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Status and Future Develpments in the Stt tracking code

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Current issues

the V^0 Pattern Recognition;

the problem of the drop in efficiency between the July11 code release and the August 11 release : the solution;

the inclusion of the SciTil hits in the Pattern Recognition;

the improvement of the Cleanup code;

the status of the Online PR.

The V^0 Pattern Recognition;

Continuous progres is being made in the development of the code;
see Lia's presentation on Tuesday for details.

The problem of the drop in efficiency between the July11 code release and the August 11 release

This problem showed up typically in the $\eta_c \rightarrow \phi\,\phi \rightarrow K^+K^-K^+K^-$ at the beginning of August;
in the final η_c mass plot there was a drop (typically -40%)
in the number of events when using the latest (at that time) revision (August11) of

PndSttMvdTracking.cxx

(which is the Stt+Mvd Pattern recogntion task).
Since the time pressure was very high, we simply decided to go back to the older version (July11) and postpone the investigation of the issue.

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This problem is caused in almost the totality of the cases (97 %) by a ‘looser’ association criterion of Mvd hits to the Track found by the Pattern Recognition [in the August 11 release].

In this way typically only 1 spurious Mvd hit is added to the track. ‘Spurious’ here means a Mvd hit belonging to a different track according to MC truth (92 %of the cases) OR an electronic noise hit (8% of the cases).

This extra Mvd hit occurs most of the time as the first hit in the track (80 % of the cases).

The Kalman fit result for such tracks with an extra spurious hit is different, the event fails the analysis cuts.

Of course, the Kalman filter is very sensitive to the Mvd hits since they have very small errors (order of 5-12 μm).

The solution for now is to use the more stringent association criterion as in July11 release. This has been put in trunk version since a few weeks.

As a long range solution I would like to try the Deterministic Annealing mechanism which is present in the Genfit Kalman filter even if it is not the default. This mechanism allows the exclusion of hits from the fit when they are ‘too far away’ from the extrapolatd position of the track.

Stefano has already tried that recently, preliminary results don’t seem to be ecouraging. However I would like to insist a bit on this idea with the help of our Munich colleagues.

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Inclusion of the SciTil hits in the Pattern Recognition

Alicia has recently finished to include the SciTil scintillator in the Pandaroot geometry. Presently the hits are available, I think she wants to add a detailed simulation of the pulse shape of the signals of the Apd's.

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.

Therefore I want to modify the Pattern Recognition 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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The improvement of the Cleanup code

This code was added aroung last May and it is designed to eliminate spurious tracks produced by the PR especially when the 'background' DPM events are turned on. See for instance my 21 June 2011 presentation to the Referees.

The ‘cleanup’ code

from 21 June 2011 presentation

The addition of the background demanded that a ‘Cleanup’ code had to be written because of the spurious tracks generated.

The elimination of the spurious tacks is based on a simple (to say) principle : require the continuity of the hits (both Stt and Mvd) along the track.

The code calculates the pieces of track where the hits should be because the track is in the Mvd region or in the Stt region.

If > 1 Stt hits are missing discard the track;

If no Mvd hits are present at all when at least one should be, discard the track.

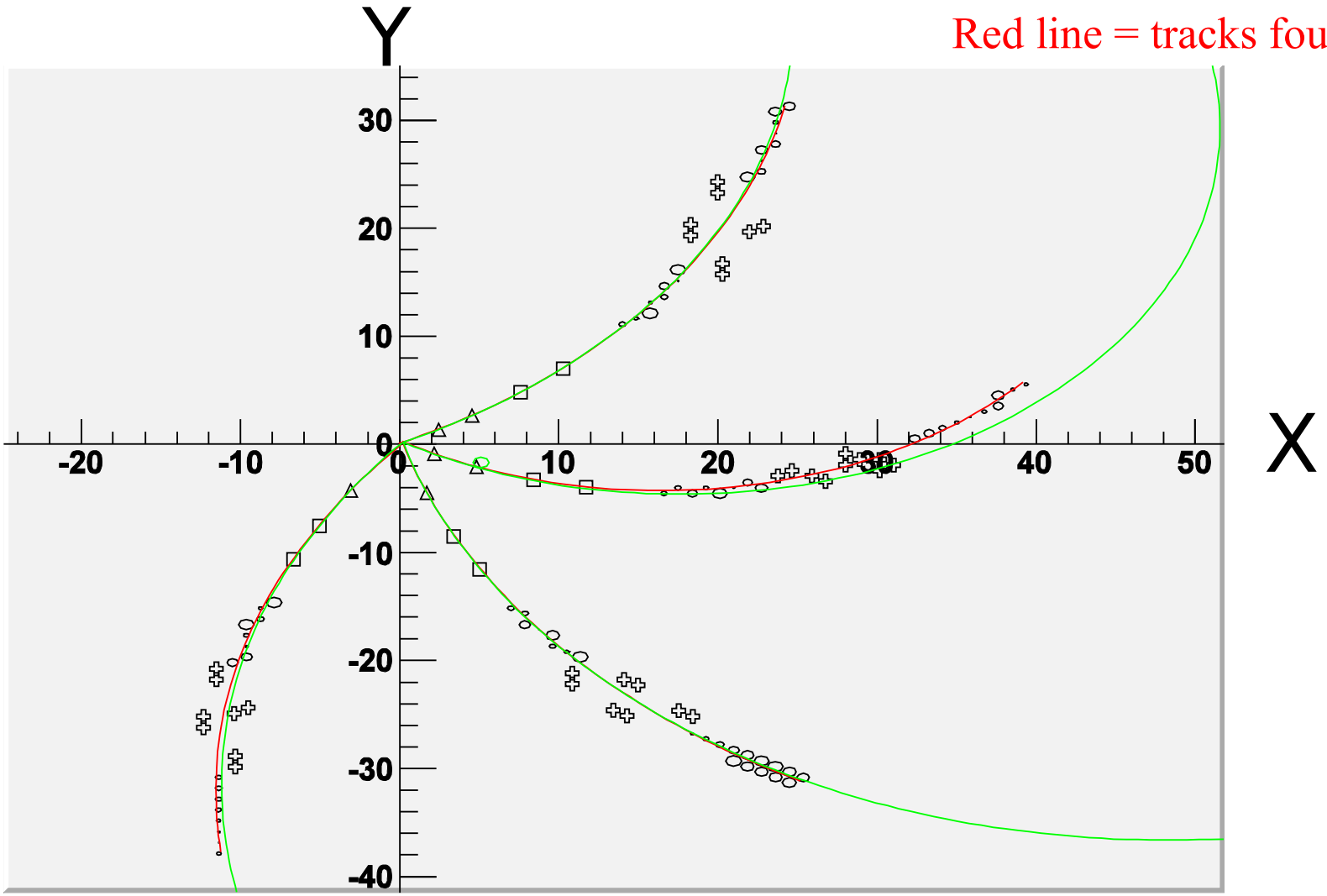
The ‘cleanup’ code

from 21 June 2011 presentation

An event without background

Green line = MC truth

Red line = tracks found by PR



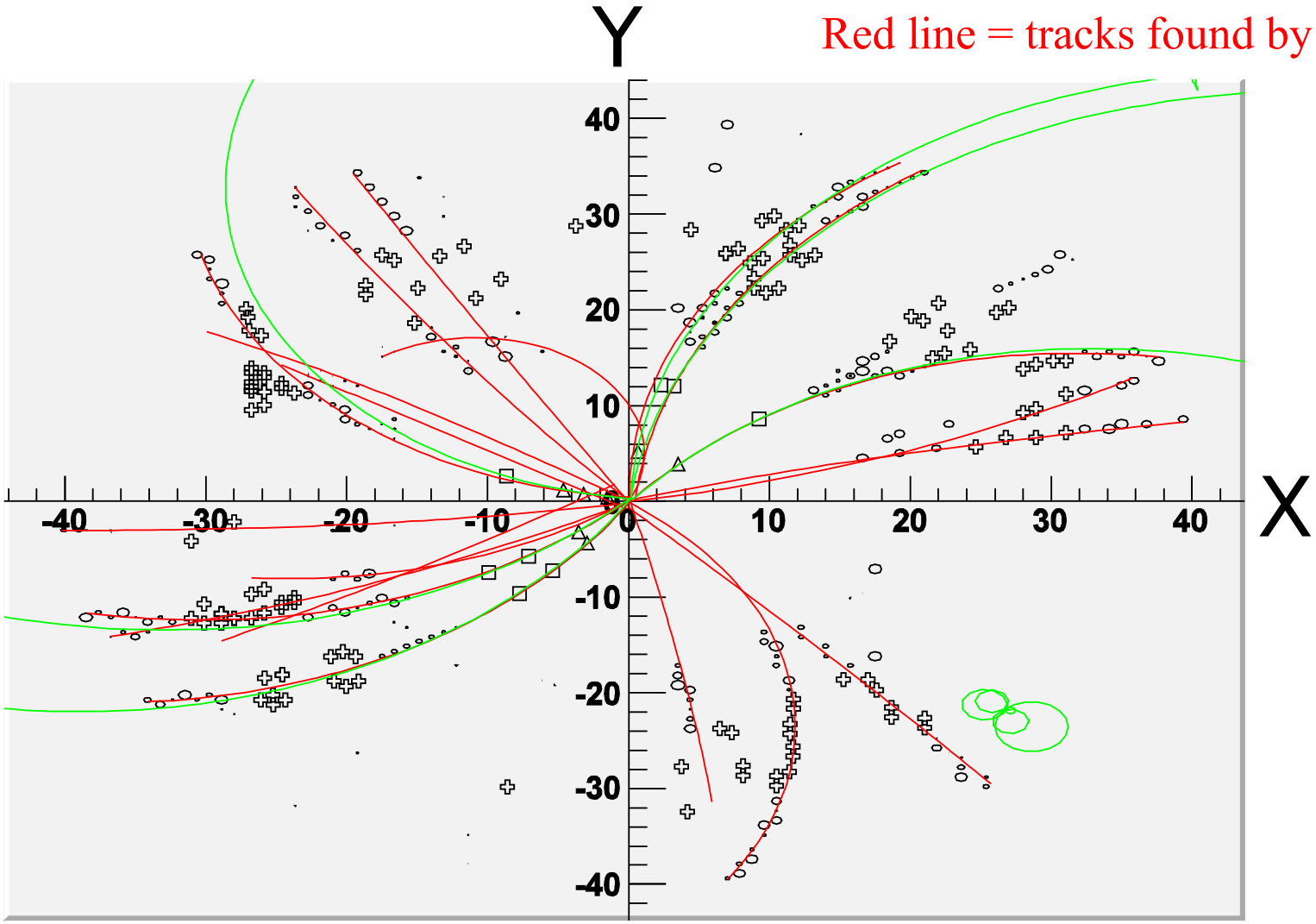
The ‘cleanup’ code

from 21 June 2011 presentation

An event with background added

Green line = MC truth

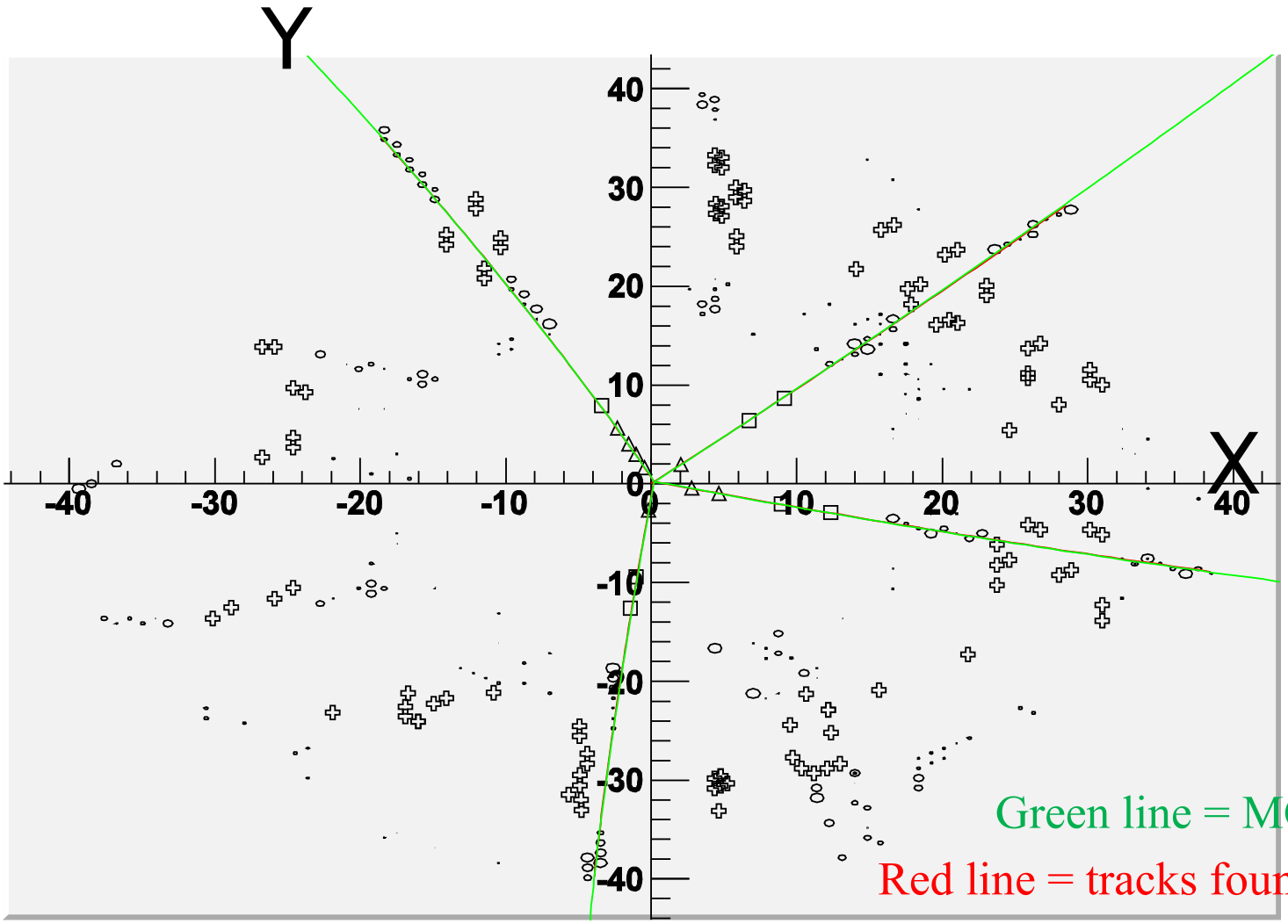
Red line = tracks found by PR



The ‘cleanup’ code

from 21 June 2011 presentation

An event with background added AND the Cleanup done



The improvement of the Cleanup code

This code hasn't been modified since last August, essentially for lack of time. Presently it tends to overkill a track, resulting in a loss of efficiency for true tracks.

My estimate for 'box generated' tracks and different topologies (1, 5, 10 tracks at different momenta) showed efficiencies at the 90% level while keeping the ghost tracks at few percent level.

Some good tracks are discarded just because the position of each Stt wire is not taken into account precisely enough with respect to the trajectory found by the PR.
Here a good amount of patience and time are necessary to complete the task and I am planning to do it after the SciTil business.

The status of the Online PR

The Giessen group is working at the implementation of the PR online using FPGA and parallelization; for info on the present status see Tuesday's talk by Yiutie Liang.