GSI, March 6th 2012

Status of the Pattern Recognition Code in the Central Tracker and Future Develpments

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Outlook

The inclusion of the SciTil hits in the Pattern Recognition;

Todo list and future prospectives;

Inclusion of the SciTil hits in the Pattern Recognition

To the Pattern Recognition it is enough for the moment just to start from the hits. These signals are supposed to be very fast (< 100 psec).
If one takes into account also the different length of the tracks coming from the interaction vertex, the spread in time of the SciTil signals with respect to the time of the production of the event at the origin is of the order of 1 nsec (see K. Goetzen studies on this).
So the SciTil signals are essentially pile-up free.

The Pattern Recognition has been modified, by starting the tracklet search from the SciTil hits and then connecting them with with Stt hits. I expect to save a lot of Cputime with this method especially when the 'Background' is turned on.

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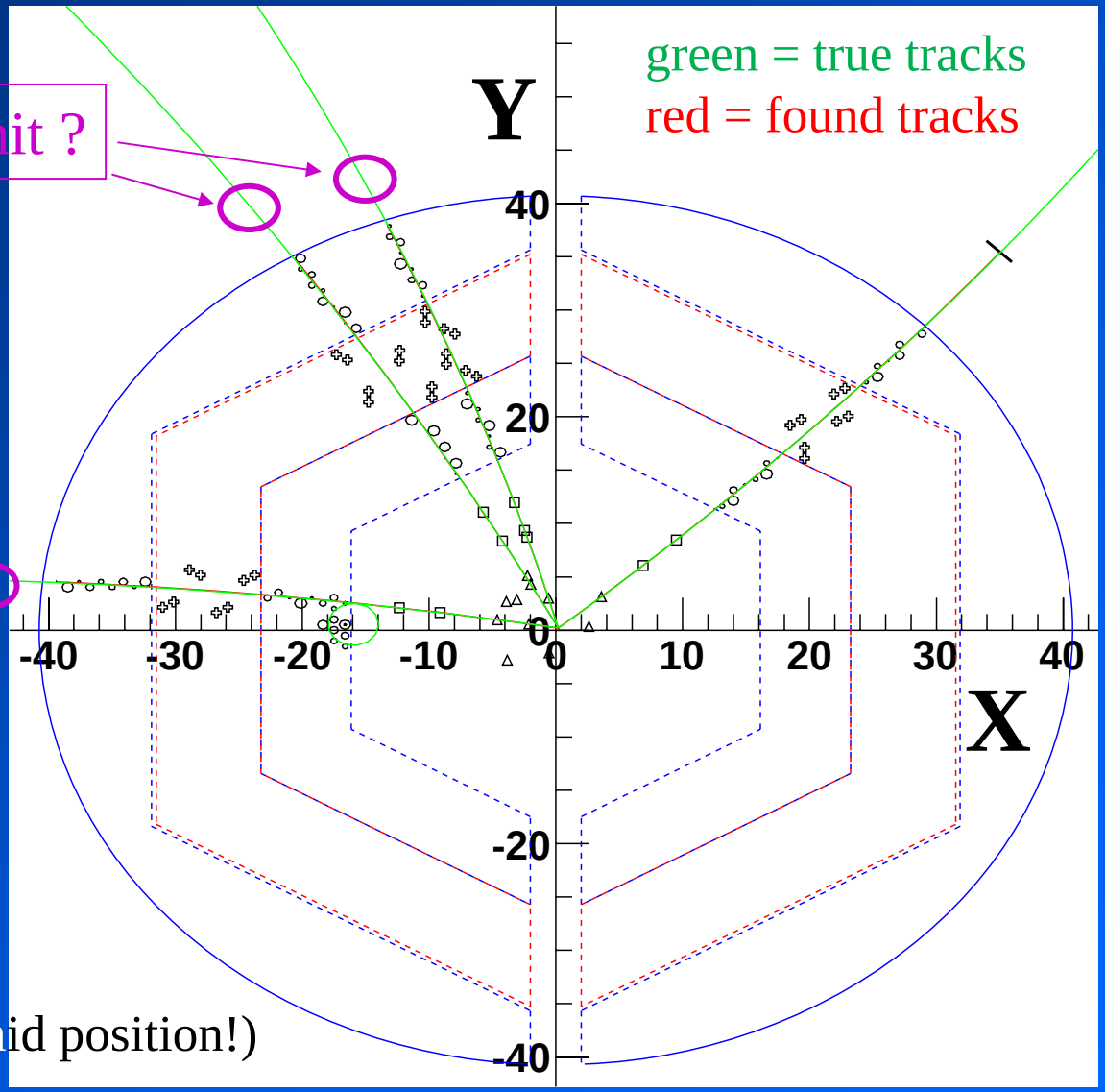
Problem in the simulation : missing hits

where is the hit ?

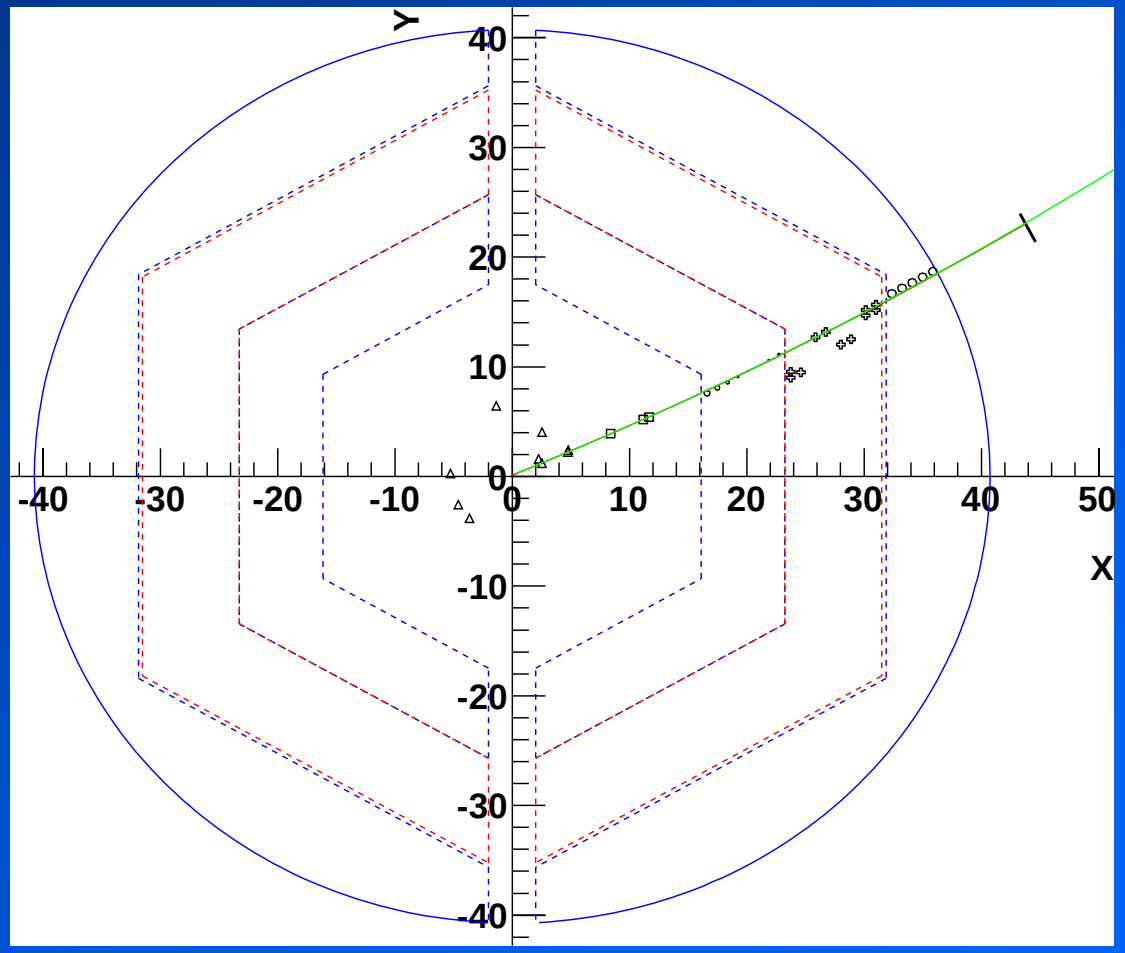


Mvd Pixel
Mvd Strip
Stt Parallel
Stt Skew, (mid position!)
SciTil

So at this meeting I could not present efficiency tables,
Cptime comparison etc. even though the algorithm is almost 100% ready.

I the following, results will be presented for 1 particle of 2 GeV/c or for 1 particle of 0.3 GeV/c transverse momentum

2 GeV/c total momentum, 1 track, XY view, no DPM bkg added.



Mvd Pixel
Mvd Strip
Stt Parallel
Stt Skew, (mid position!)
SciTil

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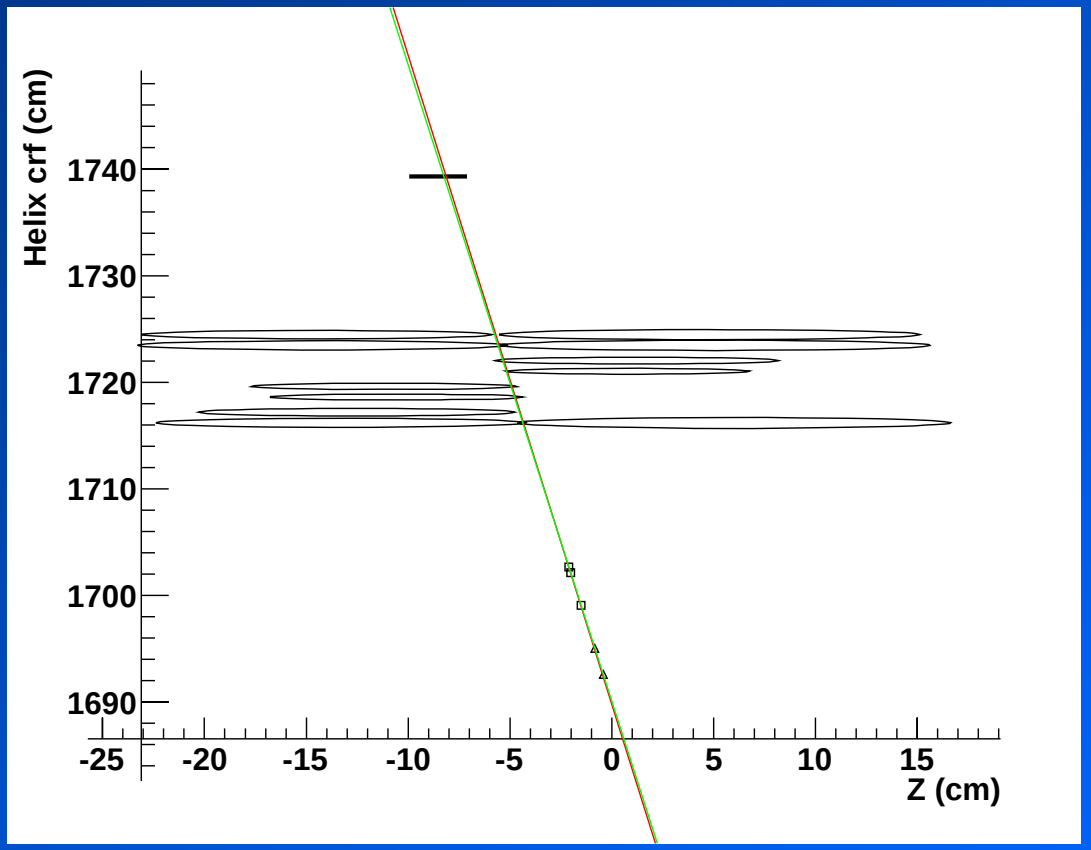
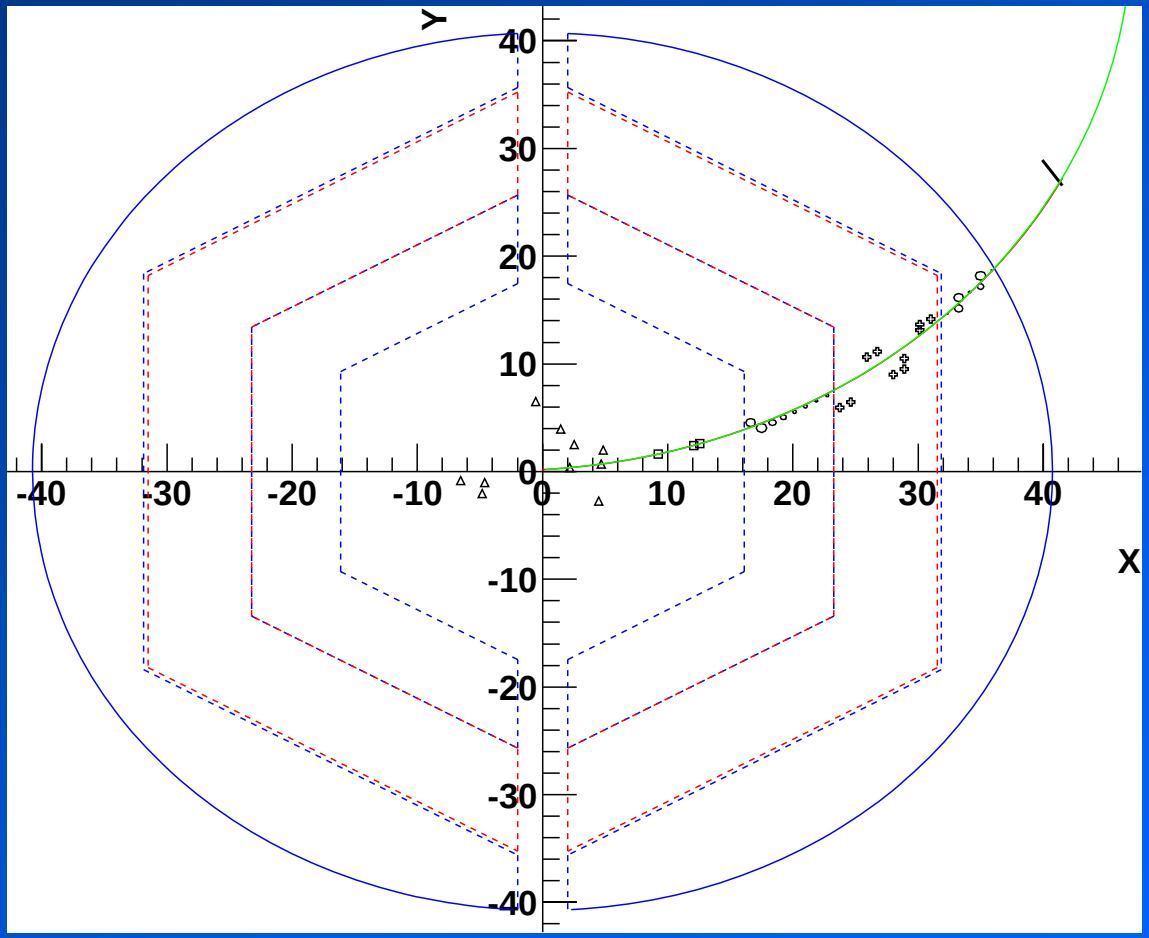
2 GeV/c total momentum , 1 track, SZ view, no DPM bkg added



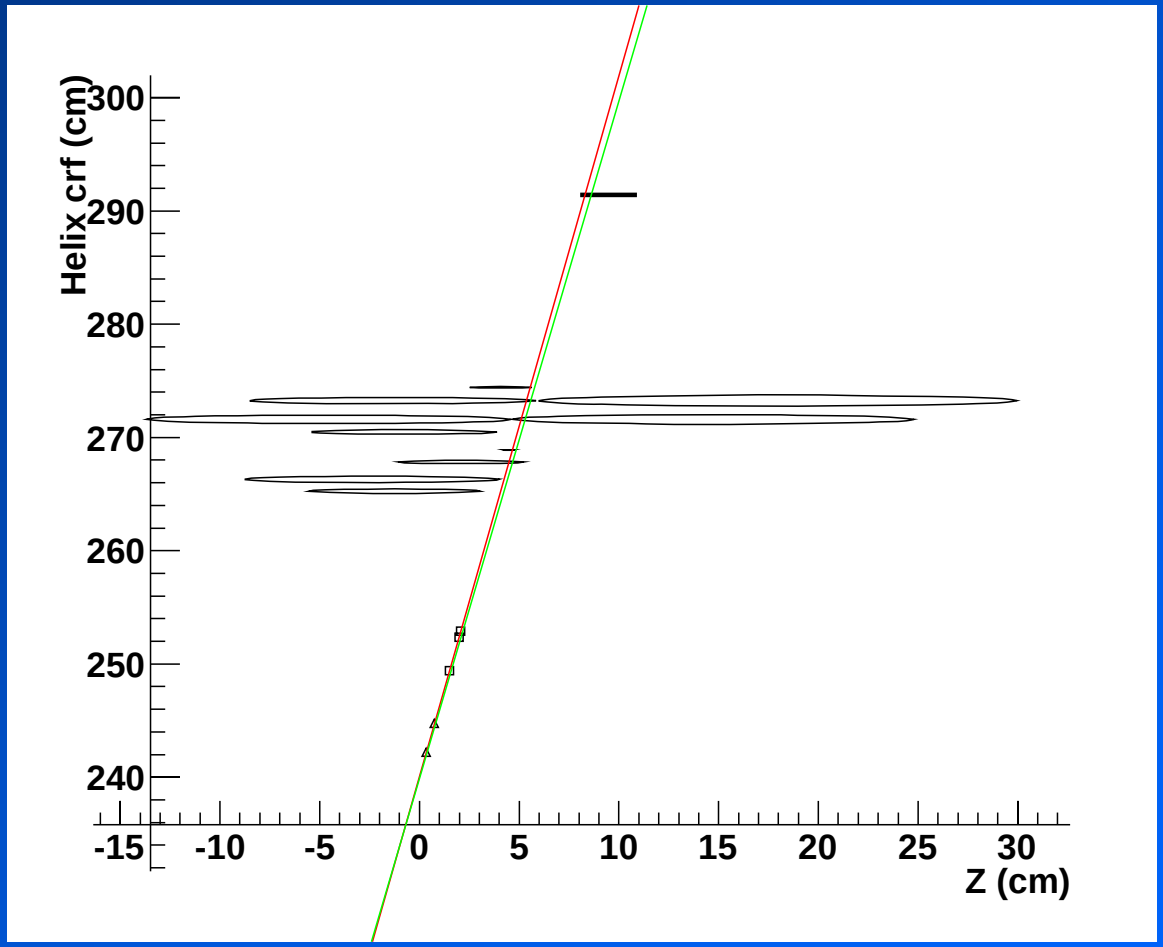
Mvd Pixel
Mvd Strip
Stt Parallel
Stt Skew, (mid position!)
SciTil

Low $P_{\perp}$ particles : 0.3 GeV/c transverse momentum , 1 track, XY view, no DPM bkg added



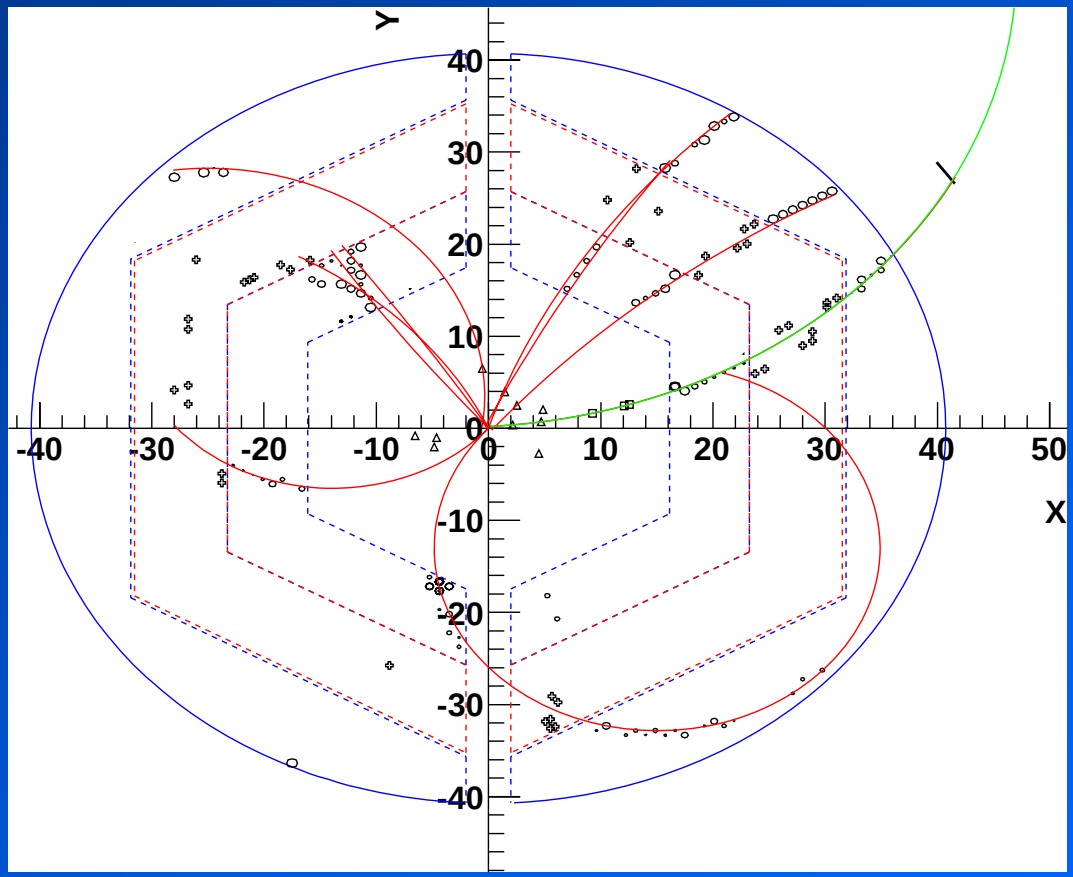
Mvd Pixel
Mvd Strip
Stt Parallel
SciTil

Low $P_{\perp}$ particles : 0.3 GeV/c transverse momentum, 1 particle,
SZ view, no DPM bkg



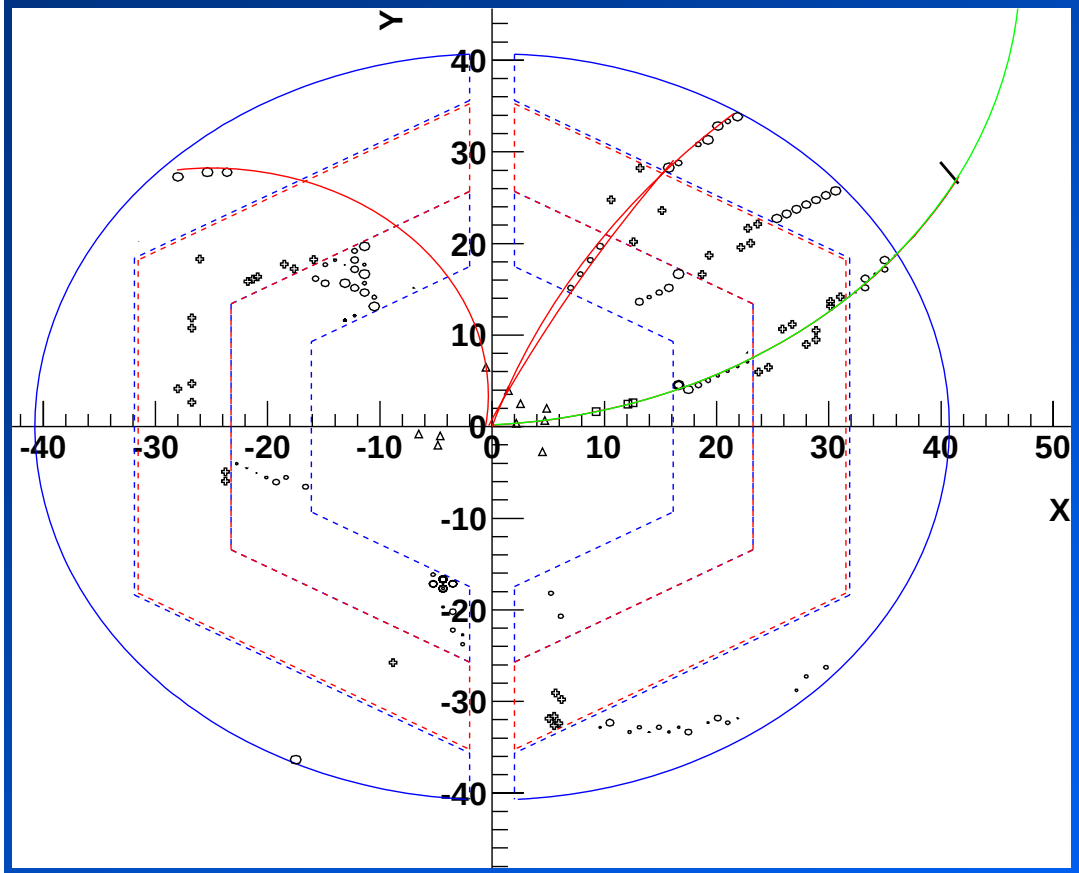
Mvd Pixel
Mvd Strip
Stt Parallel
SciTil

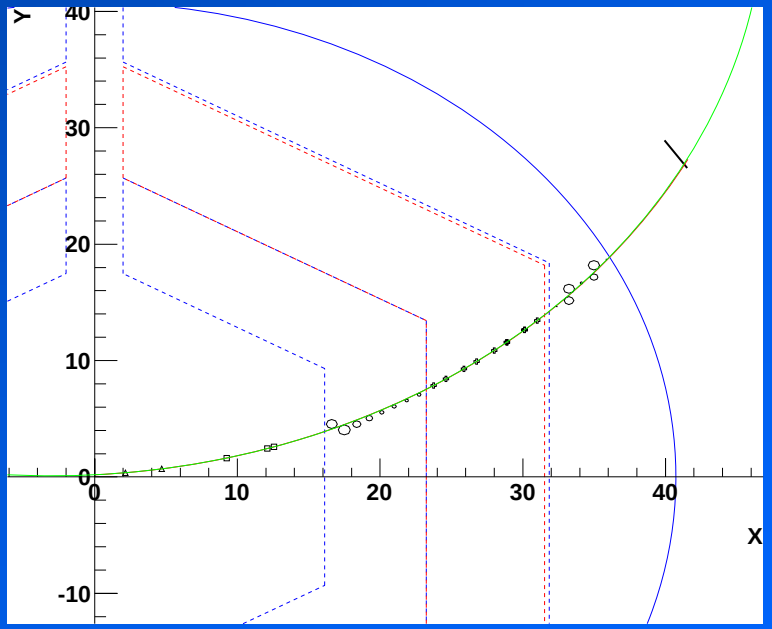
Low $P_{\perp}$ particles : 0.3 GeV/c transverse momentum, XY view, DPM bkg added, XYview, no Cleanup



Mvd Pixel
Mvd Strip
Stt Parallel
SciTil

Low $P_{\perp}$ particles : 0.3 GeV/c transverse momentum, XY view, DPM bkg added, partial (only Mvd) Cleanup





Mvd Pixel
Mvd Strip
Stt Parallel
SciTil

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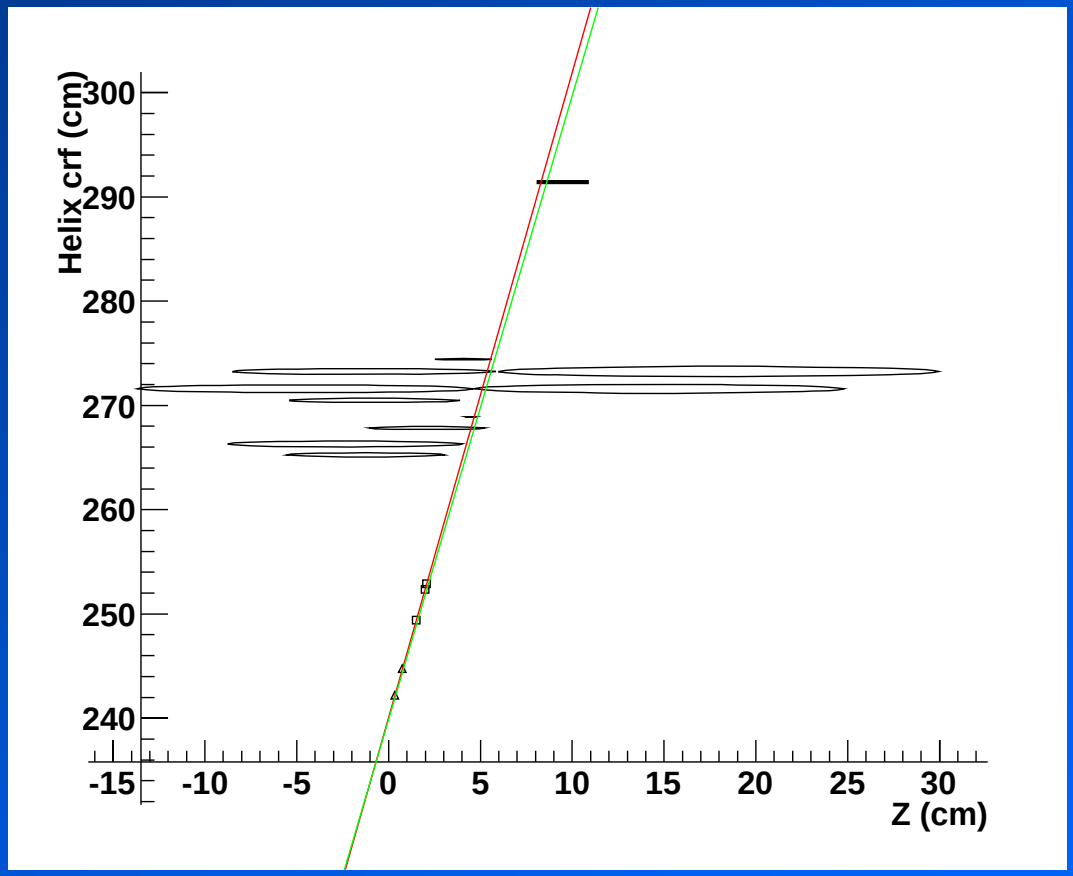
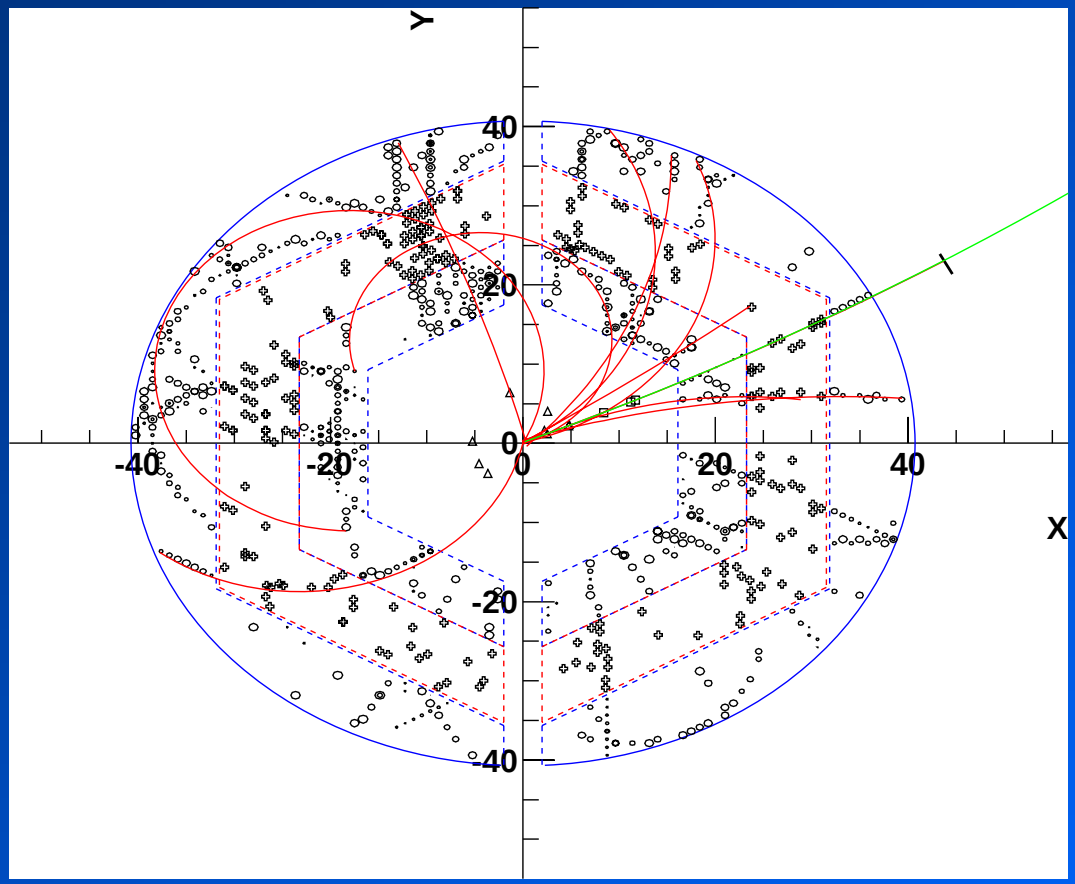
Low $P_{\perp}$ particles : 0.3 GeV/c transverse momentum, DPM bkg added, partial (only Mvd) Cleanup

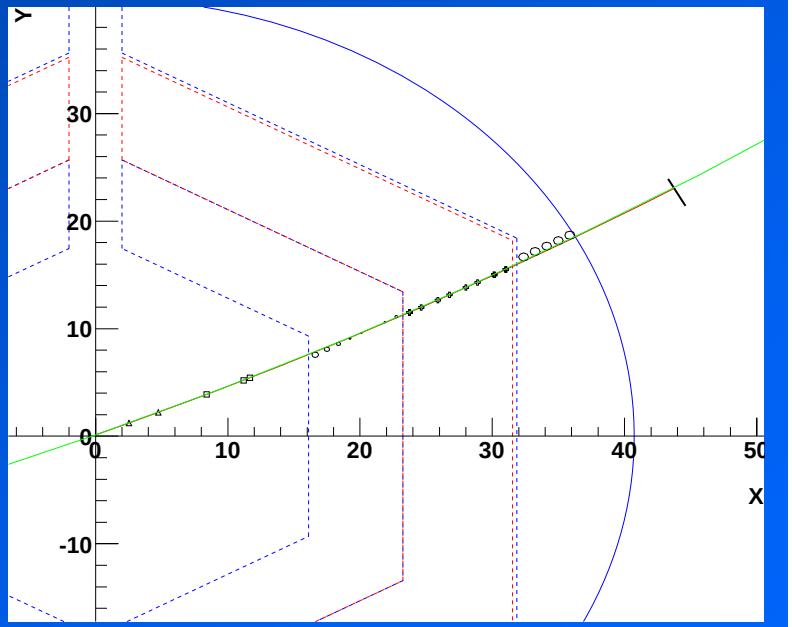


Mvd Pixel
Mvd Strip
Stt Parallel

SciTil

2 GeV/c total momentum, XY view, DPM bkg added, partial (only Mvd) Cleanup





Mvd Pixel
Mvd Strip
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SciTil

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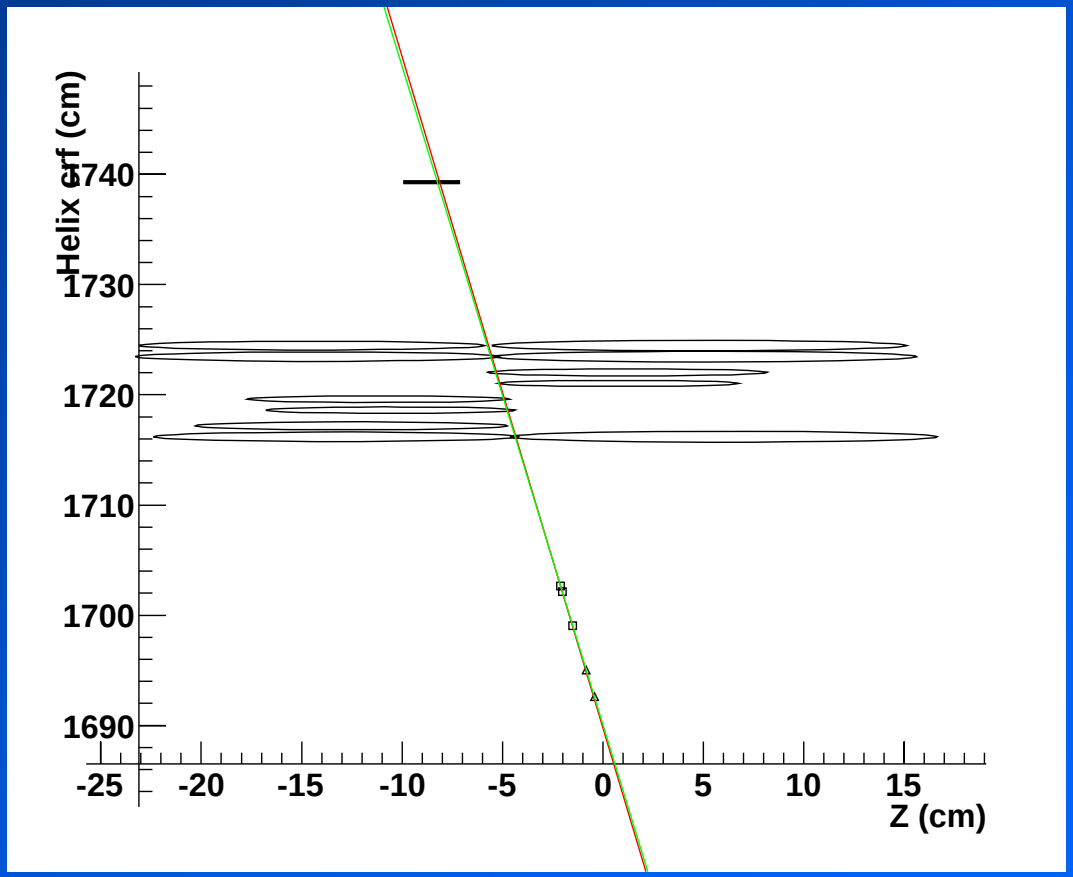
2 GeV/c total momentum, DPM bkg added, partial (only Mvd) Cleanup



Mvd Pixel
Mvd Strip
Stt Parallel
SciTil

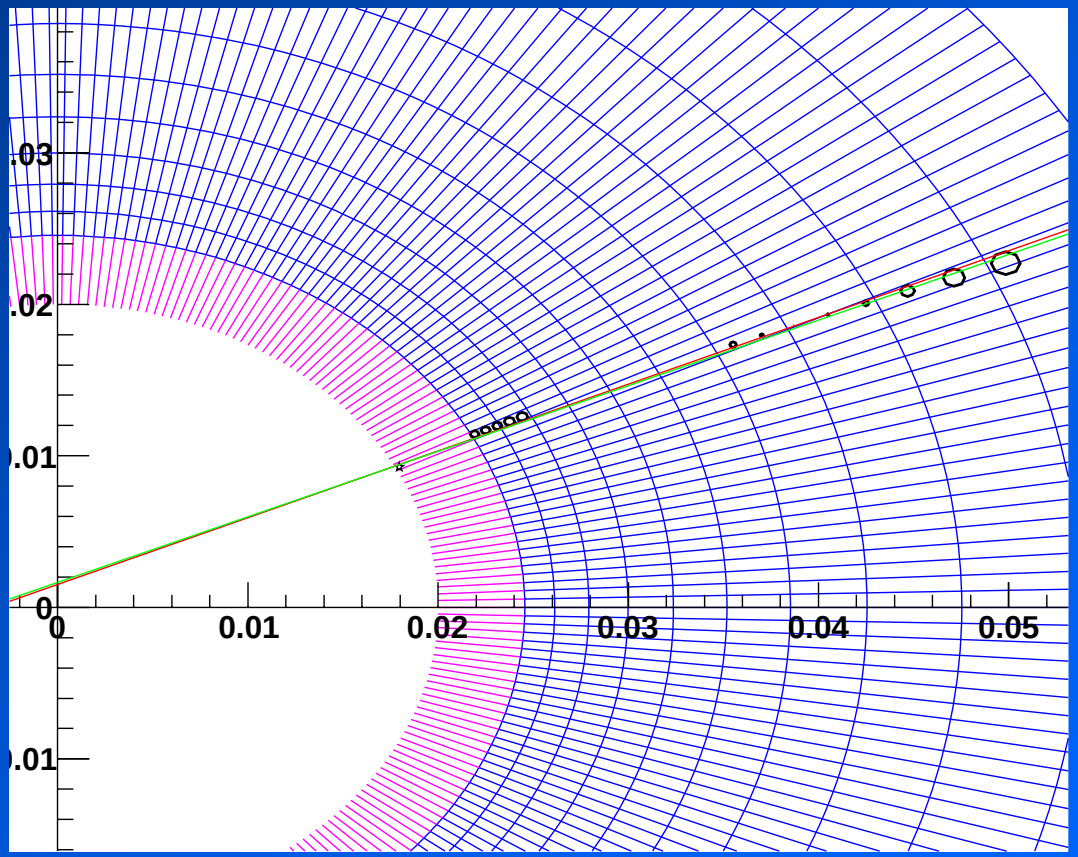
The flow chart of the Pattern Recogntion of the central tracker today, There are some ‘historical’ redundancies that will be eliminated.

1) Loop oer the SciTil Hits in XY, find tracklets in the Stt region ;
2) Loop over non-associated Stt Hits in XY, find tracklets in the Stt region + find confirmation in the SciTil region [this step will be eliminated, necessary now for low momenta tracks];

High $P_{\perp}$ particle trajectory in conformal space :

$U = X / (X^2 + Y^2)$ $V = Y / (X^2 + Y^2)$

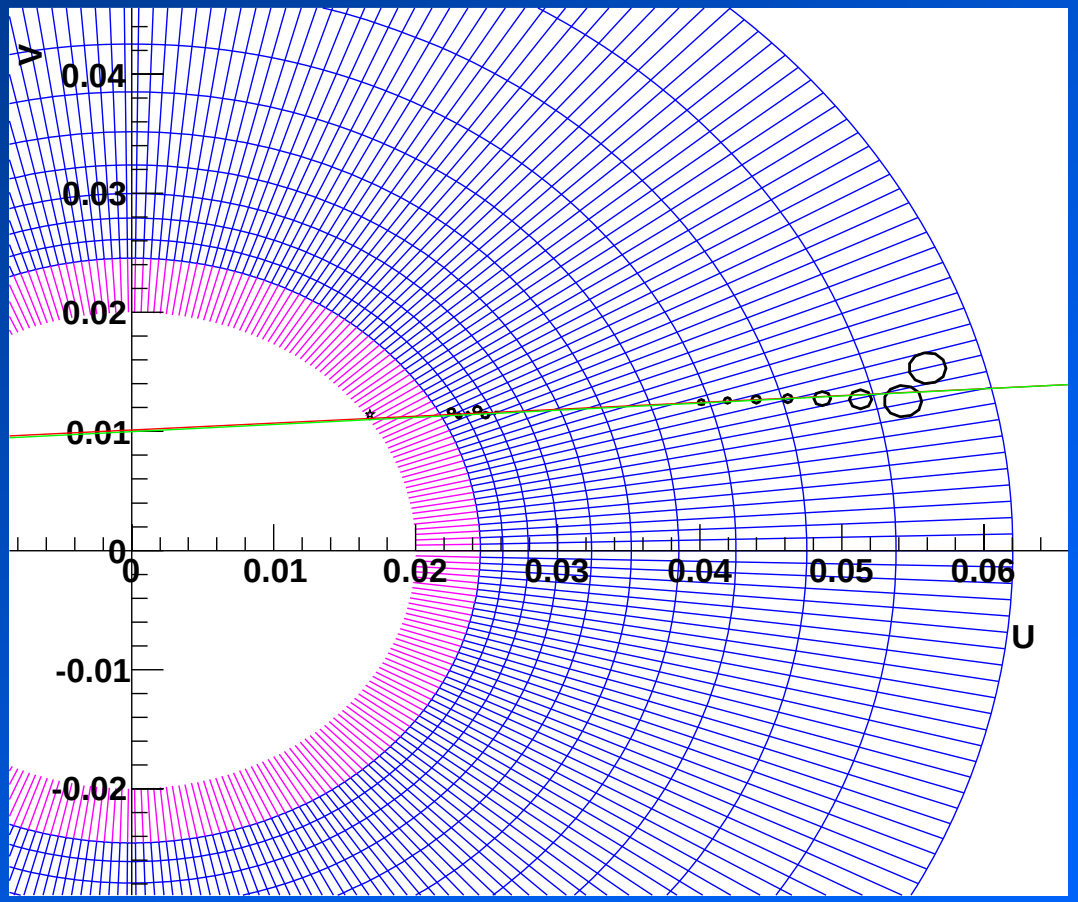
V



U

Low $P_{\perp}$ particle (0.3 GeV/c) trajectory in conformal space :

$U = X / (X^2 + Y^2)$ $V = Y / (X^2 + Y^2)$



The flow chart of the Pattern Recogntion of the central tracker today, There are some ‘historical’ redundancies that will be eliminated.

1) Loop over the SciTil Hits in XY, find tracklets in the Stt region ;

2) loop over non-associated Stt Hits in XY, find tracklets in the Stt region + find confirmation in the SciTil region [this step will be eliminated, necessary now for low momenta tracks];

3) fit of the radius and center in XY of the Helix;

4) loop over found track candidates and associate skew Stt hits and fit the remeining two parameters of the Helix [this step will be eliminated];

5) loop over found track candidates and associate the Mvd hits; fit of the radius and center of Helix again;

6) loop over found track candidates and associate the the skew Stt hits and fit the remeining two parameters of the Helix;

7) do the cleanup procedure.

The flow chart of the Pattern Recogntion of the central tracker that I will try in the future.

1) One loop for the ‘high’ $P_{\perp}$ (> 0.15 GeV/c) tracks :

   a) loop over the SciTil Hits in XY, find tracklets in the Stt region ;

   b) associate Mvd hits to this tracklet;

   c) fit of the radius and center in XY of the Helix;

   d) associate skew Stt hits and using also Mvd hits and SciTil hits fit the remaining two parameters of the Helix ;

2) Eliminate the hits successfully associated to a track and then do the loop for ‘low’ momenta tracks (< 0.15 GeV/c) starting from the Mvd candidates (if convenient, to be studied) and looking for confirmation in the Stt sytem. Form the tracklets and perform the fit as before;

3) do the cleanup procedure.

Future prospective of the Pattern Recognition;

The V^0 Pattern Recognition; this project is momentarily stopped since Lia will have her contract renewed in a couple of months.

Improvement of the cleanup code with the use of a precise geometry and the use of the SciTil hits in it. From thelatter I expect a big improvement both for the speed and for the efficiency.