Subject: No back propagation to IP for V_0 reconstruction
Posted by donghee on Tue, 02 Dec 2014 14:29:32 GMT
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Hello,

I am looking for K_s reconstruction with two different cases, when back propagation to IP is switched off and on case.
As a first attempt, a K_s sample in the pbarp -> D^{0}D^{0}bar -> K_s pi+ pi- + X reaction are considered at c.m.s = 3.8 GeV.
In reco macro, one can control IP back propagation by

Quote:

```
recoKalman->SetTrackInBranchName("SttMvdGemTrack");
recoKalman->SetPropagateToIP(kFALSE);

recoKalmanFwd->SetTrackInBranchName("FtsIdealTrack");
recoKalmanFwd->SetPropagateToIP(kFALSE);
```

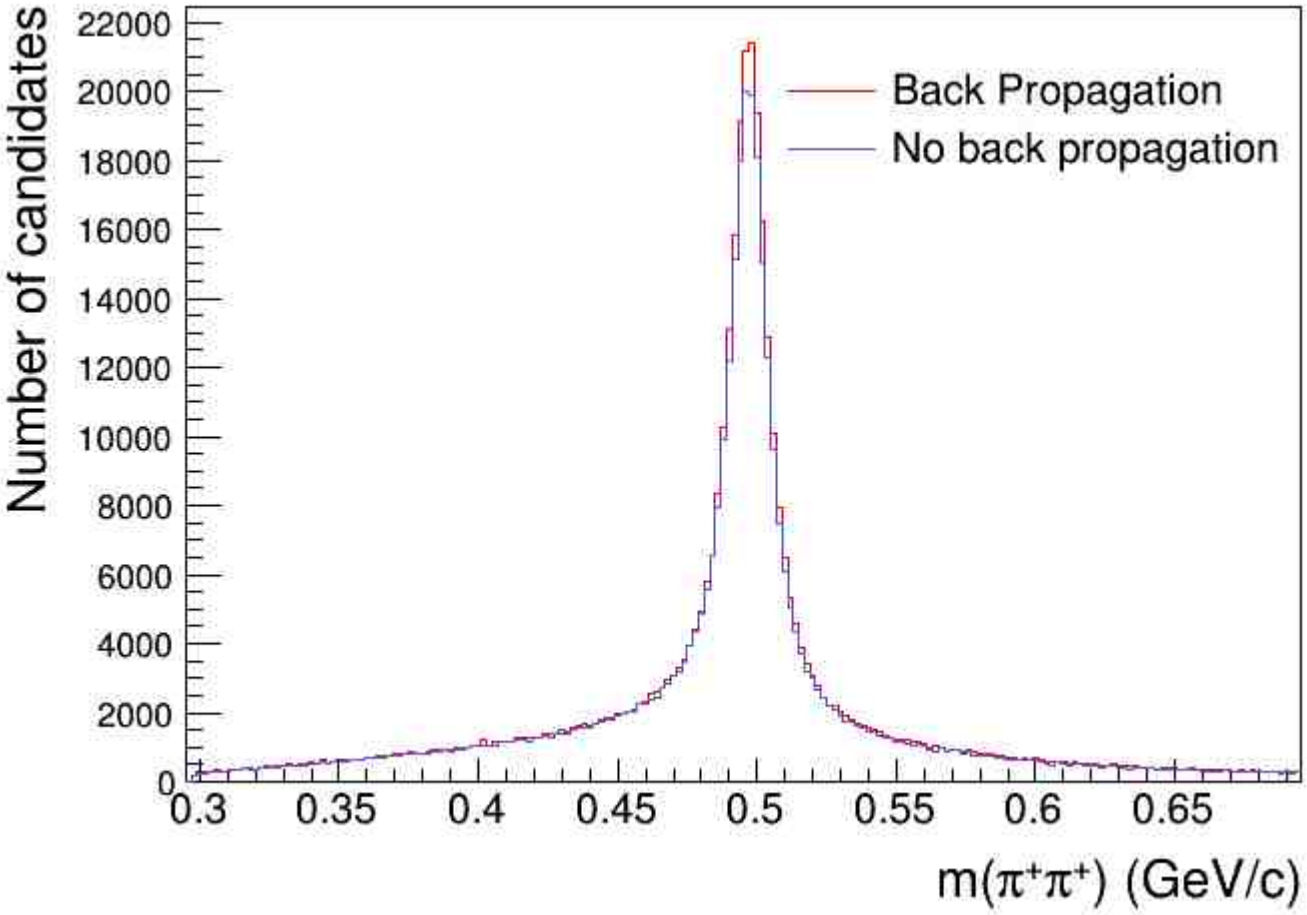
After track reconstruction, K_s mass distributions are compared, no PID has been applied and same statistics are simulated.
MC truth matched mass distributions are plotted to see the size of efficiency.
Red histo is for the propagation turns on, the efficiency is found to be 0.406192
Blue histo is for the propagation turns off, the efficiency is 0.388105

"No back propagation" in track reconstruction doesn't help too much to repair V_0 track.
For lambda case one suggest some improvement of lambda reconstruction, but I cannot see any significant advantage for K_s case.

Best wishes,
Donghee

File Attachments

1) test_mass_d04.jpg, downloaded 1819 times



Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by StefanoSpataro on Tue, 02 Dec 2014 16:14:20 GMT
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You must switch off also the backpropagation in the pid macro:

corr->SetBackPropagate(kFALSE);

Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by donghee on Tue, 02 Dec 2014 19:57:56 GMT
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Thank you for your simple and effective solution!

Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by donghee on Wed, 03 Dec 2014 22:17:27 GMT
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Hi Stefano,

Option for back propagation are touched in both reco & pid macro as you suggested.

After track reconstruction, K_s mass distributions are compared, no PID applied and same statistics are simulated.
MC truth matched mass distributions are plotted to compare directly efficiency.
Red histo is for the propagation turns on, eff=0.407035
Blue histo is for the propagation turns off, eff=0.403639

Mass resolutions are completely different, no back propagation show much worser resolution than back propagation case. This is easy to understand.
However the efficiency doesn't change.

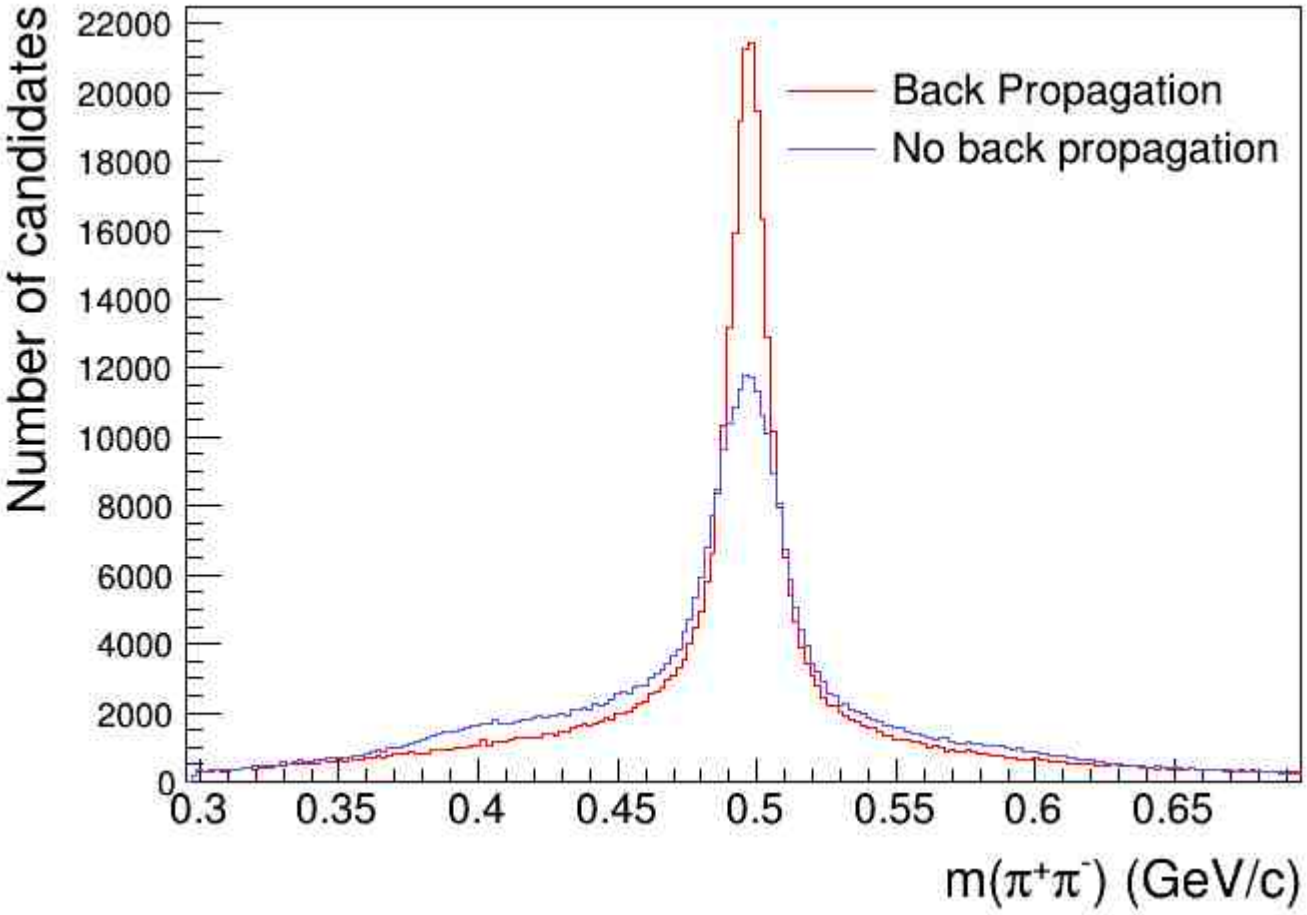
A distance/(gamma*beta) distributions for MC truth matched k_s are compiled to test V0 reconstruction, whether "no back propagation" show some improvement of tracking efficiency for V0 decay particle. Distance is defined as a length between k_s production and decay vertex.

Naively, I expected that efficiency should also increase with "no back propagation", since the decay particles produced far from IP can be reconstructed much better than "using back propagation". In middle range in normalized distance distribution, you can see a significant improvement of reconstruction efficiency for "no back propagation". But if k_s decay near the position of produciton vertex, the efficiency drop down drastically for "no back propagation"(see zoom plot at d/(gamma*beta) below 1(cm)).
I don't know correctly why 0-1 region show a huge difference.

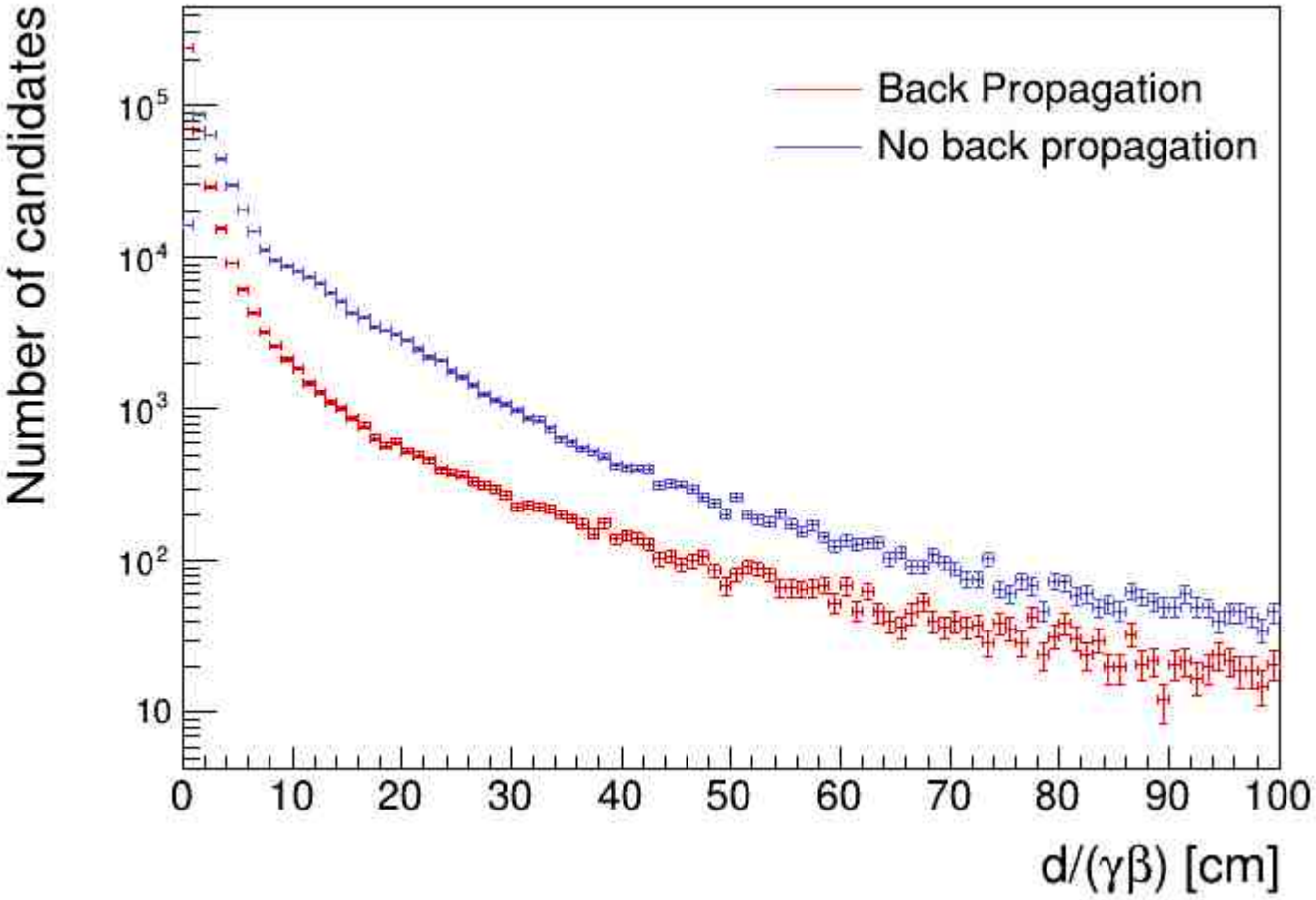
Best wishes,
Donghee

File Attachments

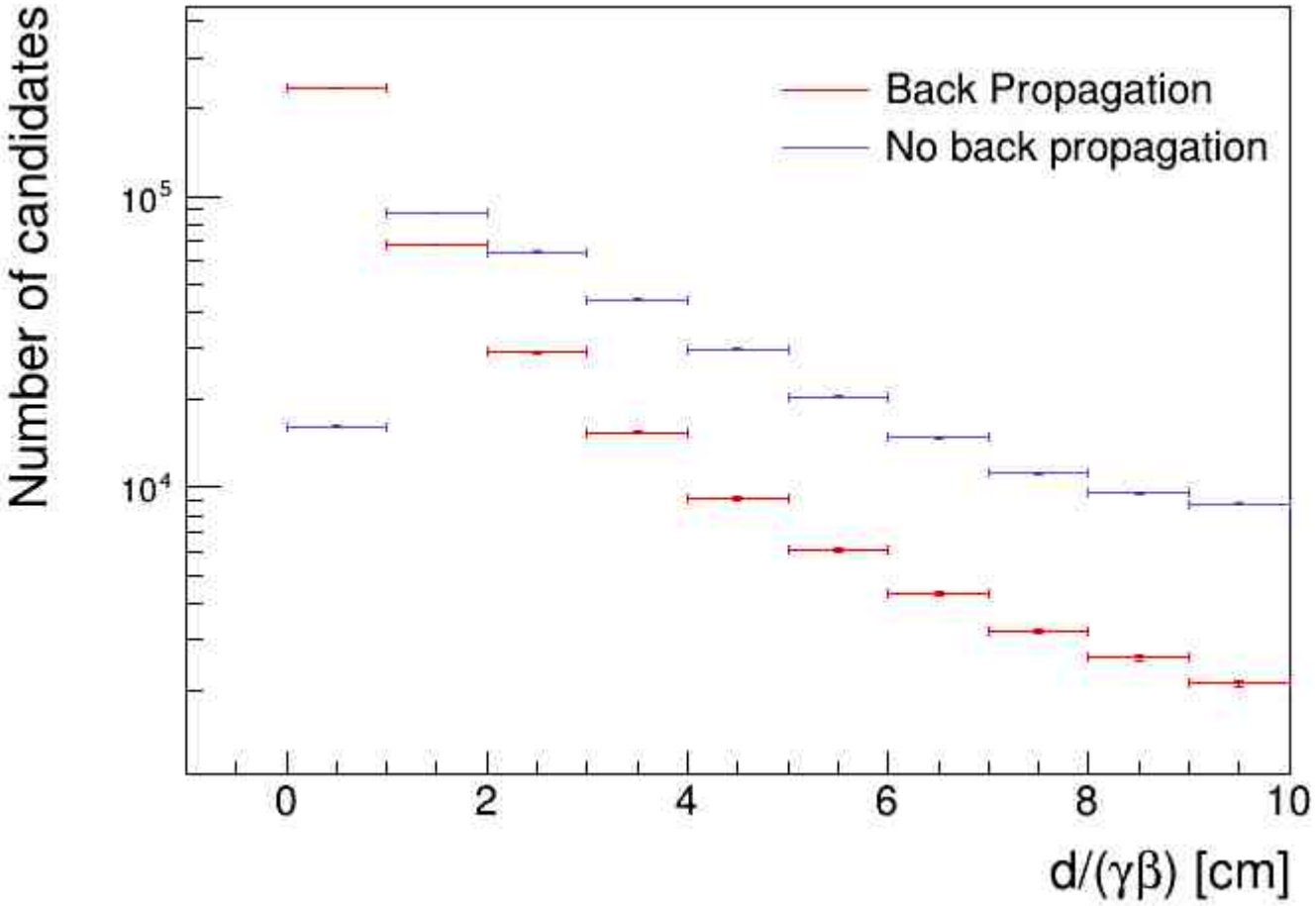
1) test_mass_d04.jpg, downloaded 1524 times



2) test_ctau_d04.jpg, downloaded 1434 times



3) test_ctau_d04_zoom.jpg, downloaded 1550 times



Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by StefanoSpataro on Wed, 03 Dec 2014 22:21:24 GMT
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Which vertex fitter are you using?

Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by donghee on Thu, 04 Dec 2014 09:47:33 GMT
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Hi Stefano,

Normalized distance distributions are the quantity of "generated distance" for correctly reconstructed K_s, i.e., MC truth matched K_s.
If I want to have a plot of reonstructed distance, then I must do a vertex fit or POCA calculation, but I did not do that.
The purpose of this plot is to see which decay position of the k_s are reconstructed well and where is bad by means of truth vertex/distance informaton.

If we want to see also a reconstructed property for K_s vertex, I can try to do further.

Best wisehs,
Donghee

Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by StefanoSpataro on Thu, 04 Dec 2014 10:07:08 GMT
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For the invariant mass distribution you need to know the production vertex, then you need to use a vertex fitter.

For the k0 vertex, I suppose you use MC information (right)?. I am not able to undertand distance/gammabeta, just distance could help. But if the counts are the same, in your comparison there sould be something wrong, because the plot means that the k0 moved from production point close to the IP (w/ back propagation) towards the external part (w/o), and this is not possible, Are you sure you are taking the distance/gamma/beta from the proper place?

Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by Ralf Kliemt on Thu, 04 Dec 2014 11:10:48 GMT
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Hi Donghee,

I agree with Stefano: You need to do a vertex fit to get the proper momentum directions of the pions. What it does is to find the position along the tracks (helices) where the momentum is tangent. Where your momentum is defined before you give it to the fit does not matter that much. If you want to use the pions defined as they were right after the Kalman filter you may simply use

PndAnalysis::ResetCandidate(RhoCandidate*) or
PndAnalysis::ResetDaughters(RhoCandidate*) .

e.g.:
(theAnalysis->ResetDaughters(kshort);)

Cheers
Ralf

Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by donghee on Thu, 04 Dec 2014 11:43:36 GMT
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Hi Stefano,

First of all, I plotted meaningless distance in previous posting.
I simply forgot to replace truth object after accessing reconstructed K_s in order to have true information.
Now I found where is something wrong and fixed my code to plot correctly.
Plots show the distance between D_0 vertex and K_s vertex and normalized one.
I access true D_0 vertex and K_s vertex by K_s itself and its daughter. Accessor looks like this.

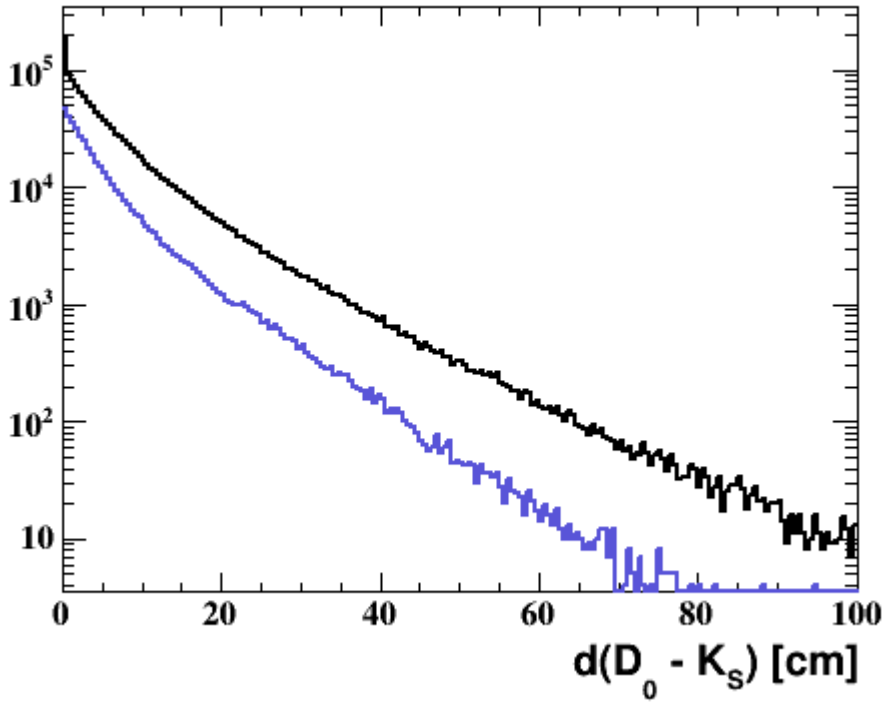
Quote:
```
RhoCandidate *truth = ks0[j]->GetMcTruth();
TVector3 vdist = truth->Pos() - truth->Daughter(0)->Pos();
Float_t dist = vdist.Mag();
Float_t ctau = dist * truth->M() / truth->P();
```

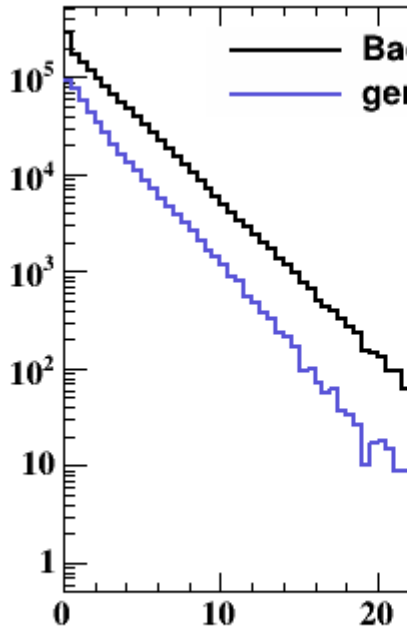
Every black line is a generated decay distance and normalized distribution by distance*(m/p).
And suvived(reconstruced correctly) decay distance are plotted to test the quality of efficiency in every decay region.
I do not see any improvement from no back propagation approach, still.

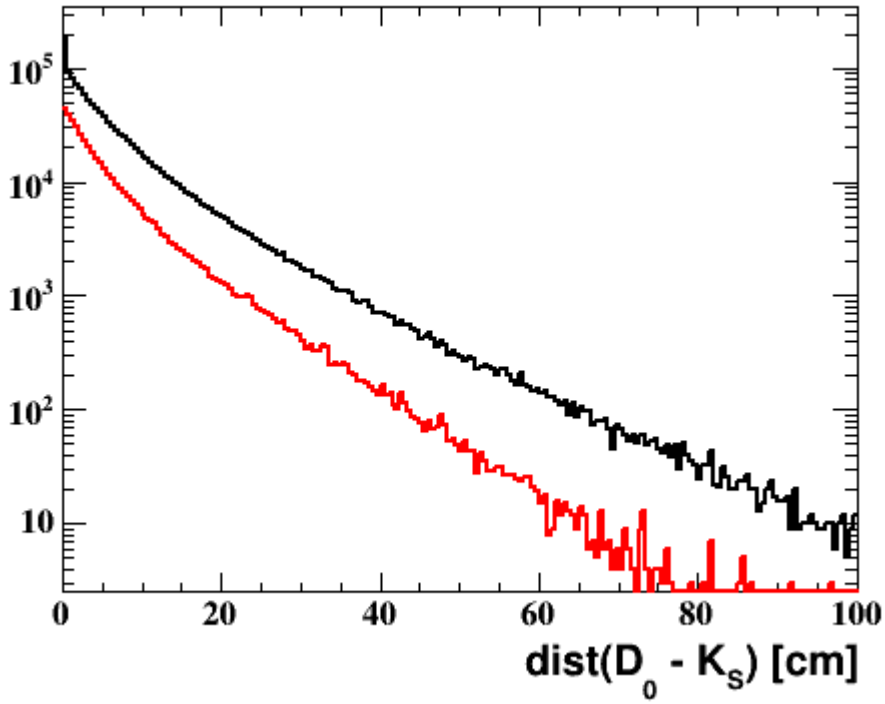
Best wishes,
Donghee

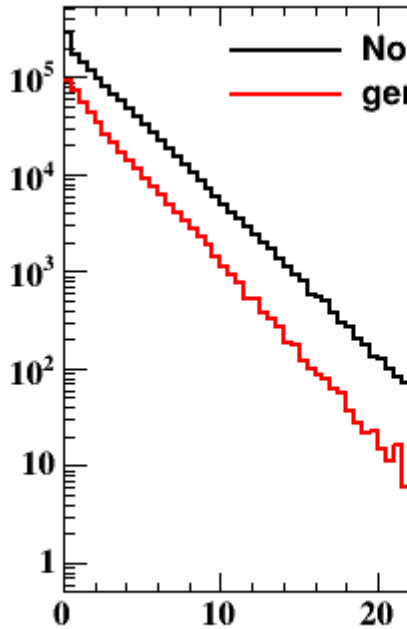
File Attachments

1) test_4_plots.png, downloaded 1178 times









Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by donghee on Thu, 04 Dec 2014 12:02:51 GMT
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Dear Ralf,

Thank you for your suggestion, too.

I aggree that I need to vertex fit absolutely to get the vertex position in reco level.
But I was working at generate level in order to see efficiency drop region by using true vertex information after reconstruction.

By the way, you mentioned that I can use simply any kind of track properties just after the Kalman filter (so let say before back propagating, you mean?) with theAnalysis->ResetDaughters(kshort);

I am not sure for this functionality, what should happen with reset of daughter in the analysis code?
Why I need to do that? A bit more detail please!

Best wishes,
Donghee

Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by StefanoSpataro on Thu, 04 Dec 2014 12:23:00 GMT
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How do you see that there are no differences? You should overlap the two histograms (and not in 2 separate plots) and plot in linear scale.
In any case the trick works for lambda, as Karin checked, maybe it does not help k0. It depends also on kinematic of the event.

Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by donghee on Thu, 04 Dec 2014 21:26:31 GMT
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Hi Stefano,

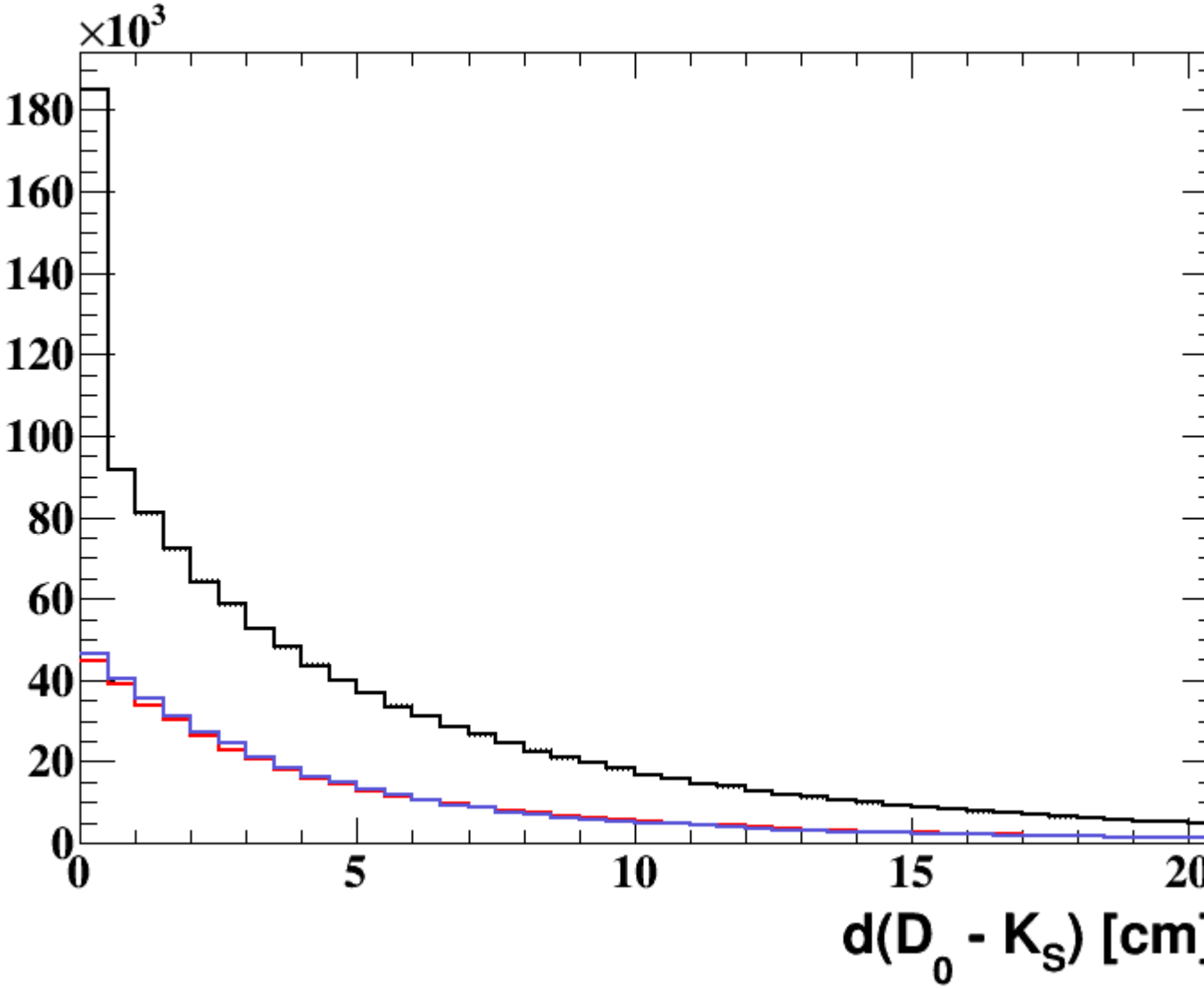
Well, I think that a ratio plot can help us. all distributions are superimposed with linear scale and ratio defined by (yes BP - no BP) / (no BP) is added. one can see a clear transition at distance 5 cm. positive value means "yes BP" is more efficient, negative value means no BP has a better efficiency in some distance range.

I guess more longer lifetime of the Lambda (c*tau = 7.89 cm) can make a clear improvement at V0 reconstruction.
In contrast, K_s (c*tau = 2.68 cm) may be very difficult to get some improvement.
It is quite pitty, however I believe that V0 track finder will be realized soon.
Anyhow I will try to show same quality plots for lambda case.

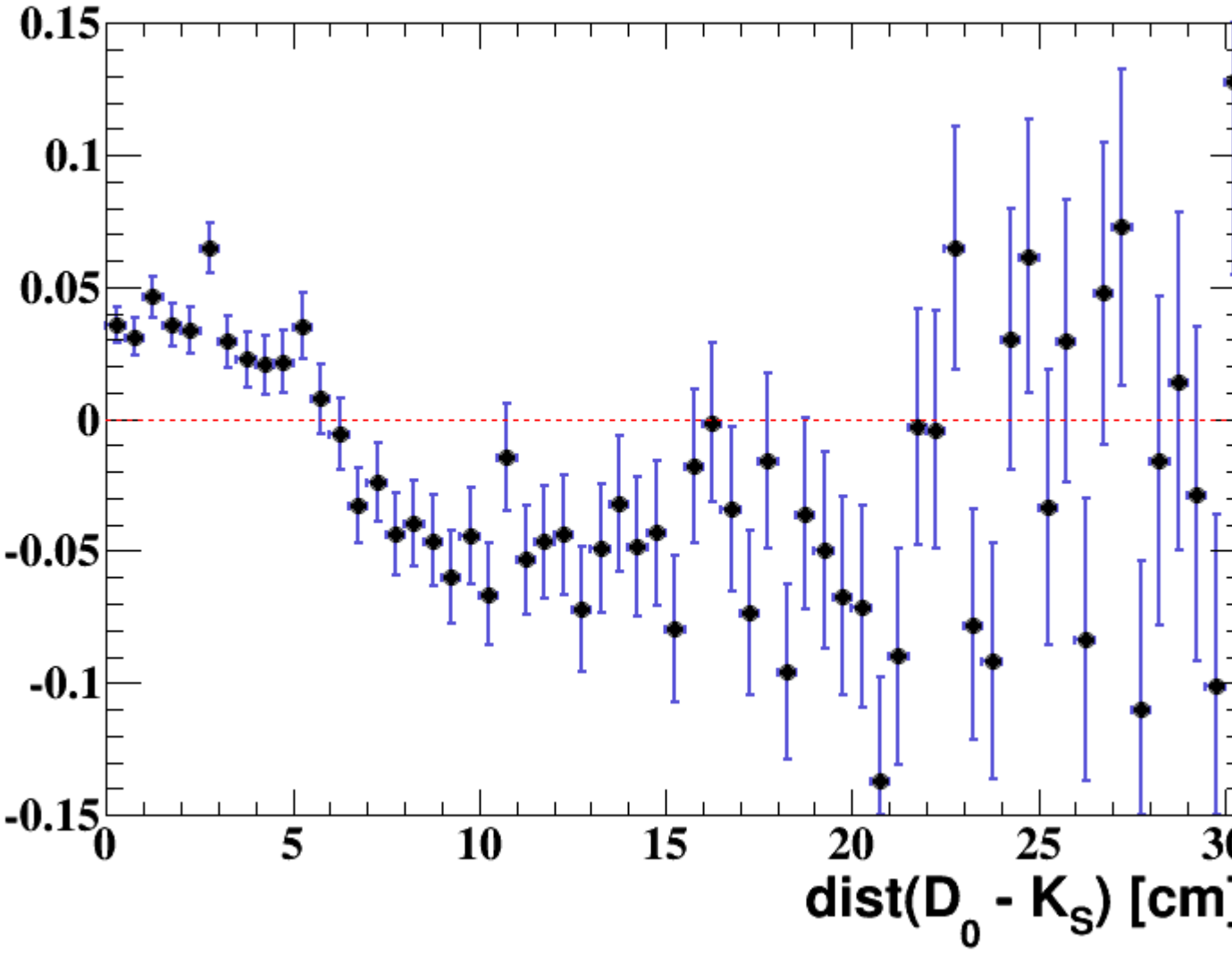
Best wishes,
Donghee

File Attachments

1) test_4_plots_linear.png, downloaded 1167 times



2) test_4_plots_ratio.png, downloaded 1176 times



Subject: Re: No back propagation to IP for V_0 reconstruction
Posted by StefanoSpataro on Sat, 06 Dec 2014 15:53:25 GMT
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I try to expain why I suggested Karin to remove the backward projection.
If you take track parameters from the first point of the track and back propagate them toward the interaction point, if the particle started far from the IP it is possible that the propagation does not converge and the track flies far from IP. In this case Geane will fail, and the track will not be processed.

We have two kinds of backpropagation: the first is in the kalman, since you want to consider in the fit the first detector hit (if you start the kalman filter from the first hit, such hit will not be used by the kalman since of course the track will sit there. If you start a bit far, like in the I.P., then you can use also that hit).
The second is in the PndPidCorrelator, since you want to have the track parameters where probably the reaction occurred (the IP), and not in the first hit (MVD in general). This is due to the fact that most often all the tracks come from the IP.

Then, in case of lambda skipping the back propagation improved the efficiency, sicne all these rejected tracks were properly computed. In case of K0S maybe they are closer to the IP and the backward propagation does not affect so much the global efficiency. moreover, if you start the kalman from the first hit, then your efficiency will be a bit poorer due to the mising hit in the fit. In case of lambda at the end you gain anyway, in case of KoS maybe you don't gain and you just loose.

I hope now the global scheme is more clear. we need some systematical study, I have some idea on how to improve for the kalman backpropagation, but I need some Guinea pig ...