Tracking 2.0

Using the forward tracker

Whitney R. Armstrong   The SANE Collaboration

Temple University

January 16, 2013

Tracker Positioning

1. Each scintillator is positioned relative to its group of 8 positioning (see wiki).
2. Each layer positioned relative to the very front of the first layer.
3. The distance from the front of the first layer to the target is used as the overall detector position.
4. The measured yaw, pitch, and roll is implemented in the scintillator positioning.

Old tracker results

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
Problem: 2 peaks in Delta-X
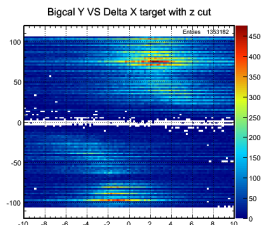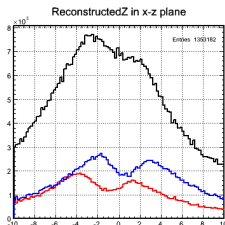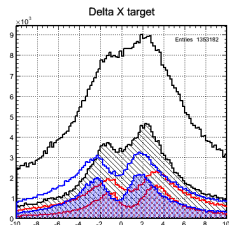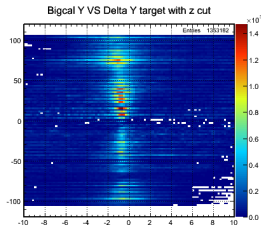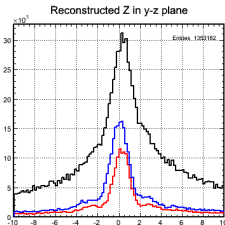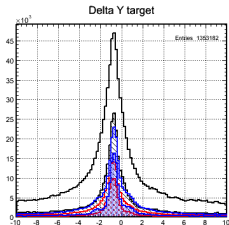
Vertical Offset

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)

Problem: 2 peaks in Delta-X

Solution: Add (an unknown) offset to the vertical position of Y1 and Y2 planes until the two peaks merge

Survey says down by 1 mm (but w.r.t what?), I find an adjustment of about 5 or 6 mm works best.

Vertical Offset

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)

Problem: 2 peaks in Delta-X

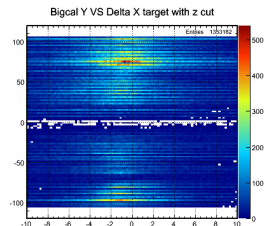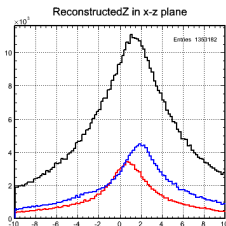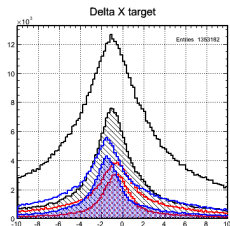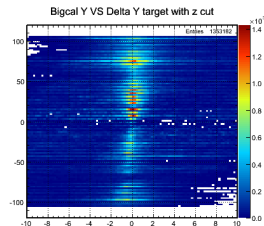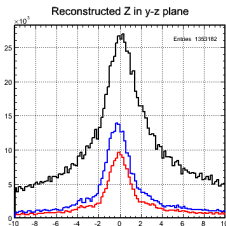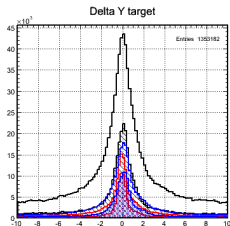Solution: Add (an unknown) offset to the vertical position of Y1 and Y2 planes until the two peaks merge

Survey says down by 1 mm (but w.r.t what?), I find an adjustment of about 5 or 6 mm works best.
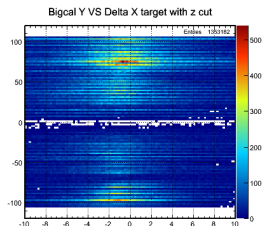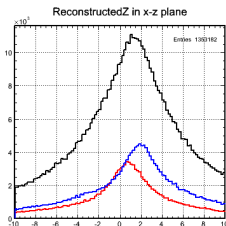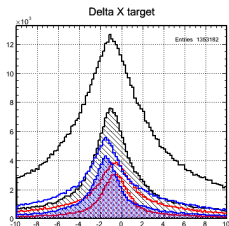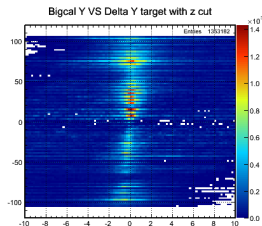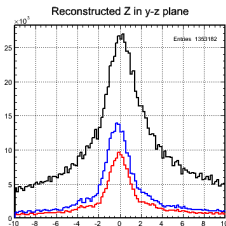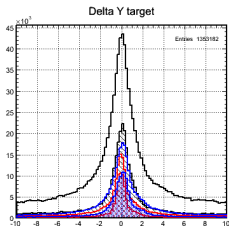
X-Z plane reconstruction

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
Problem: The target reconstruction in the X-Z plane at the target is different between Y1 and Y2.

Geometry improvments

1. Bigcal at proper position (335cm)
2. Where tracker is tracker X layer?
3. Keeping it as the laster...

Note

Re-running simulation to train ANN with new bigcal position has not been completed. However, the cluster reconstruction is independent of the ANN o there is no change to our analysis here.
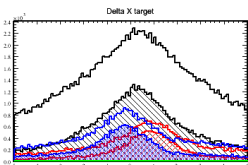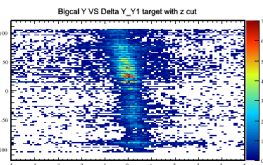
Run 72999

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)

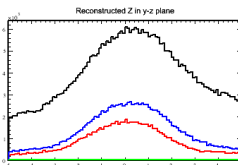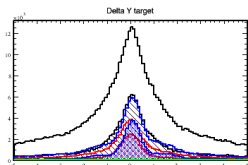Problem: The target reconstruction in the X-Z plane at the target is different between Y1 and Y2.
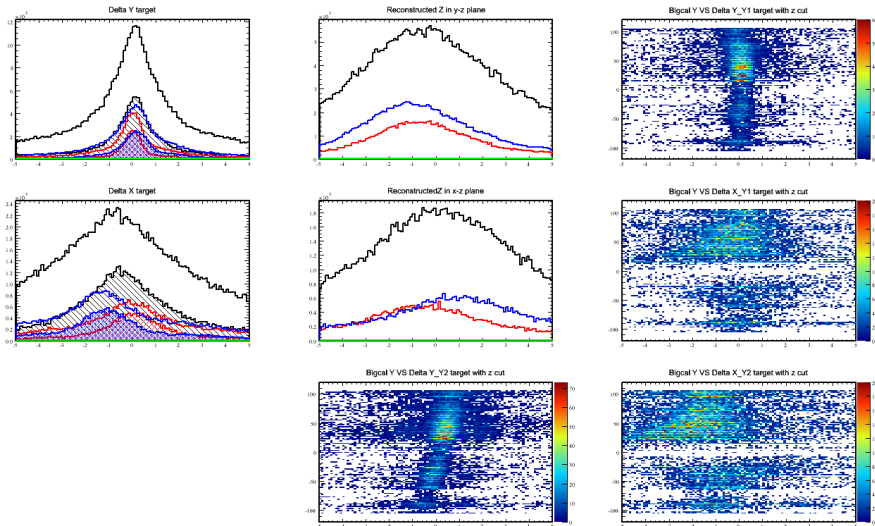
Run 72999

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
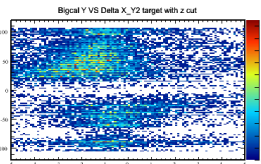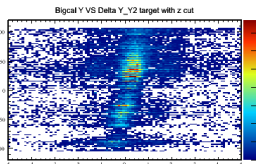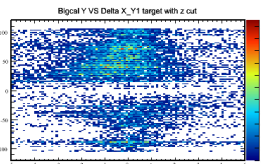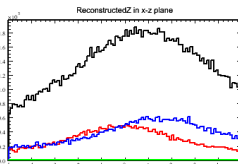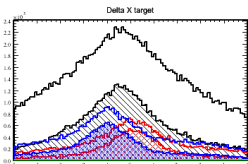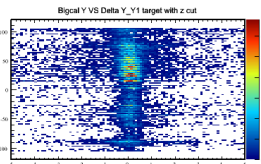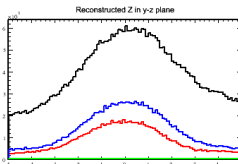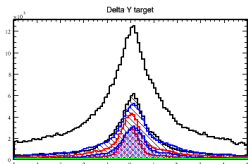Problem: The target reconstruction in the X-Z plane at the target is different between Y1 and Y2.
Switch the X layer to the front
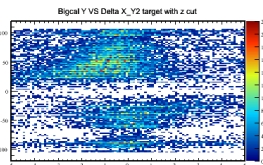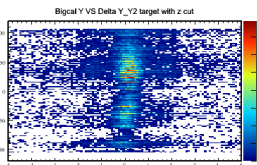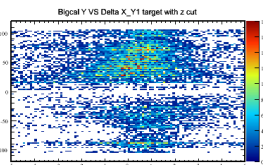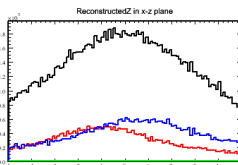
Run 72999

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
Problem: The target reconstruction in the X-Z plane at the target is different between Y1 and Y2.
Moving back the whole detector to 52cm

Simulation

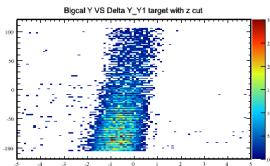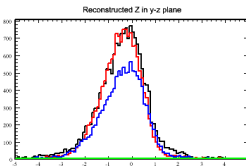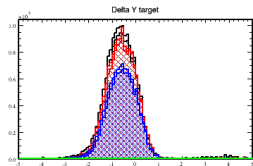- Simulate electrons,positrons, and photons
- Reconstruct using same gemeotry that went into the simulation
- Compare trends in tracker reconstruction.

The simulated tracker results should give us an idea of what the results should look like once the geometry matches the experimental reality.

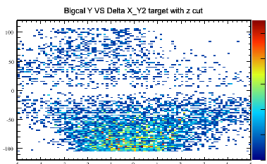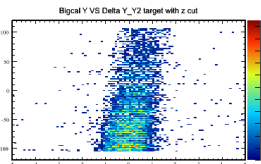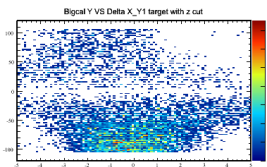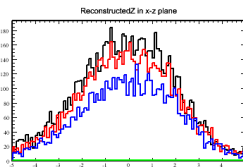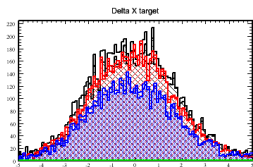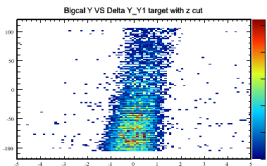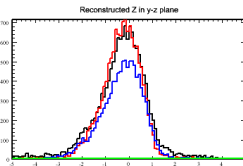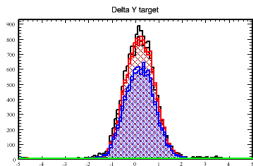Maybe there *should* be a separation in the X-Z plane due to the field or something else?

Simulation - electrons

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
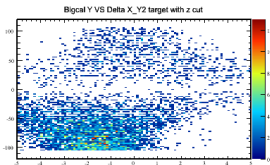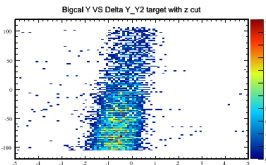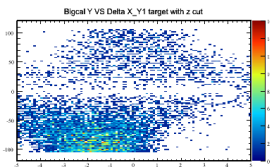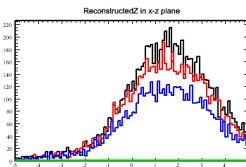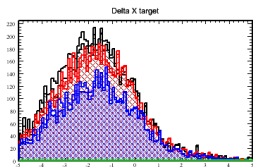
Simulation - positrons

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)

Simulation

- About 1 cm peak difference in DeltaY for electrons and positrons.
- Positron peak is on the right.
- Similar slope in cluster-Y Vs. Delta-Y for both Y1 and Y2.
- Delta-X *should be the same* for Y1 and Y2.

Geometry improvments

Still the target reconstruction in the X-Z plane at the target is different using Y1 and Y2.

Remember Delta=(raster-recon) and the x-direction points towards BETA.

Observation

Y1 appears to be over-shooting (going too negative in x) Y2 appears to be under-shooting (going too negative in x)

Shrinking the distance between the Y1 and Y2 planes should fix both of these.

Run 72999

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
Problem: The target reconstruction in the X-Z plane at the target is different between Y1 and Y2.
Adding a correction to Y1 and Y2 positions by moving them closer together by 0 mm
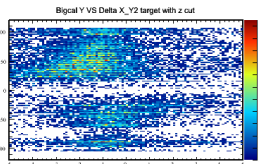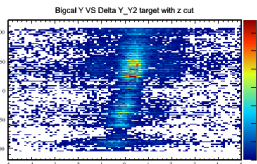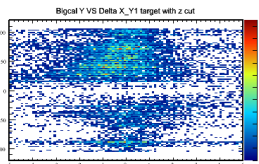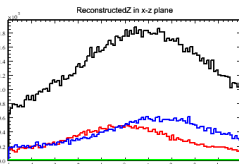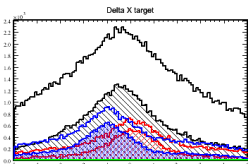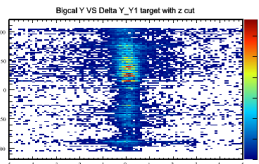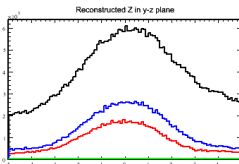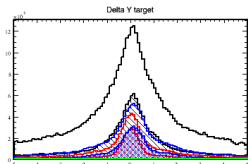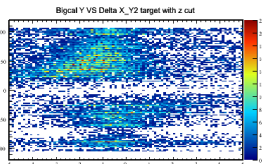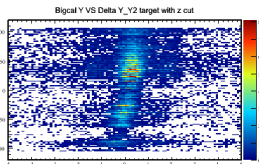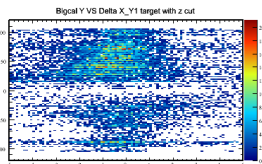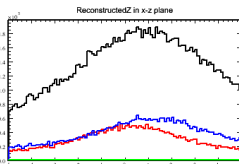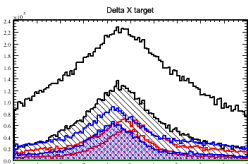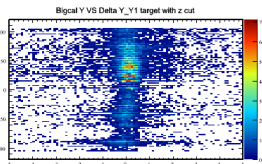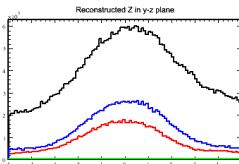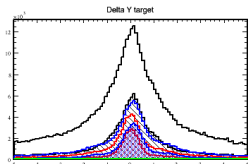
Run 72999

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
Problem: The target reconstruction in the X-Z plane at the target is different between Y1 and Y2.
Adding a correction to Y1 and Y2 positions by moving them closer together by 8 mm

Run 72999

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
Problem: The target reconstruction in the X-Z plane at the target is different between Y1 and Y2.
Adding a correction to Y1 and Y2 positions by moving them closer together by 14 mm
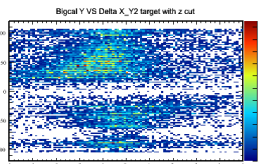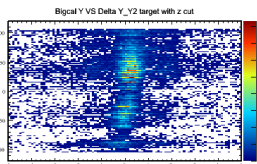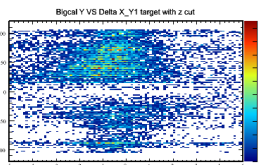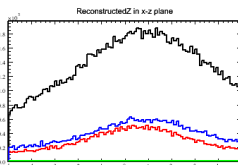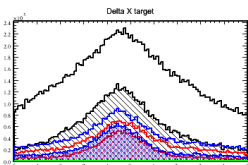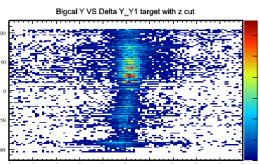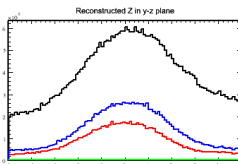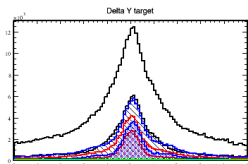
Y1 - Y2 separation correction

Observations

- The two peaks in delta-X moved closer together.
- Moving Y1 and Y2 closer by 14mm seems to do the trick. (But why?)
- Slopes in cluster-Y Vs. Delta-Y became similar (like the simulation).

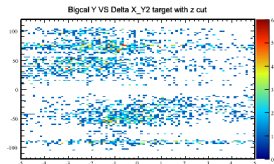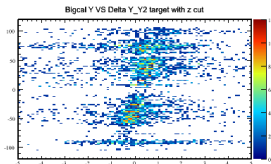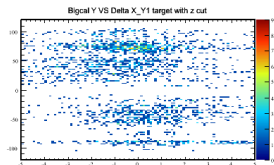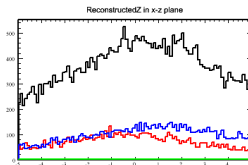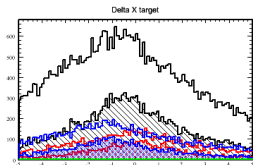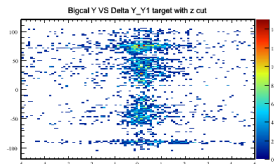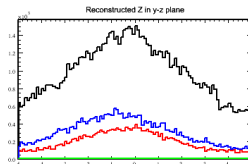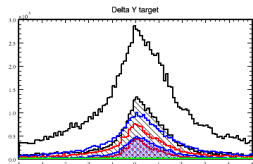Delta Y Vs cluster Y

Maybe positrons now?

Using the Cherenkov

- The previous slides used a tight *single track cut* $(0.5 < CER < 1.3)$
- We will now look at a tight *double track cut* $(1.7 < CER < 2.8)$

Run 72999 - double track cut

Run 72999 - double track cut

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
Now with X plane in *front*, and tracker positioned at 52cm
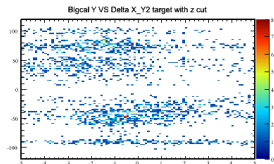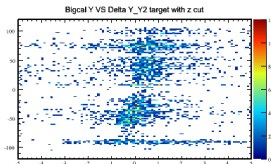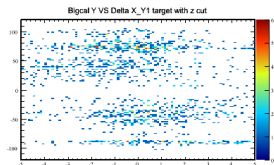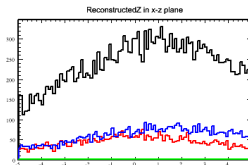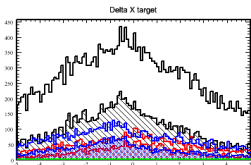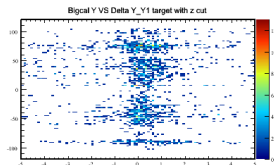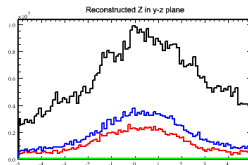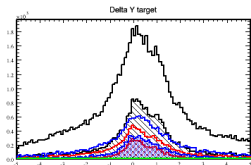
Run 72999 - double track cut

Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
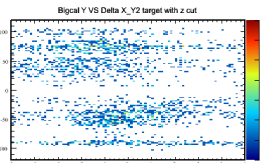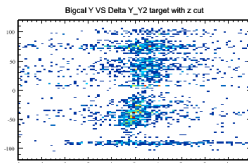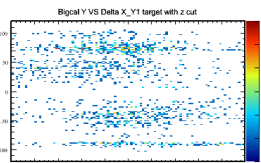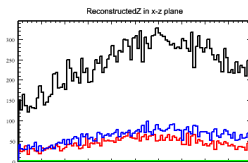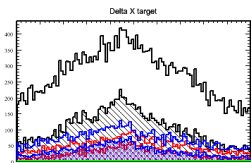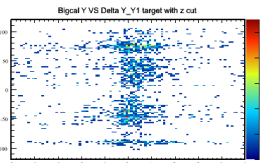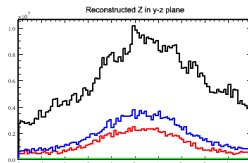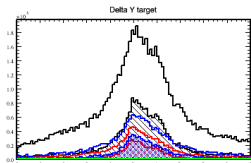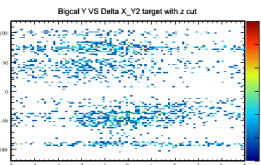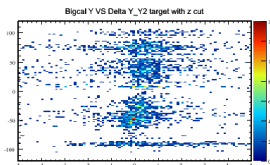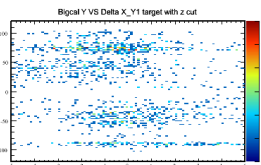Now with X plane in *front*, and tracker positioned at 52cm Adding a correction to Y1 and Y2 positions by moving them closer together by 8 mm

Run 72999 - double track cut
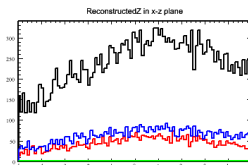
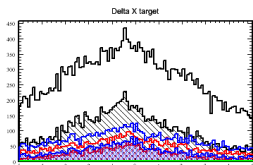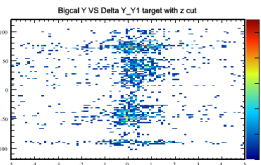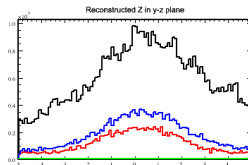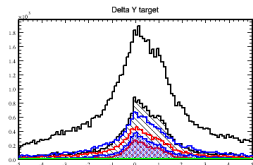Red is Y1, blue is Y2, black is both, and Delta = (raster-recon)
Now with X plane in *front*, and tracker positioned at 52cm Adding a correction to Y1 and Y2 positions by moving them closer together by 14 mm

Conclusion

Are those positrons?!?!

- Is the peak around Delta-Y = 1 due to positrons?
- It only appeared once we had the correct geometry and used a cherenkov cut where we would expect to see positrons...
- The "positron" peak is almost equal to size of "electron" peak ...