BigBite Optics

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E02-013 Collaboration
Hall A Collaboration at Jefferson Lab

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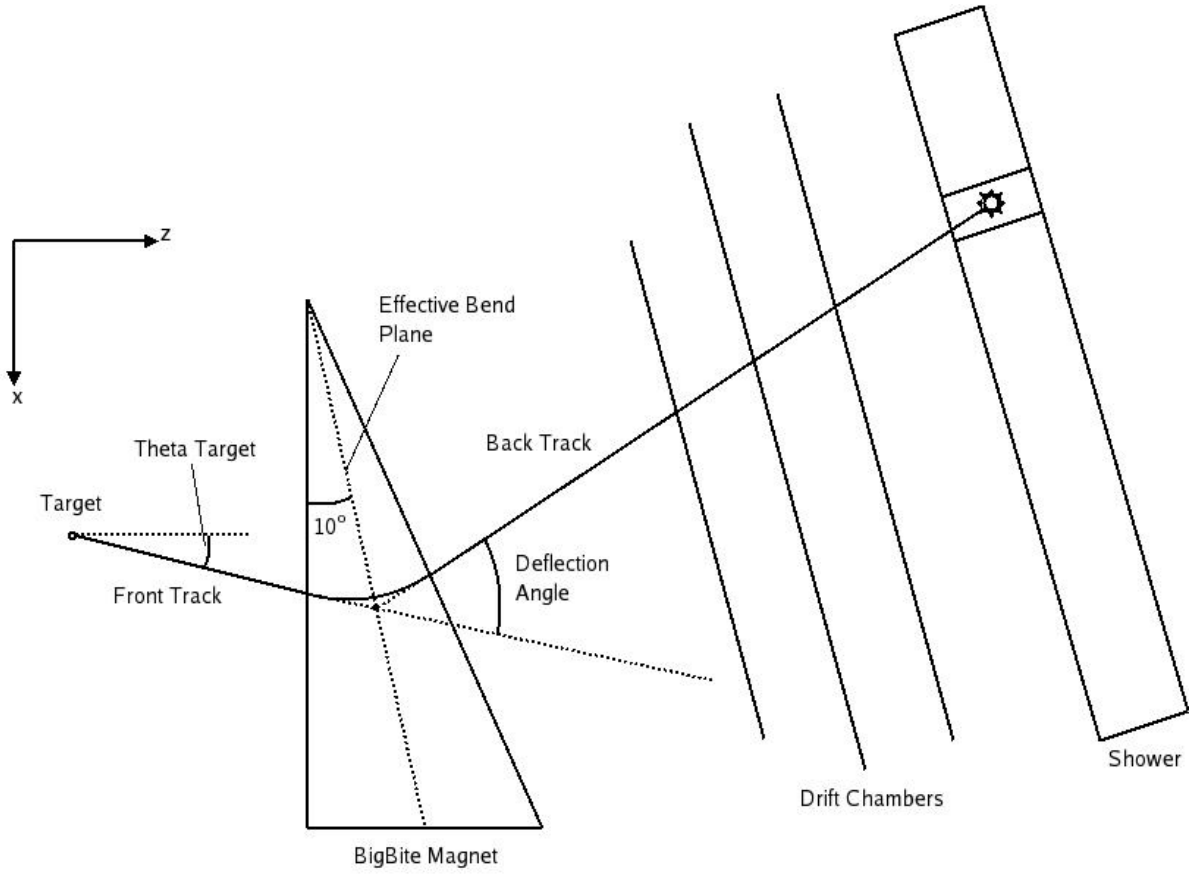
Outline

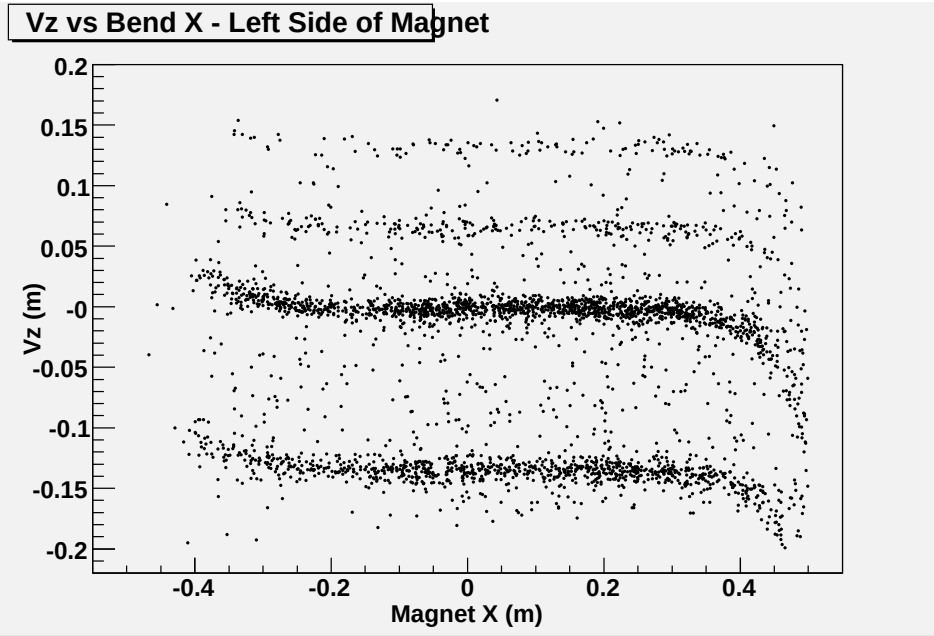
1. Optics Status

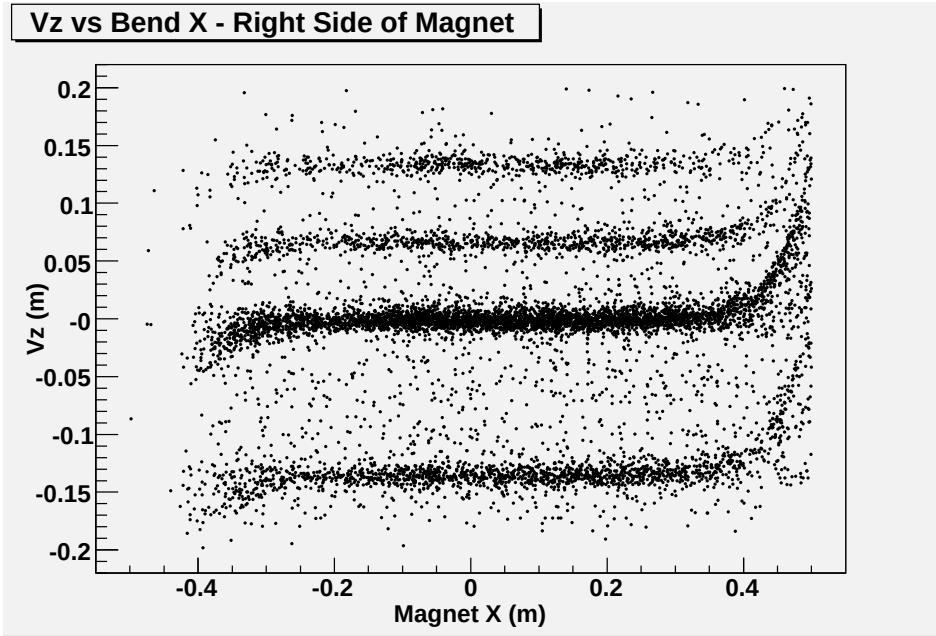
2. Outstanding issues

Optics - "magnetic midplane" model



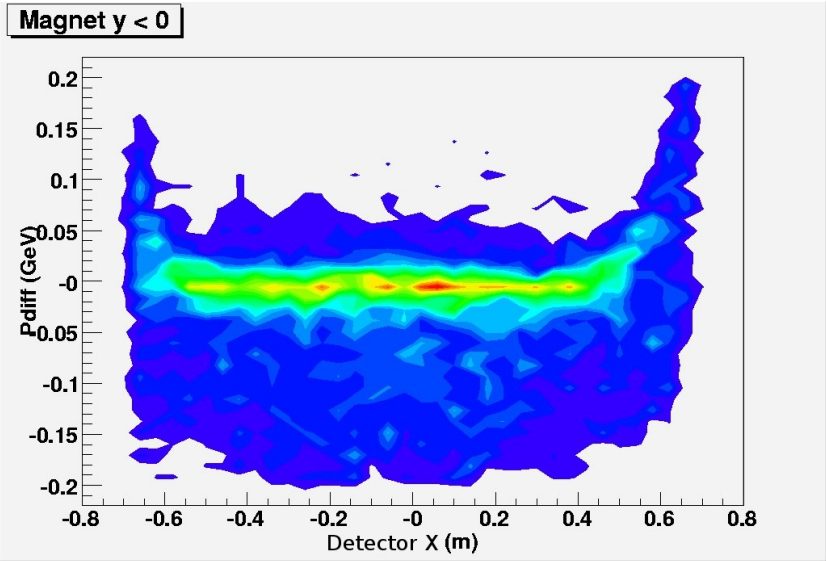
Problems observed with vertex reconstruction

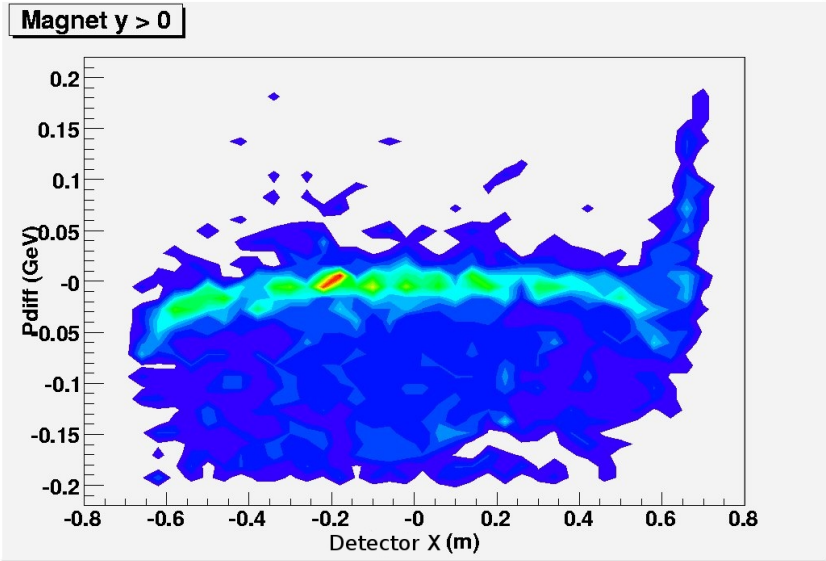




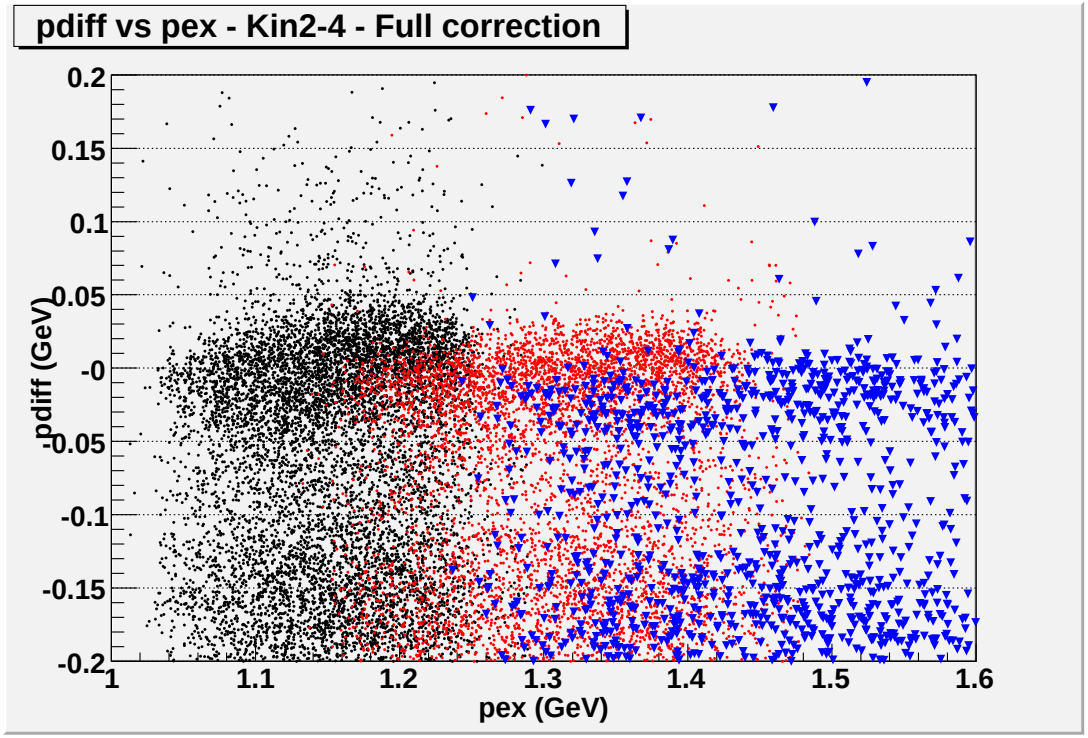
Must be fixed before momentum reconstruction

Problems observed with momentum reconstruction

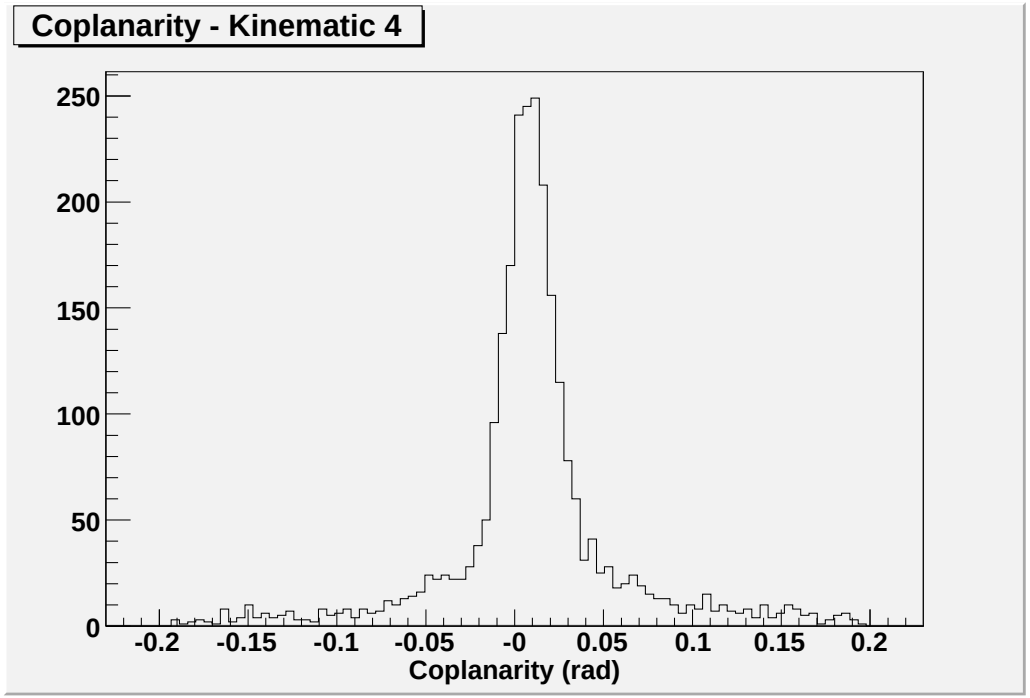




Problems exist using same coefficients for all runs



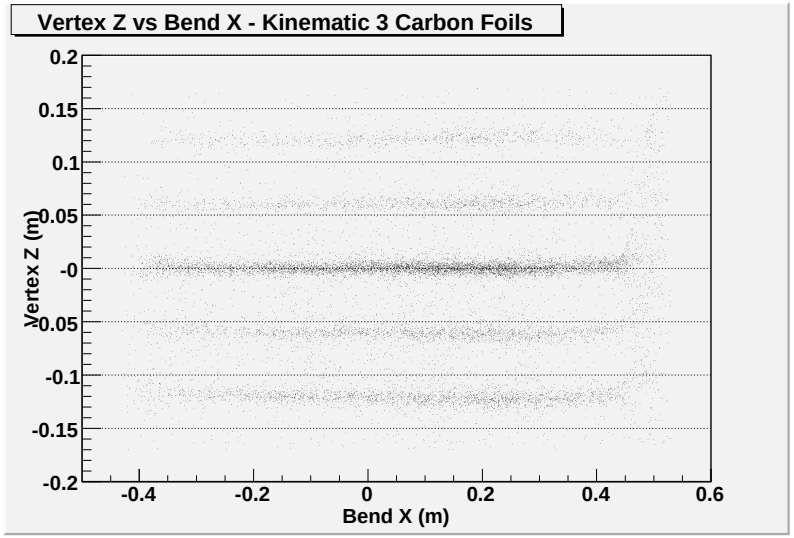
Coplanarity must be corrected



BigBite requires shift of 1.81cm vertically from survey

Vertex reconstruction done by applying offset to position

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



v_z resolution $\sigma = 4.4\mathrm{mm}$

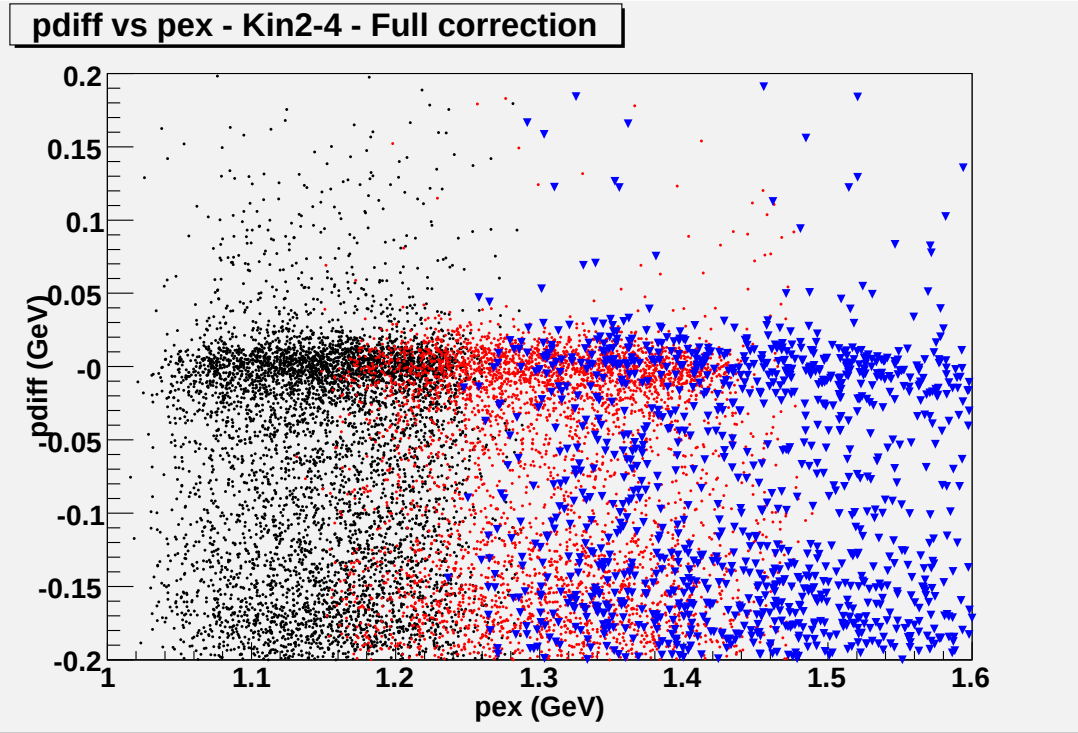
Momentum done by allowing leading coefficient to vary over magnet face

$$p = \frac{c_0(x_{\mathrm{bend}}, y_{\mathrm{bend}}) + c_x}{\vartheta_{\mathrm{def}}} + c_\vartheta \vartheta + c_y y + c_\varphi y' + a \qquad (2)$$

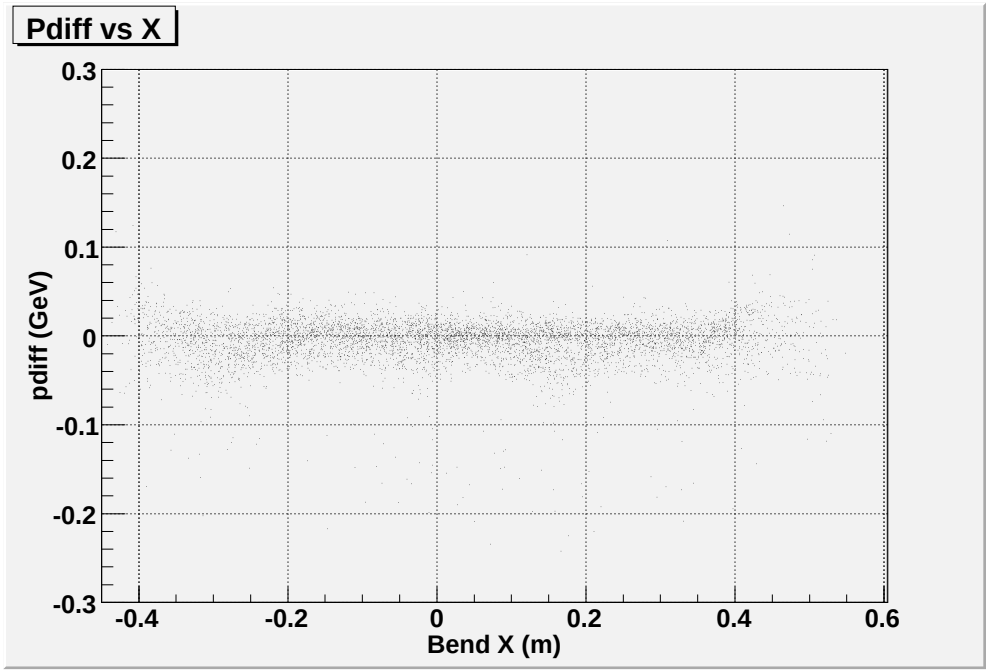
a term allows us to correct for a range of momenta

y and y' dependence must be determined *after* fitting c_0 and a

Correct momentum such that centeral regions are described by single set of coefficients

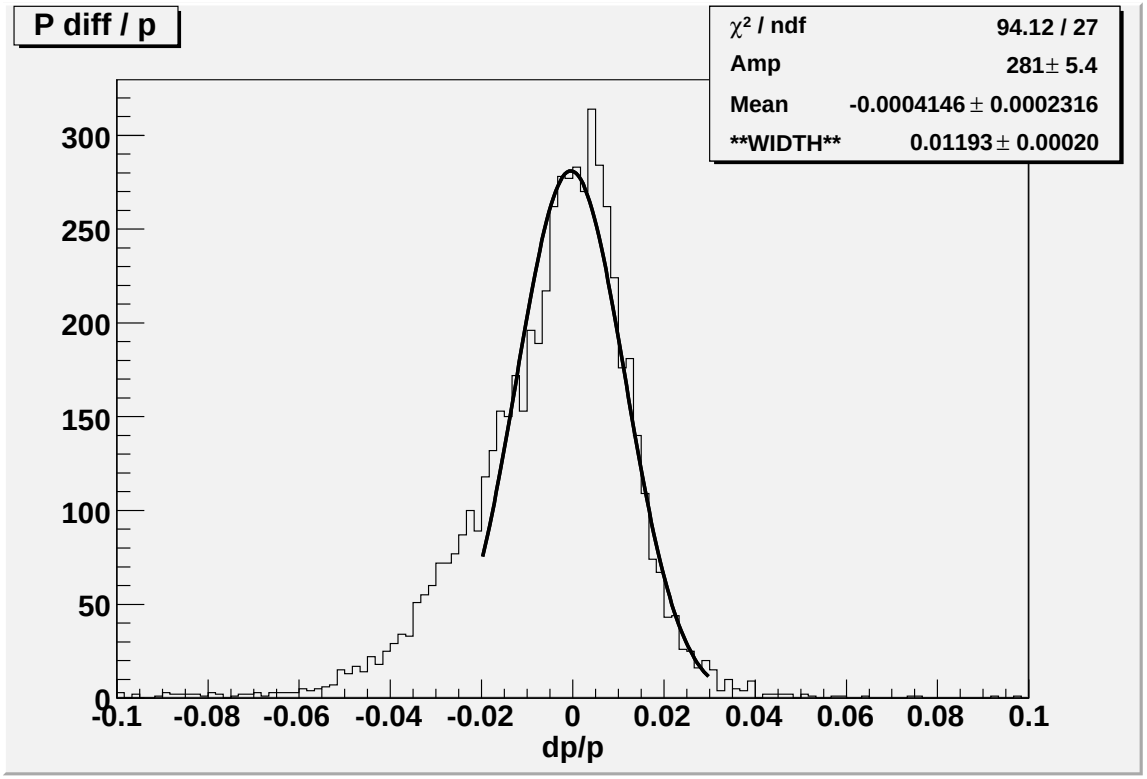


Momentum correction done by solving for c_0 at $p_{\mathrm{diff}} = 0$

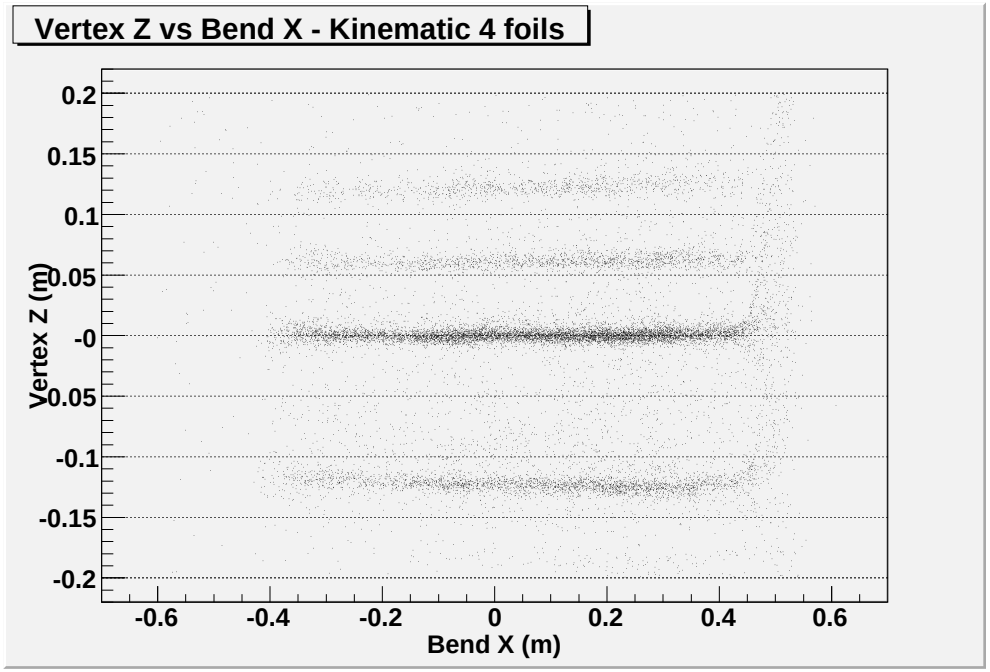


Uses all runs simultaneously

Resolution around $\sigma_p = 1.2\%$



Only outstanding issue is "bowing" of vz



May require $c(p)y'x$ term

Summary

1. BigBite variables in agreement with inplane and out of plane neutron arm measurements

2. Vertex reconstrution is largely accurate for entire face of magnet

3. Momentum reconstruction largely accurate for entire face of magnet for entire range of momentum

4. Like to call optics complete for our analysis - further work to be done by others

5. Need to touch up documentation to reflect changes