1 Fringe Field Systematic Uncertainty An Alternate Approach

Our datasets alone appear to have no significant difference in polarization according to asymmetry analysis and to michel fits. The dxi value for michel fits of each 2004 data set to its respective MC where the fringe field depolarization was removed from the MC is shown in Figure 1.

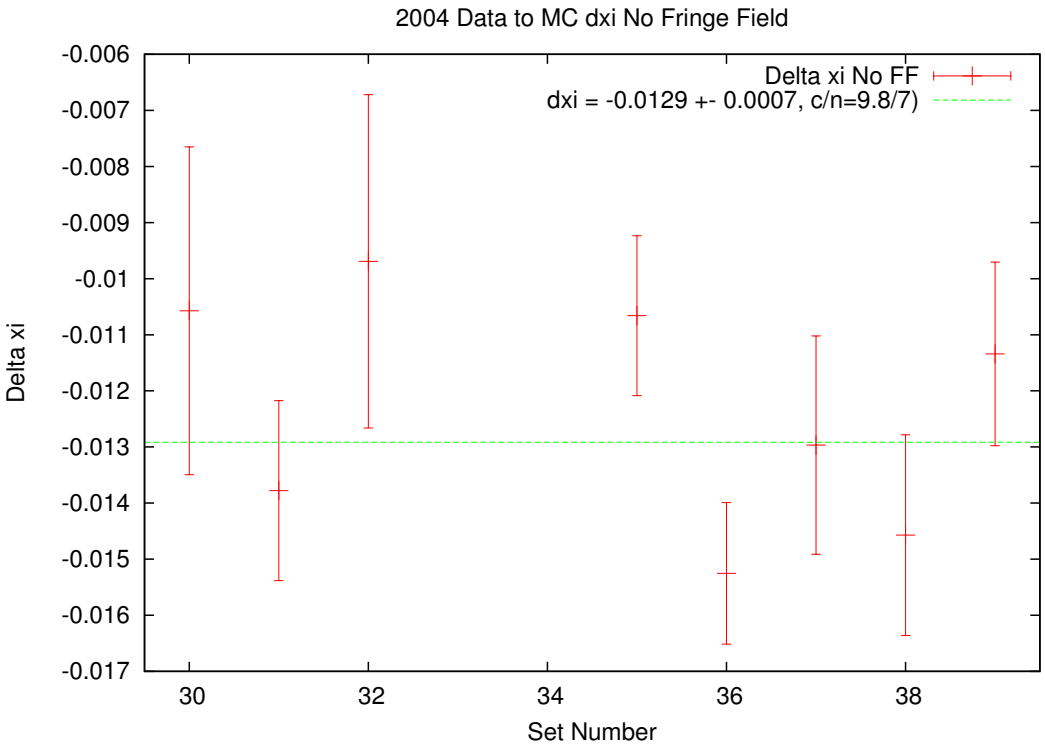

Figure 1: $\Delta\xi$ from 2004 data to MC michel fits with fringe field depolarization correction removed from the MC.

In MC the difference between the aperture set with an aperture inserted in the MC to the B2+5G set is 6.1×10^{-3}. Note that the MC production of the aperture set was run with the aperture inserted in GEANT. The raw $\Delta\xi$ values from MC to data fits with the production MC depolarization values is shown in Figure 2.

If we compare the polarization predicted by MC using the TEC characterization runs for beam input the largest difference is $4.3 \times 10^{-}3$ between

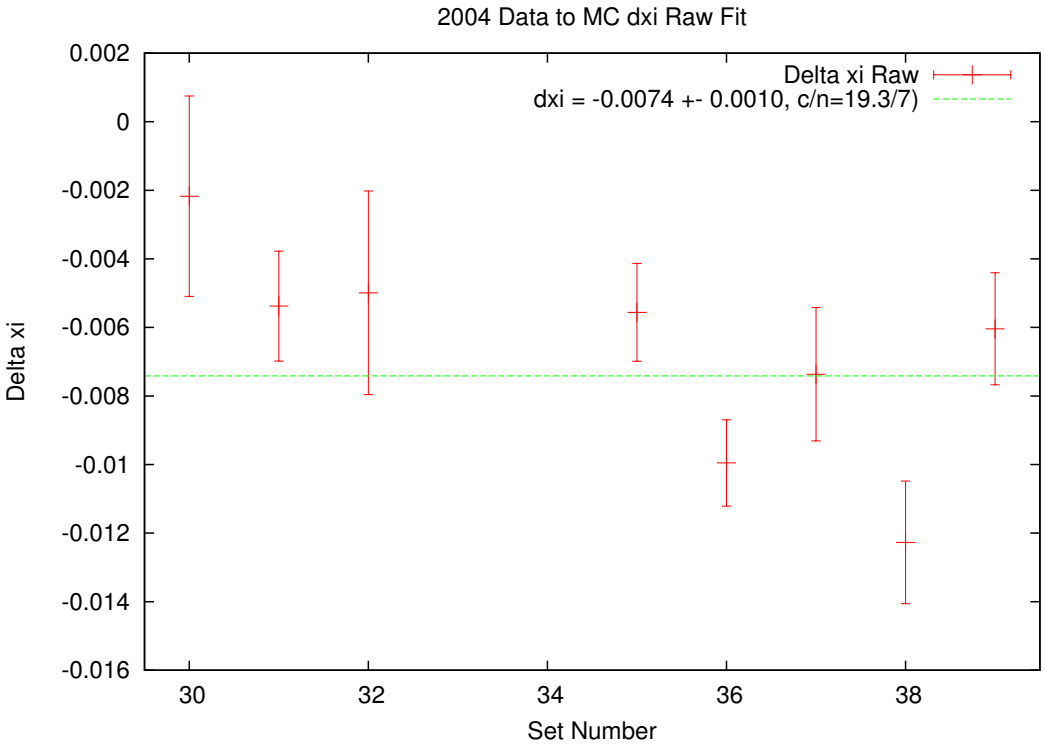

Figure 2: $\Delta\xi$ from 2004 data to MC fits, with MC fringe field of production running.

the aperture set and the B2+5G set. The difference here is smaller because no aperture was inserted in the MC, and the beam measured by the TEC for the aperture characterization run has larger tails than the one predicted by MC with an aperture inserted. $\Delta\xi$ from 2004 data to MC fits with the fringe field estimate corrected for:

1. a bug that shifted the beam by 1mm,
2. the difference between the TEC and actual polarization estimate, and
3. using no aperture, just the TEC aperture characterization run,

gives the $\Delta\xi$ values shown in Figure 3.

In 2004 we attempted to get a measurement of the TEC to Drift chamber alignment using 40MeV/c pions. The result was that the difference between

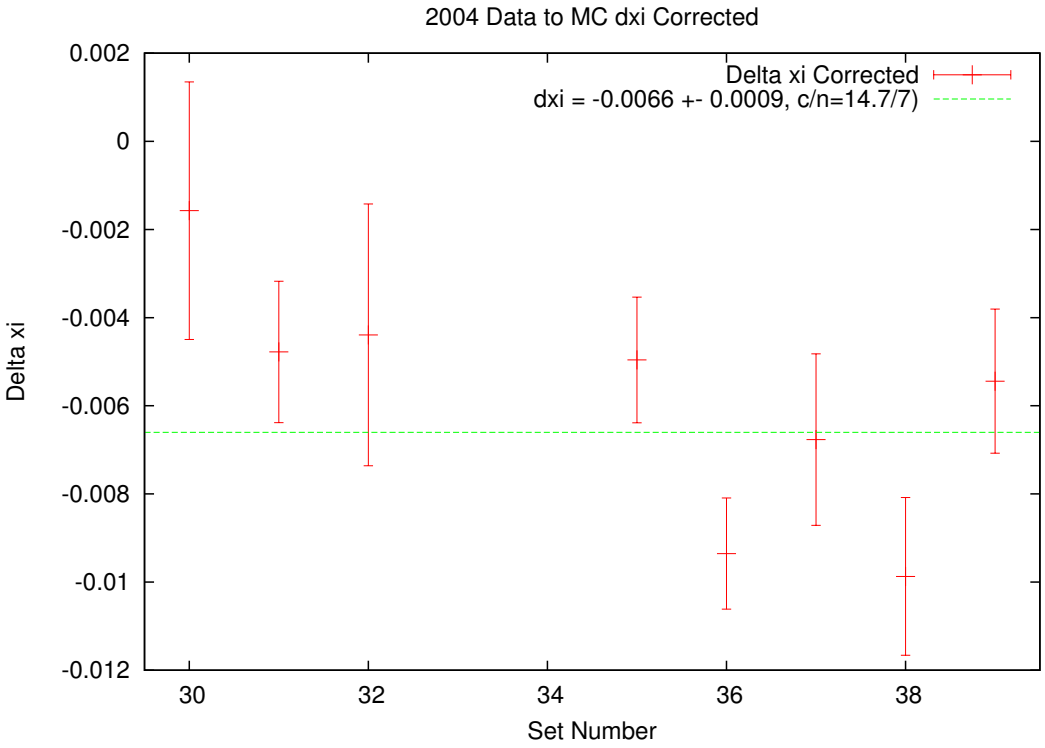

Figure 3: $\Delta\xi$ from 2004 data to MC fits, with: the MC fringe field of corrected for a bug that shifted the beam 1mm, the difference in TEC measured beam and the actual beam, and the aperture characterization from the TEC characterization run rather than inserting an aperture in GEANT.

the TEC and DC positions and angles were:

$$\Delta X = -0.71cm \tag{1}$$
$$\Delta Y = -0.38cm \tag{2}$$
$$\Delta dX = 9.8mrad \tag{3}$$
$$\Delta dY = 18.8mrad \tag{4}$$

If we apply these shifts to the input beam parameters for each of the standard running conditions we come up with another set of polarization estimates. Using these TEC to DC shifted beam inputs to estimate the MC polarization for each set results in the $\Delta\xi$ from data to MC fits as shown in Figure 4. These fits also include the correction for the difference between the

TEC measured and actual beam.

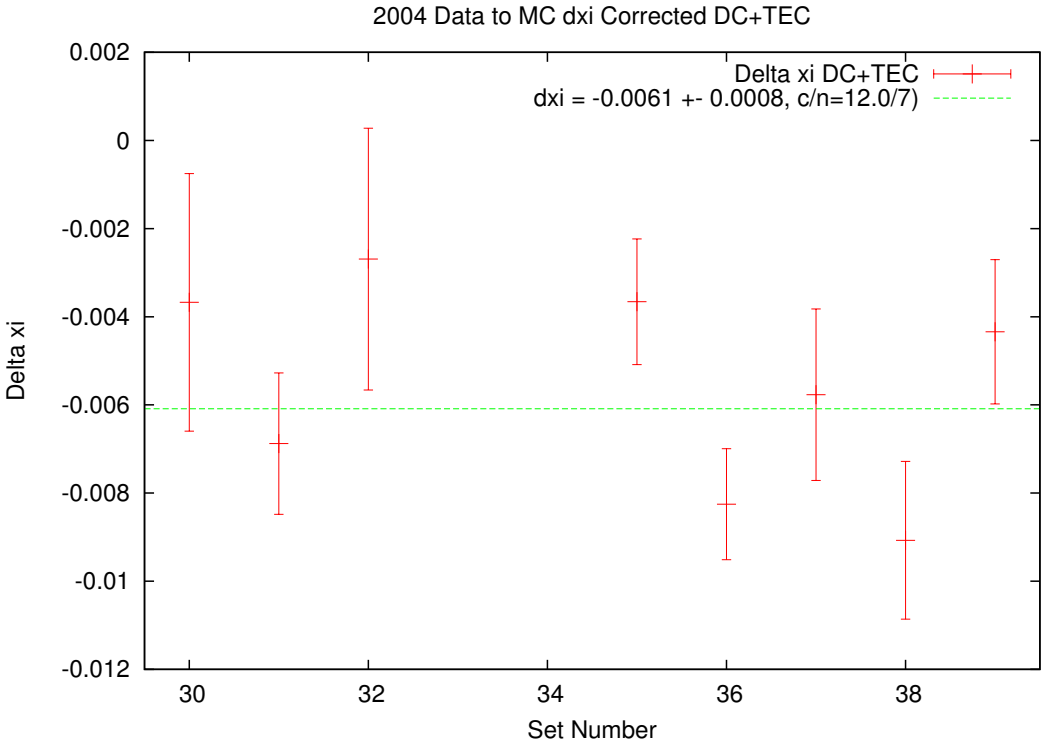

Figure 4: $\Delta\xi$ from 2004 data to MC fits where the MC beam inputs were shifted by the TEC-DC offsets The MC depolarizaton was corrected for a bug that shifted the beam 1mm, the difference in TEC measured beam and the actual beam, and the aperture characterization from the TEC characterization run rather than inserting an aperture in GEANT.