Subject: [FIXED] Ideal Tracking Bugs(?) when using FairLinks
Posted by André Zambanini on Tue, 12 May 2015 14:38:54 GMT
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Hello everyone,

for my analysis I had a closer look at some events in the eventDisplay and found some strange behavior of the ideal track finding. Basically, I found two problems and my guess is, they are independent of each other, but I'm not sure.

General Information
First, some information beforehand.
FairSoft: mar15
FairRoot: master (fb738d60 from 26.03.2015)
PandaRoot: r27581

I'm simulating events with EvtGen (momentum 4.07 GeV/c) using the decay chain: pbar p -> Xi+ Xi(1690)- -> Lambdabar pi+ Lambda K- and the lambdas decaying to pi p. The main message from the decay for you is that I have a lot of displaced vertices with distances of several centimeters to the IP.

For the reconstruction I'm using ideal track finding, both with the old track finder (PndSttMvdGemTrackingIdeal) and the new one (PndMCIdealTrackFinderNewLinks). The simulation chain uses FairLinks (fRun->SetUseFairLinks(kTRUE).

Wrongly Assigned GEM Hits
The first thing Tobias and me noticed were wrongly assigned GEM hits. From what I understood from Tobias and Stefano, this is a known issue. To illustrate this a bit, see these screenshots here:

Both, the old and the new track finder seem to assign GEM hits which don't belong to the track. The white dots indicate the MC points associated with the selected track - which works fine for MVD (blue squares) and STT (purple) hits, but seems to be off for GEM (red) hits.

Along with this comes wrong track information, as you can see with the red and blue circles, which indicate the first and last track parameters, respectively.

Tobias and me had a closer look at the new track finder and found out, that the spurious hit assignment happens when more than one MC point belong to a hit. The quick fix introduced by us is to simply ignore those hits. This came to the PndMCMatchNewLinks class with r27667 in the trunk.

My conclusion here is, that for now this is okay but maybe someone should have a detailed look at this.

Track Reconstruction with Kalman Task
After resolving the spurious GEM hits, the reconstructed track parameters still looked quite odd. I did some comparison and found out, that in a few cases the Kalman task messes things

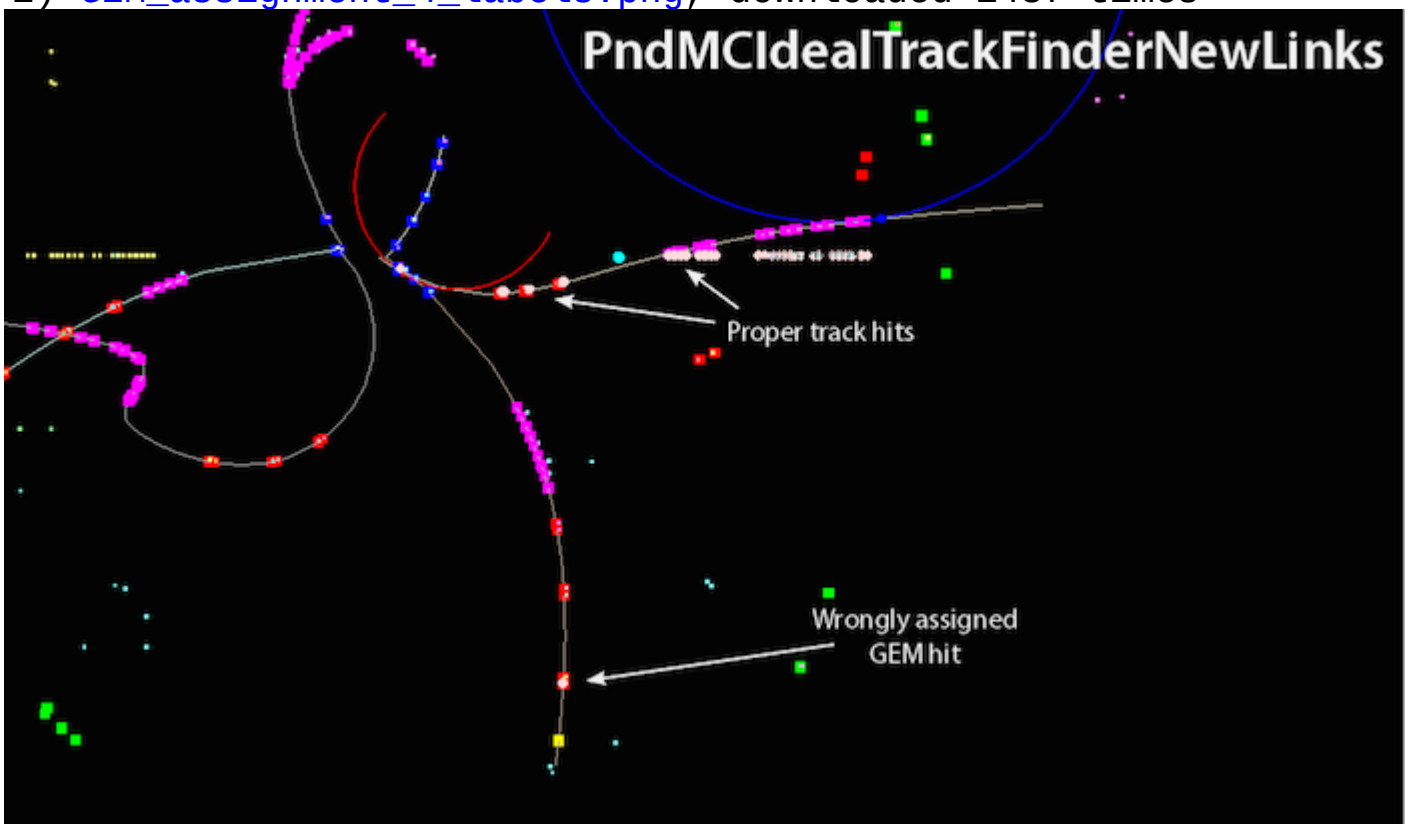
up, both for genfit 1 and 2. The following screenshots all show the result of the new ideal track finder (PndMCMatchNewLinks):

For this event, the Kalman filter produces strange tracks, independent of the genfit version. Most other events I had a look at seemed ok with genfit 2, while genfit 1 sometimes causes charge flips for instance (as visible in the screenshot above).
Ideally, I would leave the Kalman filter out, especially because for ideal tracking it seems a bit odd to use it. But this doesn't work for the PID, which seems to require the covariant matrices or something else filled by the Kalman.

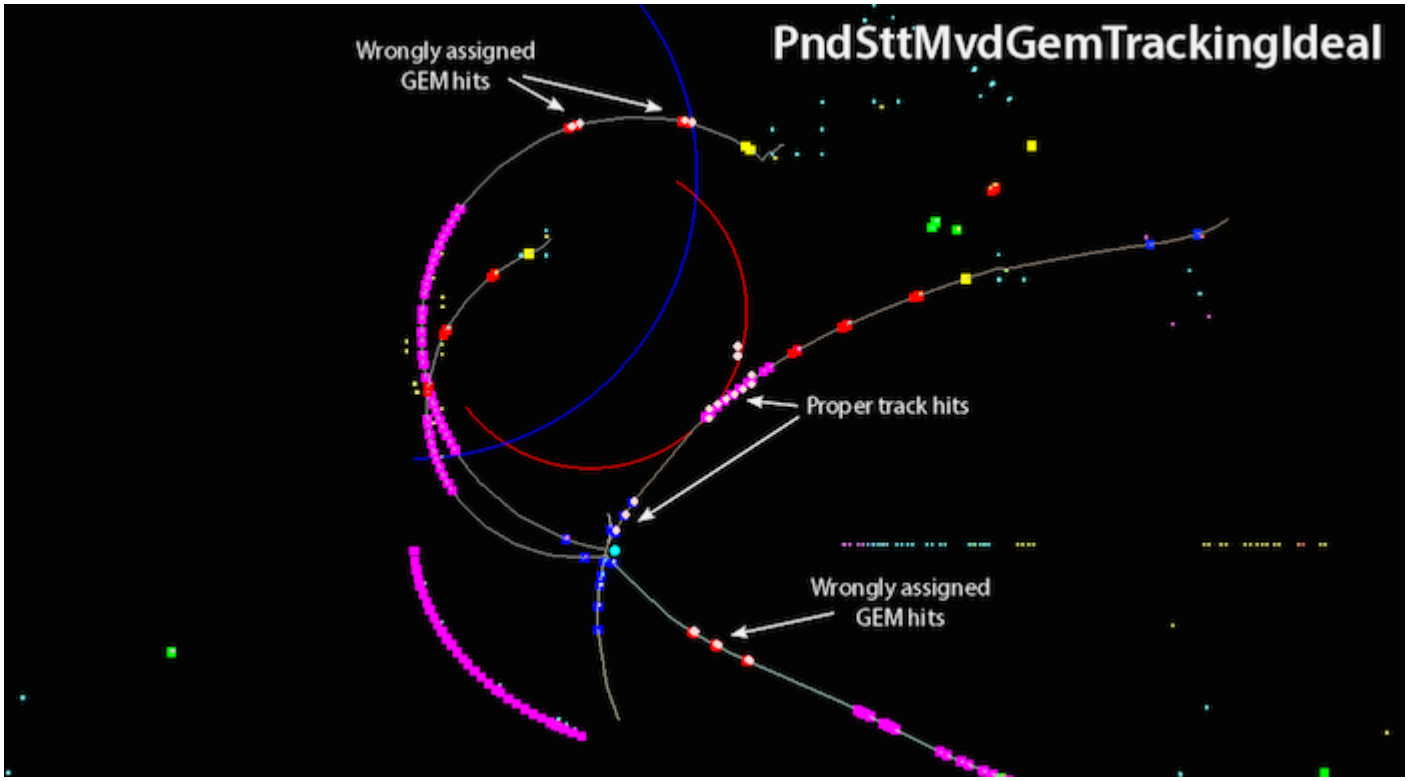
So concluding, I have two questions: Any ideas, what could cause the Kalman to produce these results? And secondly, why is it required to have it in the first place, shouldn't ideal PID be based on MC information?

File Attachments

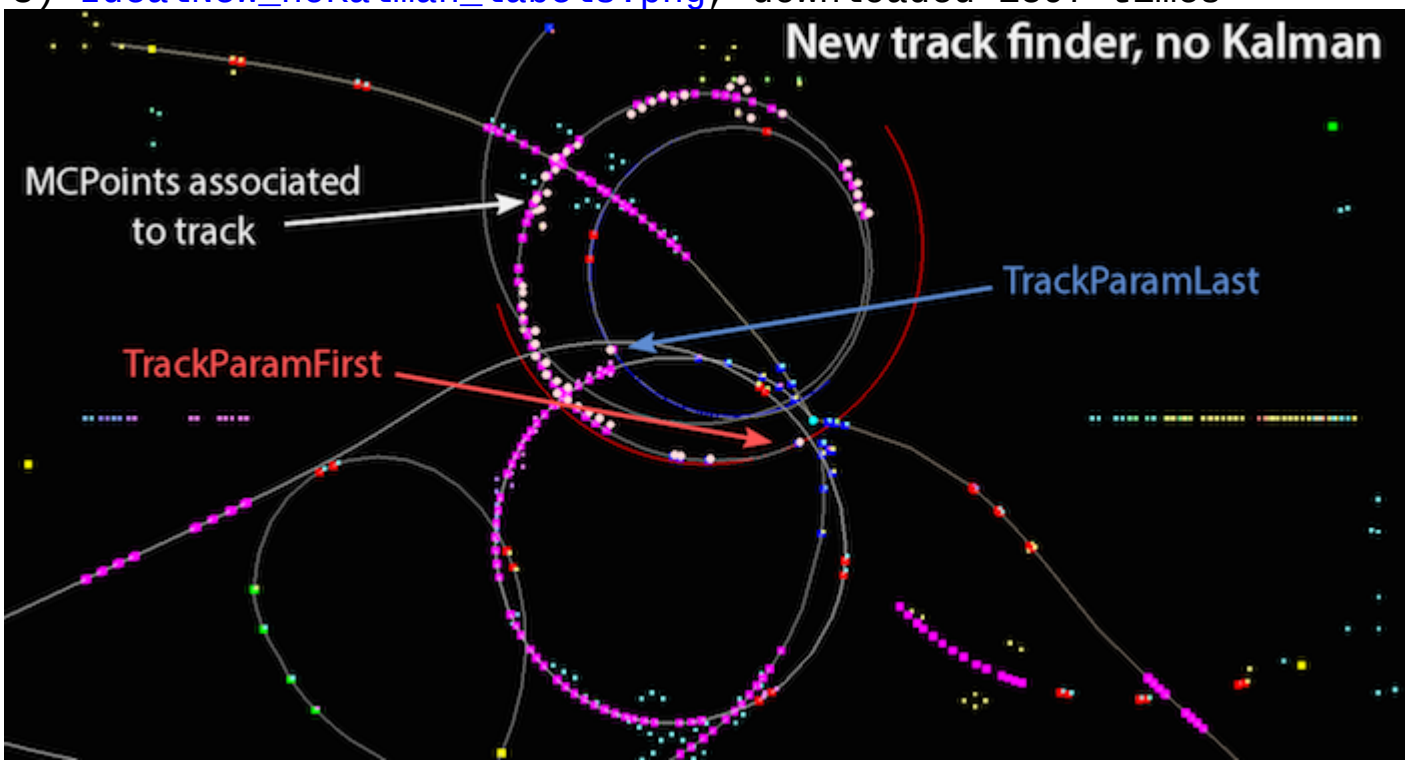
1) GEM_assignment_4_labels.png, downloaded 1437 times



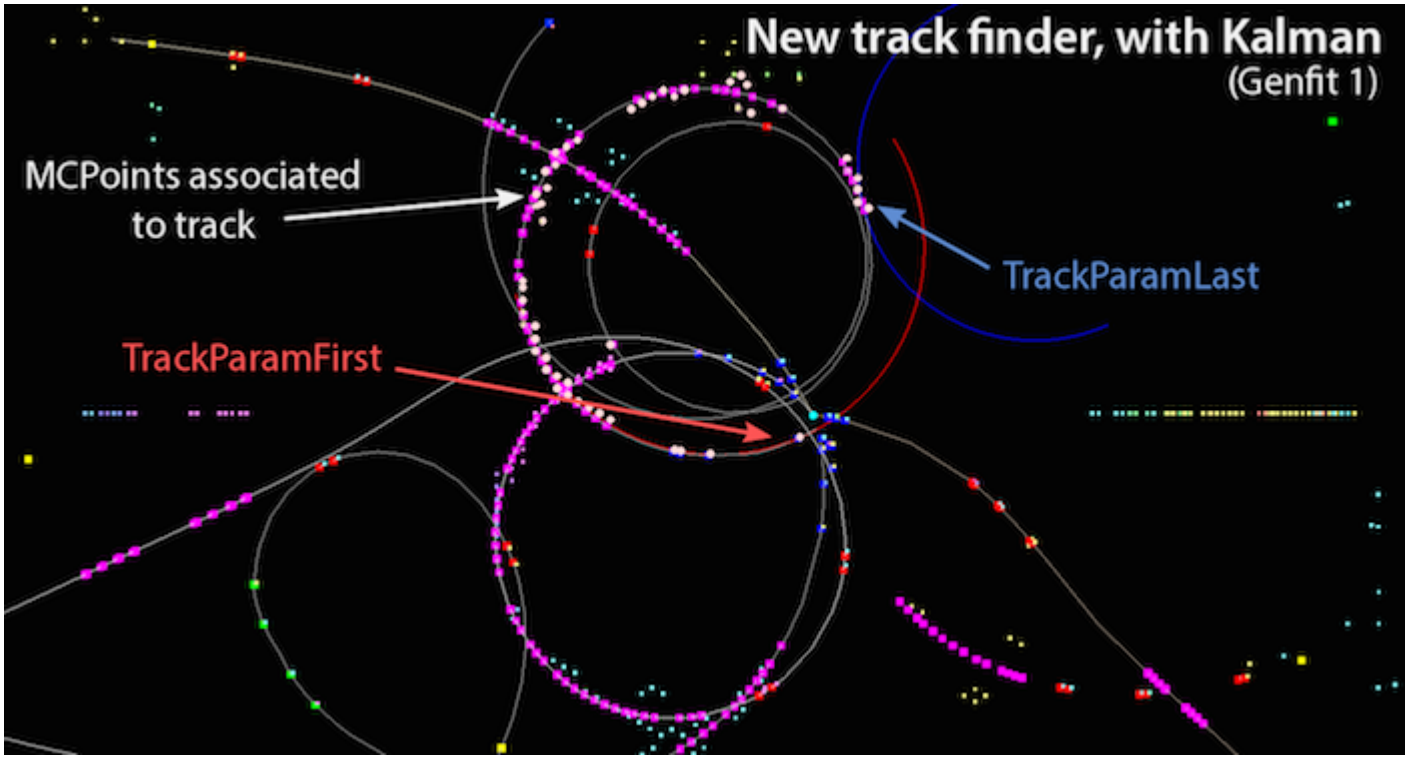
2) GEM_assignment_Ideal_Trackfinder_labels.png, downloaded 1442 times



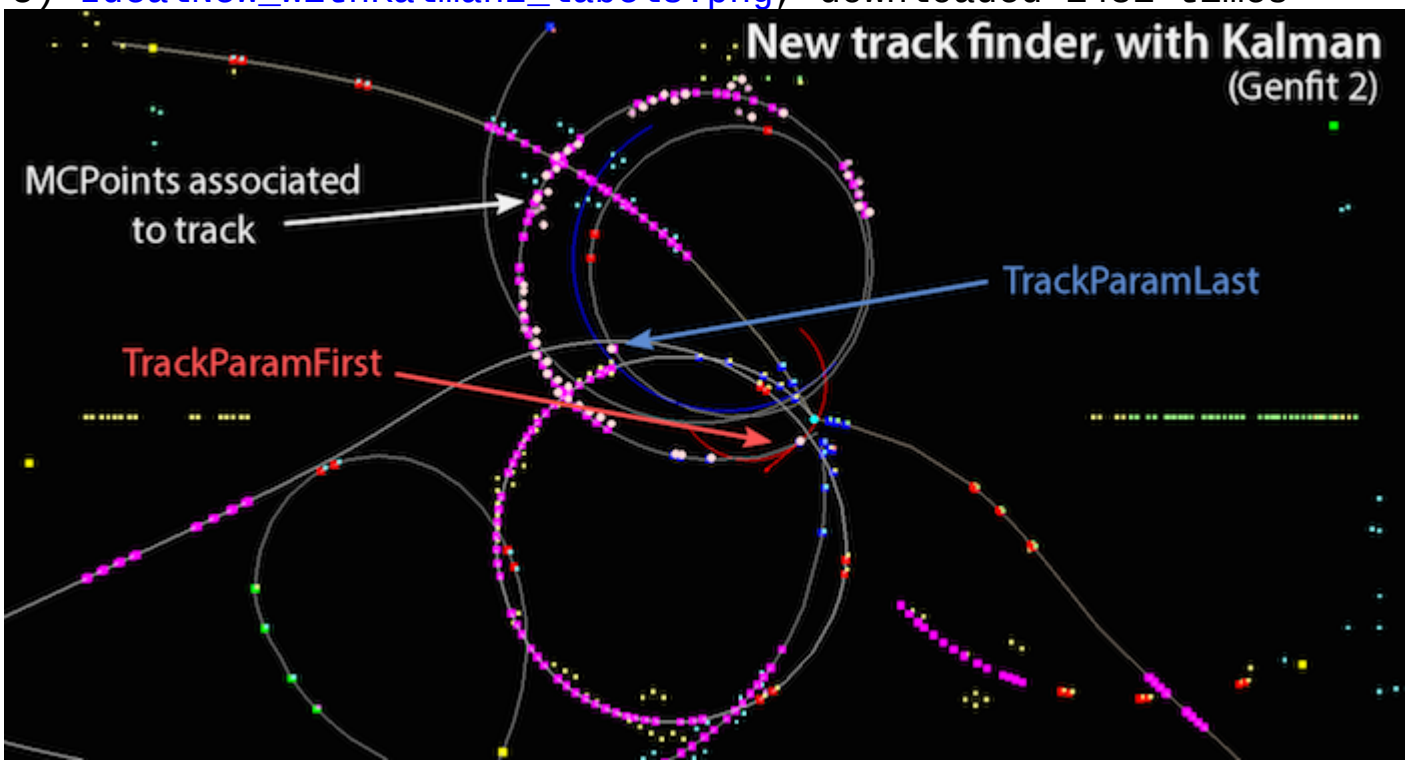
3) IdealNew_noKalman_labels.png, downloaded 1597 times



4) IdealNew_withKalman_labels.png, downloaded 1464 times



5) IdealNew_withKalman2_labels.png, downloaded 1481 times



Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by André Zambanini on Tue, 12 May 2015 16:57:08 GMT
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What the GEM hit assignment is concerned, I tried to run with the newest PandaRoot version again. As it turns out, the old ideal track finder (PndSttMvdGemTrackingIdeal) seems to assign all GEM hits correctly now. I have tried ~20 events and the assignment problem didn't occur,

previously the effect appeared every 2nd or 3rd event. A crosscheck with the new track finder (PndMCIdealTrackFinderNewLinks) shows, that this still requires the mentioned modification by skipping GEM hits with more than one point.

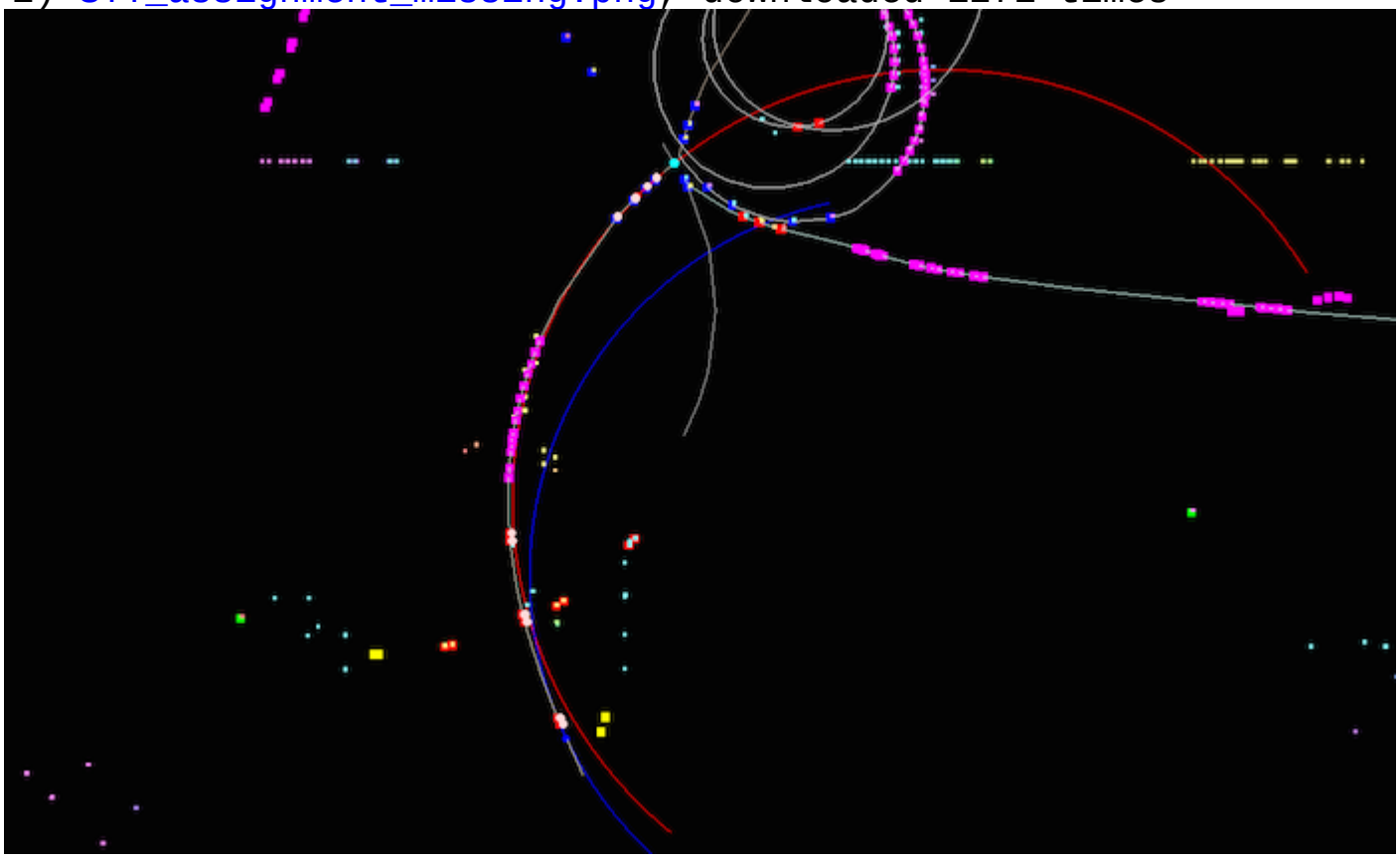
Something I found earlier as well for the PndSttMvdGemTrackingIdeal algorithm but was not at my focus: the STT hits are not always assigned, even though they match quite nicely between MVD and GEM hits of a track. I attached a screenshot showing this on an example event (seems to happen every 2-3 events for my channel).

The same event with PndMCIdealTrackFinderNewLinks looks fine.

About the Kalman filter: I still find some events where the genfit 1 propagation results in last track parameters with different charge sign (as the example in my first post), but the genfit 2 propagation is much better. All the events I looked at have a quite good match between ideal track and ideal track after Kalman.
Still, the question remains: why do we need a Kalman filter for ideal tracks?

File Attachments

1) STT_assignment_missing.png, downloaded 1271 times



Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by StefanoSpataro on Tue, 12 May 2015 21:51:40 GMT
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Can you provide a set of macro (.dec sim digi reco pid and event display) so that one can

reproduce what you are seeing?

Quote:Still, the question remains: why do we need a Kalman filter for ideal tracks?

Kalman over ideal pattern recognition is to have ideal efficiency but realistic momentum reconstruction.

Why are you using the master of FairRoot?

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Lia Lavezzi on Wed, 13 May 2015 10:15:57 GMT
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Quote:Something I found earlier as well for the PndSttMvdGemTrackingIdeal algorithm but was not at my focus: the STT hits are not always assigned, even though they match quite nicely between MVD and GEM hits of a track. I attached a screenshot showing this on an exemplary event (seems to happen every 2-3 events for my channel).

In the PndSttMvdGemTrackingIdeal there is a cut on (I think) 25 stt hits: if you have more than 25 hits, only the first 25 are assigned to the track since if you have a looping particle and you assign all the hits to the track cand, the Kalman messes up the track. Is this the case? Does it happen when you have more than 25 stt hits?

Ciao,
Lia.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by André Zambanini on Wed, 13 May 2015 10:55:54 GMT
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Quote:Why are you using the master of FairRoot?

The initial reason was because the eventDisplay wouldn't work on my machine and we tried to include the most recent changes in the FairLink system. But I don't think it is necessary anymore, I can try to go back to v15-03 again.

I'll also provide you with a minimal macro example as soon as I can get on with it.

Quote:Is this the case? Does it happen when you have more than 25 stt hits?

More than 25 hits in one track or overall? If the former, than no, it doesn't assign any hits (see also the screenshot in my last reply, the highlighted points - white points - are the assigned MC points, but none of the STT hits are assigned).

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Lia Lavezzi on Wed, 13 May 2015 14:35:56 GMT

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Quote:More than 25 hits in one track or overall?

I mean more than 25 in one track.

It is a very strange behaviour since nothing has been changed in the stt concerning the hit -> refindex -> mc point -> track id -> mc track chain... could it be just a problem of display? Did you print out the hits and see the stt hits are missing?

Lia.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Lia Lavezzi on Fri, 15 May 2015 12:47:56 GMT
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The STT hit wrong assignement should be fixed with the newest version of the SttMvdGemIdeal tracking. So, everyone who is using the ideal track finder, please update the sttmvdtracking directory!
The cut on 25 hits was wrongly assigned to the total number of hits in the event instead of the number of hits in the track and from this the missing hit problem had origin. Moreover, with Stefano, we decided to remove totally the cut @ 25 hits because of a logic problem, as said by Stefano in an earlier message to the forum.

Ciao,
Lia.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by StefanoSpataro on Fri, 15 May 2015 20:56:09 GMT
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Moreover, a bug in the ideal PR with new links was found, in the calculation of first and last point. Hopefully it will be fixed in the begin of next week.
Meanwhile, it would be good to check with your events if something strange still happens with the old PndSttMvdGemTrackingIdeal, since it uses refindex and should be independent from the new links developments.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by André Zambanini on Sat, 16 May 2015 07:57:10 GMT
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Lia Lavezzi wrote on Fri, 15 May 2015 14:47The STT hit wrong assignement should be fixed with the newest version of the SttMvdGemIdeal tracking. [...]
The cut on 25 hits was wrongly assigned to the total number of hits in the event instead of the number of hits in the track and from this the missing hit problem had origin.

Ah, this explains it. Thanks for fixing it!

Stefano Spataro wrote on Fri, 15 May 2015 22:56Moreover, a bug in the ideal PR with new links was found, in the calculation of first and last point. Hopefully it will be fixed in the begin of next week.
Meanwhile, it would be good to check with your events if something strange still happens with the old PndSttMvdGemTrackingIdeal, since it uses refindex and should be independent from the new links developments.

Yes, I'll check this beginning of next week. Thank you!

PS: I'm a bit inactive since we had a holiday on Thursday and thus a long weekend in Germany. Sorry for the inconvenience.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by André Zambanini on Mon, 18 May 2015 13:12:24 GMT
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The STT hits are now assigned properly using the SttMvdGemIdeal tracking. And I don't see any strange GEM hit assignments anymore. So it seems, that these issues have been resolved.

Let me know when the first/last track parameter issue has been resolved, then I'll crosscheck this as well.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by StefanoSpataro on Mon, 18 May 2015 13:18:26 GMT
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Just a comment: the first/last problem was found for the new ideal PR, not for the old one. If you use PndSttMvdGemIdealTracking you should see no problems there.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Lia Lavezzi on Tue, 19 May 2015 14:14:17 GMT
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Hallo Andre' and everyone,
the fix for the first/last assignement has been uploaded to svn by Stefano right now. Please cross your fingers and check if everything is fine now
Cheers,
Lia.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Jennifer Pütz on Wed, 20 May 2015 12:47:04 GMT
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Hi everyone,

I checked the fixed version with a simple simulation (100 events) of pbar p -> Pi+ Pi-. And I found the same problem with the first/last point again for some of my events.
Below there is a screenshot for one of these events.

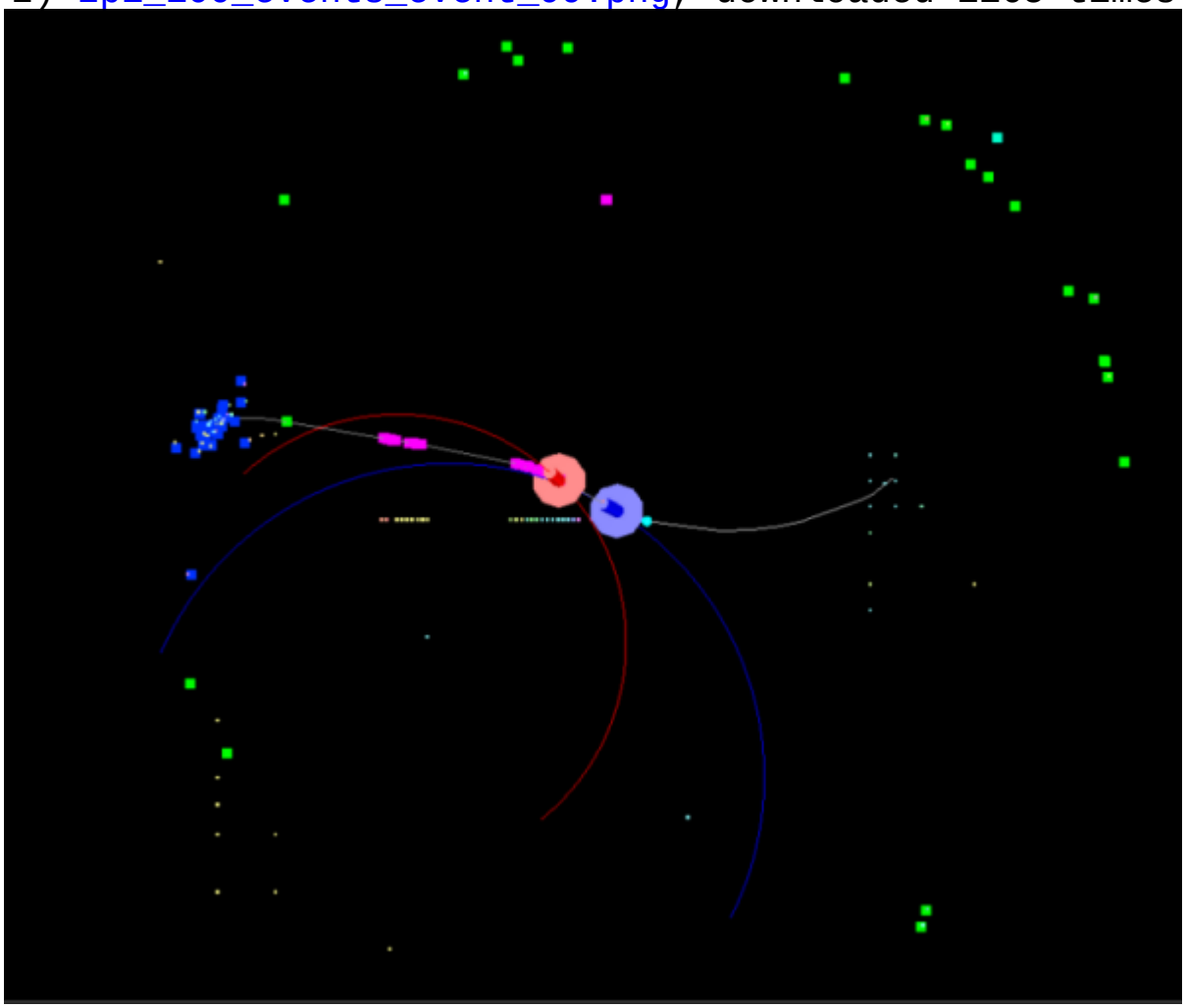
The macros I used for the simualtion and the reconstruction are attached.

Cheers,

Jenny

File Attachments

1) macros.tar, downloaded 424 times
2) 2pi_100_events_event_99.png, downloaded 1165 times



Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Lia Lavezzi on Wed, 20 May 2015 12:51:45 GMT
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Hi Jenny,
I see from the macros that you have the Kalman filter on. Have you tried to switch it off and to look at the events directly after the pattern recognition alone?

Cheers,
Lia.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Jennifer Pütz on Wed, 20 May 2015 12:55:18 GMT
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Hi Lia,

I didn't try it. But I will and let you know if this is working.

Cheers.

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Jennifer Pütz on Wed, 20 May 2015 13:26:36 GMT
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Hi,

I switched the Kalman Filter off and the events looking fine.
Below there is another event, for which the ideal tracking without the Kalman Filter is working fine. But if I switch on the Kalman Filter the first and last hit are changing.

I'm looking at the track with the highlighted points.

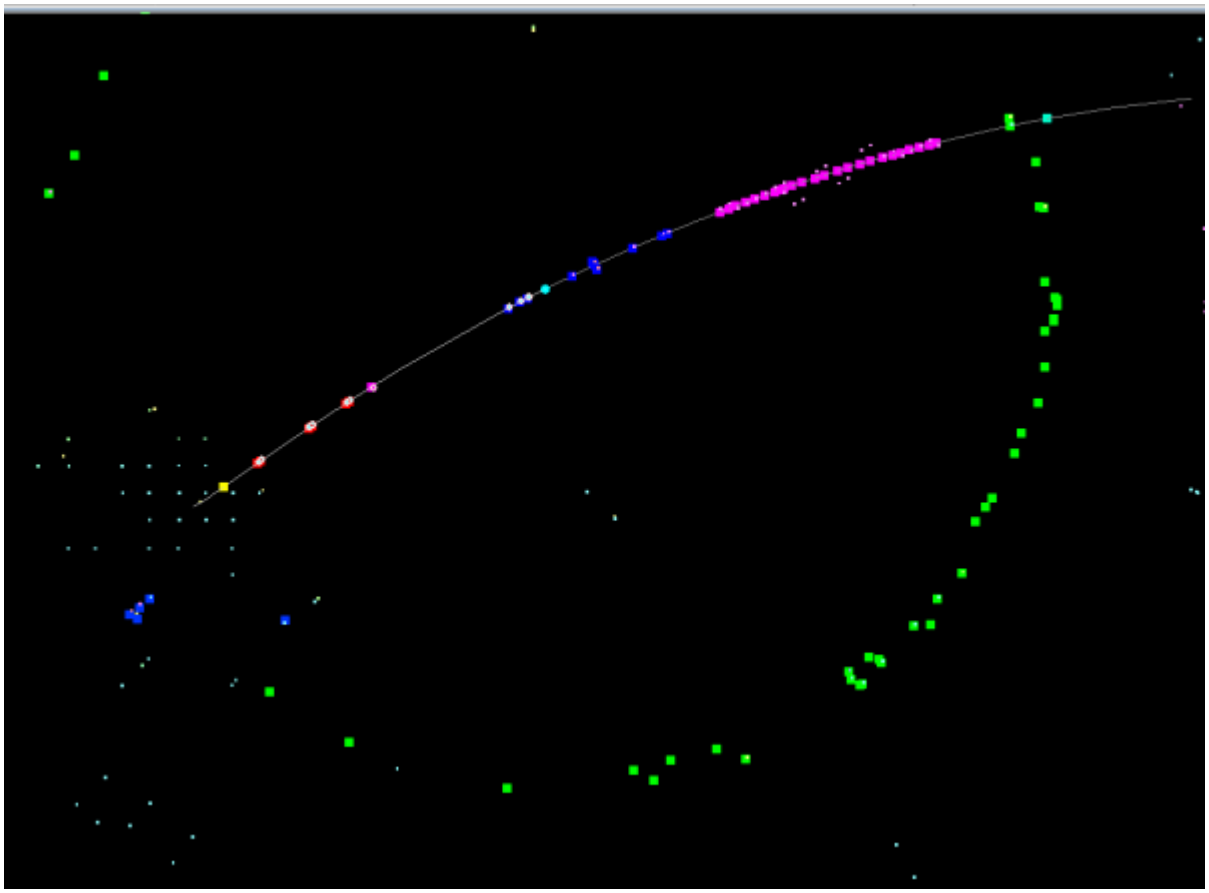
Without Kalman:

With Kalman:

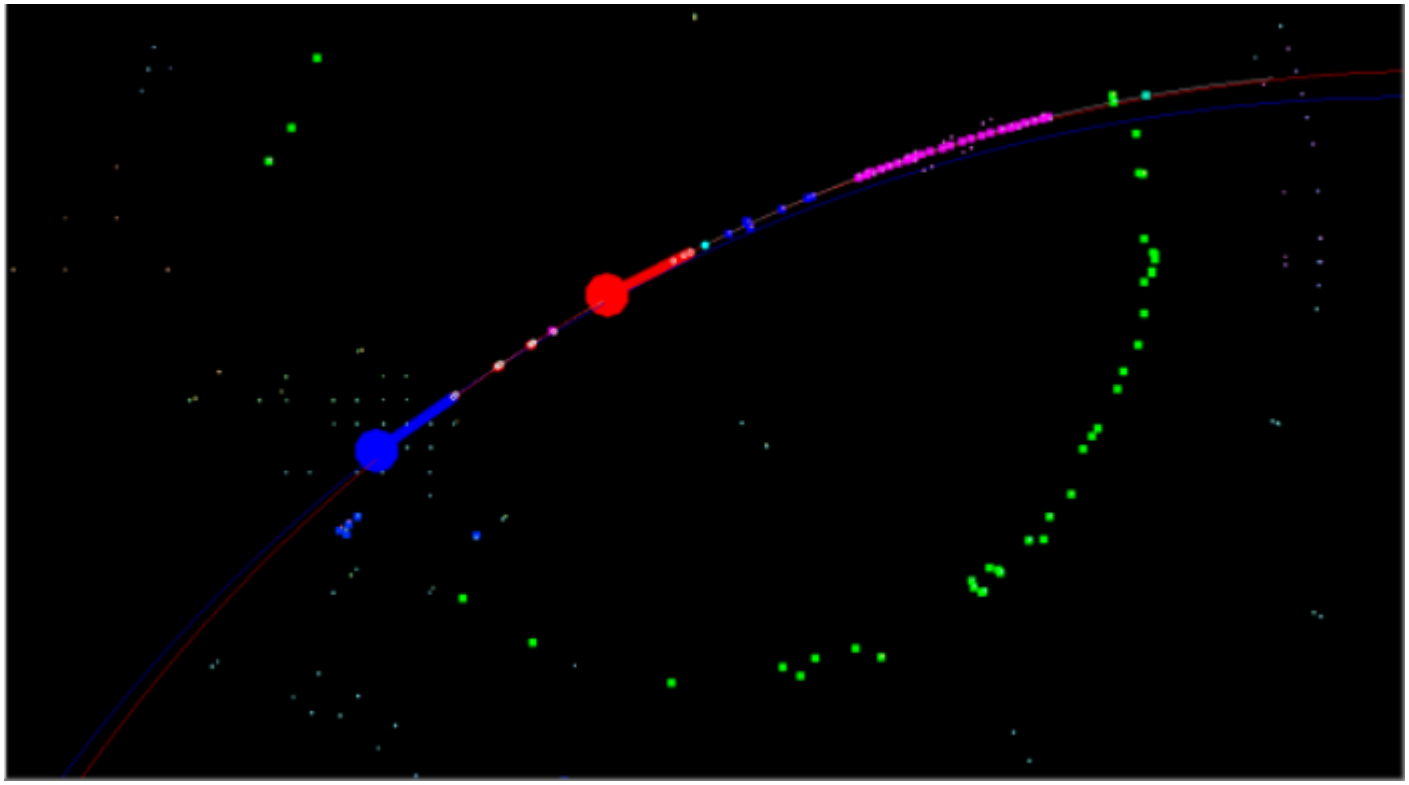
Cheers,

Jenny

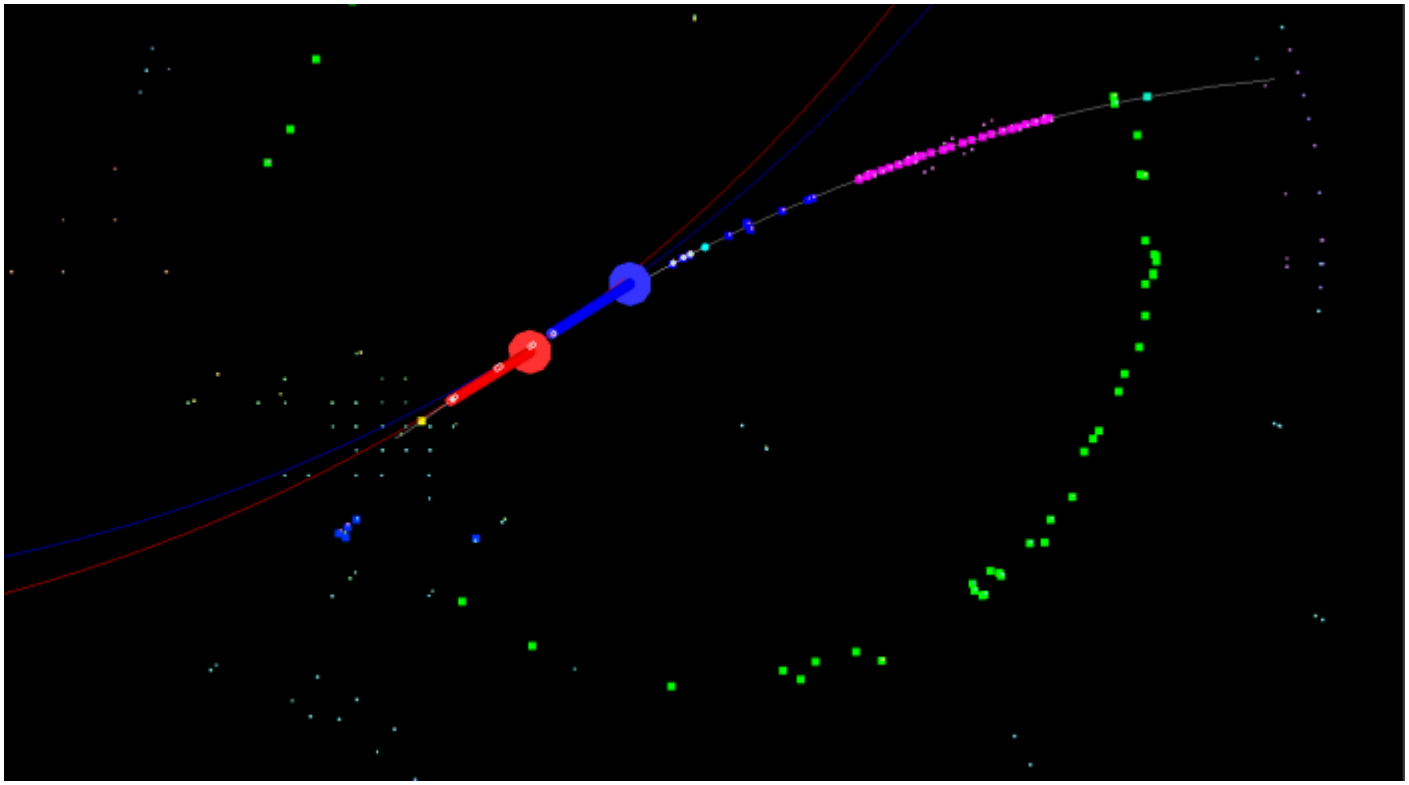
File Attachments
1) 2pi_100_events_event_82.png, downloaded 1250 times



2) 2pi_100_events_event_82_idealTrack.png, downloaded 1230 times



3) 2pi_100_events_event_82_idealTrack_with_kalman_filter.png, downloaded 1159 times



Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by StefanoSpataro on Wed, 20 May 2015 13:34:39 GMT
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The problem of the Kalman is well known and cannot be fixed.
You can try to use genfit2, which in theory should solve the problem (and if not we can address the developers).

Subject: Re: Ideal Tracking Bugs(?) when using FairLinks
Posted by Lia Lavezzi on Wed, 20 May 2015 13:40:25 GMT
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I agree with Stefano. The fixes we made in these days were in the pattern recognition stage, not in the Kalman.
Let's hope genfit2 has that bug fixed (but I never tried it).
Anyway, glad to hear that at least before the Kalman everything is fine now.
Cheers,
Lia.