Subject: [FIXED] Problems with PndKinFitter::AddMassConstraint
Posted by StefanoSpataro on Mon, 05 May 2014 15:54:34 GMT
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Dear all,
most probably the "analysis" topic would be better, but since I did the tests with fast sim then I report here.

I run the standard psi(2S) -> J/psi pi+ pi- which you can find in macro/scrut simulation macros. I modified the analysis macro (ana_ste.C) in order to have montecarlo ID and to plot some variables from the fit. The analysis macro is attached.

If I take my J/psi pi+pi- combinations (psi) and put a 4 constraint fit:

```
PndKinFitter kinfit(psi2s[j]);
      kinfit.Add4MomConstraint(ini);
kinfit.Fit();
```

I have decent results:

You can see the original invariant mass, the fitted invariant mass (RMS from 48 MeV to 50 KeV), chi2 peaked around 3 (4 degrees of freedom), flat probability between 0 and 1.

But if I try to apply a mass constraint fit to only the mu+mu- (J/psi):

```
PndKinFitter mfitter(jpsi[j]);  // instantiate the PndKinFitter in psi(2S)
mfitter.AddMassConstraint(m0_jpsi); // add the mass constraint
mfitter.Fit();      // do fit
```

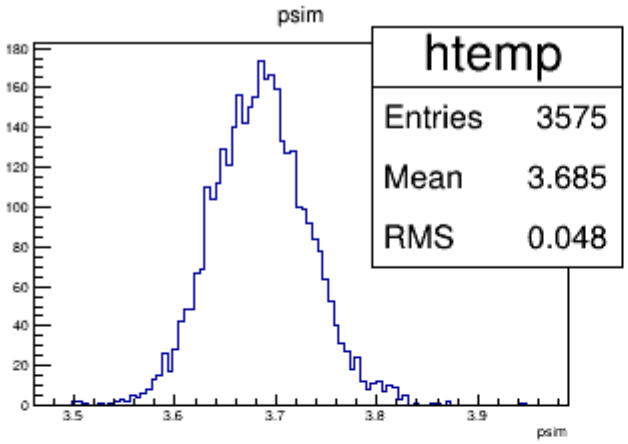
Then the results are not so fine:

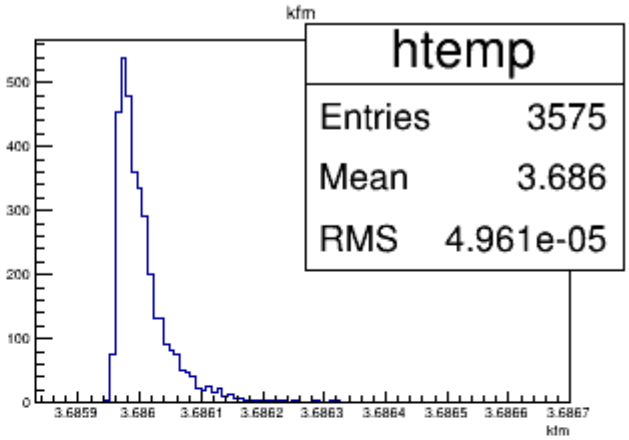
Invariant mass before and after the fit (RMS from 46 MeV top 6 MeV, which is a big value considering that it is a mass constraint fit and it should be a delta, 1 NDF), chi2 peaked at very low values, and prob not flat.

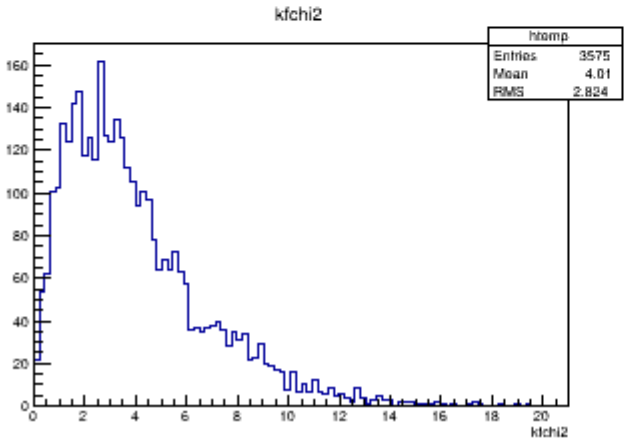
I would say tht the AddMassConstraint function has some problems.

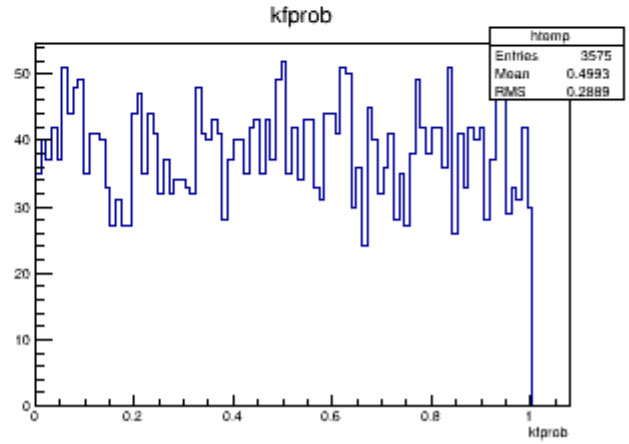
File Attachments

1) psi.gif, downloaded 1401 times

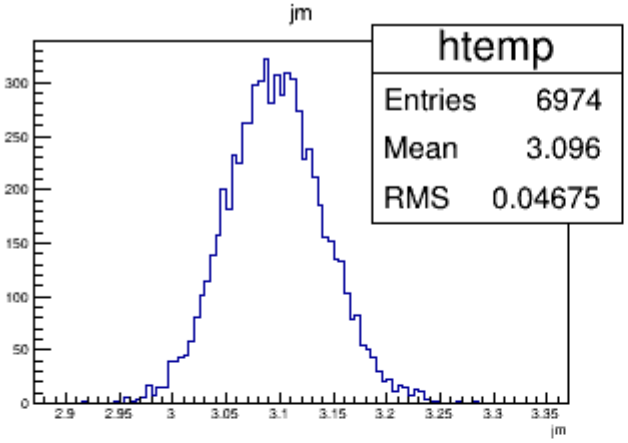


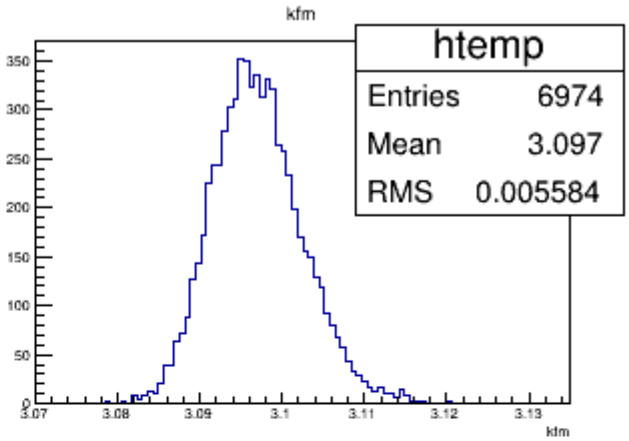


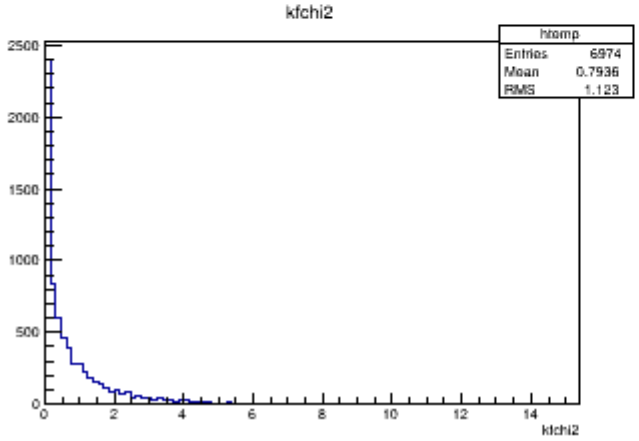


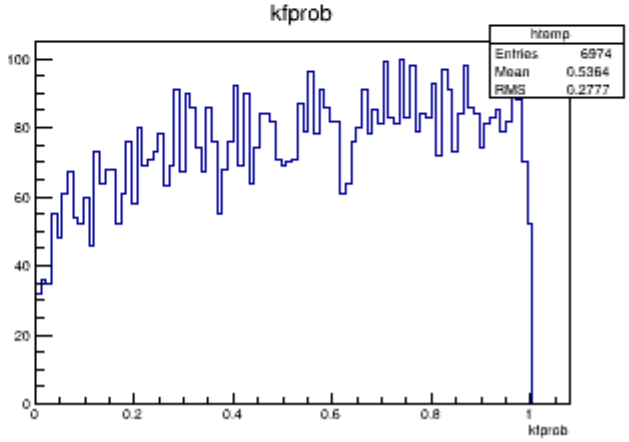


2) jpsi.gif, downloaded 1463 times









3) ana_ste.C, downloaded 650 times

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by StefanoSpataro on Tue, 06 May 2014 08:39:40 GMT
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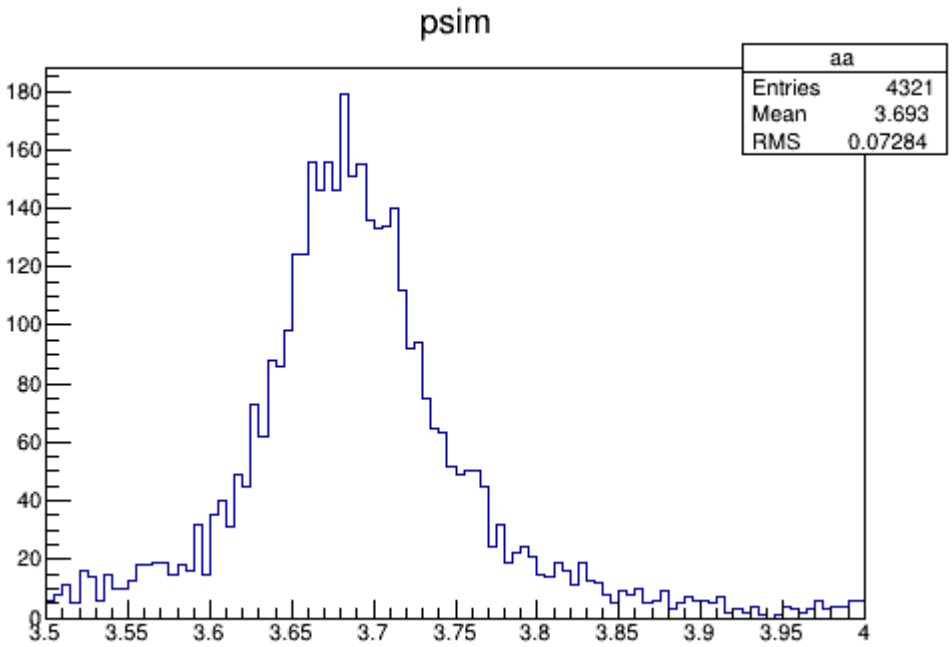
For completeness I attach here the plots obtained with full reco. The behavious is the same of the fast sim.

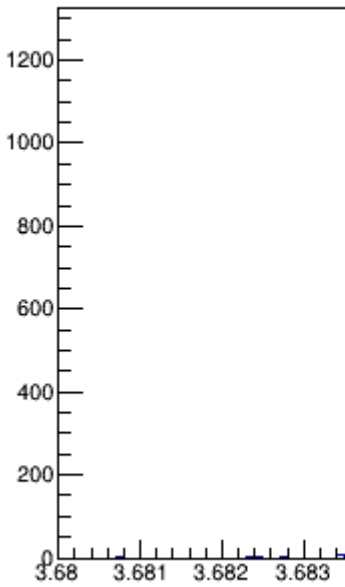
psi(2S)

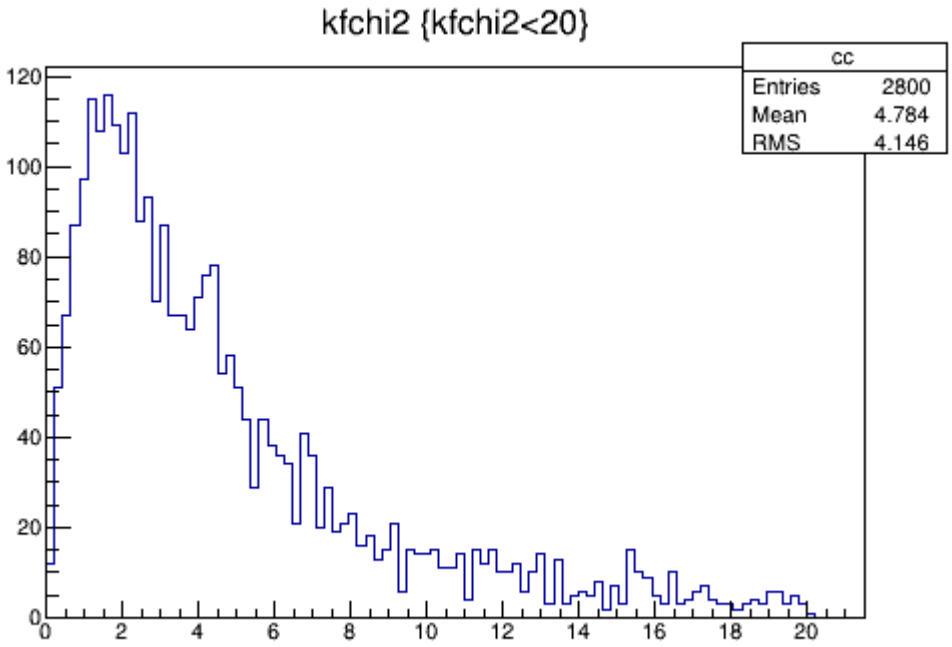
J/psi

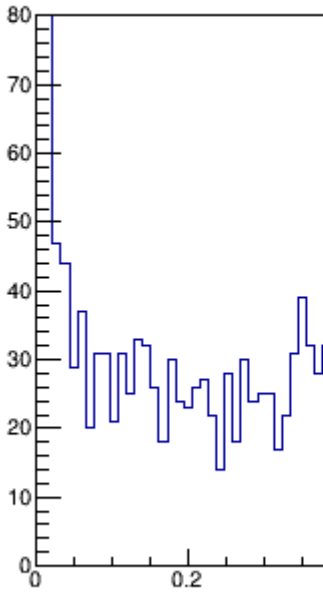
File Attachments

1) psi_full.gif, downloaded 1050 times

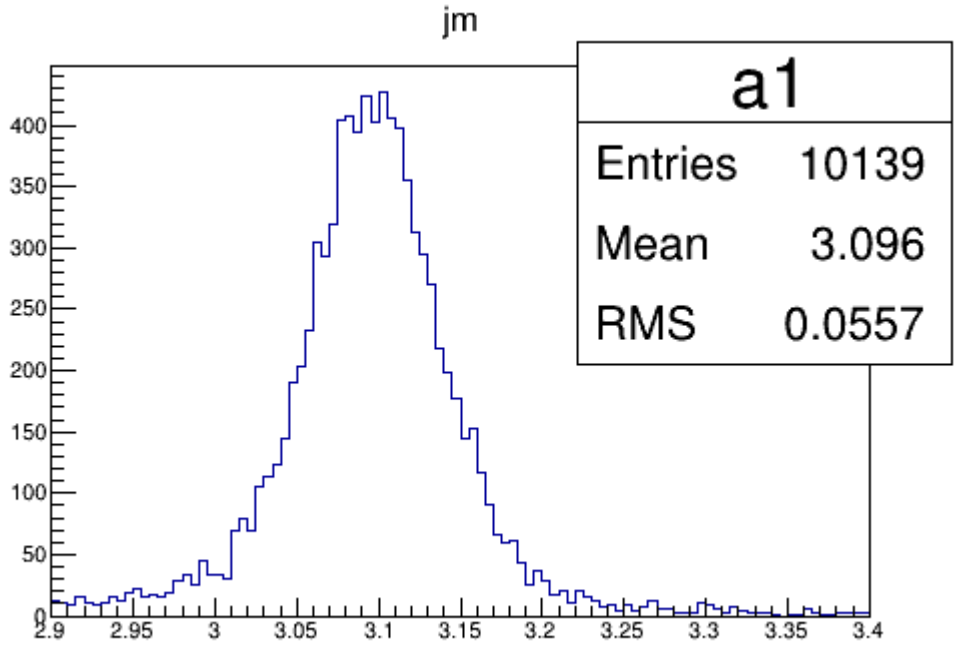


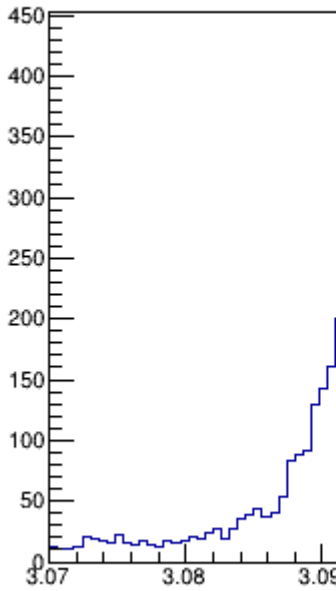


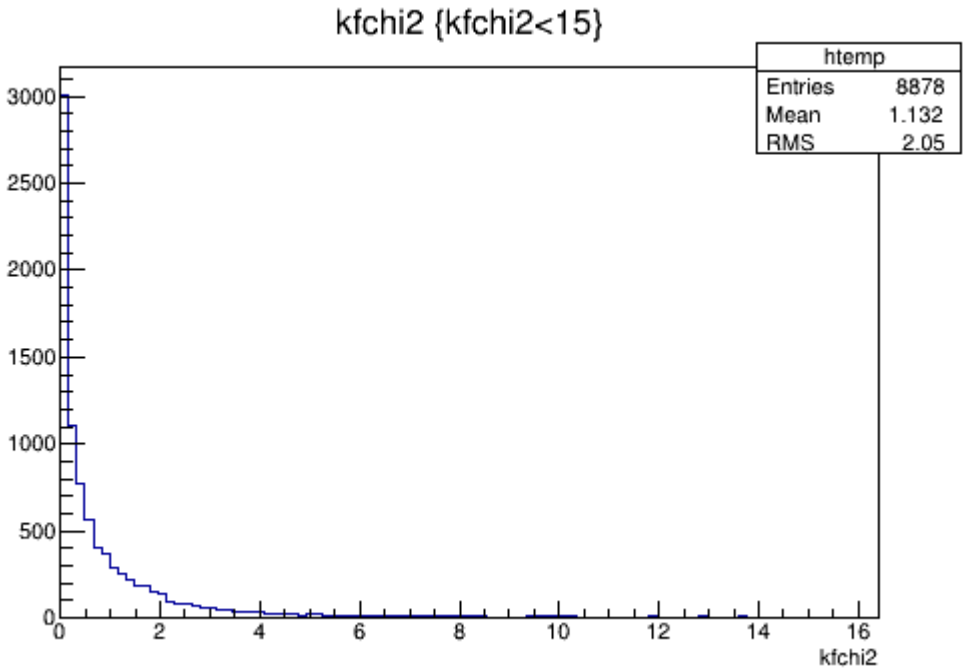


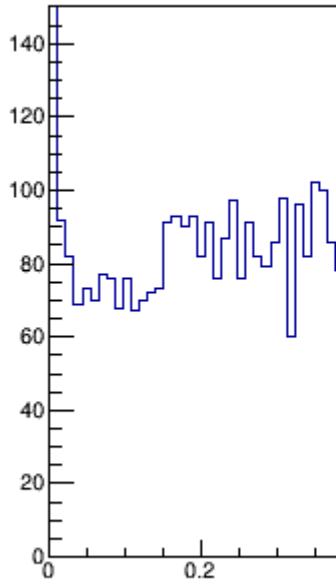


2) jpsi_full.gif, downloaded 968 times









Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by Ralf Kliemt on Wed, 07 May 2014 13:36:02 GMT
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Hi Stefano.

Why should the mass after the fit be a delta peak? The fitter tries to match the constraint by adjusting the final state four-momenta within the errors in a linearized way. The fitted composites are then recalculated by that adjusted final state. As you can see the resolution is much better after the fit.

Cheers
Ralf

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by StefanoSpataro on Wed, 07 May 2014 15:32:57 GMT
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This is a mass constraint fit, you force the total mass being a defined value, and then you use the modified parameters to check other distributions (i.e. you fit the j/psi mass and check the improvement in the resolution of psi mass). The mass must be a delta, or must have sigma much narrower than resolution... in this case you have only one moderate improvement. The 4C fitter works nicely and you have a delta there, or better a very narrow distribution. A broader distribution means that the fit did not converge to a global minimum, and I am not surprised seeing that chi2 distribution.

The main question is: why the chi2 distribution is screwed? Once fixing this, I believe the fitter will produce good results. The fact that the 4C fitters works nicely, in both full and fast sim, means that covariances are fine.

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by StefanoSpataro on Fri, 09 May 2014 15:05:23 GMT
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Hi,
I have received this answer from Vishwajeet:

Quote:Dear Stefano,

What you are looking at is a simplistic Mass constraint fit which fixes everything with respect to the constrained mass.
I had a look at the PndKinFitter class.

The delta mass peak can be obtained by replacing (line : 339 -348 Trunk version (rev: 21681) by the following code snippet

```
fmD[fNc+0][kN+0] = -2.*Px;
fmD[fNc+0][kN+1] = -2.*Py;;
fmD[fNc+0][kN+2] = -2.*Pz;
fmD[fNc+0][kN+3] = 2.*Etot;
fmD[fNc+0][kN+4] = 2.*a*Py;
fmD[fNc+0][kN+5] = -2.*a*Px;
fmD[fNc+0][kN+6] = 0.0;
```

I have tested it with the macro in /macro/run/ana_complete.C Unfortunately my wiki and forum login access is no longer there (as it was with my FZ email) .

Actually the full mass constraint fit should include the vertex information and this can be

implemented with not much effort.
I will see if I can do that. In that case, what Ralf pointed out in the forum is right.

Please tell me if it is fine.

cheers,
Vishwajeet

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by Ralf Kliemt on Mon, 12 May 2014 10:26:43 GMT
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Hi Stefano,

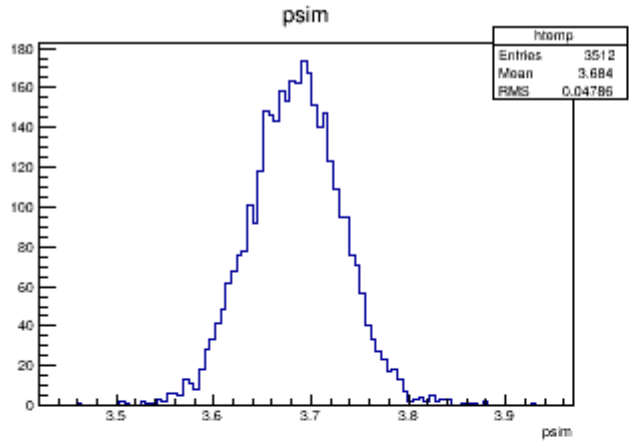
I tried these matrices and find a good behaviour in the Compond system mass.

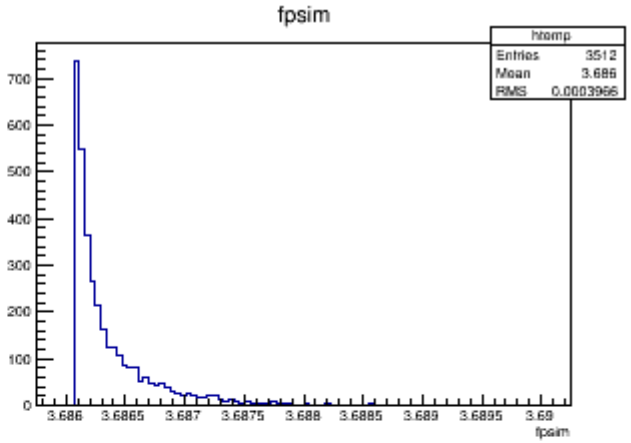
You see the Psi(2S) is reconstructed "as a needle". However, the pion masses differ, which is expected because their masses are no constrain entereing the fit.

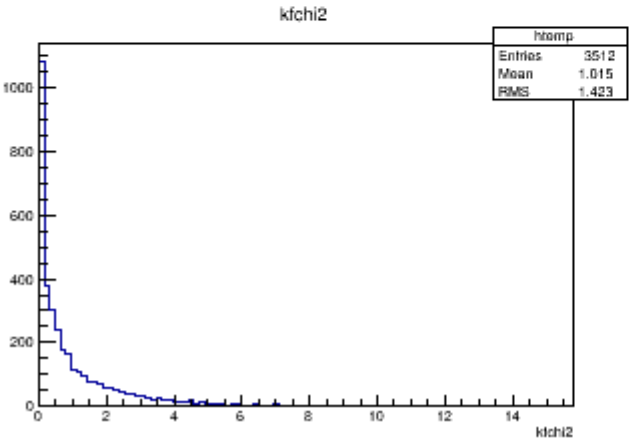
Shall I submit those changes to the trunk?

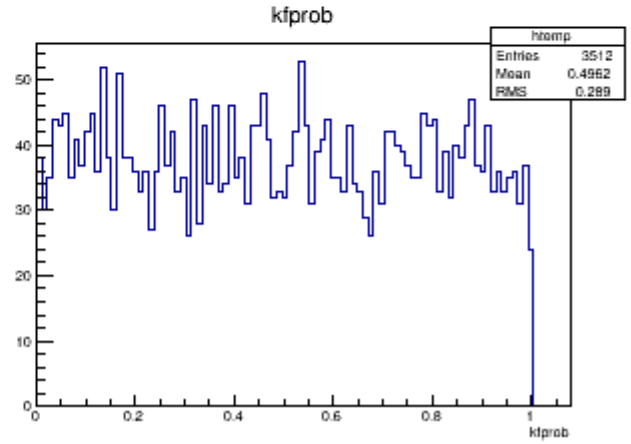
Cheers
Ralf

File Attachments
1) kftest.gif, downloaded 938 times

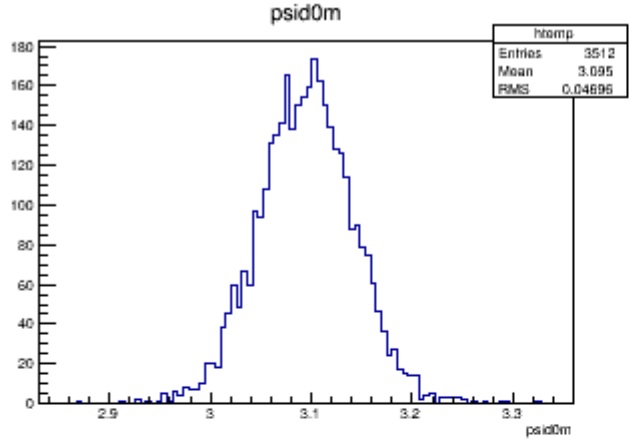


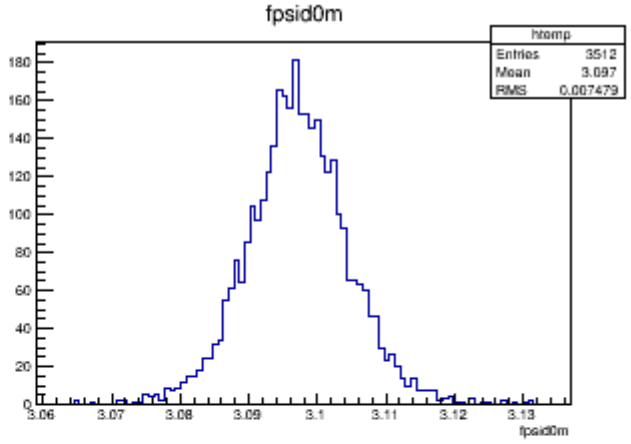


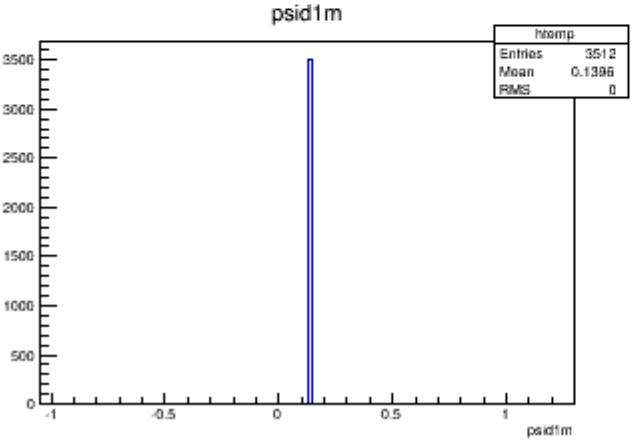


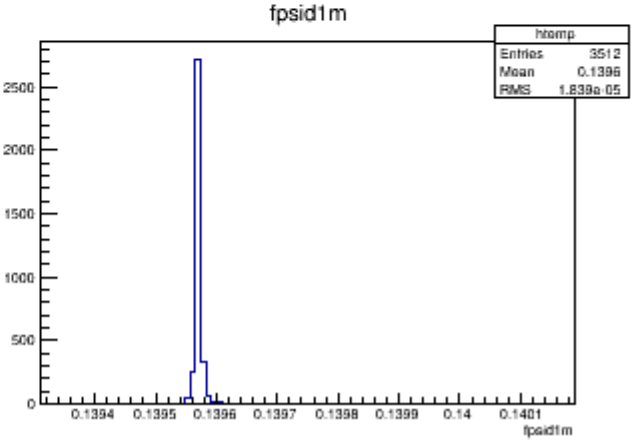


2) kfdtst.gif, downloaded 1047 times









Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by Ralf Kliemt on Mon, 12 May 2014 10:33:02 GMT
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Hi Stefano,

I tried these matrices and find a good behaviour in the Compond system mass.

You see the Psi(2S) is reconstructed "as a needle". However, the pion masses differ, which is expected because their masses are no constrain entereing the fit.

Shall I submit those changes to the trunk?

Cheers
Ralf

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by StefanoSpataro on Mon, 12 May 2014 10:34:16 GMT
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Mass and probability seems fine, still the chi2 is strange. But checking the code it seems it is calculated in the same way of other constraint fits, I don't understand...

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by Ralf Kliemt on Mon, 12 May 2014 12:22:16 GMT
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Well, the chi2 function should look like that for ndf=1.
See: http://en.wikipedia.org/wiki/Chi-squared_distribution

Ralf

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by StefanoSpataro on Mon, 12 May 2014 12:27:14 GMT
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Ok, then you can commit

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by Ralf Kliemt on Mon, 12 May 2014 13:33:04 GMT
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Well.

I submitted it to both, the trunk and scrut14. Isuppose people want to use it today.

Ralf

Subject: Re: Problems with PndKinFitter::AddMassConstraint
Posted by StefanoSpataro on Tue, 13 May 2014 14:57:13 GMT
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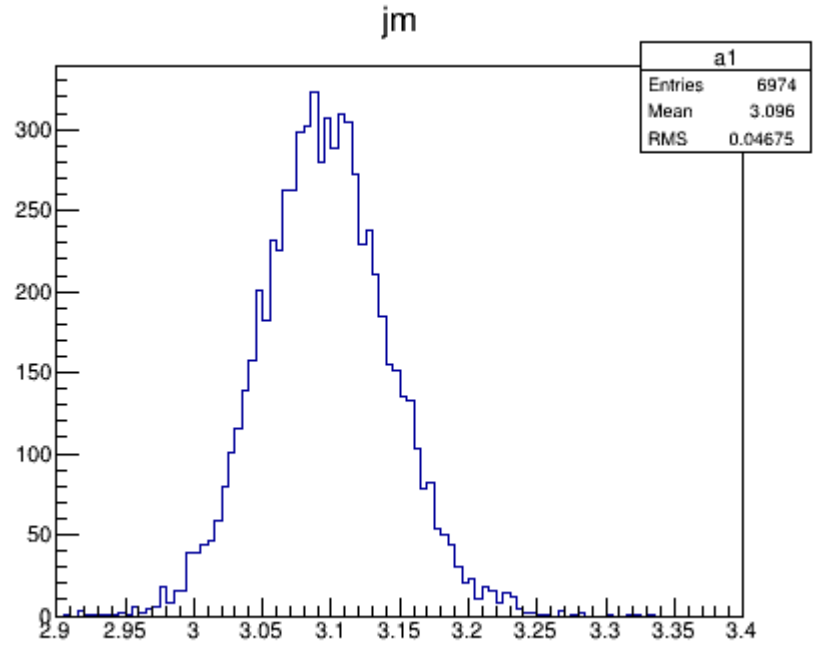
To close the topic,
I put here the new J/psi plots for fast simulation:

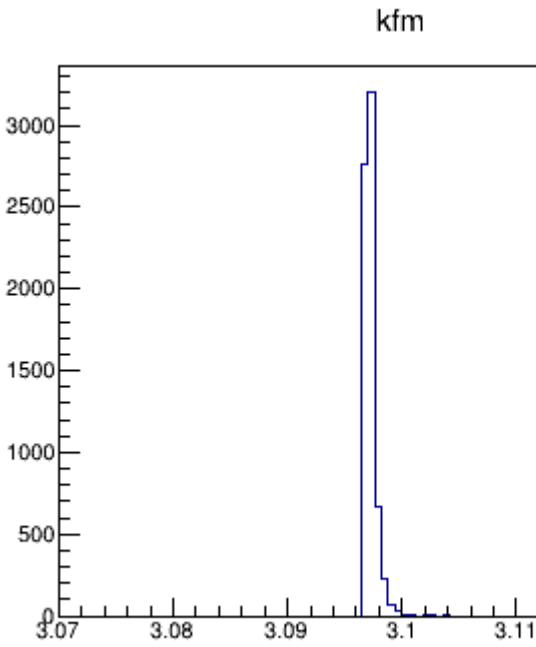
and for full:

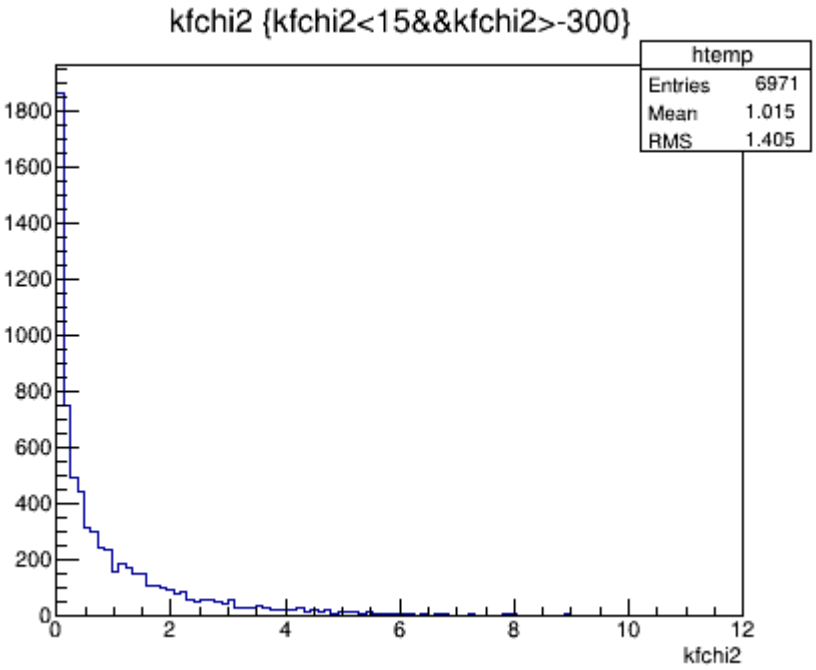
Everything seems fine now. Only one comment: in full I found one combination with negative chi2 over 10k events. I suppose the cut in probability will take it away.

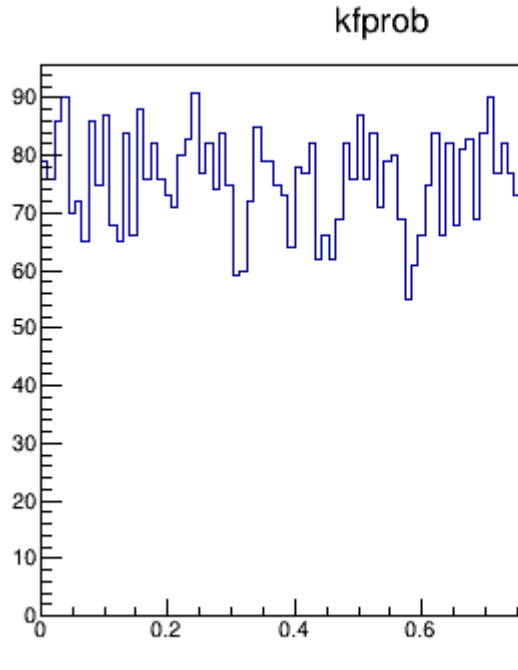
File Attachments

1) jpsi_fast_new.gif, downloaded 1140 times

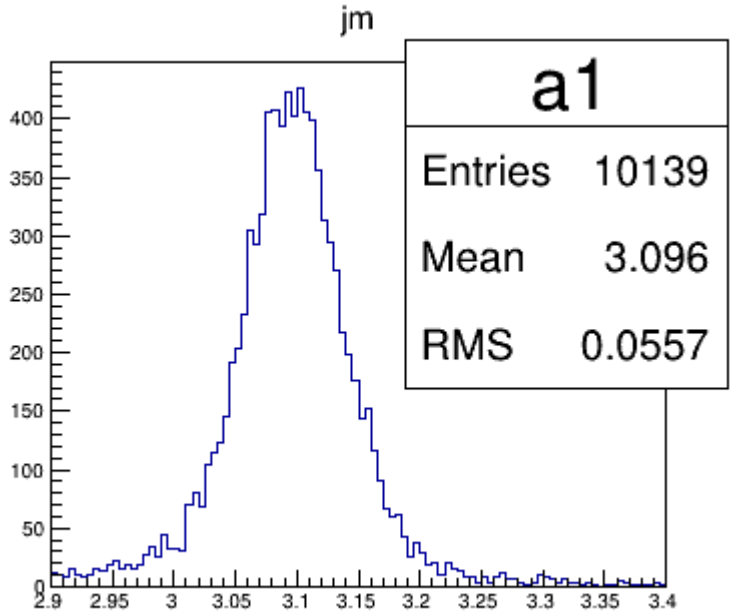


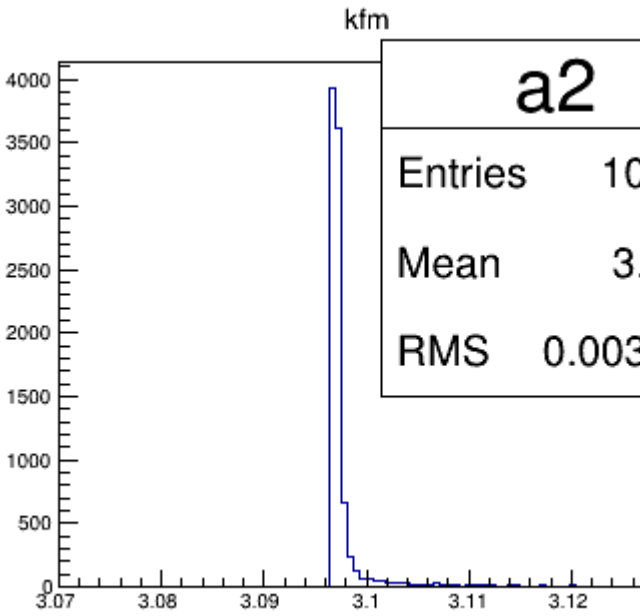


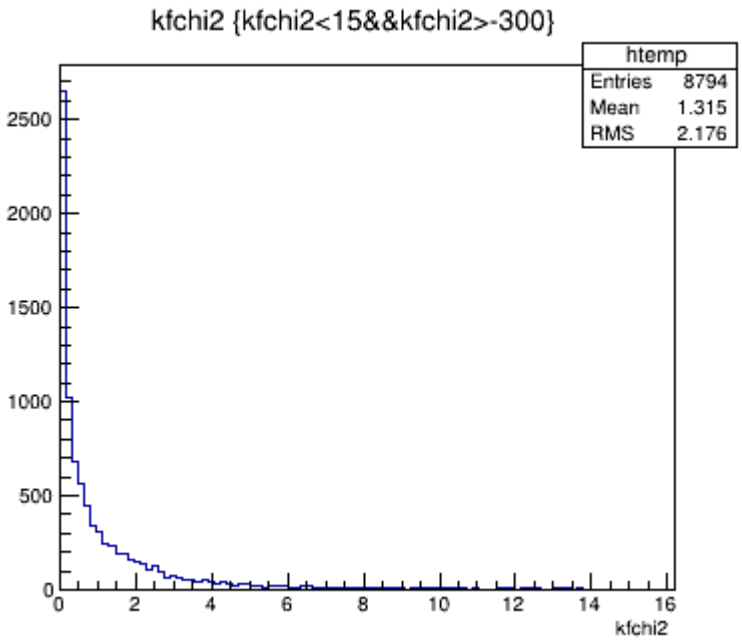


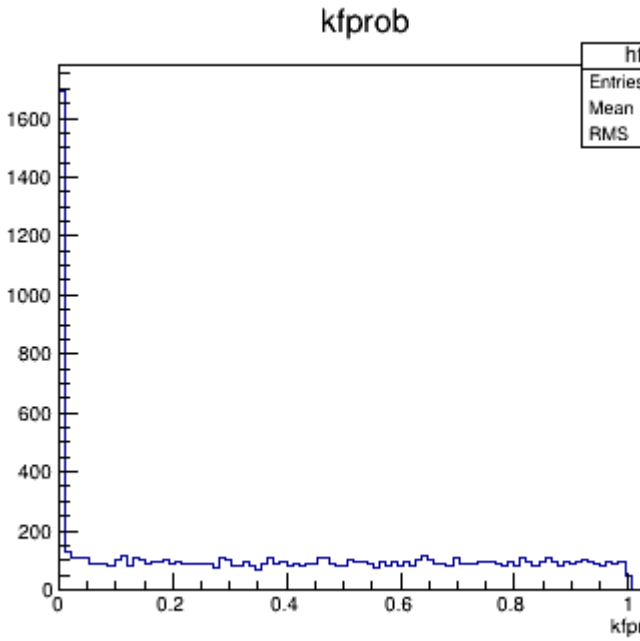


2) jpsi_full_new.gif, downloaded 1129 times


jm
a1
Entries 10139
Mean 3.096
RMS 0.0557


kfm
a2
Entries 10
Mean 3.
RMS 0.003


kfchi2 {kfchi2<15&&kfchi2>-300}
htemp
Entries 8794
Mean 1.315
RMS 2.176
kfchi2


kfprob