Forward Tracker Update

SANE Analysis Update

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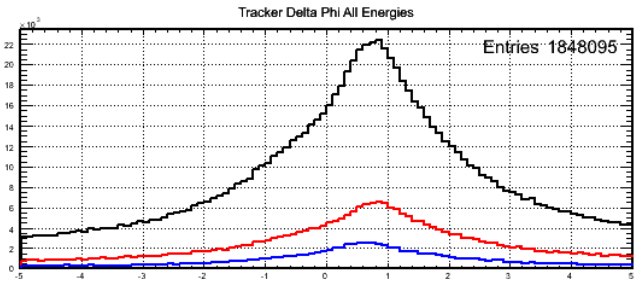
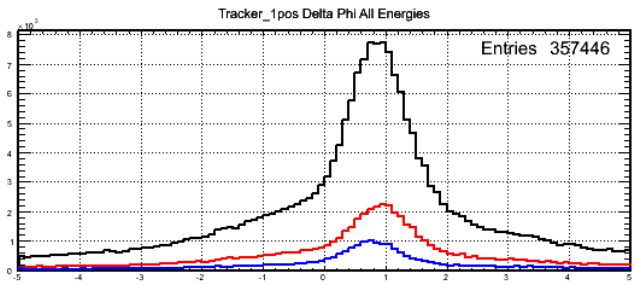
Temple University

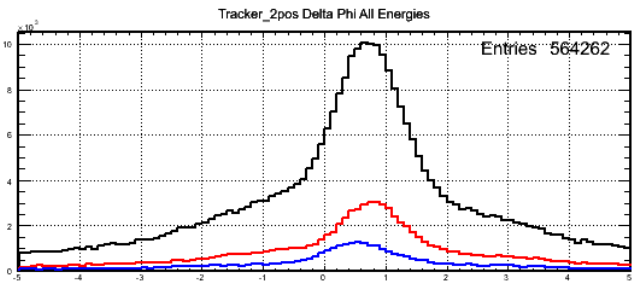
September 26, 2012

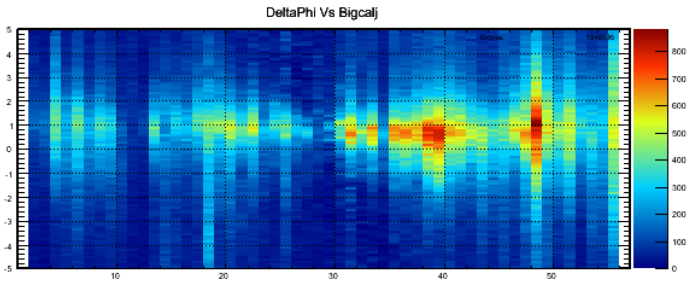
1. Forward Tracker
   - Forward Tracker $\Delta\phi$
   - Vertex Reconstruction
     - Varying the Y-offset
   - Averaging the plane's Z postion
   - Correcting the X-coordinate
   - Correcting the X and X Coordinate
   - A closer look at each plane

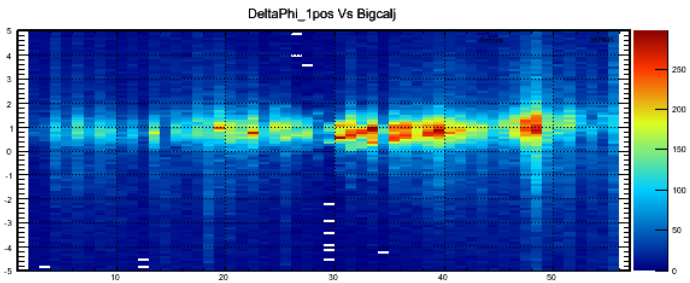
Tracker $\Delta\phi$

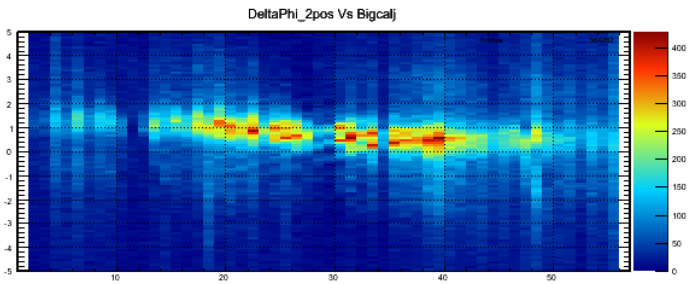






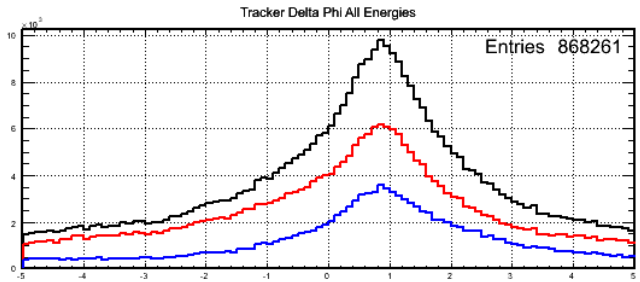


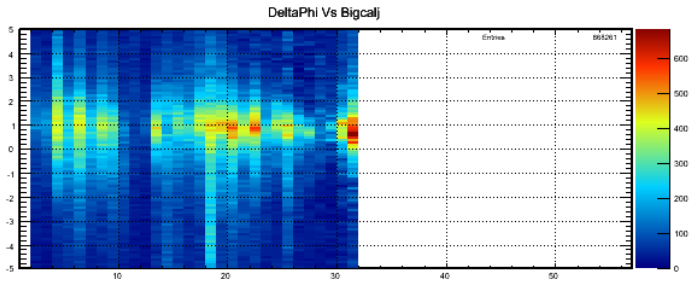


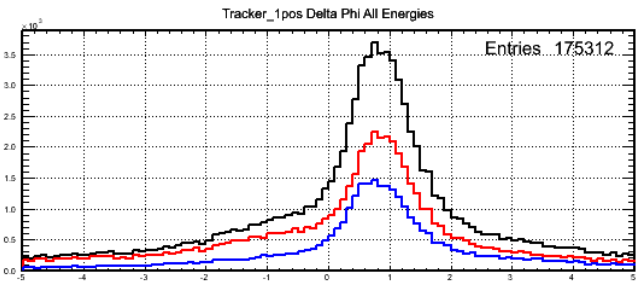


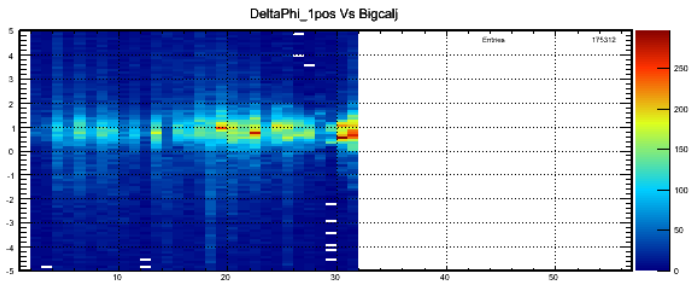
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

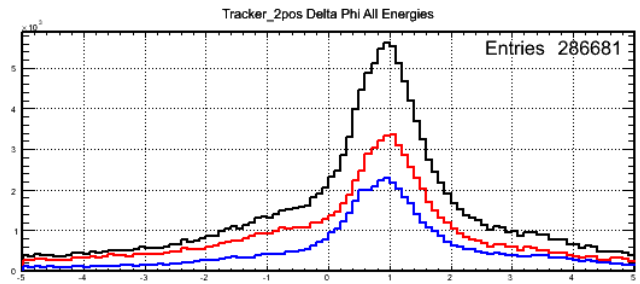
Protvino - Tracker $\Delta\phi$

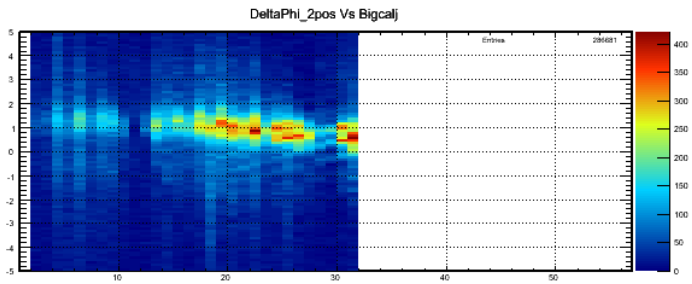






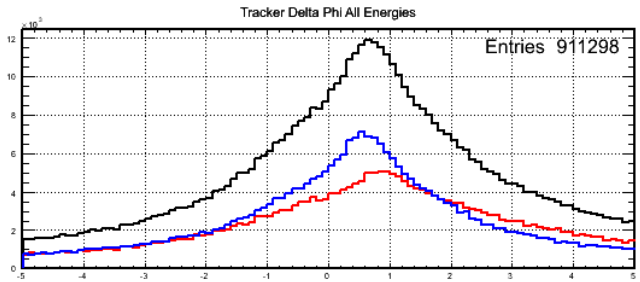


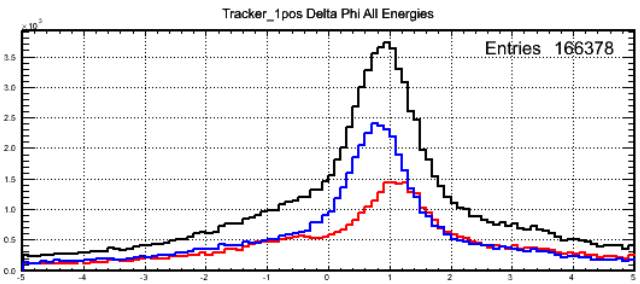


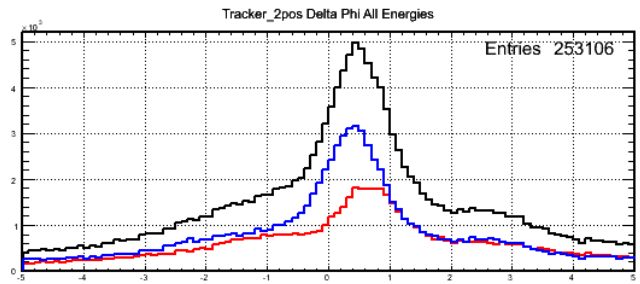


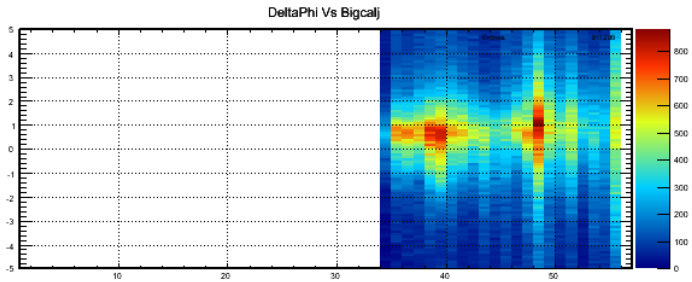
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

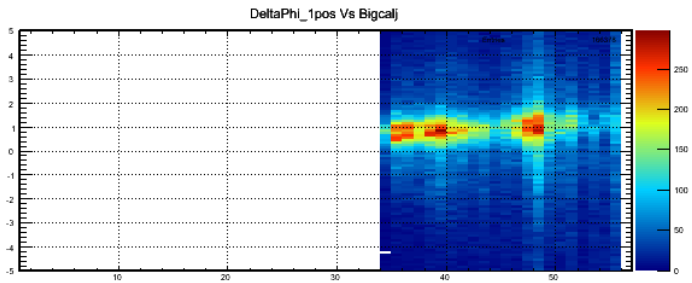
RCS - Tracker $\Delta\phi$

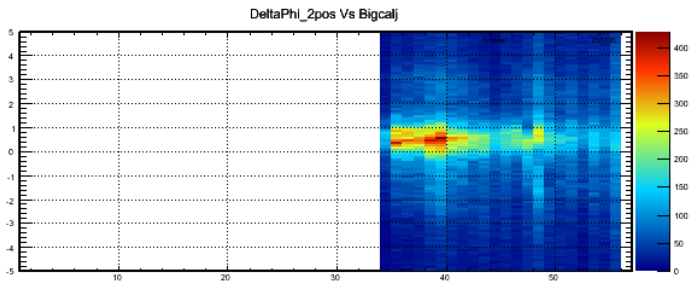






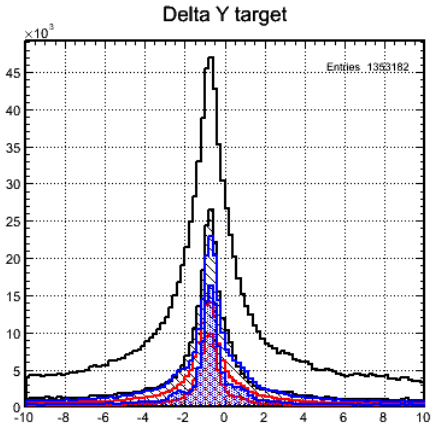


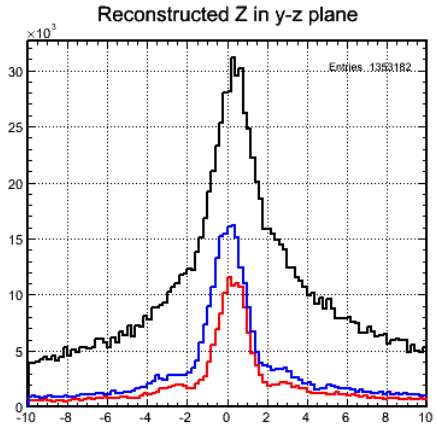


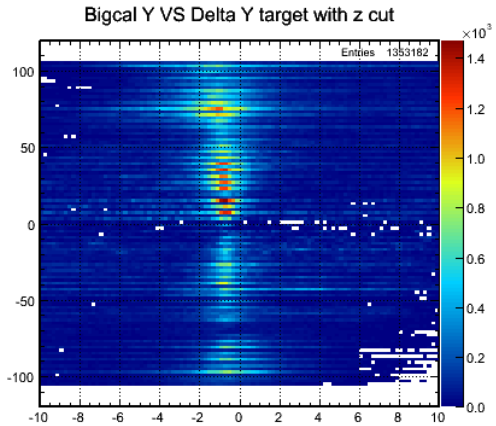


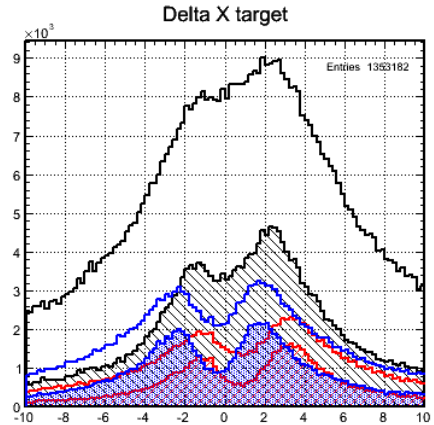
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

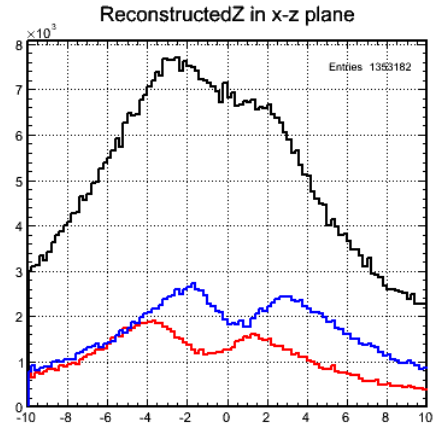
Vertex from Bigcal and Tracker

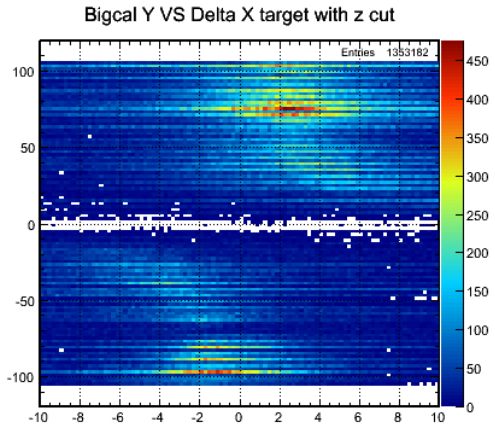






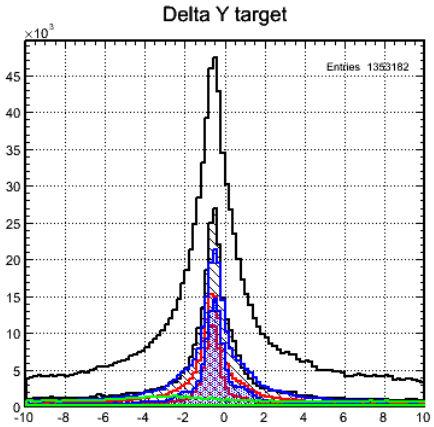


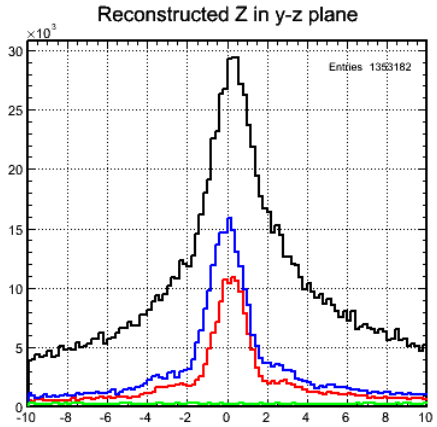


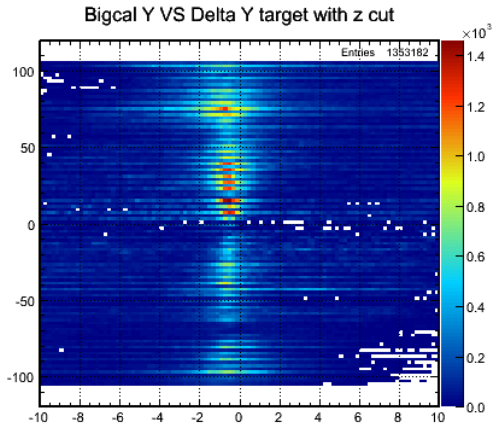


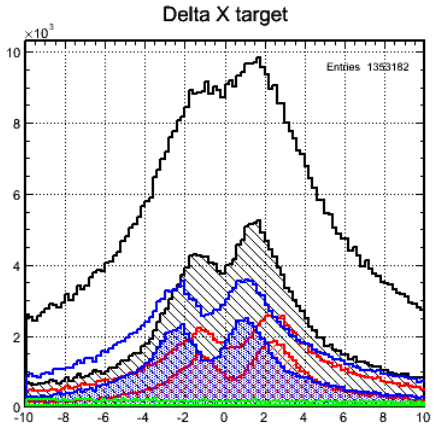
- Results with the Y1 and Y2 offsets to 0 mm and -1.5 mm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

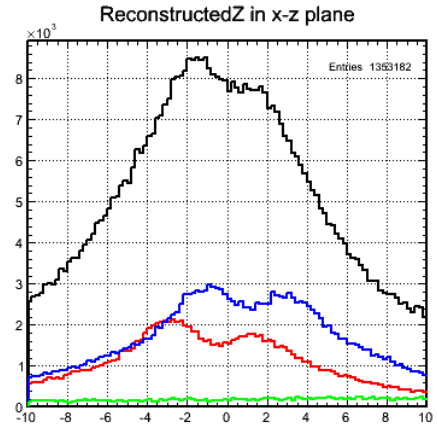
Vertex from Bigcal and Tracker

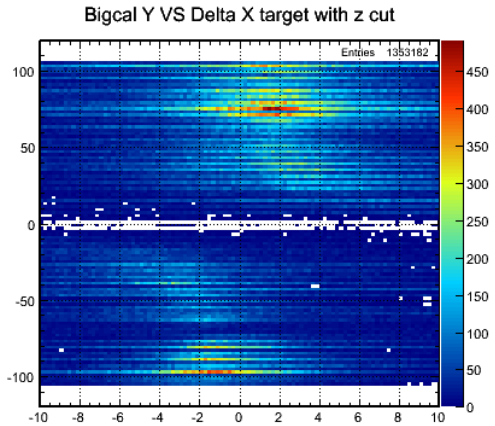






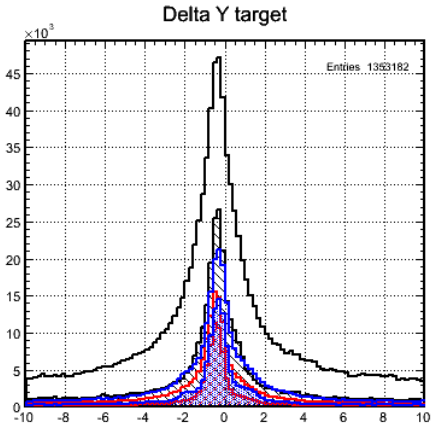


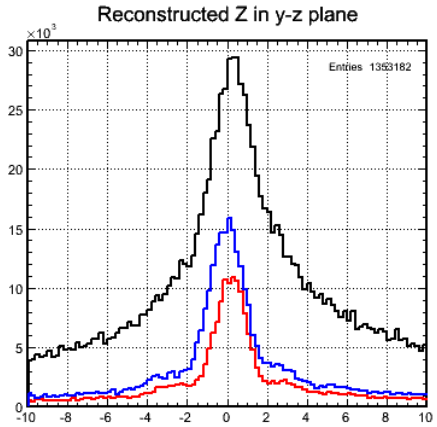


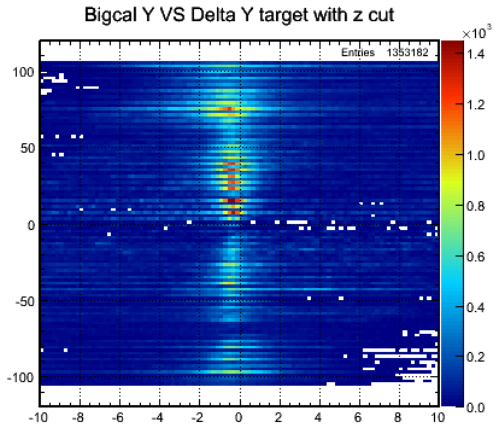


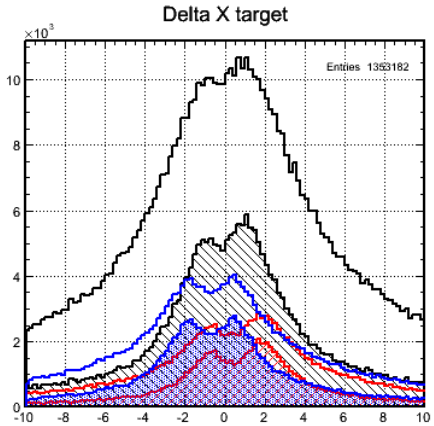
- Results with the Y1 and Y2 offsets to -1.5 mm and -3 mm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

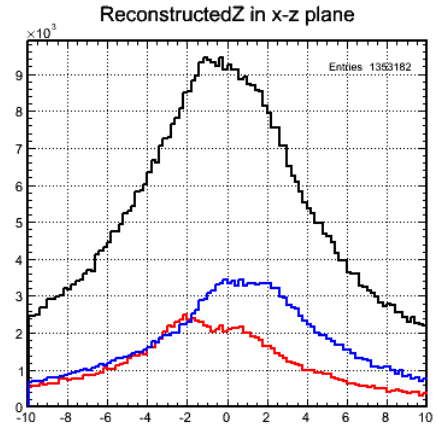
Vertex from Bigcal and Tracker

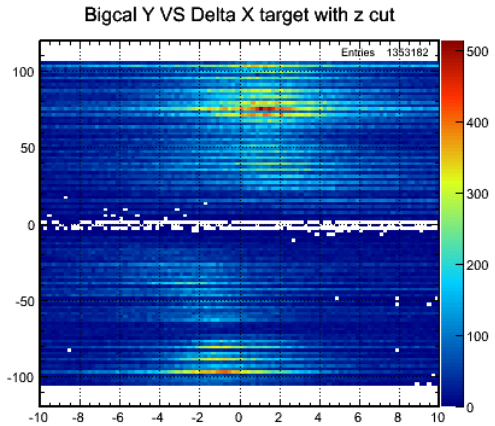






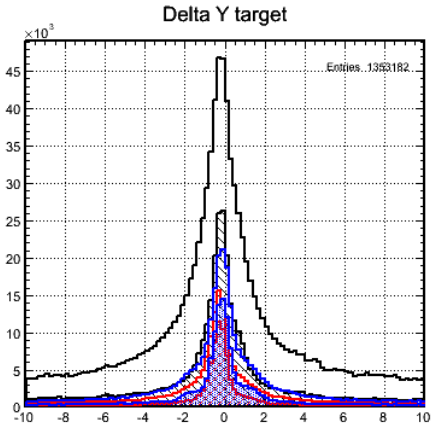


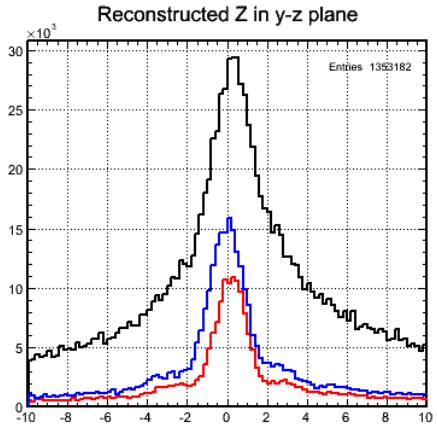


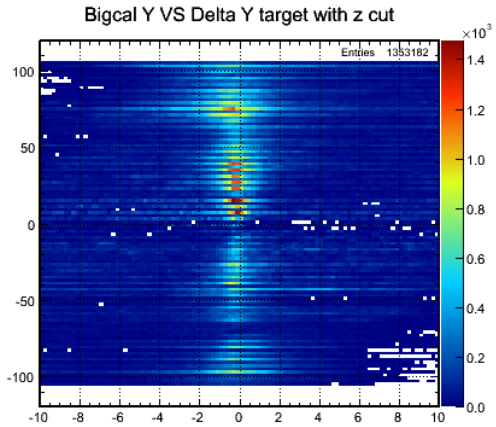


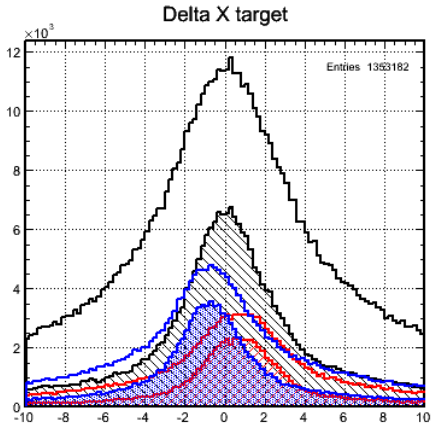
- Results with the Y1 and Y2 offsets to -3 mm and -4.5 mm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

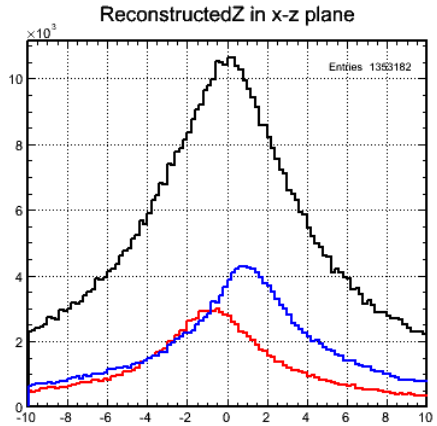
Vertex from Bigcal and Tracker

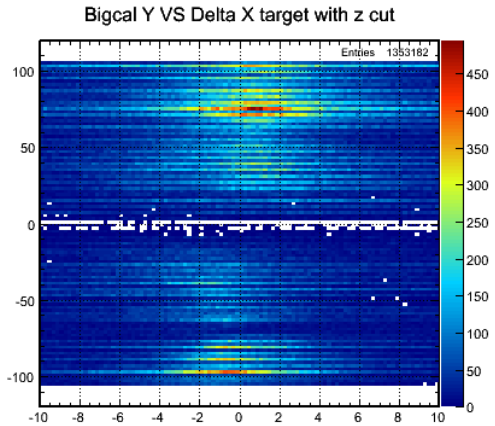






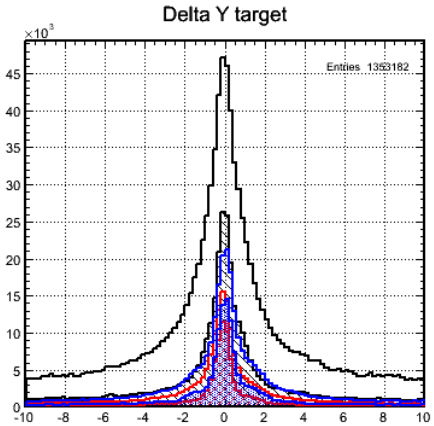


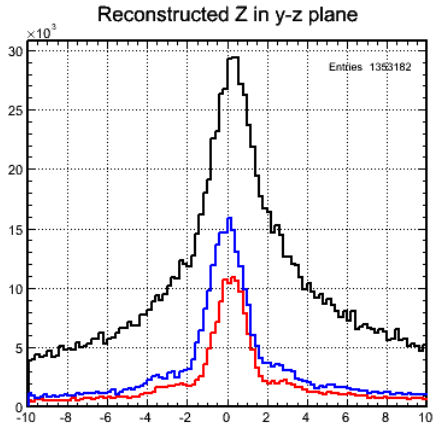


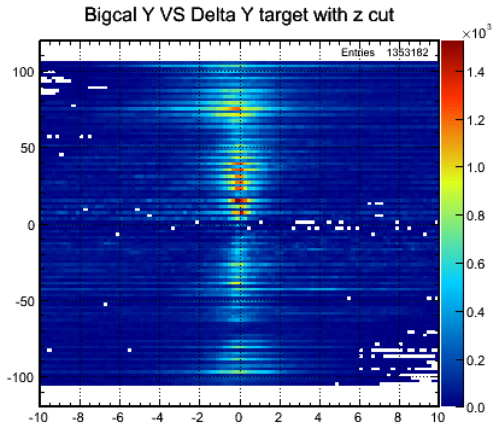


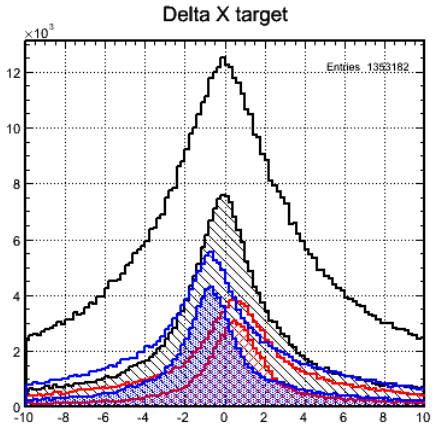
- Results with the Y1 and Y2 offsets to -4.5 mm and -6 mm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

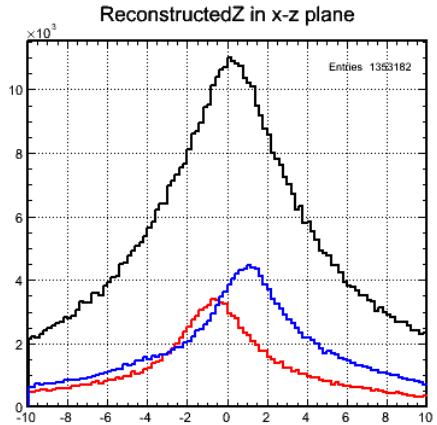
Vertex from Bigcal and Tracker

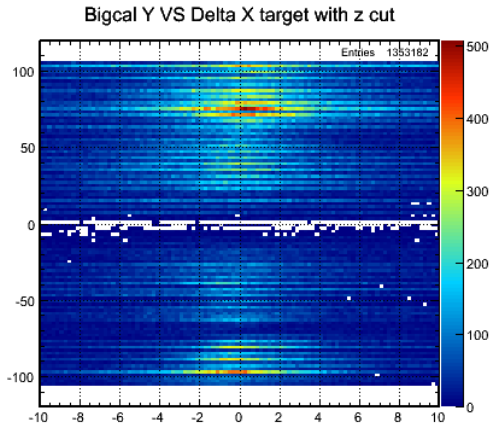












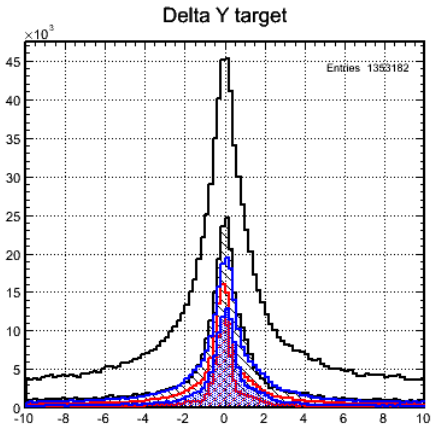
- Results with the Y1 and Y2 offsets to -6 mm and -7.5 mm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

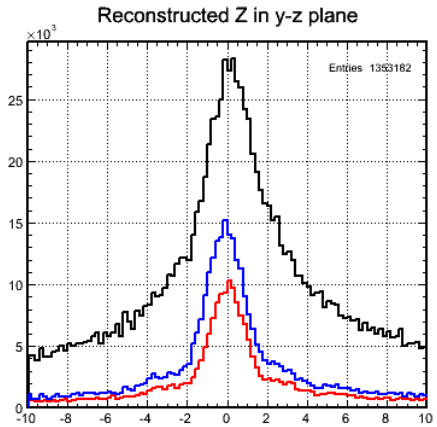
Vertex from Bigcal and Tracker

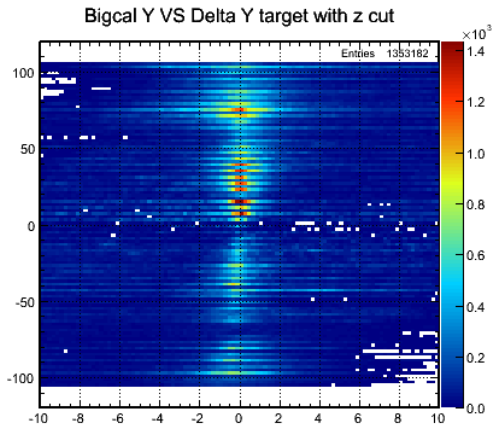
Instead of using the z positions of the Y layer, we can use the average z position between the Y and X layer.

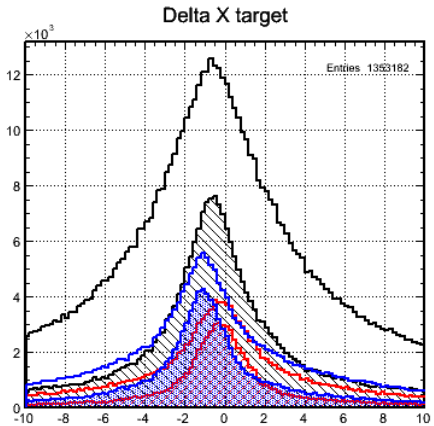
X-Y plane averaged Z position

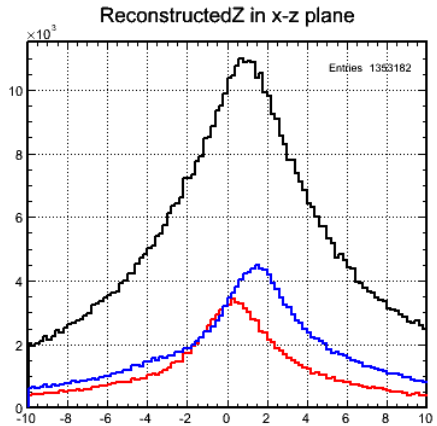
The blue and red peaks in delta X moved closer together.

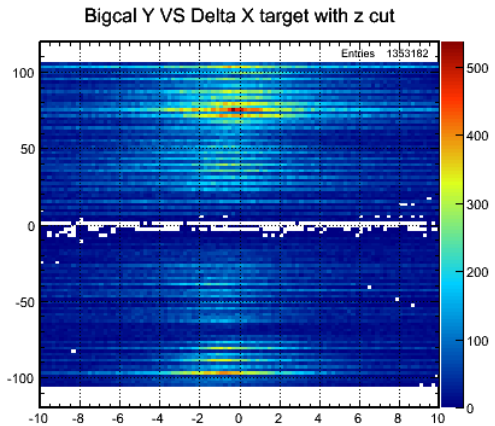








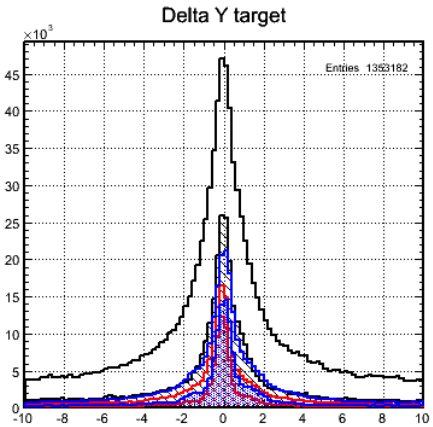


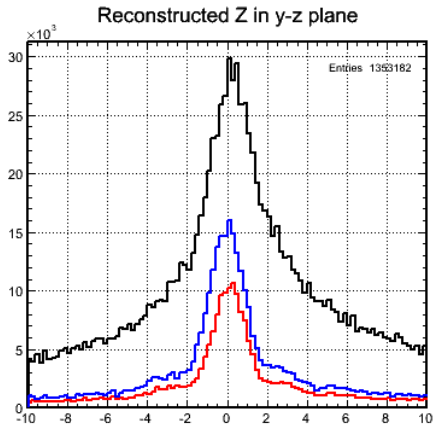


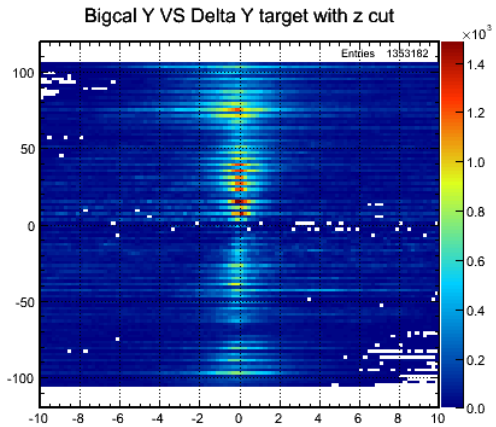
- Results with the Y1 and Y2 offsets to -6 mm and -7.5 mm
- $Z_{tracker} = 50.5$cm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

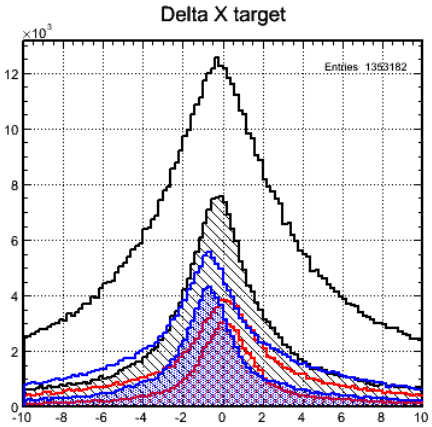
X-Y plane averaged Z position

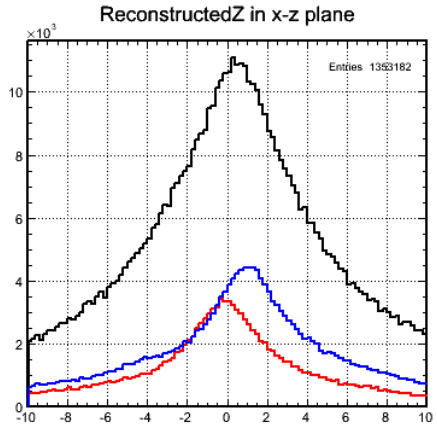
Adjusting the Z position...

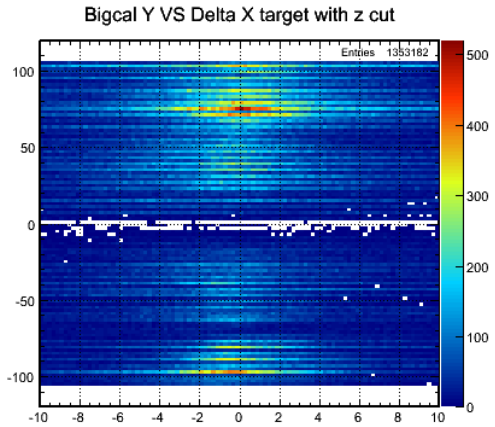












- Results with the Y1 and Y2 offsets to -6 mm and -7.5 mm
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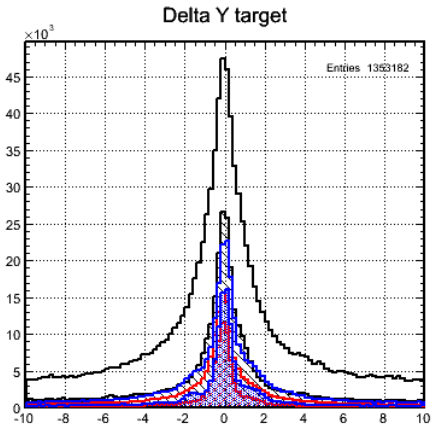
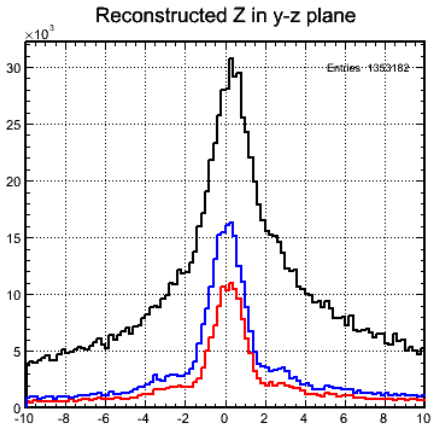
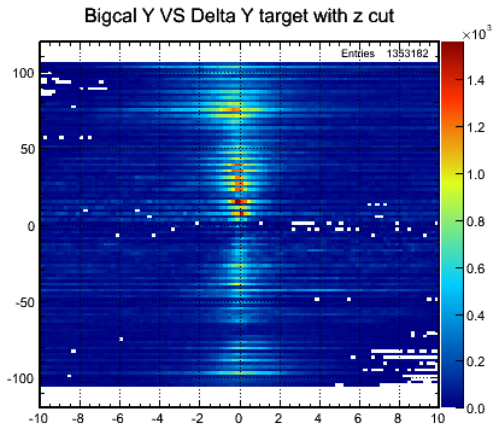
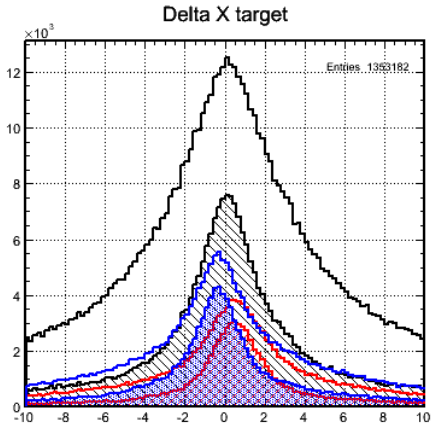
X-Y plane averaged Z position

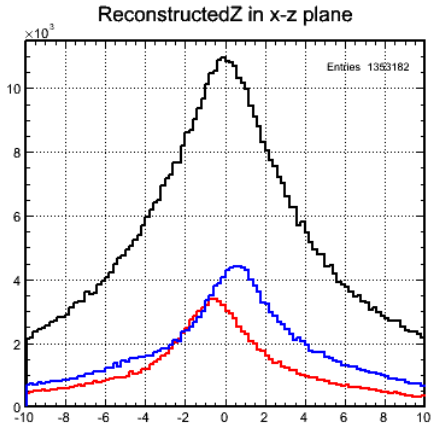
Adjusting the Z position...

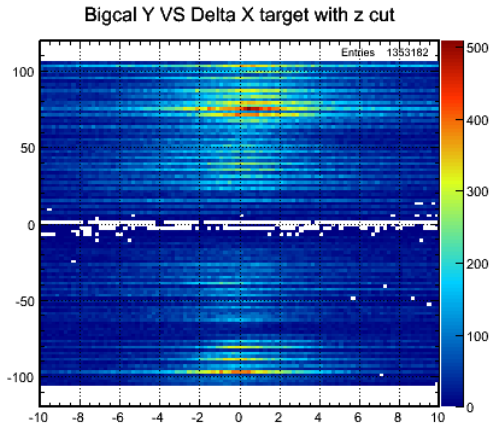












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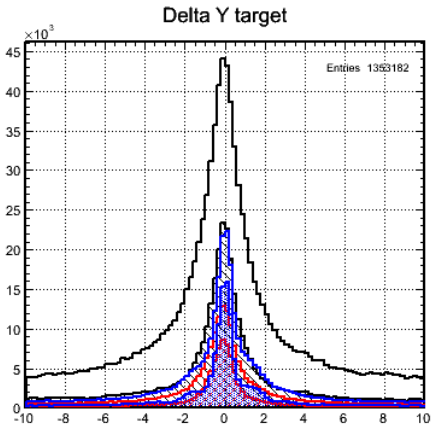
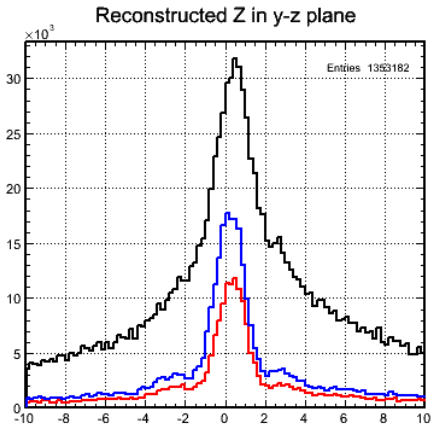
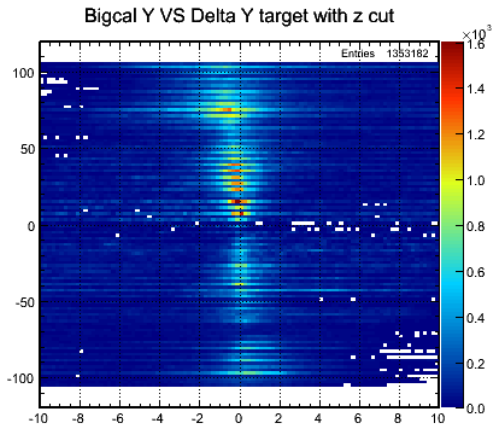
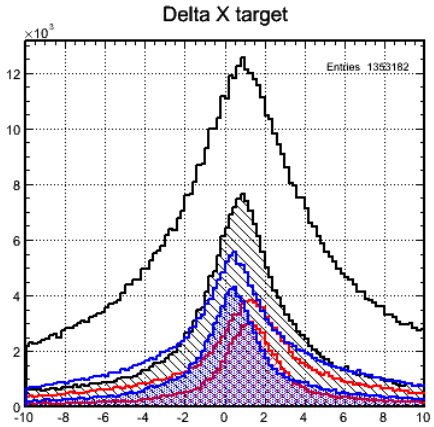
X-Y plane averaged Z position

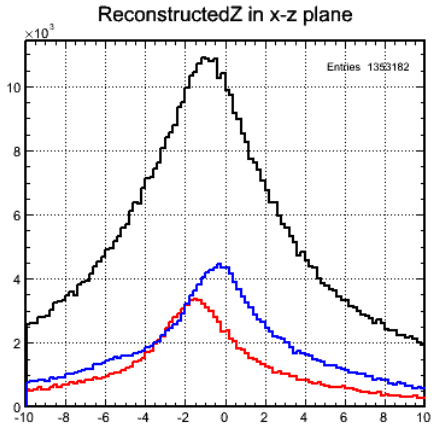
Adjusting the Z position...

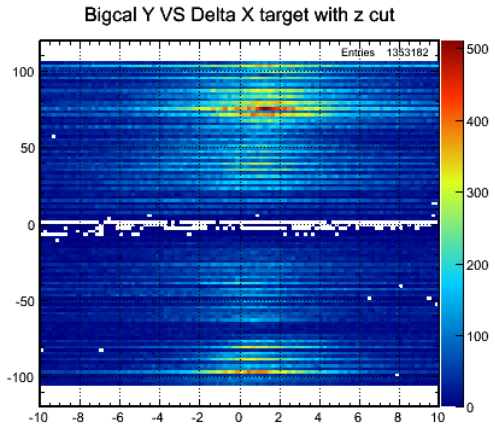












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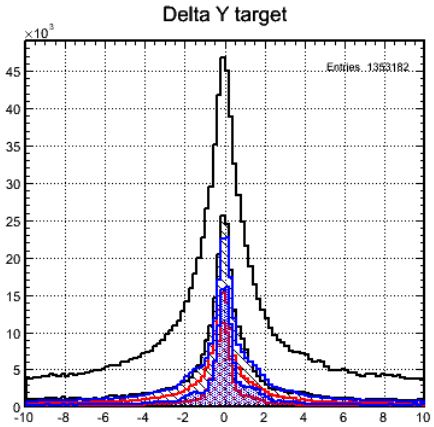
Using average and correcting the x coordinate

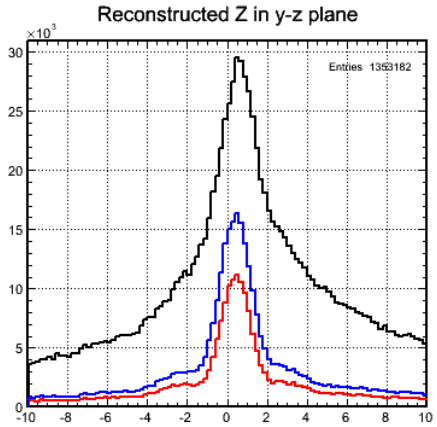
Using the x position and the angle of a track straight to the target origin the x coordinate is corrected.

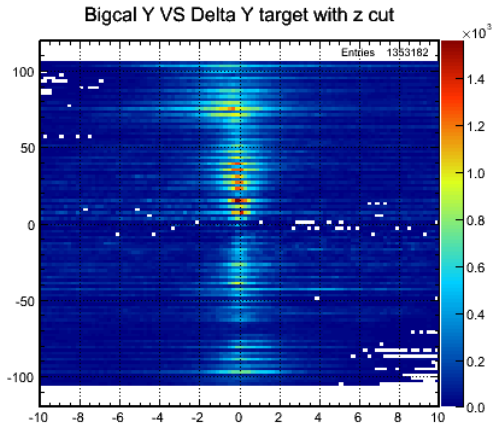
$$\Delta x = \Delta z \; tan(\theta) \; x_{corrected} = x - \frac{x(Z_{X1} - Z_{Y1})}{(Z_{X1} + Z_{Y1})}$$

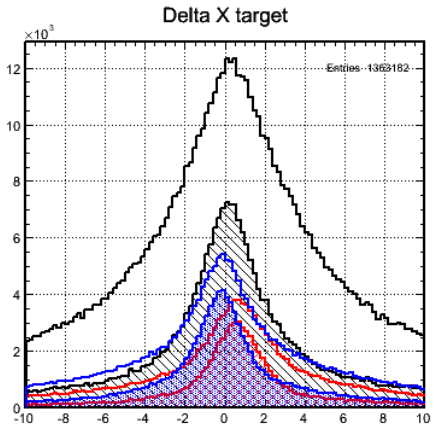
X corrected position

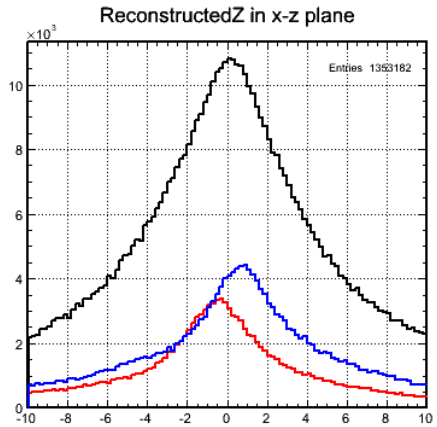
X corrected for angle. The two plane's reconstructed Z in y-z plane become aligned

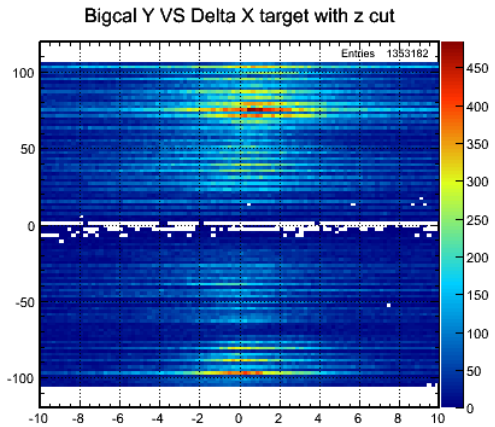












- Results with the Y1 and Y2 offsets to -6 mm and -7.5 mm
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- Blue - Tracker (X+Y2) Positions

Correcting x and y coordinates

Correction of both coordinates.

X coordinate

$$\Delta x = -\Delta z \; tan(\theta)/2$$

$$x_{corrected} = x - \frac{x(Z_{X1}-Z_{Y1})}{(Z_{X1}+Z_{Y1})}$$

Y coordinate

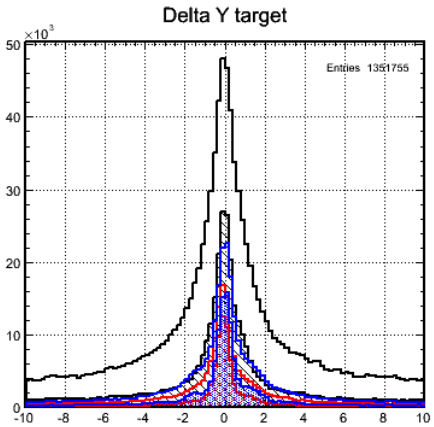
$$\Delta y = \Delta z \; tan(\theta)/2$$

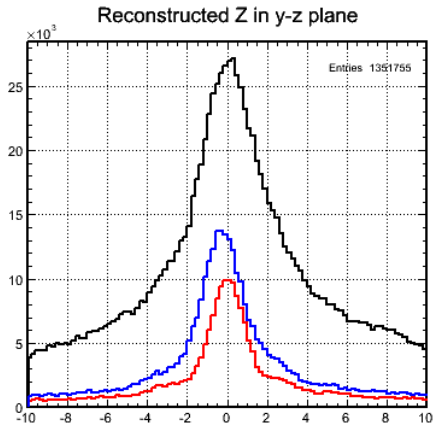
Note the sign difference.

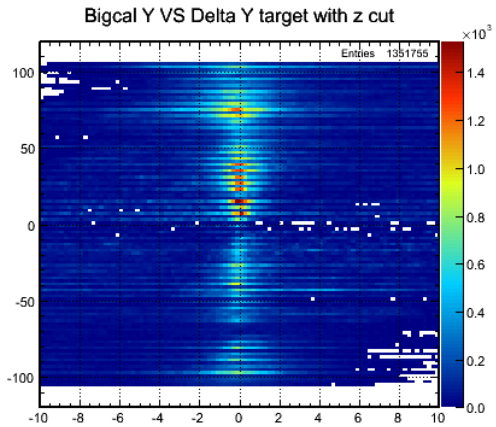
$$y_{corrected} = y + \frac{y(Z_{X1}-Z_{Y1})}{(Z_{X1}+Z_{Y1})}$$

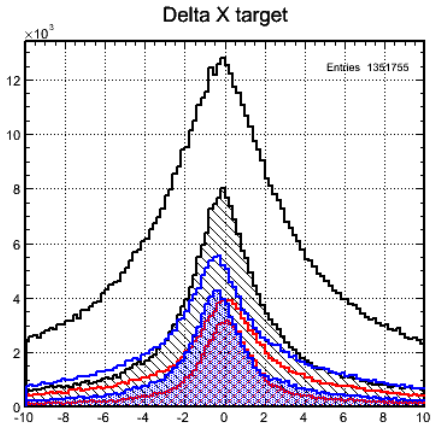
X and Y corrected position

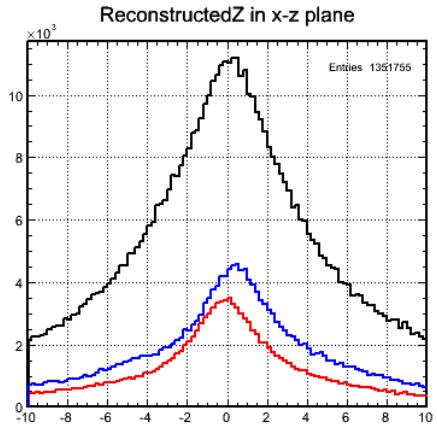
X and Y corrected for angle... z reconstruction becomes unalined again.

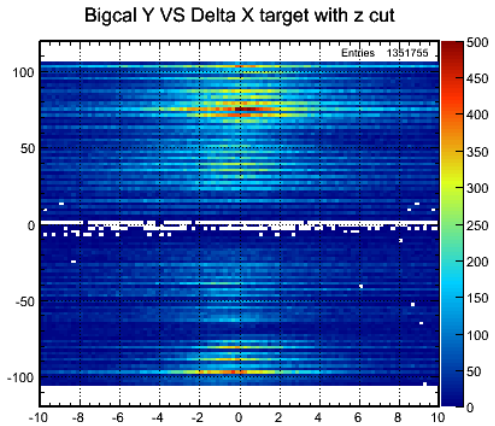












- Results with the Y1 and Y2 offsets to -6 mm and -7.5 mm
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- Black - Tracker (X+Y1+Y2) Positions
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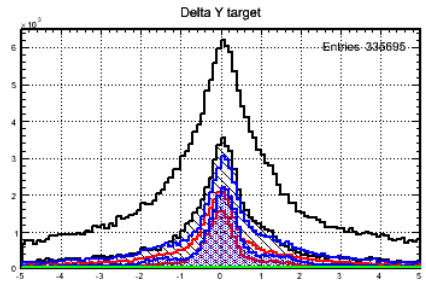
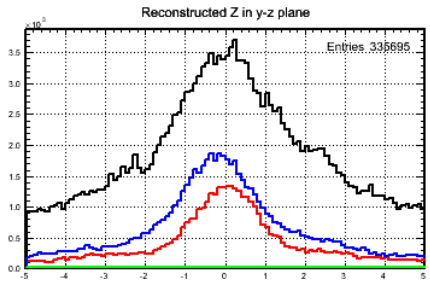
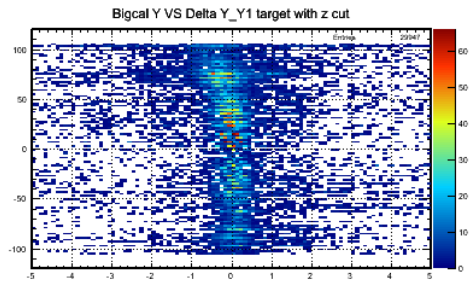
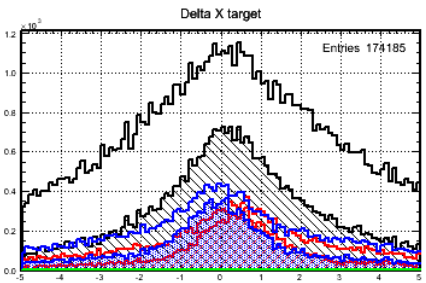
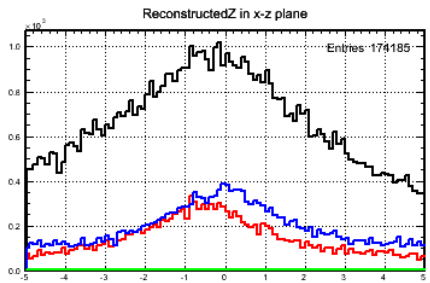
X and Y corrected position

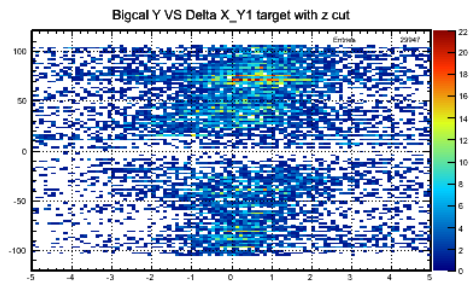


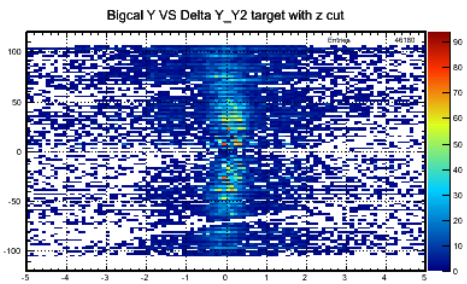


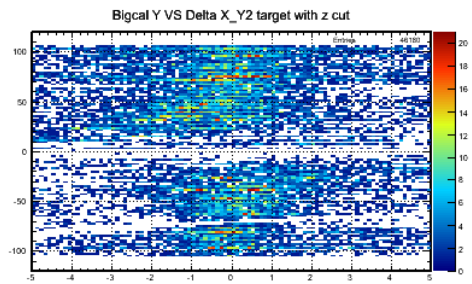












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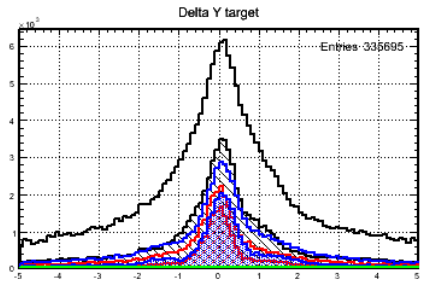
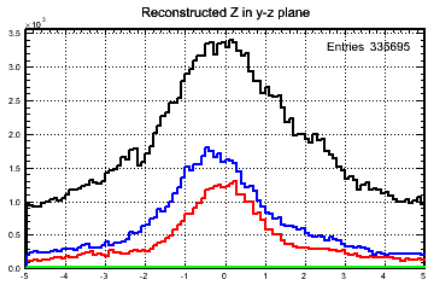
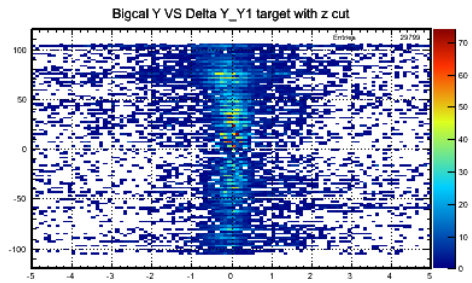
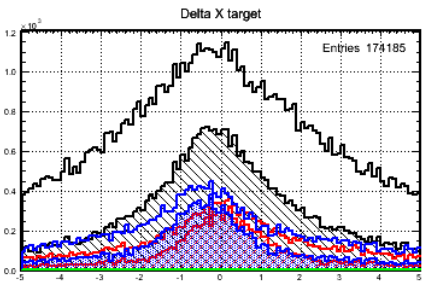
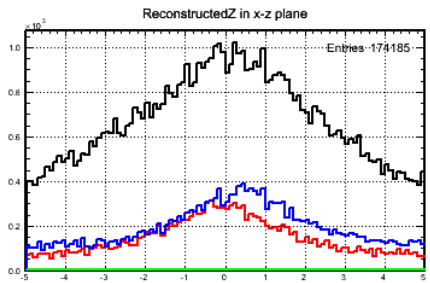
X and Y corrected position

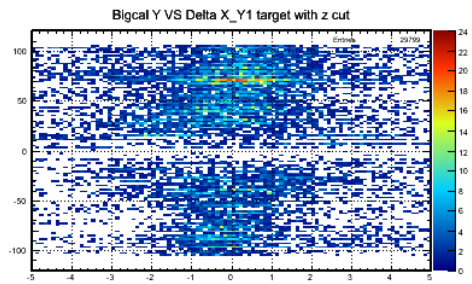


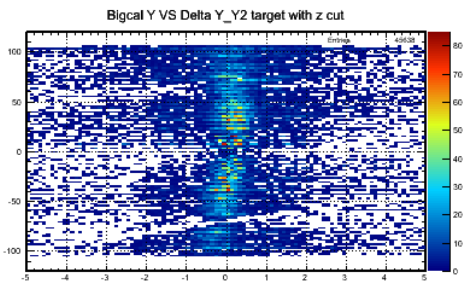


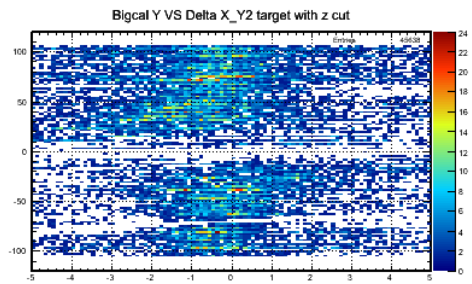












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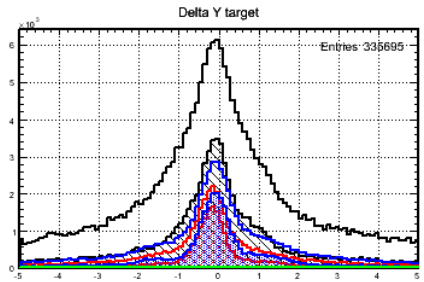
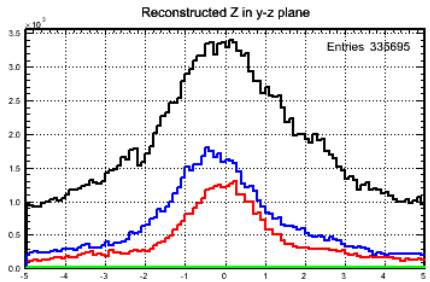
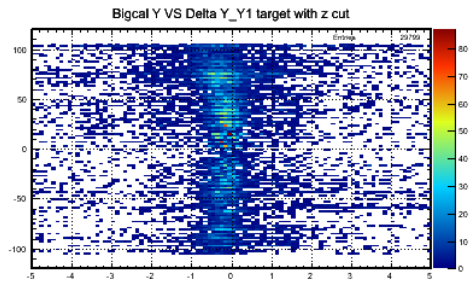
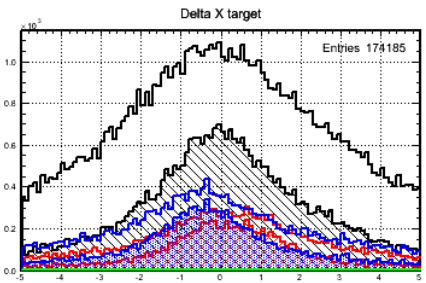
- Blue - Tracker (X+Y2) Positions

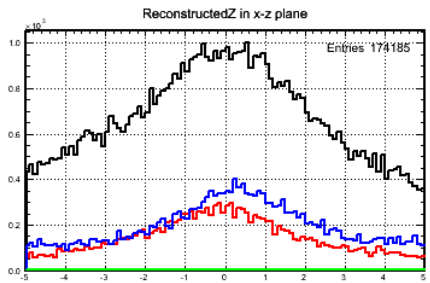
X and Y corrected position

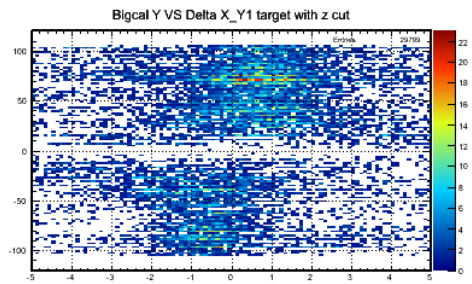


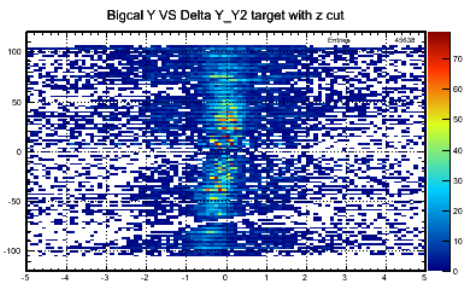


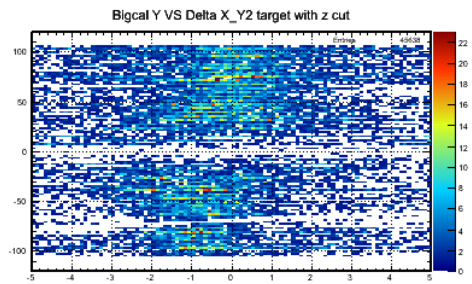






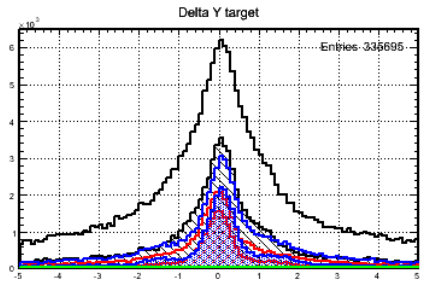


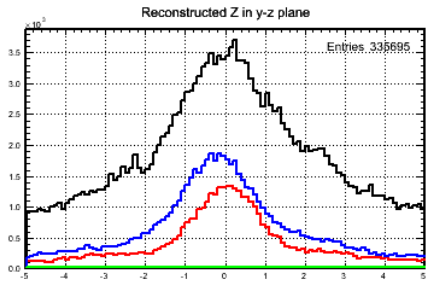


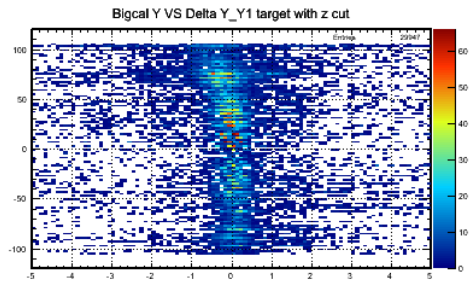


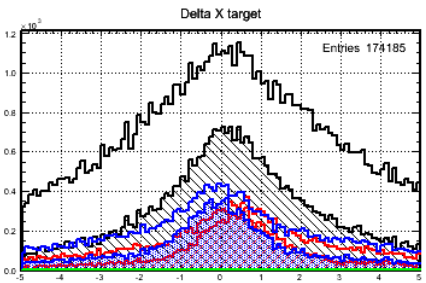
- Results with the Y1 and Y2 offsets to -6 mm and -7.5 mm
- $Z_{tracker} = 49$ cm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

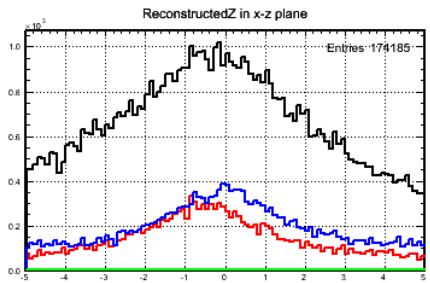
X corrected position

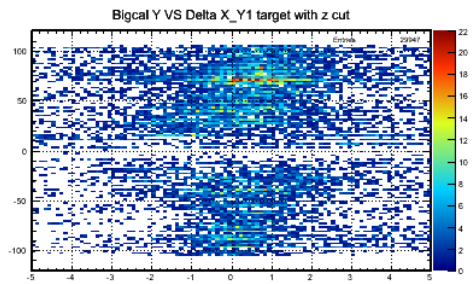


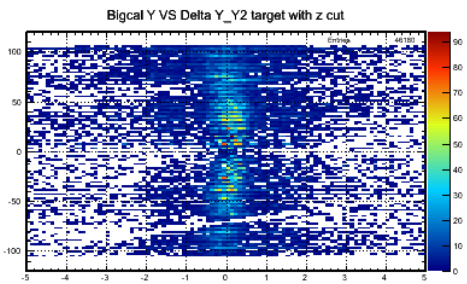


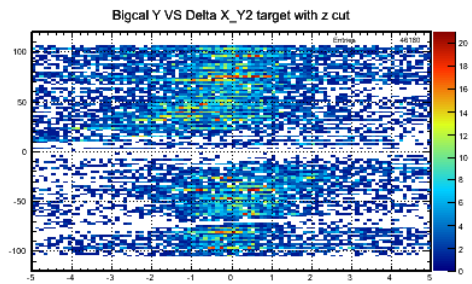






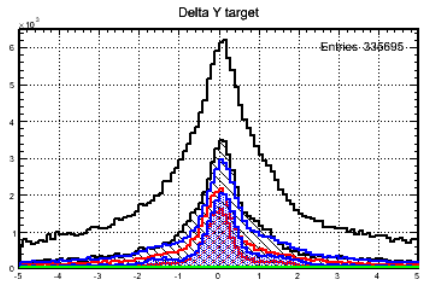


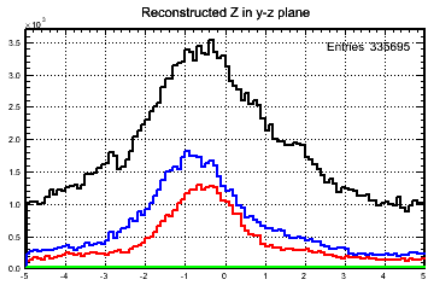


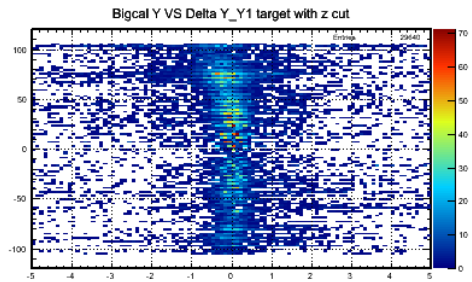


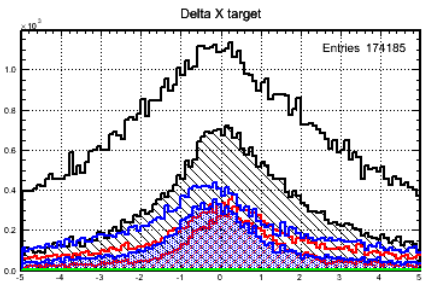
- Results with the Y1 and Y2 offsets to -7.5 mm and -9 mm
- $Z_{tracker} = 48.5$ cm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

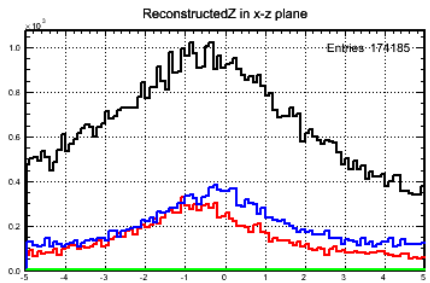
X corrected position

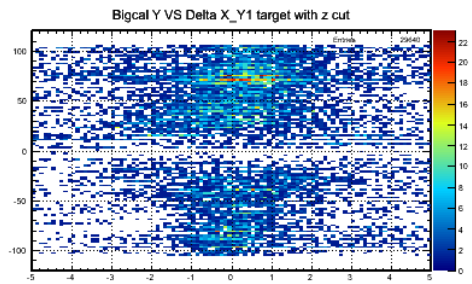


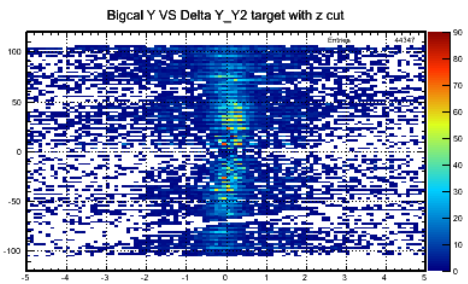


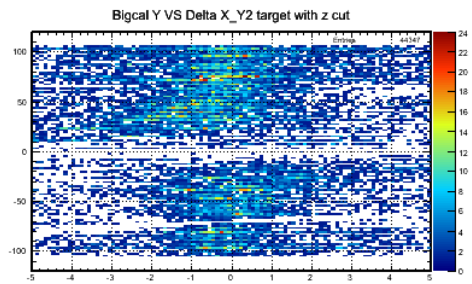






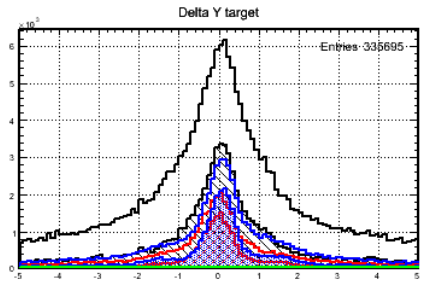


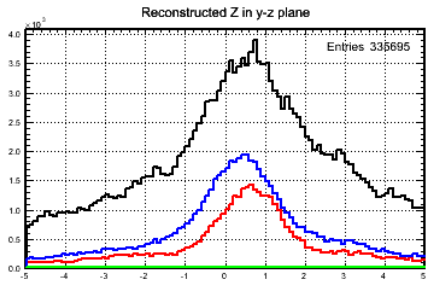


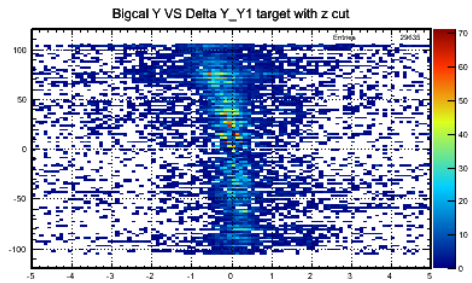


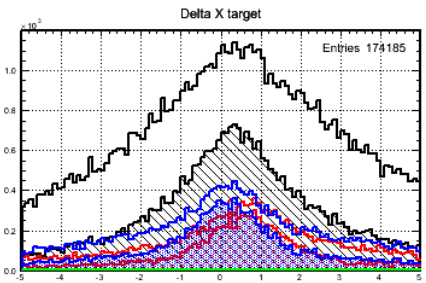
- Results with the Y1 and Y2 offsets to -7.5 mm and -9 mm
- X1 offset set to +1.5mm
- $Z_{tracker} = 48.5$ cm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

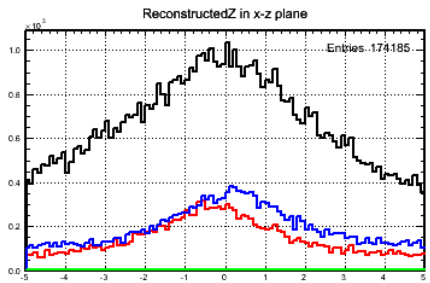
X corrected position

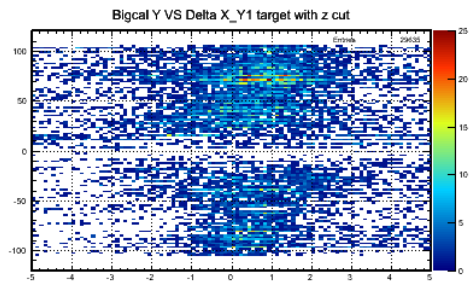


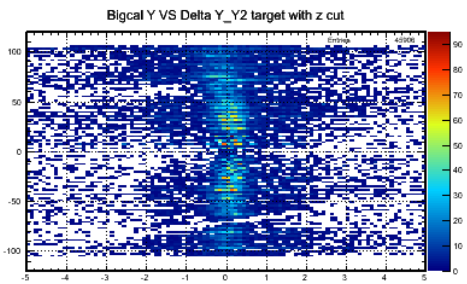


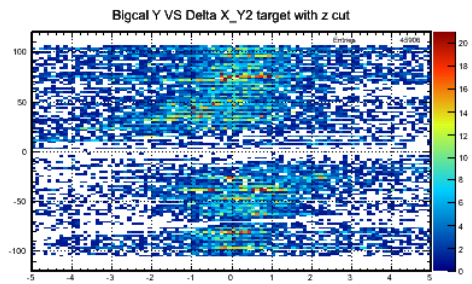










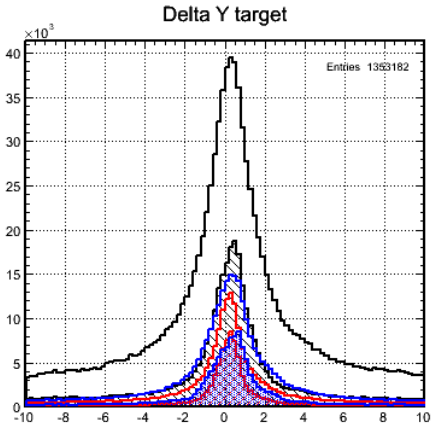


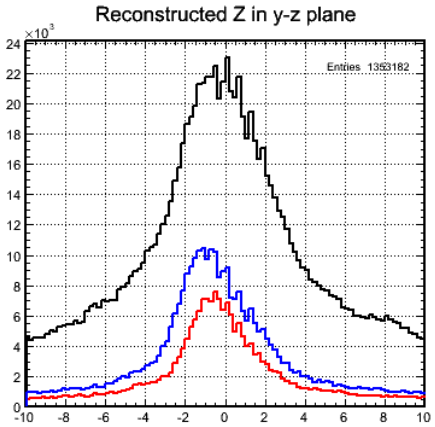
- Results with the Y1 and Y2 offsets to -7.5 mm and -9 mm
- X1 offset set to -4.5mm
- $Z_{tracker} = 48.5$ cm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

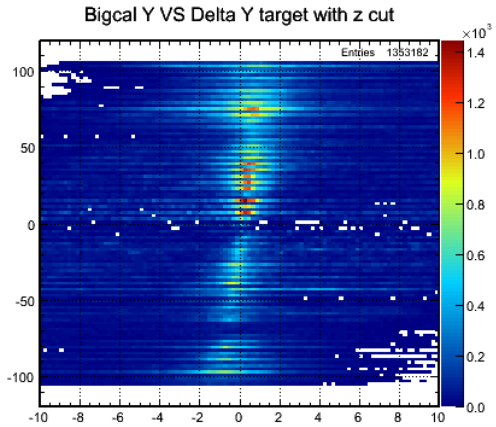
Conclusion

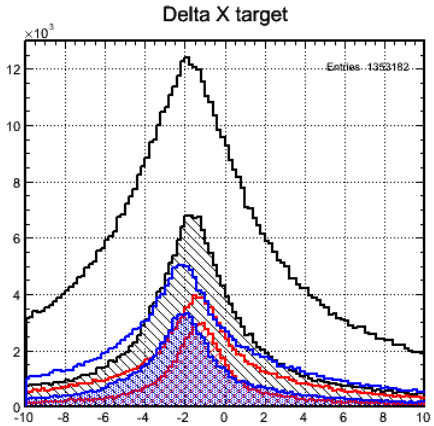
- $Z_{tracker} \simeq 49cm$
- $X_{offset} \simeq -1.5mm$
- $Y1_{offset} \simeq -6.0mm$
- $Y2_{offset} \simeq -7.5mm$

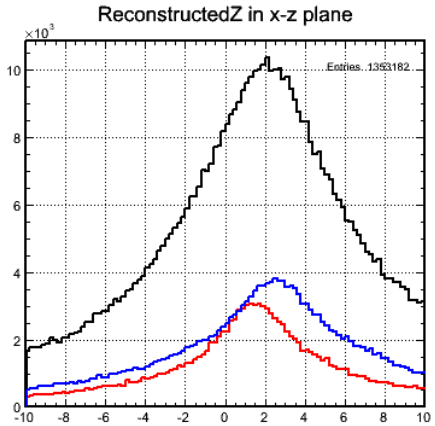
Before

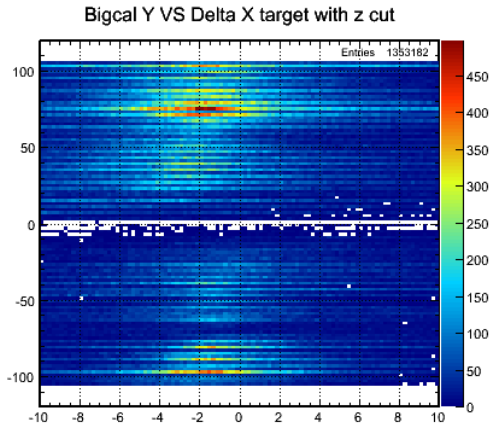






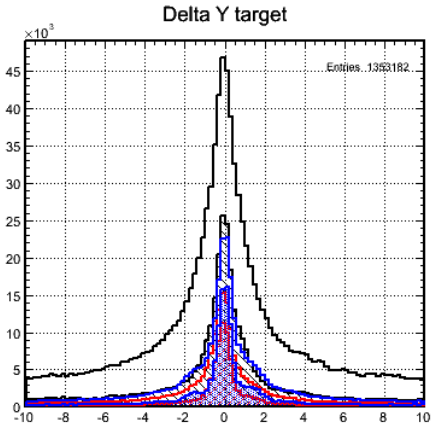


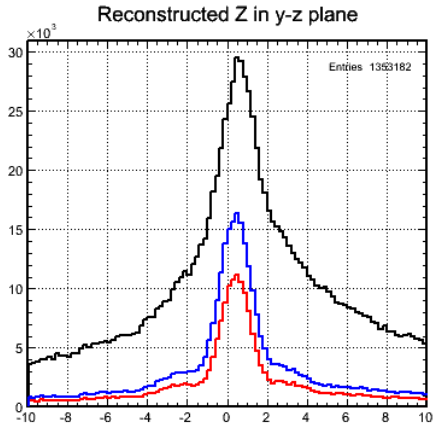


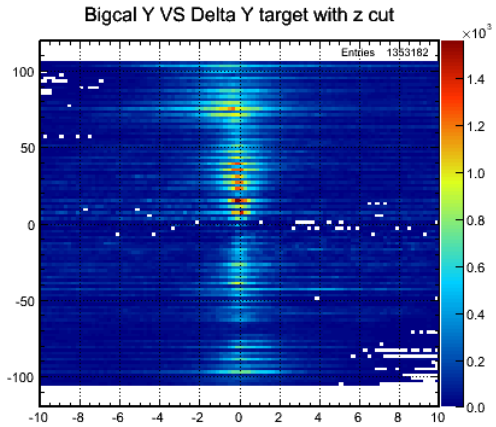


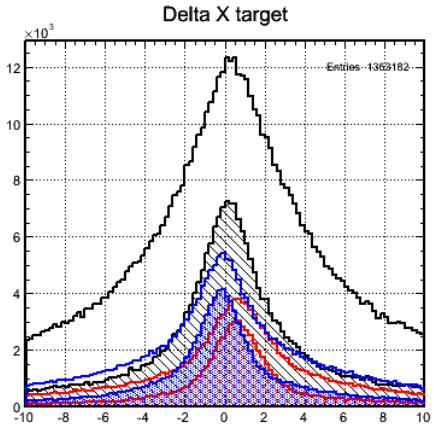
- Results with the Y1 and Y2 offsets to 0 mm and -1.5 mm
- X1 offset set to -1.5mm
- $Z_{tracker} = 51.7$ cm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

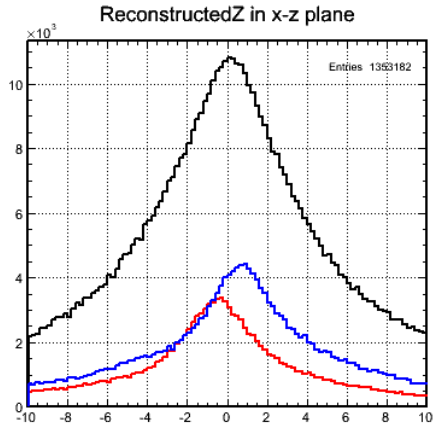
After

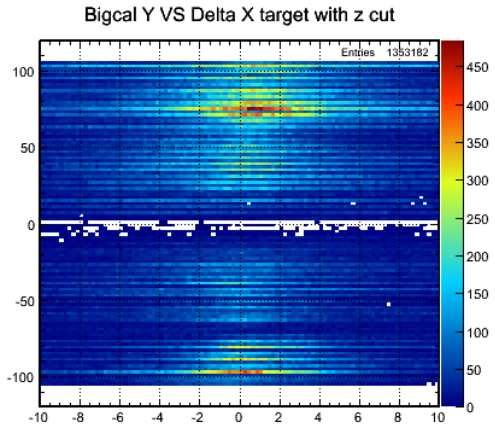












- Results with the Y1 and Y2 offsets to -6 mm and -7.5 mm
- X1 offset set to -1.5mm
- $Z_{tracker} = 49.5$ cm
- Black - Tracker (X+Y1+Y2) Positions
- Red - Tracker (X+Y1) Positions
- Blue - Tracker (X+Y2) Positions

Currently working on...

From the survey the "Pitch" was about -0.71 degrees or -0.0123 radians $40tan(0.0123) = 0.49$ cm.
So the tracker is leaning back with $1/2$ a cm difference from top to bottom.