BigBite Optics Corrections

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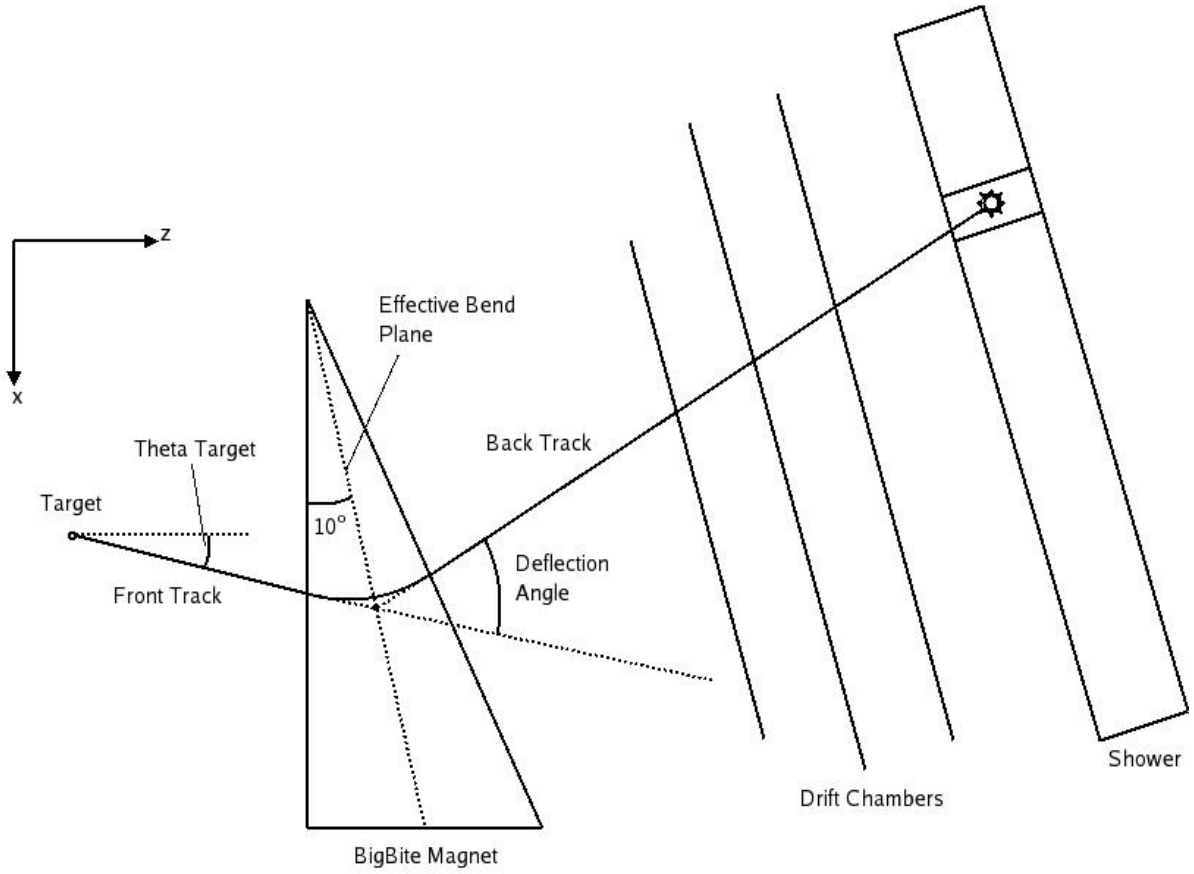
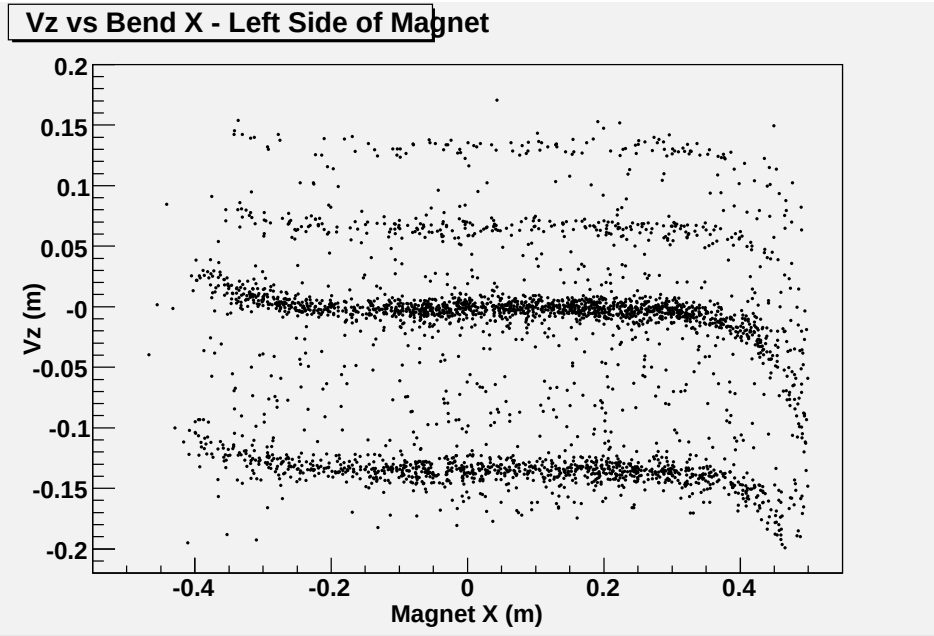
E02-013 Collaboration
Hall A Collaboration at Jefferson Lab

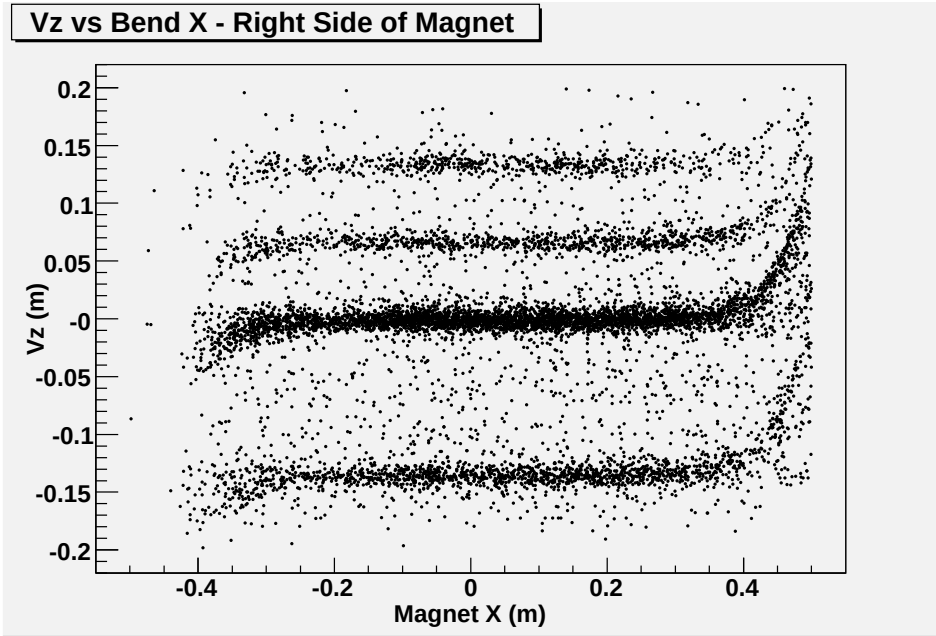
May 14, 2007

Optics - "magnetic midplane" model



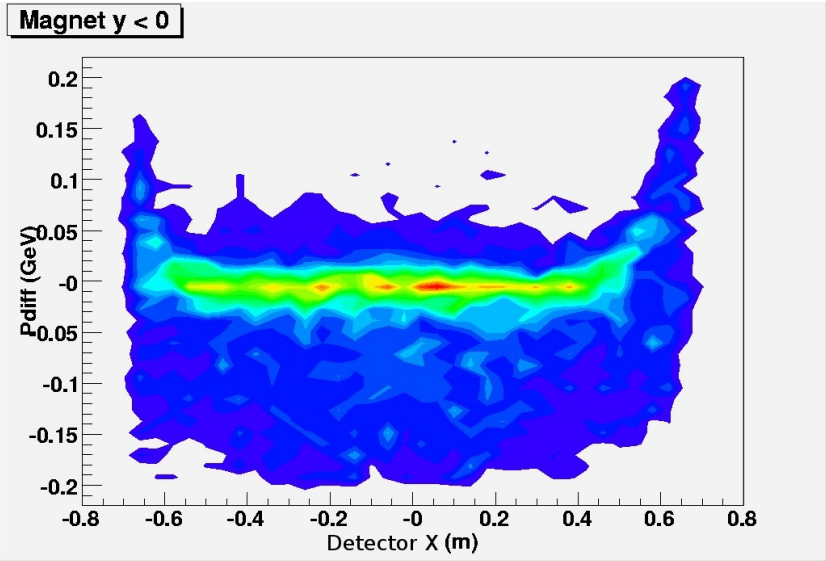
Problems observed with vertex reconstruction

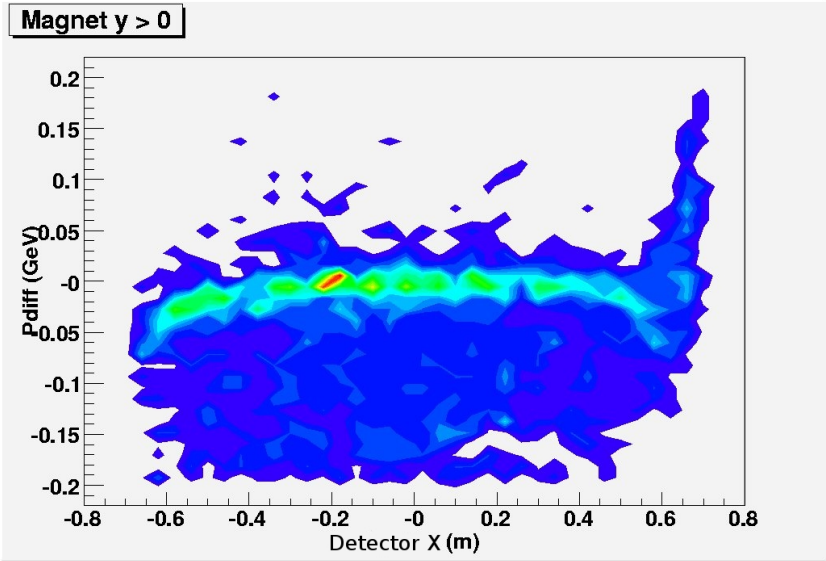




Must be fixed before momentum reconstruction

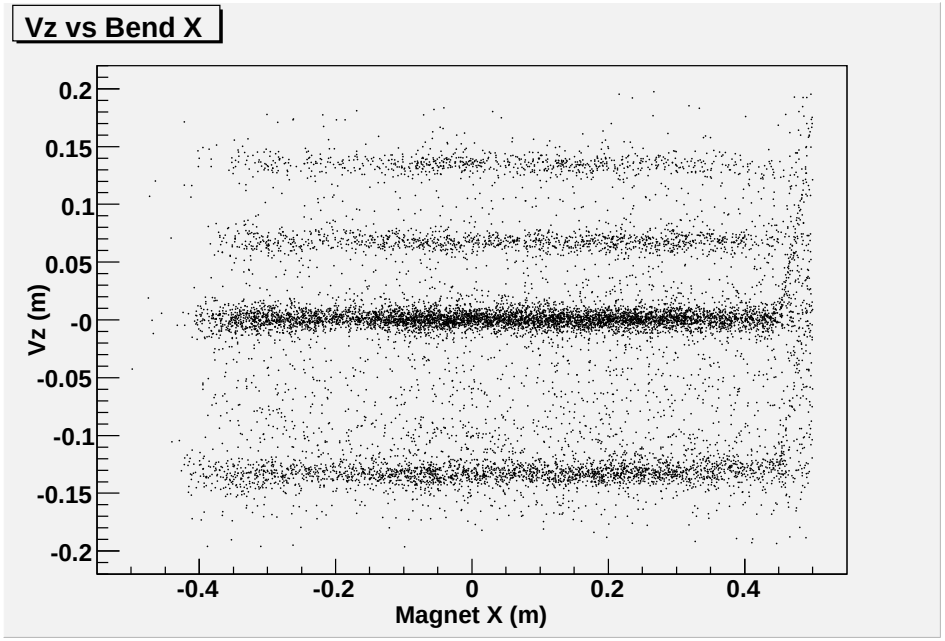
Problems observed with momentum reconstruction





Vertex reconstruction done by applying offset to position

$$V_z = c_0 V_0 + c_x x + c_y y + c_\theta x' + c_\varphi y' + c(x_{\mathrm{bend}}, y_{\mathrm{bend}}) \qquad (1)$$



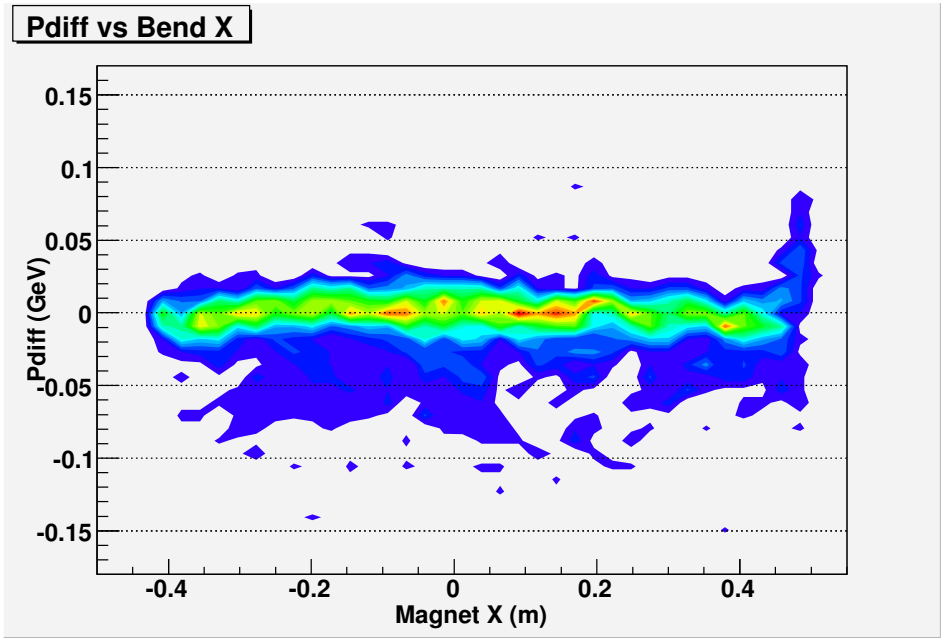
$x_{\mathrm{bend}} > 0.45$ poorly fit

Momentum done by allowing coefficients to vary over magnet face

$$
\begin{aligned}
p \quad = \quad & \frac{c_0(x_{\mathrm{bend}}, y_{\mathrm{bend}}) + c_{x_{\mathrm{bend}}}(y_{\mathrm{bend}})}{\vartheta_{\mathrm{deflection}}} + \\
& + c_\vartheta(x_{\mathrm{bend}}, y_{\mathrm{bend}})\vartheta_{\mathrm{target}} + c_y(x_{\mathrm{bend}}, y_{\mathrm{bend}})y + \\
& + c_\varphi(x_{\mathrm{bend}}, y_{\mathrm{bend}})y' \qquad (2)
\end{aligned}
$$

$c_{x_{\mathrm{bend}}}$ currently not allowed to vary over x_{bend}

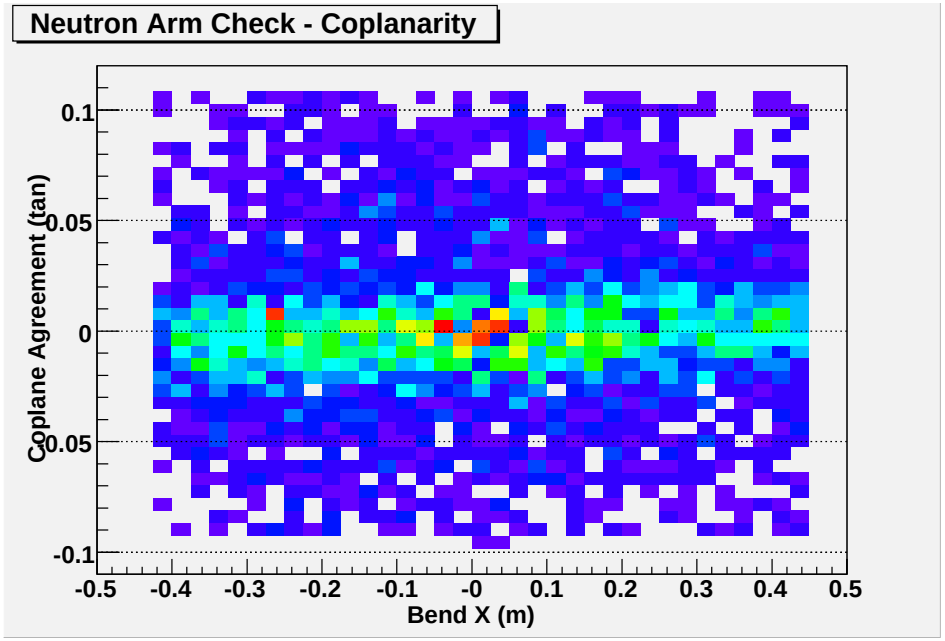
Corrected momentum:



$x_{\mathrm{bend}} > 0.45$ poorly fit

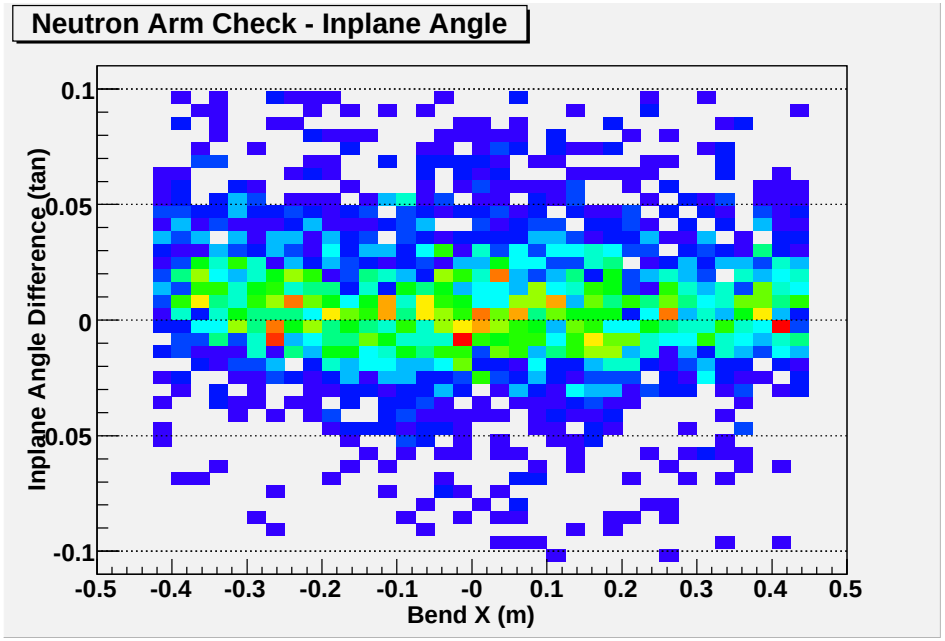
May need to do second iteration for $c_{x_{\mathrm{bend}}}$

$$\text{coplane} = \frac{p_{\text{proton},y}}{p_{\text{proton},z}} - \frac{q_y}{q_z} \tag{3}$$



Need linear correction - Possible z position misalignment

$$\text{inplane} = \frac{p_{\text{proton},x}}{p_{\text{proton},z}} - \frac{q_x}{q_z} \tag{4}$$

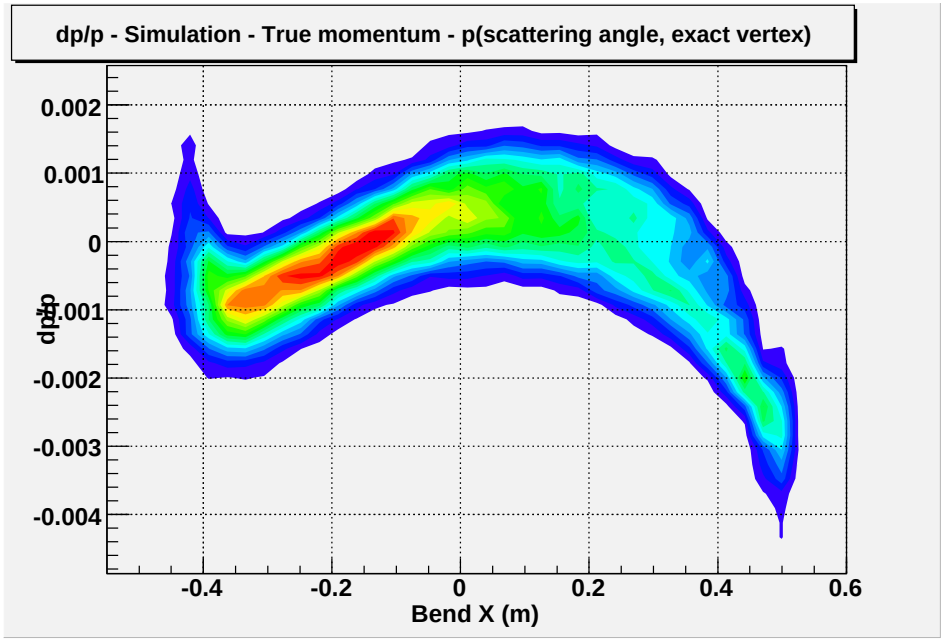


Possible problems at extreme ends

Model Deviations

Midplane model cannot handle deflections present at field boundaries

Simulation shows $\frac{\delta p}{p} = 0.2\%$ maximum deviation at extremes, 0.1% RMS



To Do

- Finalize fitting scripts
- Integrate table lookup in to AGen library
- Automate coefficient determination
- Write up documentation
- Put together BigBite calibration package

Thesis Status

- Should be on schedule for projected optics completion near June 1
- Calibration of other Q^2 points will be done as replayed
- Will shift majority of time to G_E^n analysis after optics completion
  - Understanding charged/uncharged background contributions
  - Determining leakage rates

Time Table

June 1, 2007	- Have BigBite Optics resolved
December 31, 2007	- Full analysis of all datapoints completed
January 1, 2008	- Begin writing thesis
Spring 2008	- Defend and graduate