PRELIMINARY FFS TRACKING REPORT
WEEK 38
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0.1 Introduction

The following report briefly summarizes the first attempt at creating so-called "Global" tracks in the Front Forward Spectrometer (FFS). The analyses presented here are based on data from the 5000 events of run 2513. This run was chosen because it has a large fraction of events with trigger 6—note that trigger 4 (ZDC) was downscaled for this run.

0.2 Analysis

The purpose of the short, rather preliminary analysis has been to see if it is possible to reproduce the success obtained in the MRS, as detailed in BRAHMS Analysis Note 4. To speed the work along, no attention was payed to event details such as centrality; the only condition applied is that the events used had **trigger 6**. In addition, one should realize that **NO VERTEXING WAS PERFORMED** in this analysis. In fact, in the code used, `BrFFSTrackingModule`, the vertex is (0,0,0) (note also that the name for this vertex is `WrongVertex`, so there should be no confusion!). For all local tracking, `BrClusterFinder` and `BrTrackFollowFinder` were used. The following parameters were used in the analysis:

```
   //First T1:
t1Cluster = new BrTPCClusterFinder("T1", "T1");
t1Cluster->SetMaxPixelCutoff( 10.0 );
t1Cluster->Book();

   t1Tracker = new BrTrackFollowFinder("T1", "T1");
t1Tracker->SetTrackingMethod( 1 );
t1Tracker->SetSearchWidthX( 0.1 );
t1Tracker->SetSearchWidthY( 0.2 );
t1Tracker->Book();

   //and then T2...

   t2Cluster = new BrTPCClusterFinder("T2", "T2");
t2Cluster->SetMaxPixelCutoff( 10.0 );
t2Cluster->Book();

   // BrTrackFollowFinder
t2Tracker = new BrTrackFollowFinder("T2", "T2");
t2Tracker->SetTrackingMethod( 1 );
```

```
t2Tracker->SetSearchWidthX( 0.1 );
t2Tracker->SetSearchWidthY( 0.2 );
t2Tracker->Book();
//Try FFS tracking...
ffsTracker = new BrFFSTrackingModule("Tracker","Tracker");
ffsTracker->DefineHistograms();
ffsTracker->Book();
ffsTracker->SetDebugLevel(0);
```

In this analysis, no attempt has been made to optimize the local tracking. The code has been used as shown above. It is not yet known (primarily because it has yet to be investigated) whether the clustering and local tracking are functioning well. We can say that they function to the extent that many local tracks are generated, and as shown in BRAHMS Analysis Note 3, the local tracks in T2 seem to point to the slat in H1 which one would expect. Also, as will be seen below, so–called "Global" tracks are found in the FFS, which one could interpret as a sign that the local tracking is functioning.

0.2.1 A Brief Aside...

So far the phrase 'so–called "Global" tracks' has been used twice. Why not just use Global tracks. The reason is that the 'so–called "Global" tracks' are actually just a collection of local tracks with the matching angle of these two tracks. Thus, when one projects the "global" track through space to, for example, the vertex, one is really only projecting a local track. This means that we are ignoring some information about the track which we could keep by calculating a "real" global track, *i.e.* the track which *best fits* all the local tracks which it contains. It is entirely possible that such a "real" track would not be any more accurate in practice, it must be the best way to go *in priciple*.

0.3 Results

The results are shown in the following figures. There are two sets of plots, one set obtained using the geometry output file from a `gbrahms` run with the FS set at 4 degrees. It is immediately obvious that something is wrong, as several of the peaks are not centered at zero, as one might expect. This can be seen most clearly in figure 1a, and 1c, the distributions of Δ X and Δ Y at the D2 matching plane. (Note that Δ X = BackTrack projected to midplane X - FrontTrack projected to midplane X, and simalarly for Y.) In addition, as can be seen in Figure 2 b, the matching angle difference is not centered about zero. The positive news can be seen in Figure 2 a, to wit: the difference between the slopes of the Front and Back tracks is centered around zero. This suggests, but does not *prove* that the drift velocities in the two TPCs are well described. The reconstructed momenta are shown in Figures 2 c and d. One notes from figure 3 b, that the projected y position of the vertex is not at zero. Recall, as stated above, that this tells us that the tracks in T1 point back to a point below 0. To try to get all of the above mentioned distributions to center on zero (which may not be correct!). One can attempt to tune the geometry file. This was done by moving the T1 detector center in the geometry file from $x = -55.047$, $y = 0.00$ to $x = -57.047$, $y = 2.00$. The results after the change are shown in figures 4-6.

0.4 To Do

As has been stated several times, This note is, in the BRAHMS tradition, a "quick and dirty" summary of what the author has done the last 3 days. Still, if you are the first to read this and email the author, you win the Weekly Carlsberg for Week 38!

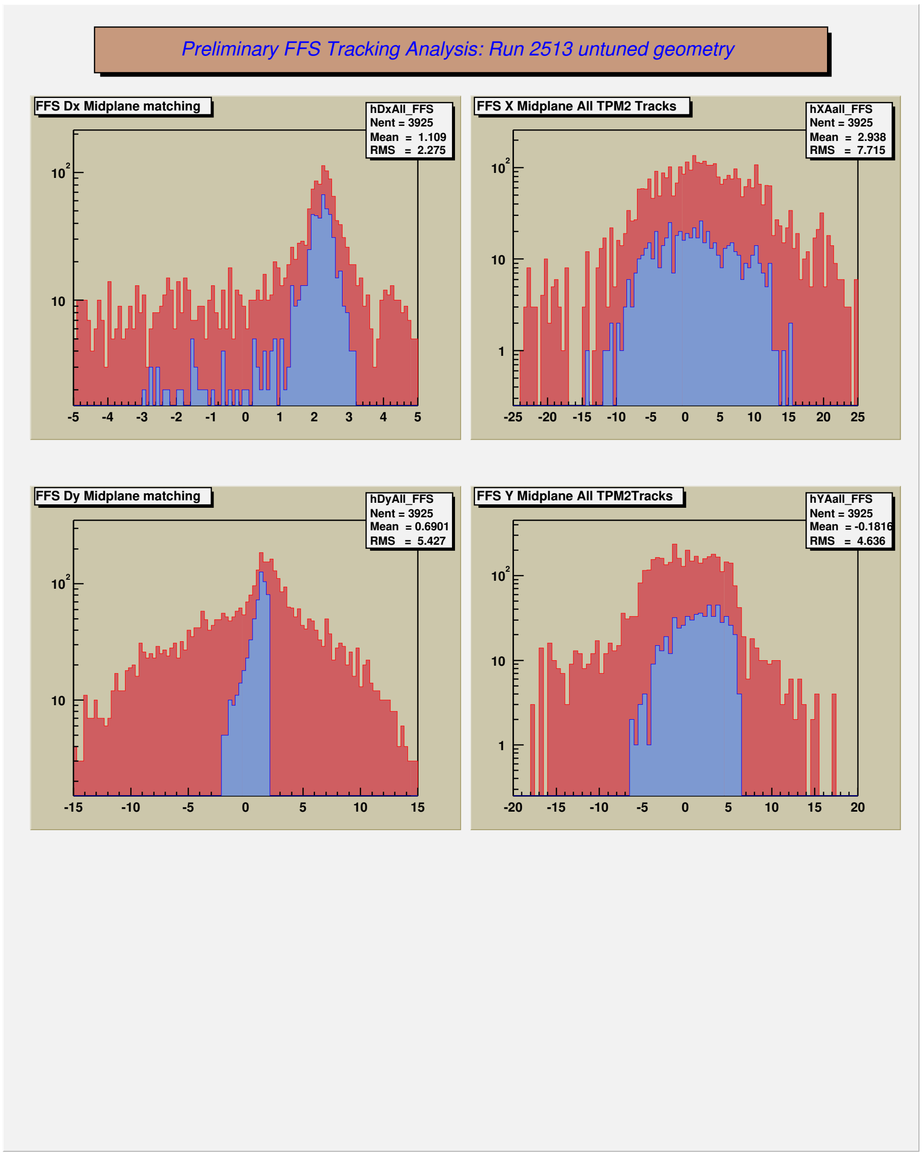
Among the most immediate tasks:

1. Investigate the Local Tracking for T1 and T2.
2. Compare the track projections to the correct vertex.
3. Match the "global" tracks to hit slats
4. Calculate track length from Vertex to hit slat
5. plot momentum vs β!

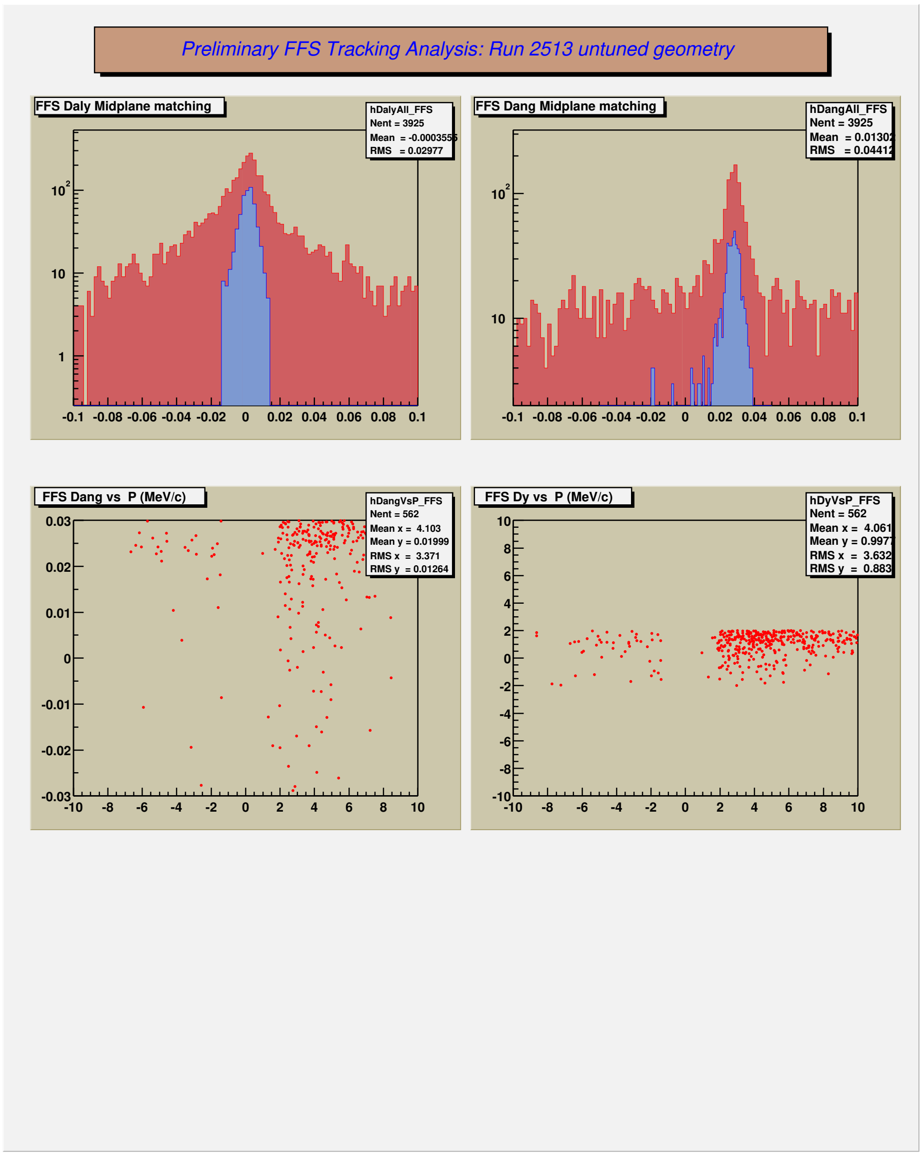
0.5 Finally...

Any questions regarding this document and the results herein should be directed to I.G. Bearden, bearden@nbi.dk. Any and all comments and suggestions are very welcome. I will respond to such comments via the listserver `brahms-l@bnl.gov` so that all may enjoy the wisdom of my reply. Also, this analysis was done using BRAT-1-10-0, with minor modifications to some of the histogram scales and some matching parameters. The analysis code is available upon request, but not yet put in to CVS.

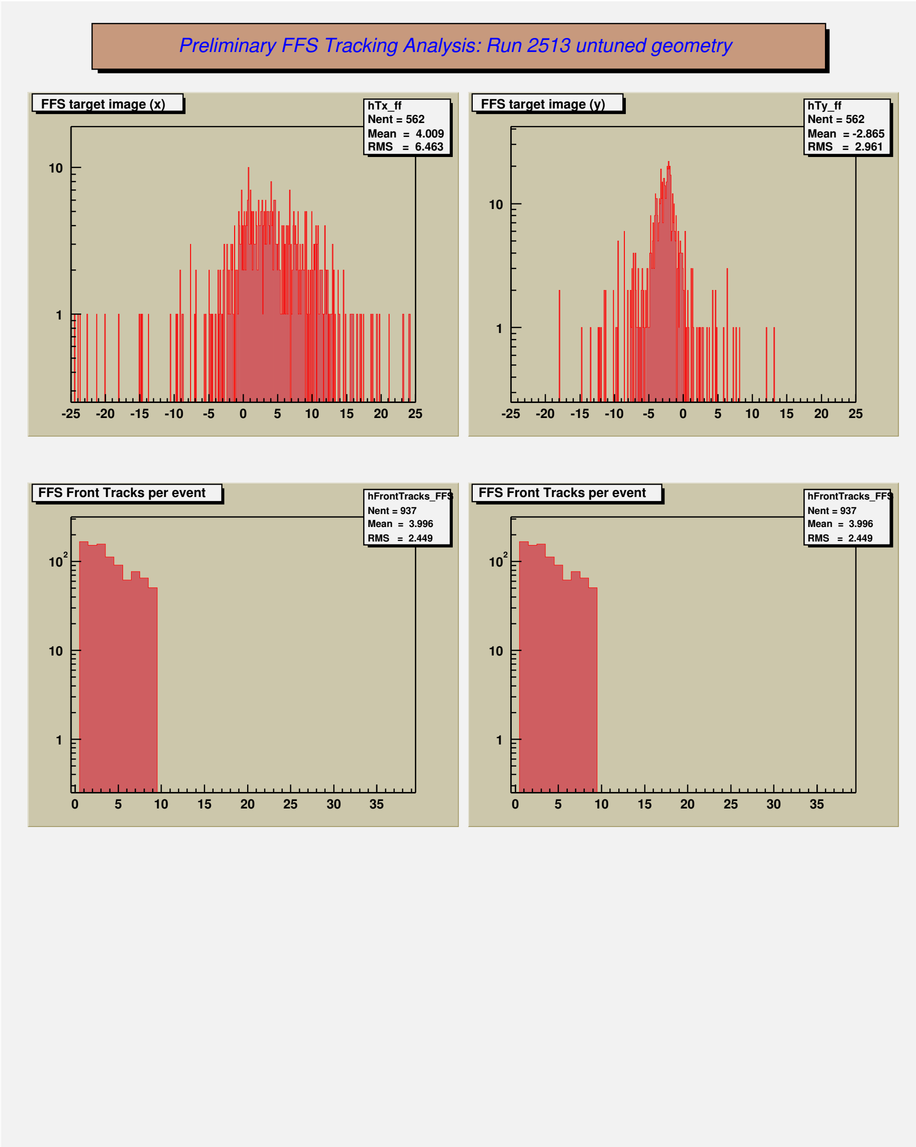
Much of the credit for the analysis should go to P. Christiansen who has been working on the clustering and local tracking and to D. Ouerdane who provided the skeleton of the analysis code used here. The author takes all responsibility for errors appearing in the document.



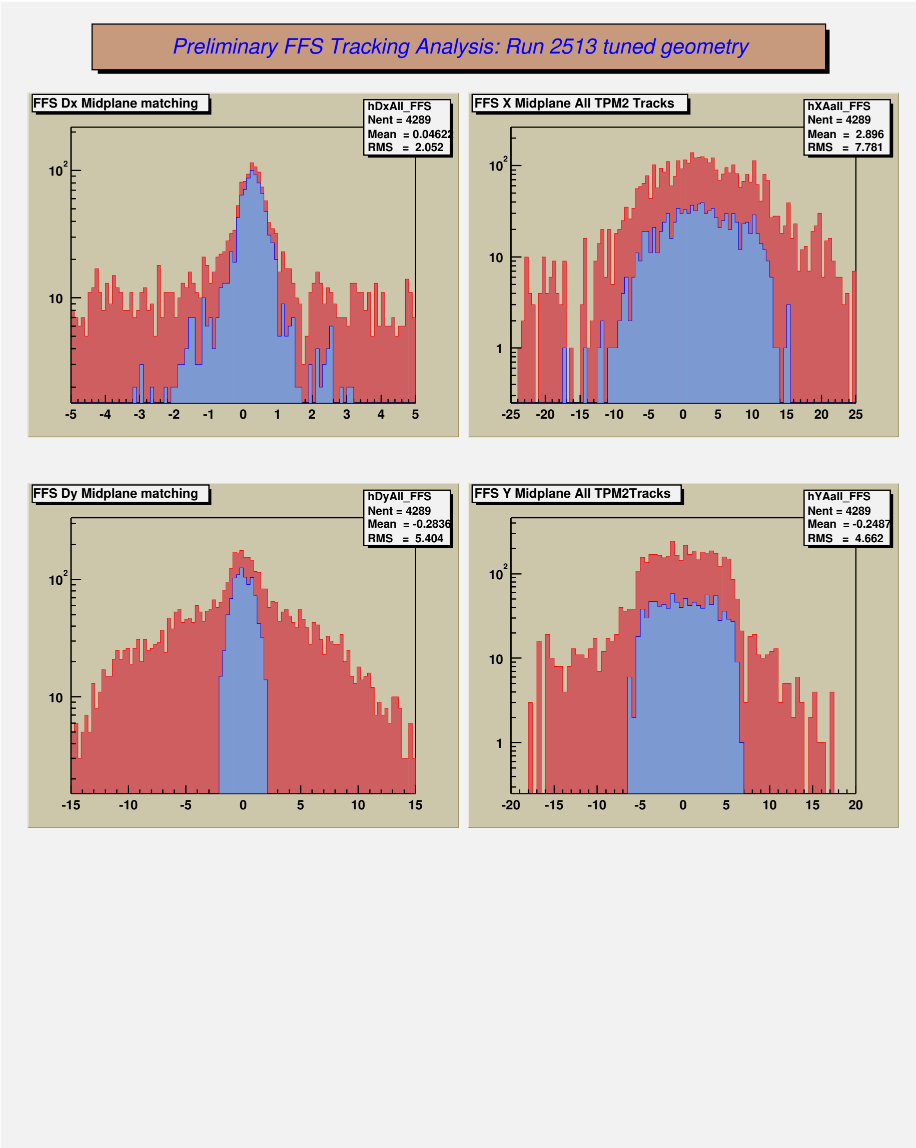
Figur 1: Distribution of all track candidates (red) and accepted FFS tracks (blue) for (clockwise from top left): D2 Midplane ΔX, D2 Midplane X distribution of BackTracks *i.e.* T2 tracks, D2 Midplane Δ Y, and D2 Midplane Y distribution of BackTracks.



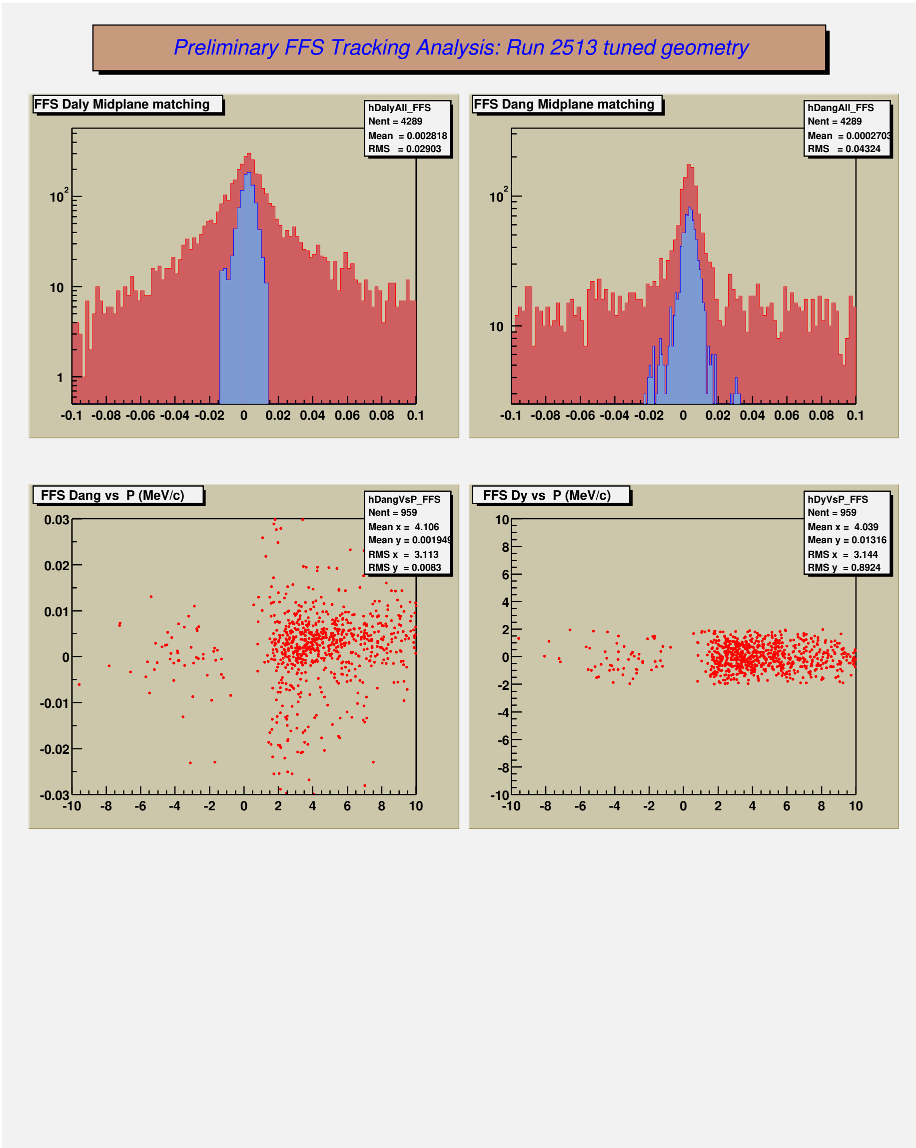
Figur 2: Distribution of all track candidates (red) and accepted FFS tracks (blue) for (clockwise from top left): D2 Midplane Δ matching angle, and matching angle. The two bottom plots show the reconstructed momentum vs Δ angle and Δ Y.



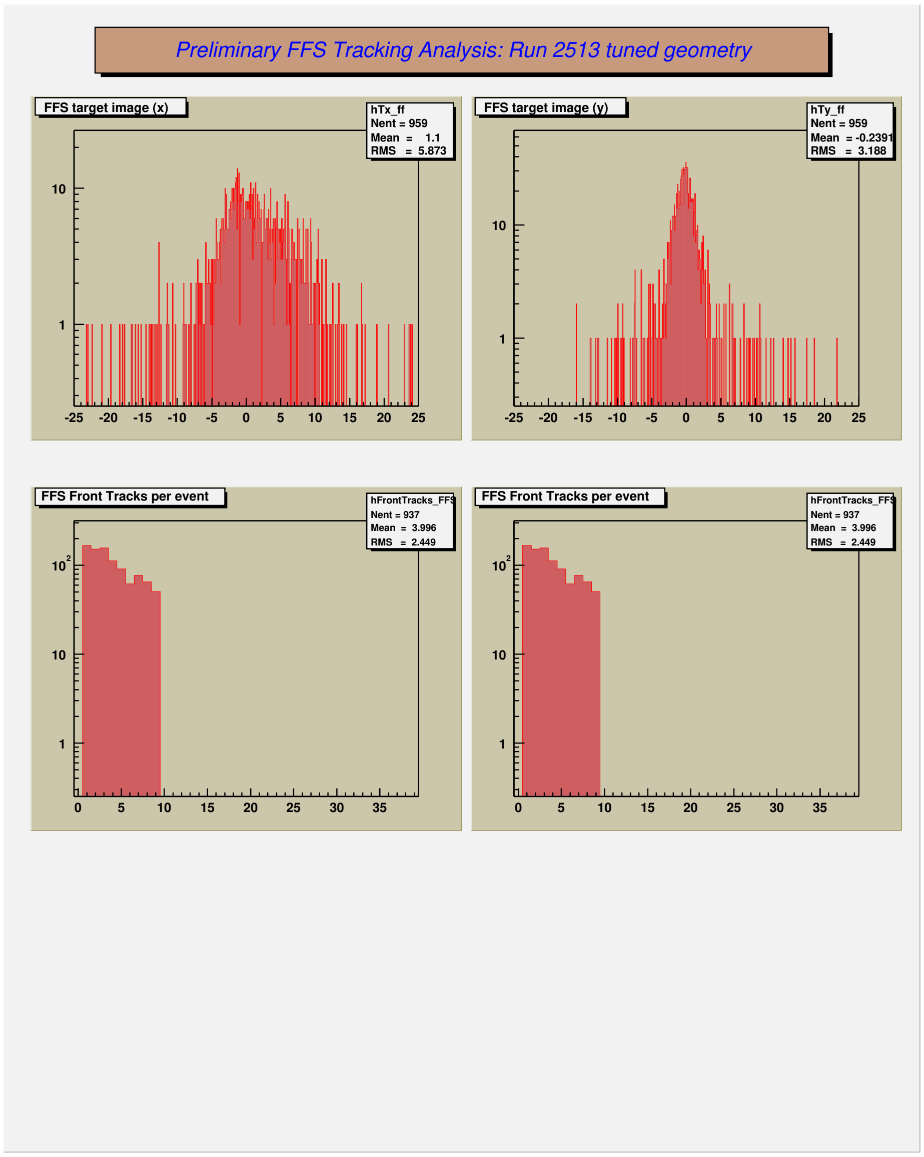
Figur 3: Tracks projected back to `WrongVertex`, *i.e.* the plane perpendicular to the beam directions containg $z = 0$. The top left is the x distribution which is broad due to the fact that the vertex is not contstant. The top right is the y distribution which is centered at $\approx 2.0cm$ (nb: the mean of the distribution is shown, but a gaussian fit gives -2cm for the mean.)



Figur 4: Distribution of all track candidates (red) and accepted FFS tracks (blue) for (clockwise from top left): D2 Midplane ΔX, D2 Midplane X distribution of BackTracks *i.e.* T2 tracks, D2 Midplane Δ Y, and D2 Midplane Y distribution of BackTracks. Plots produced using “tuned” geo file (see text).



Figur 5: Distribution of all track candidates (red) and accepted FFS tracks (blue) for (clockwise from top left): D2 Midplane Δ matching angle, and matching angle. The two bottom plots show the reconstructed momentum vs Δ angle and Δ Y. Plots produced using "tuned" geo file (see text).



Figur 6: Tracks projected back to `WrongVertex`, *i.e.* the plane perpendicular to the beam directions containg $z = 0$. The top left is the x distribution which is broad due to the fact that the vertex is not contstant. The top right is the y distribution which is centered at $\approx 2.0cm$ (nb: the mean of the distribution is shown, but a gaussian fit gives $-2cm$ for the mean.) Plots produced using "tuned" geo file (see text).