BB Tracking (for Gen) -- Update
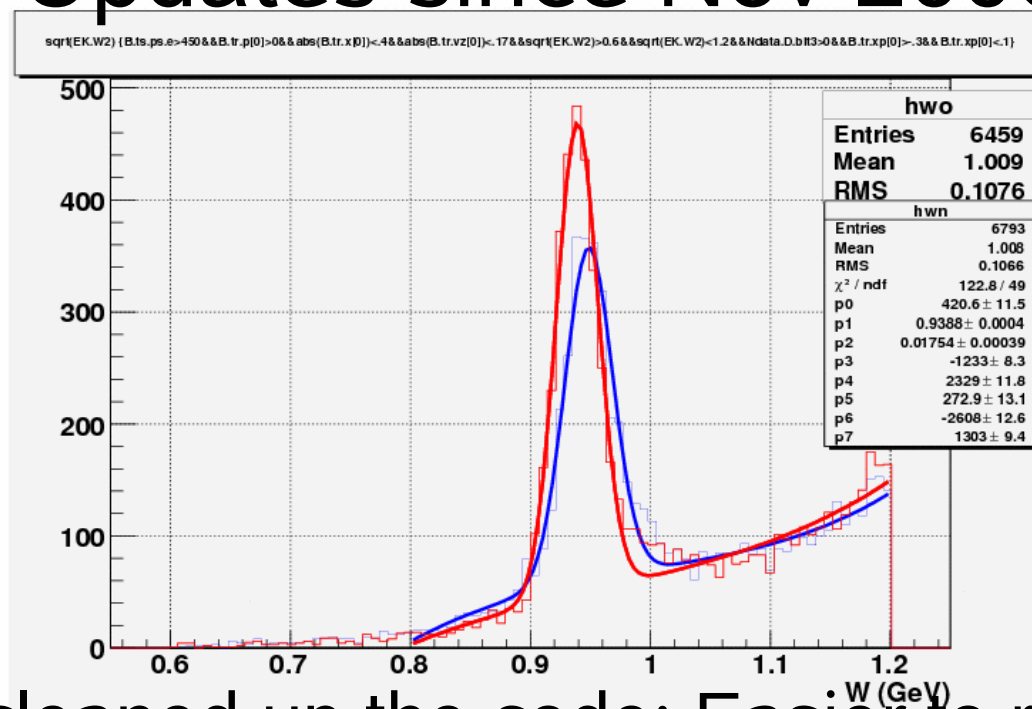
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Updates since Nov 2006
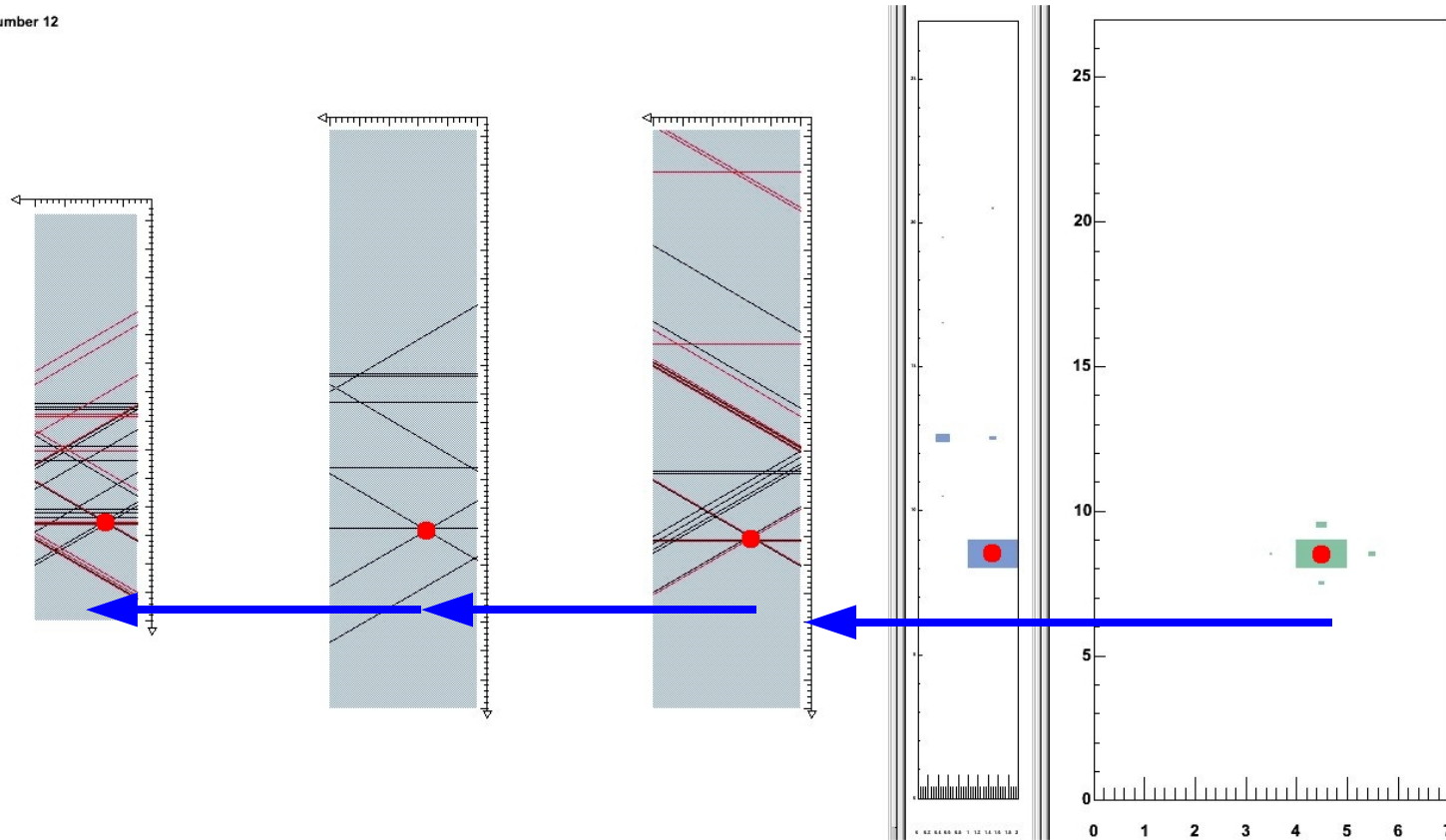

- Seamus cleaned up the code: Easier to read

- Track-sorting algorithm made a heap sort (so now NlogN)

- Fixed an un-identified bug so that now the better hit is used in 2-hit-per-plane conditions: improved resol.

- (new) 0.76 sec/track vs. (old) 1.15 sec/tracks

- 75% of events with track candidates are reconstructed
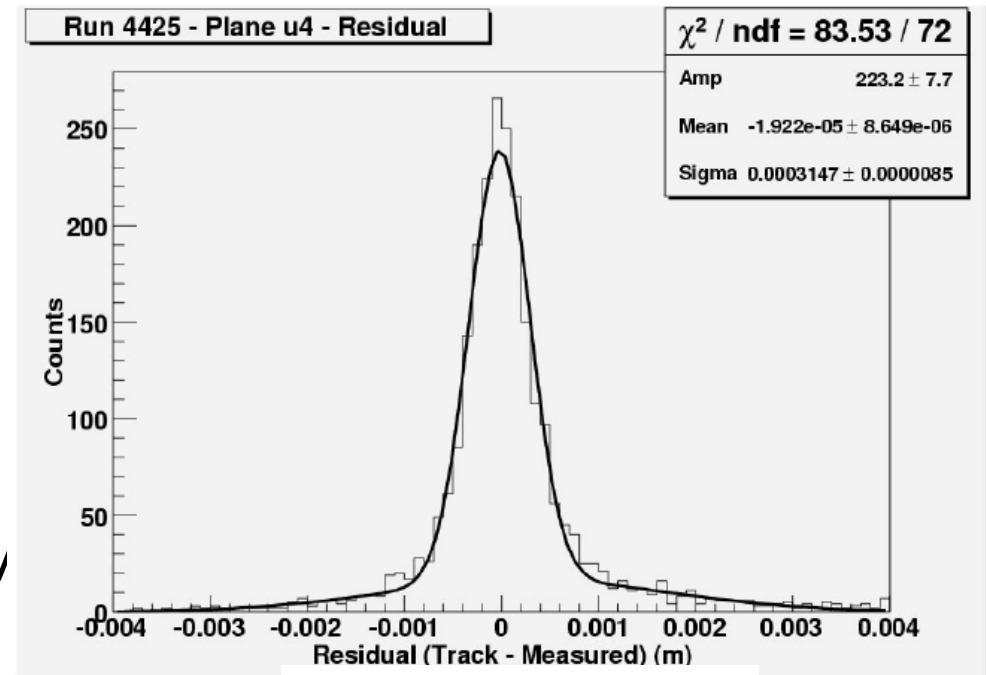
Talk from November 2006

BB Tracking Algorithm

- Identify the electron in the shower

- Look in "window" between shower and BB, projecting track onto planes

- All possible hits are included in cluster-finding (hundreds to tens-of-thousands of possibilities)

BB Tracking results

- Algorithm is general and works, but is slow. All possible combinations of down to N planes (N=13 for GNn) attempted.

- Improved prediction of tracking time has been used to trade-off tracking efficiency with analysis speed.
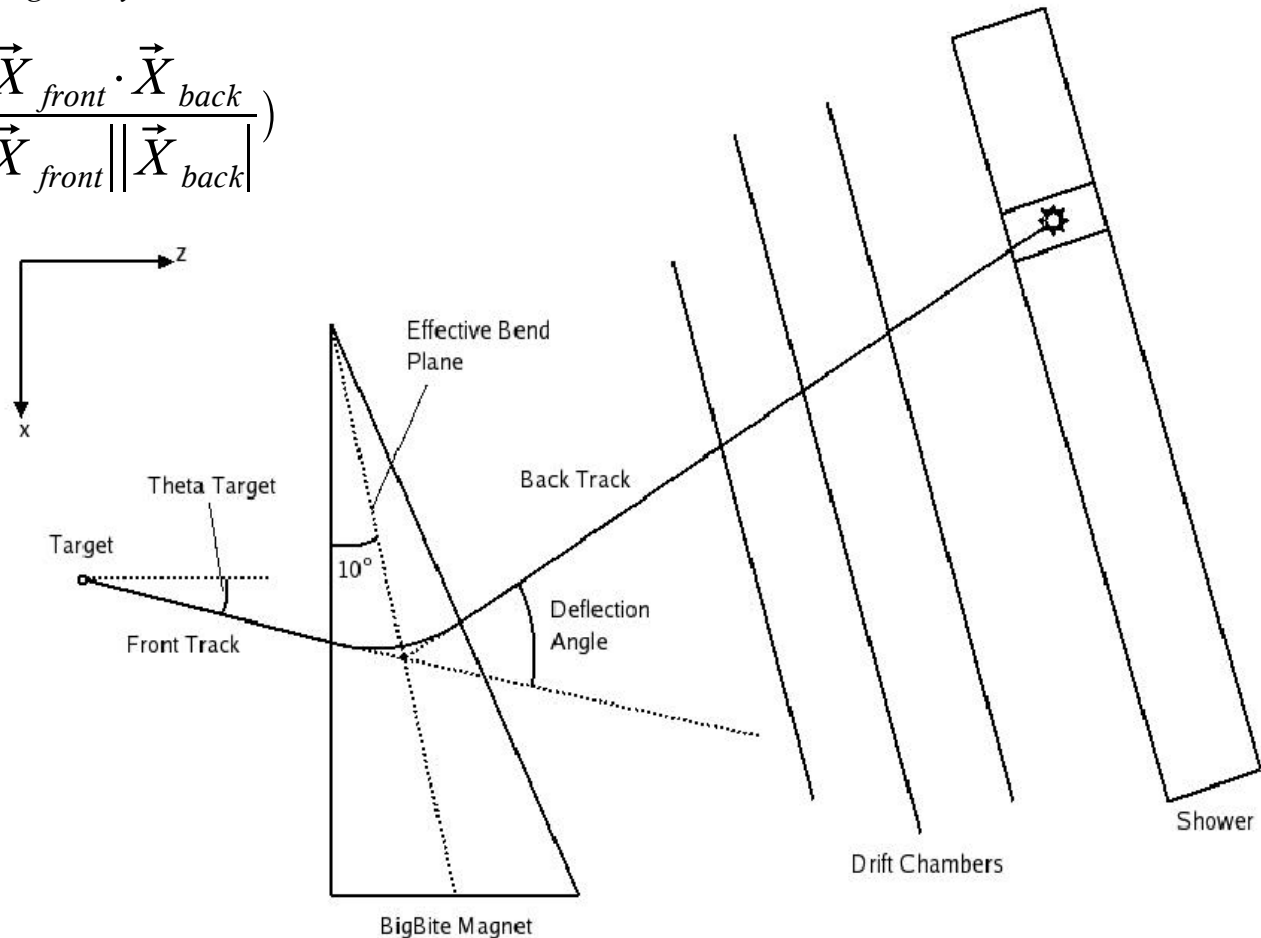

Run 4425 - Plane u4 - Residual

χ^2 / ndf = 83.53 / 72

Amp	223.2 ± 7.7
Mean	-1.922e-05 ± 8.649e-06
Sigma	0.0003147 ± 0.0000085

Residual (Track - Measured) (m)

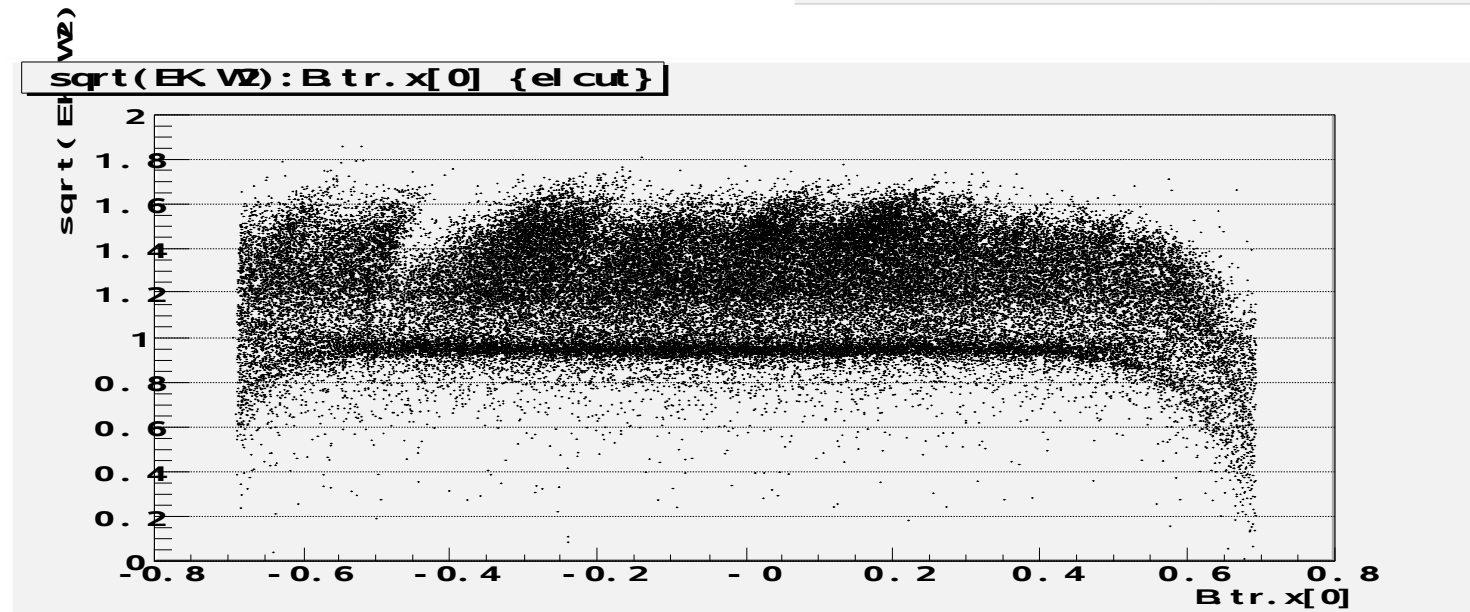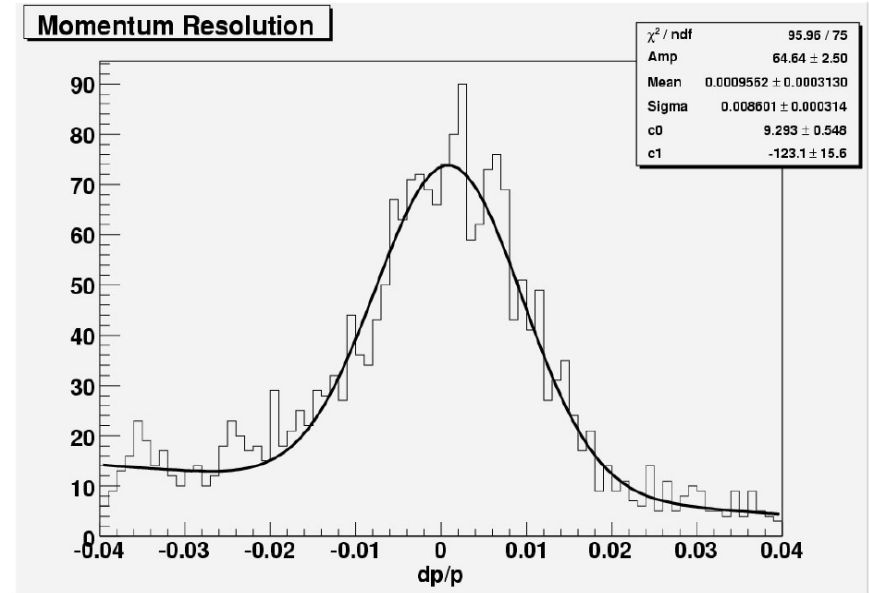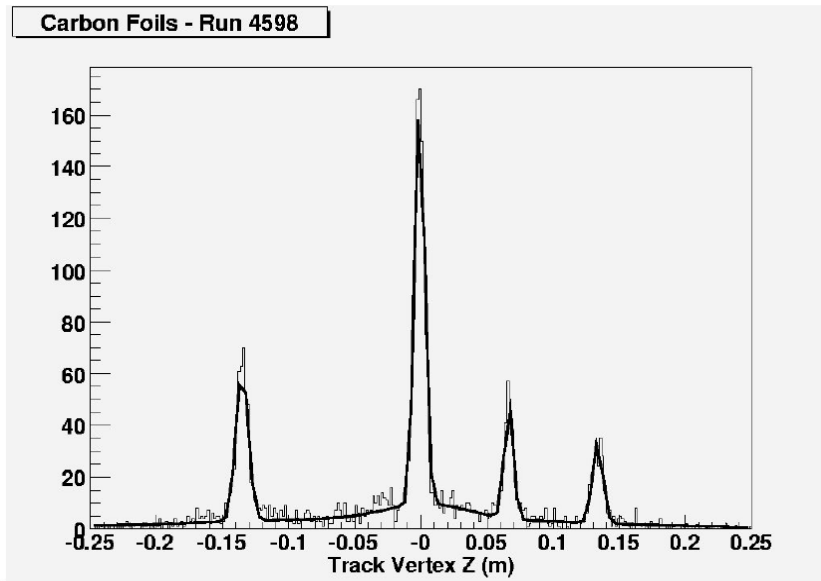| Reconstruction Resolution:	
σ_x	130μm
σ_y	300μm
σ_θ	0.3mr
σ_ϕ	0.7mr

BB Optics model (Dipole + Corrections)

$$p = \frac{c_0 + c_x \, x_{bend}}{\theta_{defl}} + c_\theta \, \theta_{targ} + c_y \, y_{det} + c_\phi \, y'_{det}$$

$$\theta_{defl} = \arccos\left(\frac{\vec{X}_{front} \cdot \vec{X}_{back}}{\left|\vec{X}_{front}\right|\left|\vec{X}_{back}\right|}\right)$$
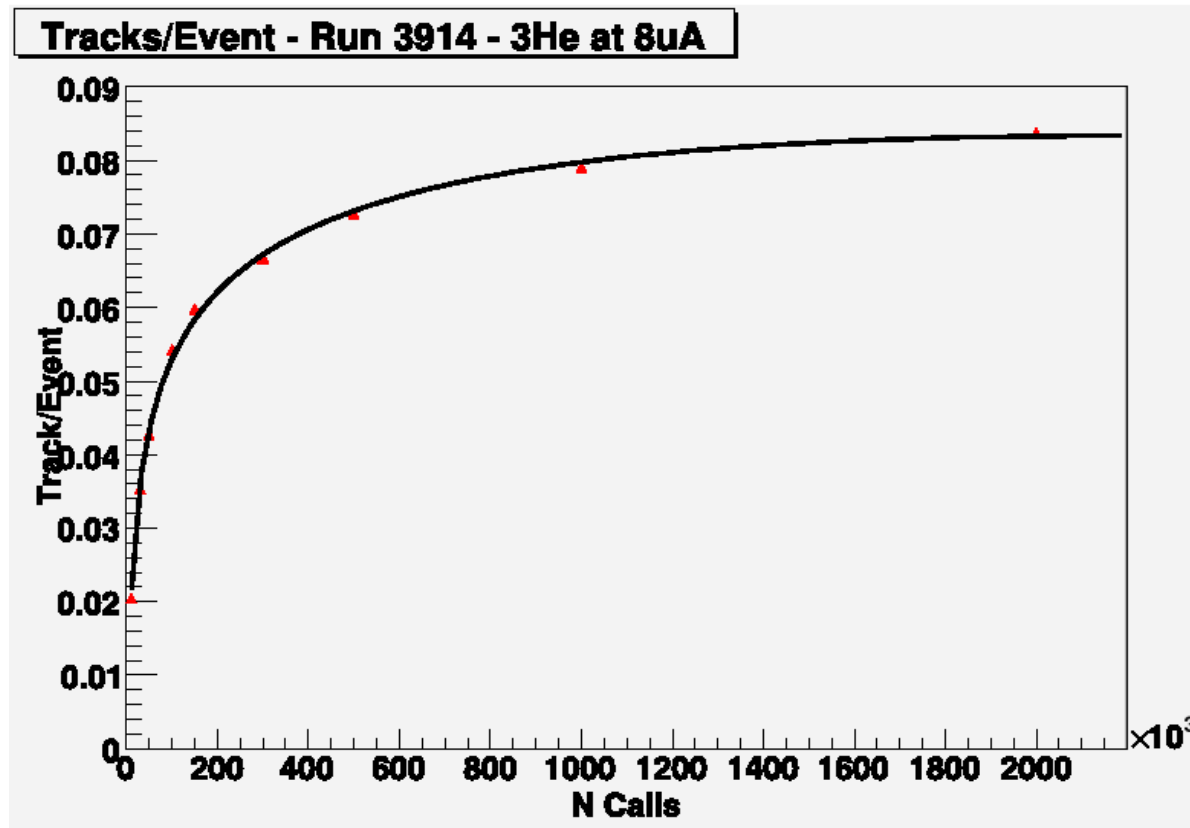

Likewise for the other quantities... (theta_target, phi_target, y_target)

BB Optics Results

Ncalls vs. Ntracks found

The Gen analysis ran with a cut-off of 1000*10^3 calls, and a minimum of 13 planes.

The algorithm does NOT use the paired x-x', etc. planes to build clusters or solve the L-R ambiguity. This is an improvement I would like to see.

Room for Improvement

Tracking Algorithm works but is slow. It can skip events that are too busy:

- Run 4490, 6uA on He3 (L~4e36), T2 ~ 2.2kHz
    12% had a track + 6.7% rejected as too busy
    7 evts/sec OR 0.87 track-evts/sec

- Run 4427, 2.5uA on H (L~1e36?), T2 ~ 890Hz
    12% had a track + 2% rejected as too busy
    17 evts/sec OR 2.1 track-evts/sec

- Better use of paired planes might help in speed and identification of 'clusters'

- The tracking efficiency is ~90%.