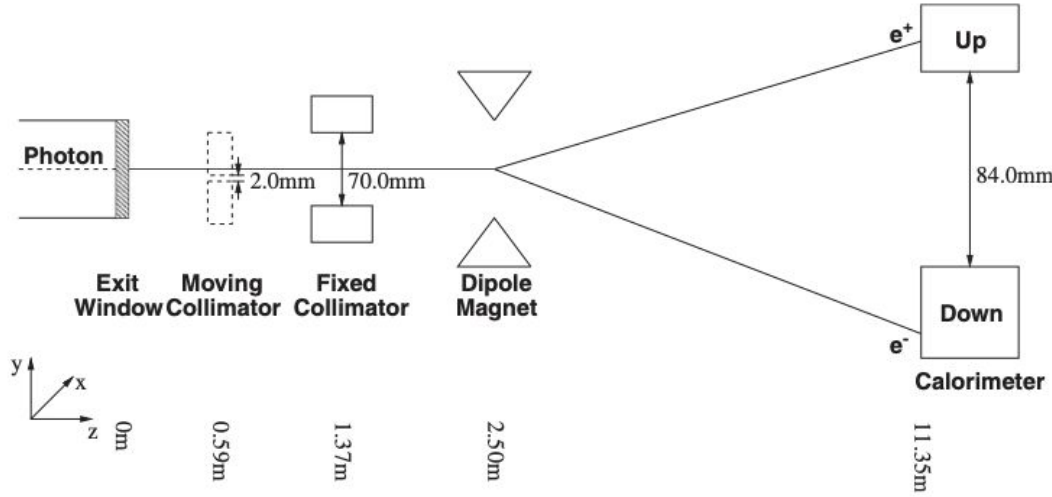
Ongoing -

- The cross-check parameters are recalculated after constraining the electron hit position to lie at least 4 cm away from both the upper and lower edges of each CAL along the Y axis.

Back Up

ZEUS Pair Spectrometer Layout

M. Helbich et al. / Nuclear Instruments and Methods in Physics Research A 565 (2006) 572–588



The energy of the photon is

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The transverse x-position of the photon is

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and the transverse y-position (bend plane of magnet) is

$$y_\gamma = \frac{E_{\text{up}}y_{\text{up}} + E_{\text{dn}}y_{\text{dn}}}{E_{\text{up}} + E_{\text{dn}}}. \quad (7)$$

The energy weighting in the last equation arises because the magnet imparts equal transverse momentum to each electron.

- **ZEUS Pair Spectrometer:** Photon conversion at Exit Window, $B = 0.6$ m dipole magnet with $B_x \approx 0.5$ T. The distance from the dipole region to the calorimeters was approximately **8.85 m**, providing a long lever arm for the separated e^+e^- pair.
- **ePIC Luminosity Detector:** Photon conversion occurs near $z \approx -58$ m, $B = 1.2$ m dipole magnet with a central field of $B_x \approx 0.86$ T. The distance from the dipole region to the calorimeters is approximately **4 m**. A short high bending maneuver.
- **Implication:** Compared to ZEUS, ePIC has a **shorter lever arm but a much larger magnetic field integral ($\int B dl$)**. Even when the field is reduced for 5 GeV and 10 GeV electron-beam operation, the extended field distribution strongly influences the e^+e^- trajectories, **motivating a check weather the approach holds in ePIC**.