Subject: Psi3770 study with run981 tpc mode
Posted by donghee on Wed, 20 Jul 2011 13:01:52 GMT
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Hi,

I'm now testing latest production of psi3770 at Gridka.
The data corresponds to run981 with tpc mode and just look 84500 events from totally produced 0.1M evt. PndKinVtxFitter failed and cannot go through whole 500 events.

I require following cuts.

At least 3 positive particles and also 3 negative particles since psi3770 will decay with 6 final states.

E/p < 0.85 due to electron tracks (Energy from EMC info.)

Rejects bad reconstructed track with checking GetMicroCandidate().GetChiSquared() == -1 in the track lists.

In figure tracks.gif, total charged and reconstructed tracks from 84500 events for psi3770 data is shown.

In D_mass.gif, you can find D_mass distribution with three different categories.
First column is raw D+ and D- distribution, and second column shows D+ and D- mass distributions after applying a PndKinVtxFitter.
Third one is the plots matched with MC true information, if 6 reconstruced(candidate tracks) tracks are associated with MC true tracks IDs and without overlapping and double counting, then assigned as a MC true matched events.
The mean position of D+ and D- masses are slightly shifted from norminal position.

The resolution of D+ and D- vertex are shown in Resolution.gif.
In order to get precise vertex resolution, one need to apply sidebin subtraction for signal region, because bg+sig cannot be separated.
So, I took the data only region within 1.8693 +/-0.05 from fitted D+ and D- mass distribution, and then got the vertex position for that.
Subtraction of true with reco for vertex position X, Y, Z of D+ and D- are plotted in this plot.
I have still 0.13 cm resolution for x, y direction.
Even if I take only MC true matched events, the resolution doesn't change so much.

Psi_distribution.gif shows psi3770 reconstruction with using signal region of D+ and D- mass.
Here once again vertex fits for psi3770 have been applied in second, and in third coloumn psi3770 with MC true matched events are additionally plotted to get the feeling for estimation of Psi3770 efficiency.

When I required the MC true matching to reconstructed track, some events have double or even more counting at MC true matching, since sometimes two or three reconstructed tracks are induced essencially same origin of one MC track.
If I have those event, I throw away those events. I need still some tests to reduce those multi-counting problem in my analysis.

PID would be real solution.

So, efficiency of Psi3770 is extremely low with this approach.
If I try same analysis with 4CFitter, I couldn't achieve until finishing complete analysis with 500 events, simply run crash with 4Cfitter for psi3770.

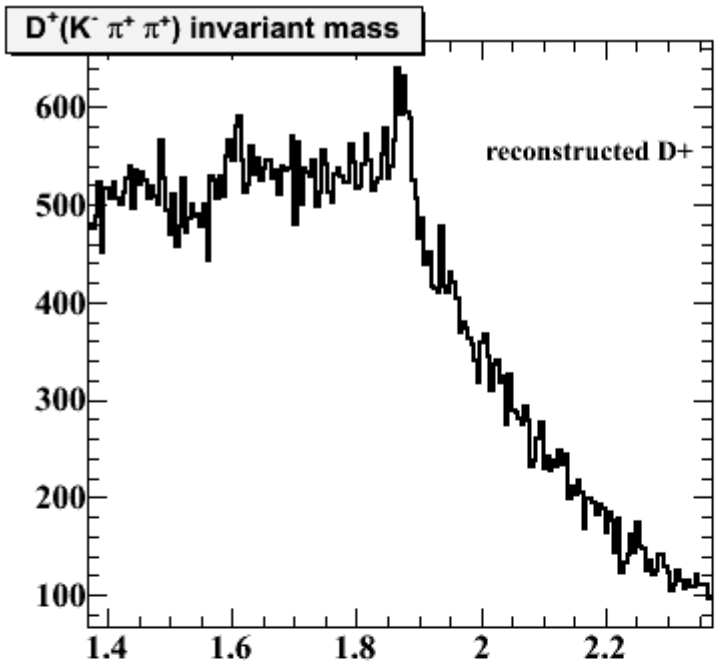
If you have some other suggestions and items, which we need to check in psi3770 data, please don't hesitate make an advice.

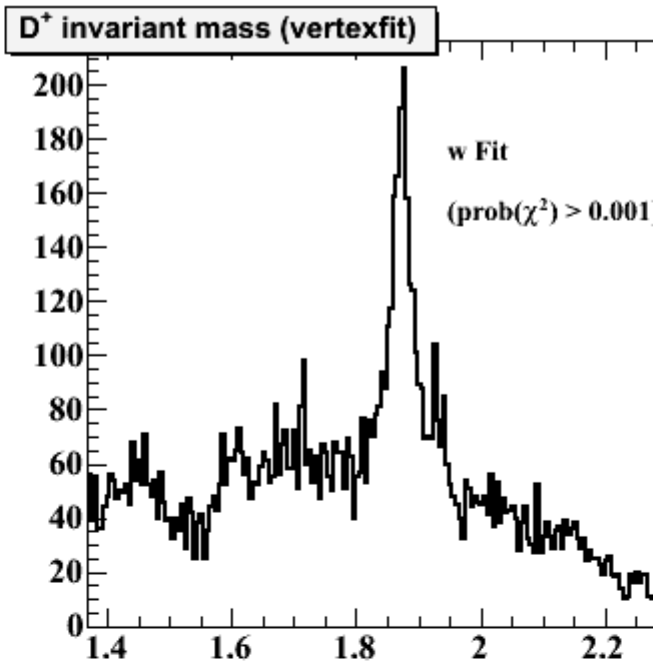
Best wishes,
Donghee

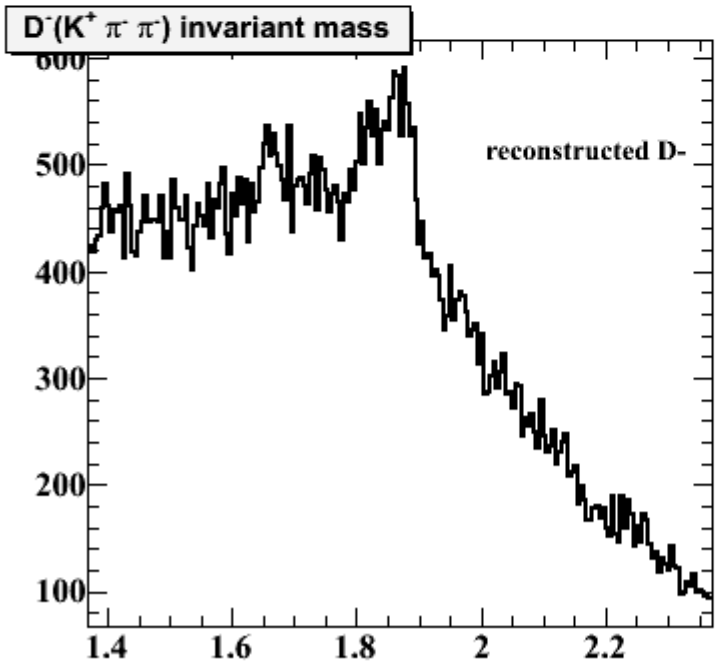
I found D_mass

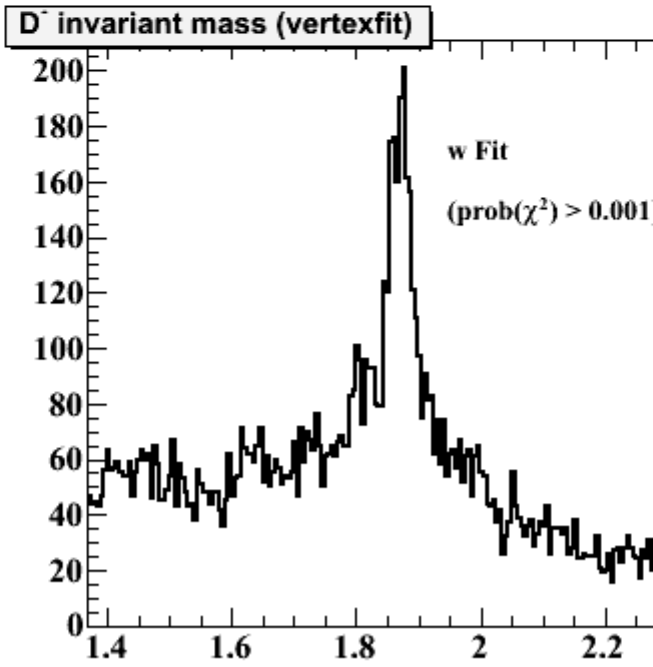
File Attachments

1) D_mass.gif, downloaded 1037 times

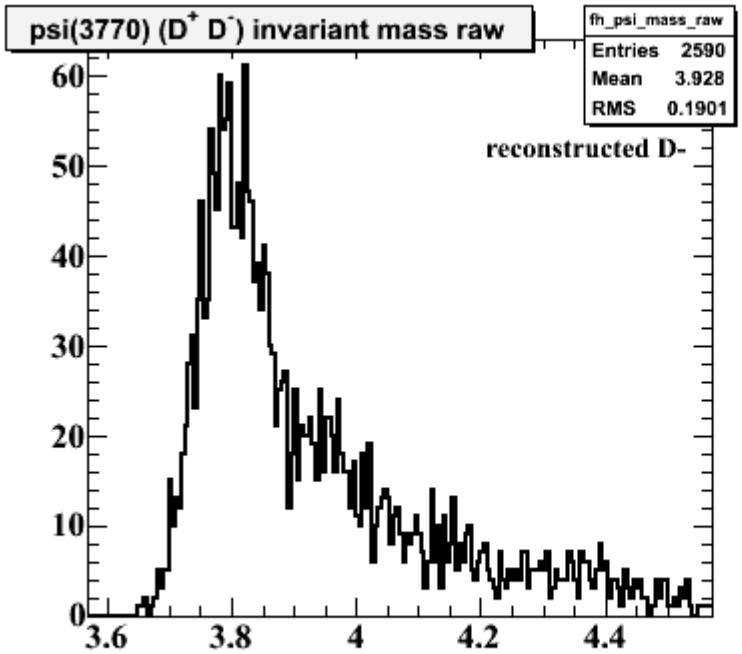


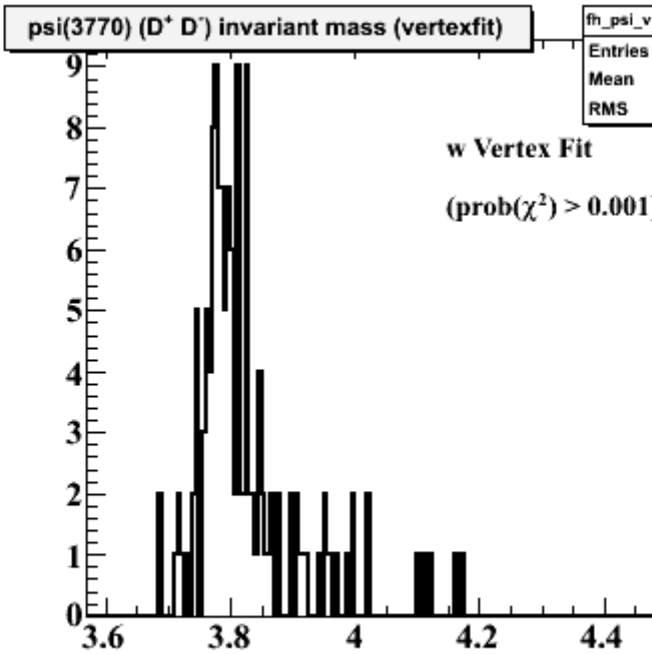




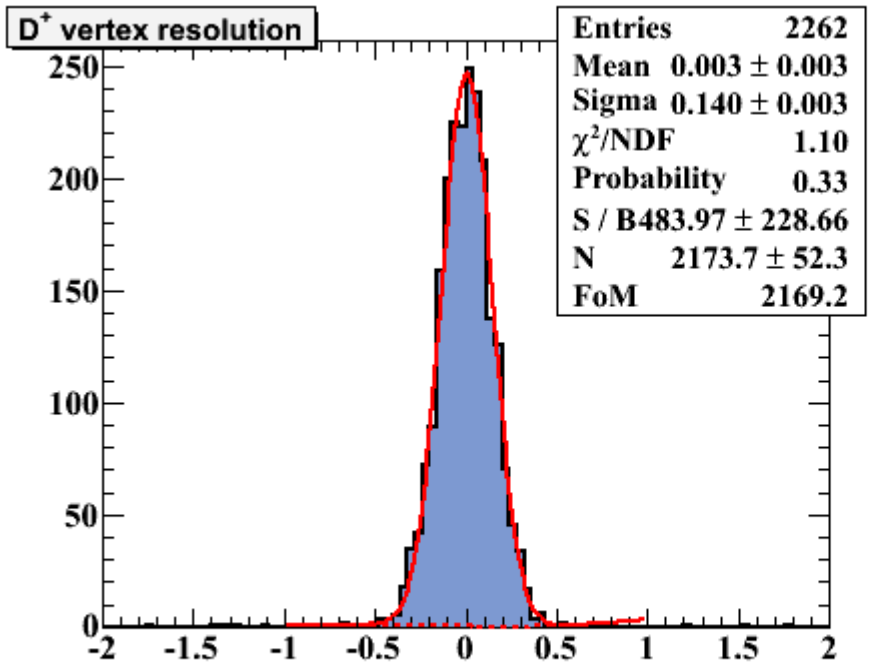


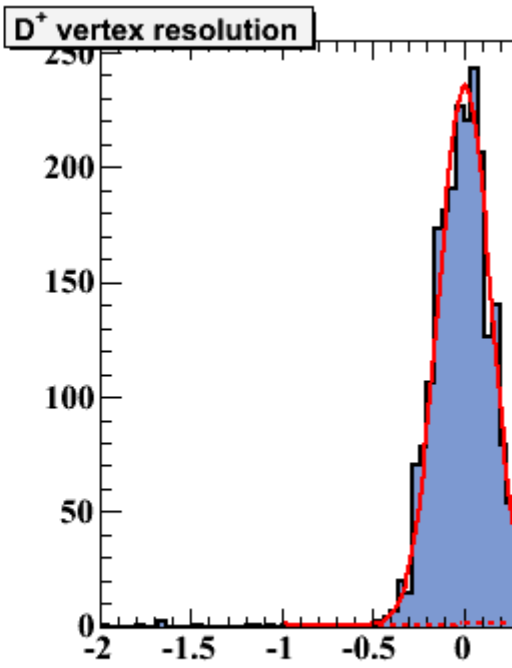
2) Psi_distribution.gif, downloaded 1014 times

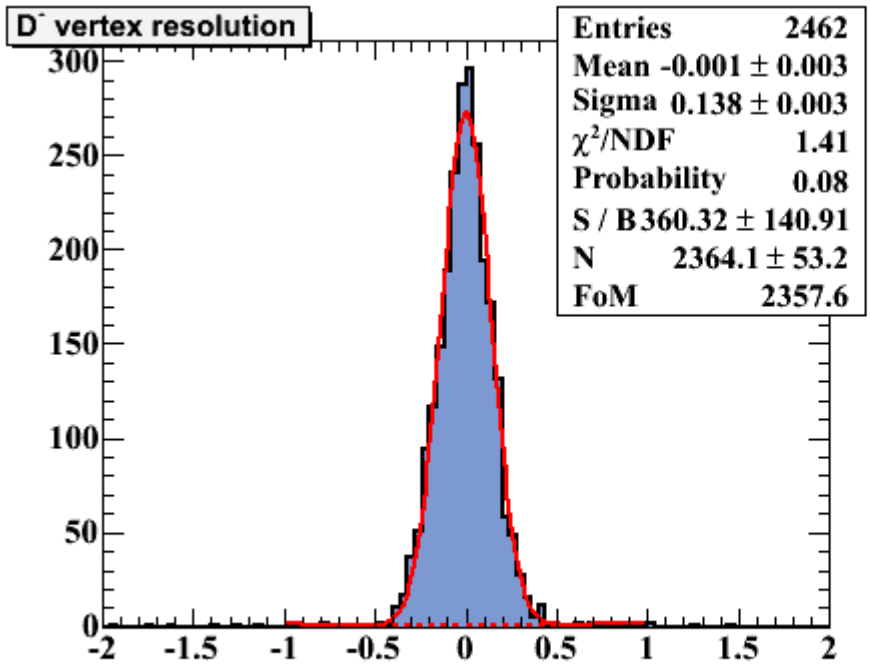


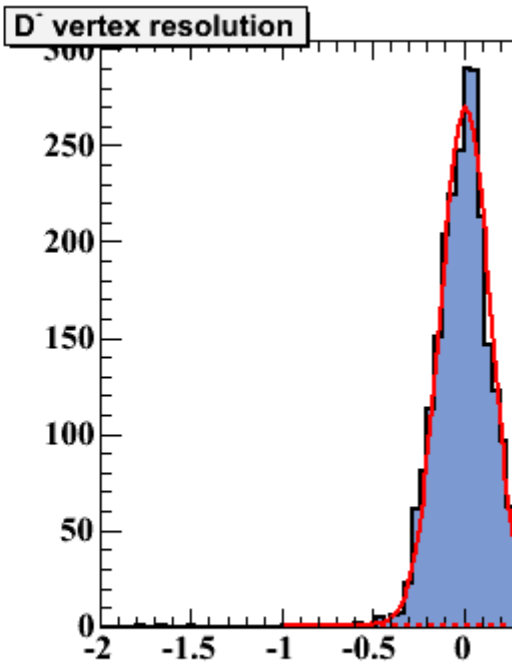


3) Resolution.gif, downloaded 942 times

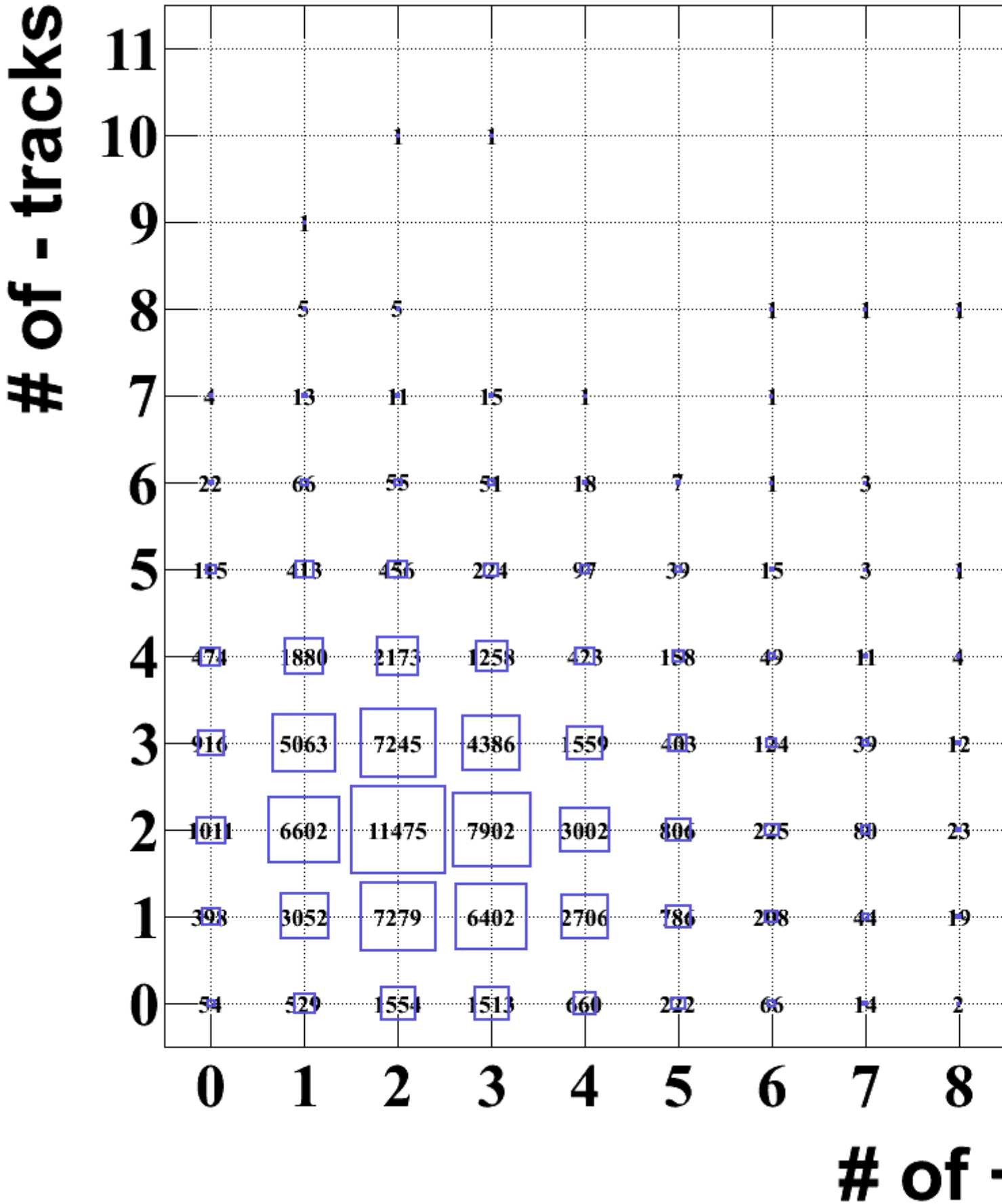








4) tracks.gif, downloaded 963 times


of - tracks
11
10
9
8
7
6
5
4
3
2
1
0
0 1 2 3 4 5 6 7 8
of -
1 1
1
5 5 1 1 1
4 13 11 15 1 1
22 66 55 51 18 7 1 3
195 413 456 224 97 39 15 3 1
474 1880 2173 1258 423 188 49 11 4
916 5063 7245 4386 1559 403 124 39 12
1011 6602 11475 7902 3002 806 225 80 23
398 3052 7279 6402 2706 786 208 44 19
54 529 1554 1513 660 222 66 14 2

Subject: Re: Psi3770 study with run981 tpc mode
Posted by StefanoSpataro on Thu, 21 Jul 2011 08:14:56 GMT
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Hi,

Donghee Kang wrote on Wed, 20 July 2011 15:01Hi,

I'm now testing latest production of psi3770 at Gridka.

For the nth time, you are not using gridka, you are using our pandagrid (I suppose).

Quote:
The data corresponds to run981 with tpc mode and just look 84500 events from totally produced 0.1M evt. PndKinVtxFitter failed and cannot go through whole 500 events.

What do you mean by "failed"? Has it crashed, or simply not produced good results?

Quote:
E/p < 0.85 due to electron tracks (Energy from EMC info.)

You don't have electron tracks in the data sample, then you can take out this selection which decreases the efficiency. Once you used ideal pid you use mc to select your particles.

Quote:
Rejects bad reconstructed track with checking GetMicroCandidate().GetChiSquared() == -1 in the track lists.

These are tracks with problem in the kalman, but maybe they are not bad reconstructed, I would use them.

Quote:
In D_mass.gif, you can find D_mass distribution with three different categories.
First column is raw D+ and D- distribution, and second column shows D+ and D- mass distributions after applying a PndKinVtxFitter.

How are you calculating prob(chi2)?

Quote:
The mean position of D+ and D- masses are slightly shifted from norminal position.

Have you fitted the peak? How much is the center and the sigma?

Quote:
The resolution of D+ and D- vertex are shown in Resolution.gif.

In order to get precise vertex resolution, one need to apply sidebin subtraction for signal region, because bg+sig cannot be separated.

If you use mc pid you don't have physical background but only the one from reconstruction tails. You should not take out such bg.

Quote:
I have still 0.13 cm resolution for x, y direction.
Even if I take only MC true matched events, the resolution doesn't change so much.

I have not yet checked vertex resolution fir psi, for for eta_c it is on the order of 100ub.

Quote:
Psi_distribution.gif shows psi3770 reconstruction with using signal region of D+ and D- mass. Here once again vertex fits for psi3770 have been applied in second, and in third coloumn psi3770 with MC true matched events are additionally plotted to get the feeling for estimation of Psi3770 efficiency.

Have you tried with stt? I have a much higher efficiency there.

Quote:
When I required the MC true matching to reconstructed track, some events have double or even more counting at MC true matching, since sometimes two or three reconstructed tracks are induced essencially same origin of one MC track.
If I have those event, I throw away those events. I need still some tests to reduce those multi-counting problem in my analysis.

You should not reject nthose events, but simply take the best cadidate, with momentum closer to the mc one. This would save you a lot of tracks.

Quote:
PID would be real solution.

You have already mc pid, then you have already the solution

Quote:
So, efficiency of Psi3770 is extremely low with this approach.
If I try same analysis with 4CFitter, I couldn't achieve until finishing complete analysis with 500 events, simply run crash with 4Cfitter for psi3770.

Maybe you have some bug in your code. I was able to run both the fitters with eta_c and w/o any problems/crash. Maybe you have some problems with indices.

Good luck!

Subject: Re: Psi3770 study with run981 tpc mode
Posted by donghee on Thu, 21 Jul 2011 09:57:01 GMT
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Hi Stefano,

I can now answer for few selected items.

With STT mode general feature of psi3770 looks quite good.
Please have a look attached plots, that are produced with stt mode.

I have definitive problem with 4C fitter, maybe I have to check the track list again as you suggested.
But I have no overlapping of track ID(reconstructed) if I correctly defined track candidates.

That is one of simple solution.
But sometimes momentums are quite similar, there are no clean separation in the momentum range.
Quote:
You should not reject nthose events, but simply take the best cadidate, with momentum closer to the mc one. This would save you a lot of tracks.

I don't know why the huge difference between stt and tpc are existed...

Best regards,
Donghee

File Attachments

1) Dmeson_mass_distribution_stt.eps, downloaded 394 times
2) Dmeson_vertex_resolution_stt.eps, downloaded 412 times
3) Psi_mass_stt.eps, downloaded 438 times

Subject: Re: Psi3770 study with run981 tpc mode
Posted by donghee on Thu, 21 Jul 2011 12:44:37 GMT
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Dear Stefano,

I'm using vertex fitter for D- in following procedure.

kip is positive kaon candidate and pim is negative pion candidate, respectively.

Then I do
Quote:
```
Dminus.Combine(kap, pim, pim);
PndKinVtxFitter Dmvtxfitter(Dminus[j]);
Dmvtxfitter.Fit();
double   chi2 = Dmvtxfitter.GlobalChi2();
unsigned ndf = 1;
```

```
TChisqConsistency cons(chi2,ndf);
double prob = cons.Likelihood();
```

Concerning resolution issue, if I have wrongly used the vertex fit, then I can understand bad resolution of D+ and D-.
but if I was using correctly the fit function, then I have to have oder of ~100 micrometer = 0.1mm = 0.01cm

I have still ~1.4mm(=0.14cm) after subtracting value between

> Quote:
> TVector3 Dvertex = (TVector3)mckaontrack->GetStartVertex();
> TVector3 DpVtx = Dpvtxfit->Pos();

Unit is here cm... because the smearing is visible with same unit in the D vertex distribution.
Upper plots are generated true vertex of D, and belows are reconstructed one, as I show you already few times.

I will check some bug..

Best wishes,
Donghee

File Attachments

1) Dmeson_vertex_distribution.eps, downloaded 450 times

Subject: Re: Psi3770 study with run981 tpc mode
Posted by donghee on Thu, 21 Jul 2011 13:40:09 GMT
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Hi stefano,

I think that pion hypothesis of our tracking should be directly affected to psi3770 analysis.

I want to try two different hypothesis with kaon and pion in pid part, separately
and then want to check how the results will be changing.

In my simple guess, I need to touch only PidCorrelator part with exchanging pion mass to kaon mass.

Best regards,
Donghee

Subject: Re: Psi3770 study with run981 tpc mode
Posted by StefanoSpataro on Fri, 22 Jul 2011 17:16:41 GMT
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Donghee Kang wrote on Thu, 21 July 2011 15:40Hi stefano,

I think that pion hypothesis of our tracking should be directly affected to psi3770 analysis.

I want to try two different hypothesis with kaon and pion in pid part, separately
and then want to check how the results will be changing.

In my simple guess, I need to touch only PidCorrelator part with exchanging pion mass to kaon mass.

In reality this is already done for stt in the macros, now updated in svn with ideal fitting. You have to touch the kalman as shown in the reco macros, the correlator does not influence so much the results.
About tpc,they were priduced with pion hypothesis, because the ideal one seems not to work.

Subject: Re: Psi3770 study with run981 tpc mode
Posted by StefanoSpataro on Fri, 22 Jul 2011 17:24:38 GMT
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Several questions came to my mind.
a) Are you identifying pions and kaons from mc? Have you checked that they are primaries? And are yiou sure the the mccorrelation is done properly? (i.e., you could have misplaced trees, in particular if you are summing upo files)
b) Have you applied a selection around D mass? To take away bad combinations with bad momenta
c) Why you assume the ndf is 1? I think at this stage one should not use any chi2 cut, considering that we have to understand the errors before.

Subject: Re: Psi3770 study with run981 tpc mode
Posted by donghee on Mon, 25 Jul 2011 09:43:58 GMT
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Hi Stefano,

Quote:
a) Are you identifying pions and kaons from mc? Have you checked that they are primaries? And are yiou sure the the mccorrelation is done properly? (i.e., you could have misplaced trees, in particular if you are summing upo files)

I made running my analysis code with one produced run file (contain 500 events), and then I added up produced all histograms (typically 200 runs) with simple merging process.

Here is the way to get MC true information in the analysis code.
For both STT and TPC, I can have correct values of MC momentum and the theta and all other info about true MC from below lines.
Quote:

```
        for(Int_t mc=0;mc<mc_array->GetEntriesFast();mc++)
    {
      PndMCTrack *mctrack=(PndMCTrack*)mc_array->At(mc);

      double mom=mctrack->GetMomentum().Mag();
      double the=mctrack->GetMomentum().Theta()*TMath::RadToDeg();
      TVector3 primary  = (TVector3)mctrack->GetStartVertex();
           if(!(mctrack->IsGeneratorCreated())) continue;
      if(mc==0 && mctrack->GetPdgCode()== -321){ ... //stuff for histogram}
      if(mc==1 && mctrack->GetPdgCode()==  211){ ... //stuff for histogram}
      if(mc==2 && mctrack->GetPdgCode()==  211){ ... //stuff for histogram}
      if(mc==3 && mctrack->GetPdgCode()==  321){ ... //stuff for histogram}
      if(mc==4 && mctrack->GetPdgCode()== -211){ ... //stuff for histogram}
      if(mc==5 && mctrack->GetPdgCode()== -211){ ... //stuff for histogram}
        }
```

Quote:
b) Have you applied a selection around D mass? To take away bad combinations with bad momenta

I used selector with the range of mass 1.8693 +/- 0.05 GeV/c, in panda word,
TPidMassSelector *DMassSel=new TPidMassSelector("Dselector", 1.8693, 0.1);
When Psi reconstruction is made, I require mass window of D+ and D- according 1.8193 < M_(D+ or D-) < 1.9193 GeV.

Quote:
c) Why you assume the ndf is 1? I think at this stage one should not use any chi2 cut, considering that we have to understand the errors before.

The probability must be 0 < prob(chi2,ndf) < 1.
When I use ndf getting from the fitter for D+ and D-, ndf is always 4.
From that values, prob can only have 0 < prob(chi2,ndf) < 0.25. That should be wrong.
For Psi case, I used ndf directly from PndKinVtxfitter.
Quote:

```
double   chi2 = vtxfitter.GlobalChi2();
double   pull = vtxfitter.GetPull();
unsigned ndf =  vtxfitter.Getdof();
TChisqConsistency cons(chi2,ndf);
double prob = cons.Likelihood();
```

I understand that the meaning of probability bigger than 0.001 is that D or Psi events simply would be taken only with successfully fitted events.
You suggested that I don't need to reject any events from probabilities or even chi2s cut.
In this analysis, I have actually 4 different data samples like

So, I can take the data without requirement of chi2 fit as you want to do.

Best wishes,
Donghee

Subject: Re: Psi3770 study with run981 tpc mode
Posted by donghee on Tue, 26 Jul 2011 09:14:02 GMT
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Dear

Here is some new study of psi3770 channel.
I have tried to test the effect of pion and kaon hypothesis in the psi3770 reconstruction.

Please remind the psi(D+D-)-> decay into 6 final state with K-pi+pi+K+pi-pi-.

In the STT reconstruction, I have prepared an extra reco and pid file with kaon hypothesis, which has an assumption of kaon mass in PndRecoKalmanTask during the kalman fit.

So, I have two different pid files according only pion hypothesis and only kaon hypothesis, respectively.
Then I tried to build D+, for instance, with negative Kaon candidate from kaon pid file and positive pion candidates from pion pid file. That is quite simple approach to test the influence on D+ and D- reconstruction and vertex resolution.

In attached files, the D+ and D- mass distributions are compared.
Dmeson_mass_distribution plot show the results on the pion hypothesis, which is our standard approach. Tracking has been done only with pion hypothesis in this case.
In Dmeson2_mass_distribution, kaon hypothesis and pion hypothesis are used according D+(K-pi+pi+) or D-(K+pi-pi-) decay topology. As I said, I made kaon pid file with kaon hypothesis as an extra step.

What we can learn from both plots is the number of reconstructed events are increased due to correct mass hypothesis.
But vertex resolution of D+ and D- are practically unchanged.
I (or you) could expect some improvement of D+ and D- vertex resolution, but unfortunately it doesn't so much help in the reconstruction level.

welcome any comments.

Best wishes,
Donghee

File Attachments
1) Dmeson_mass_distribution.eps, downloaded 413 times
2) Dmeson2_mass_distribution.eps, downloaded 417 times

Subject: Re: Psi3770 study with run981 tpc mode
Posted by StefanoSpataro on Sat, 30 Jul 2011 22:06:23 GMT
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I have run analysis on psi channel and I have obtained D vertex resolutionof around 60um for X and Y and around 100 um for Z, the probably youhave done something not correct.
Please check the macro Ana_check.C inside psi3770 folder, to find whichcould be your problem.

Subject: Re: Psi3770 study with run981 tpc mode
Posted by donghee on Mon, 01 Aug 2011 02:13:17 GMT
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Hi, Stefano

First of all, you are perfectly right, I have made mismatching between MC true and reco. I had to use tree->GetEntry(i-1); but I put "i", so all index was shifted
It is now corrected and all data need to be re-analysed.
I think that vertex resolution will be fine, result will be posted in forum soon.

By the way, did you test psi3770 with TPC data?

regard,
Donghee

Subject: Re: Psi3770 study with run981 tpc mode
Posted by StefanoSpataro on Mon, 01 Aug 2011 05:45:05 GMT
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Yes,
you can find my slides inthe tracking wiki.