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
```

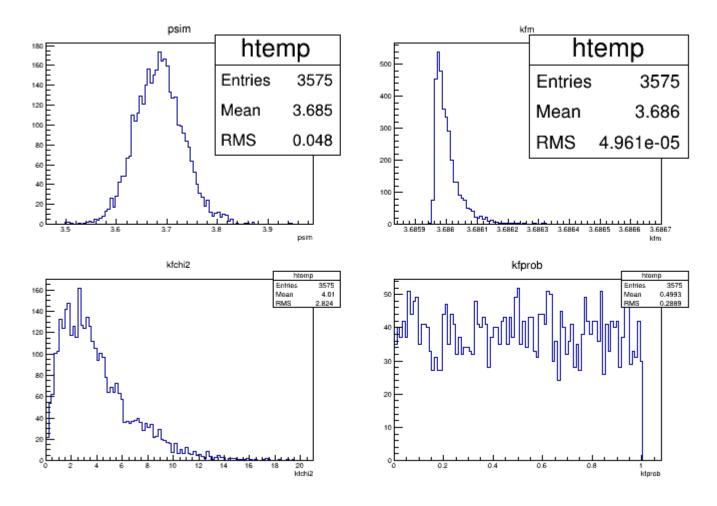
Then the results are not so fine:

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.

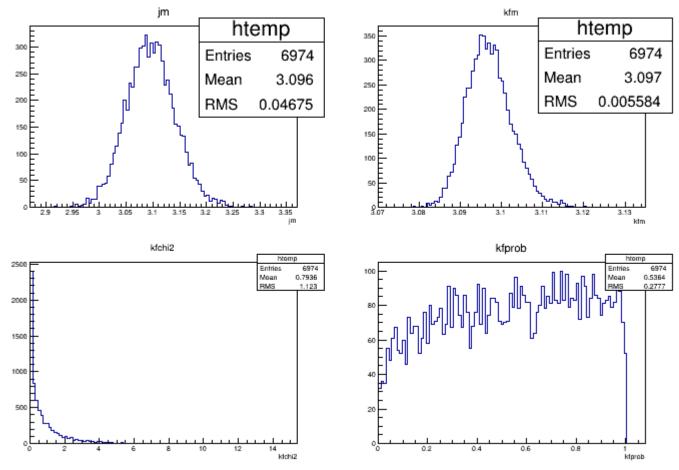
I would say tht the AddMassConstraint function has some problems.

```
File Attachments
```

```
1) psi.gif, downloaded 1291 times
```



2) jpsi.gif, downloaded 1347 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.

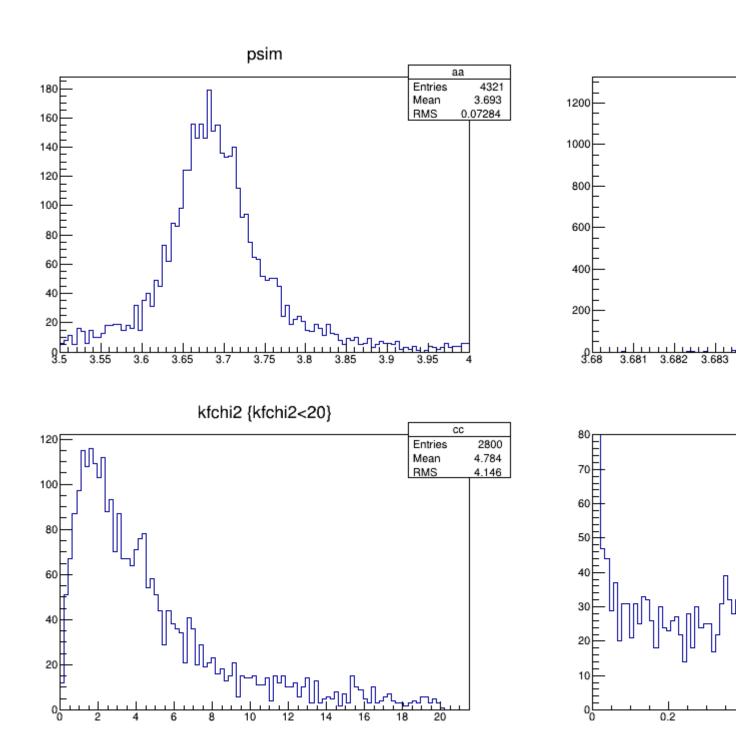
psi(2S)

J/psi

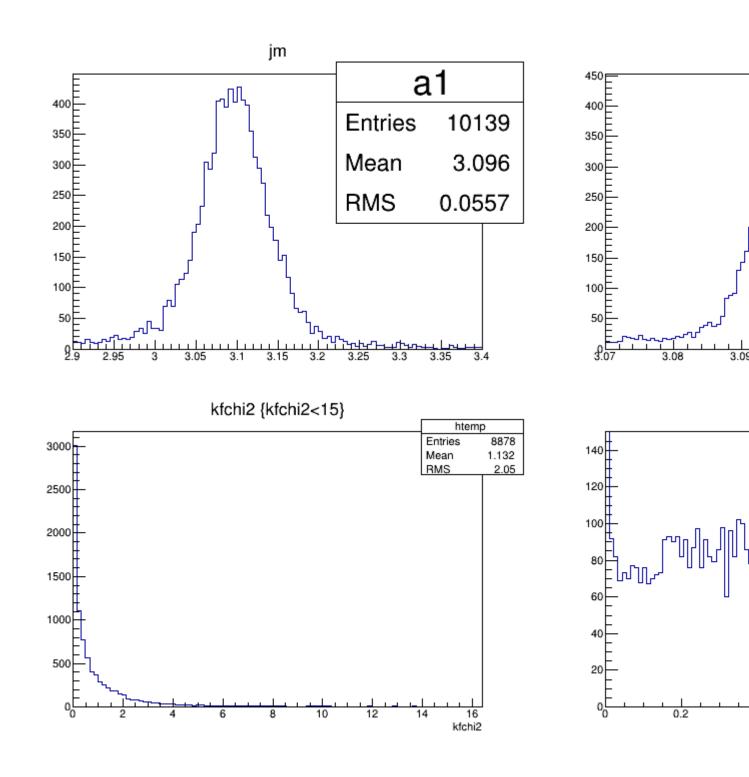
File Attachments

1) psi_full.gif, downloaded 950 times

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2) jpsi_full.gif, downloaded 870 times



Subject: Re: Problems with PndKinFitter::AddMassConstraint Posted by Ralf Kliemt on Wed, 07 May 2014 13:36:02 GMT View Forum Message <> Reply to Message

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.

Subject: Re: Problems with PndKinFitter::AddMassConstraint Posted by StefanoSpataro on Wed, 07 May 2014 15:32:57 GMT View Forum Message <> Reply to Message

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 View Forum Message <> Reply to Message

Hi Stefano,

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

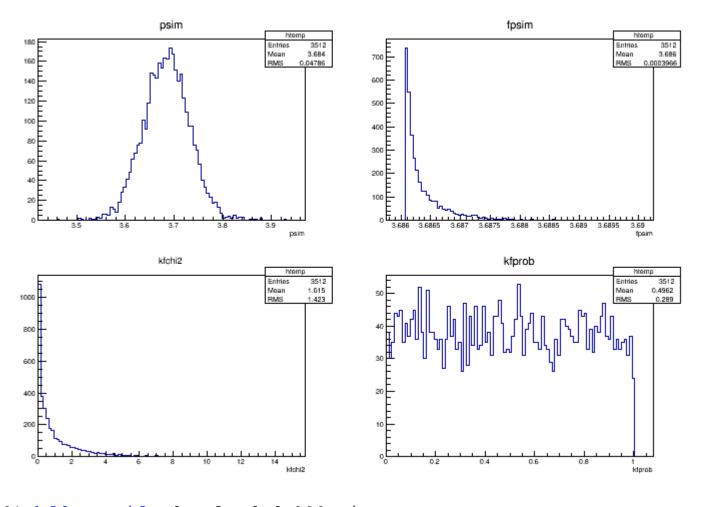
You see the Psi(2S) is reconstructed "as a needle". However, the pion masses differ, which is expected because their masses are no constrain entereing the fit.

Shall I submit those changes to the trunk?

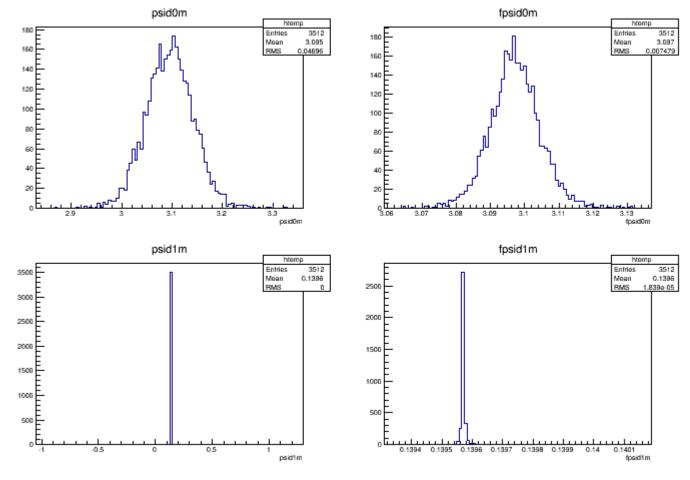
Cheers Ralf

File Attachments

1) kftest.gif, downloaded 851 times



2) kfdtst.gif, downloaded 990 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 View Forum Message <> Reply to Message

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:

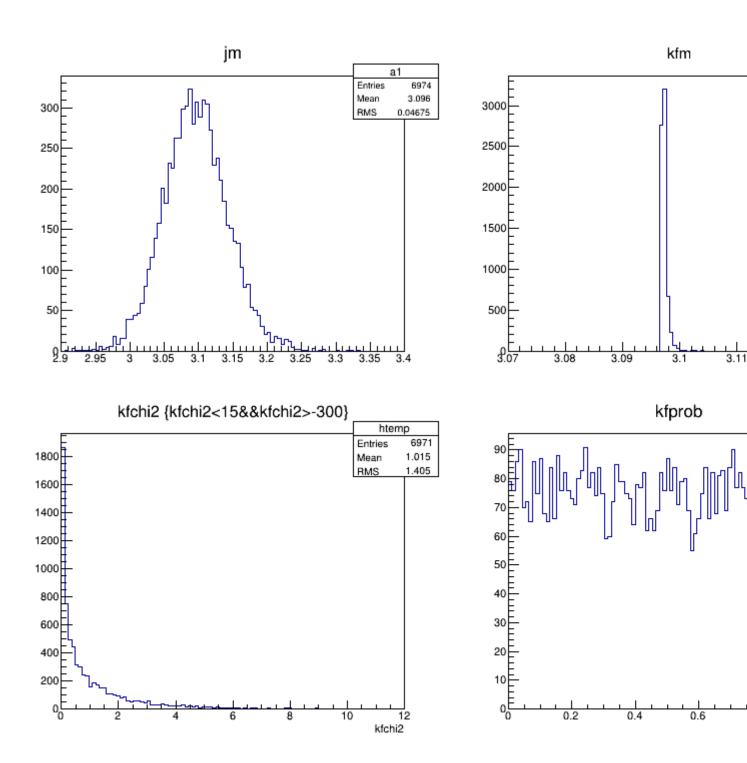
and for full:

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 1048 times

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2) jpsi_full_new.gif, downloaded 1026 times

