Subject: Psi analysis as a cross check from donghee kang
Posted by donghee on Wed, 17 Aug 2011 10:37:47 GMT
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Hi Panders,,,,

I would like to show you and to make sure, the psi(3770) benchmark channel is in principle being cross checked.
Here is a brief summary (presentation), which you can get some numbers global acceptance and resolutions of D+, D-, psi, and its products.

General way of psi analysis is based on the MC true PID matching (assuming ideal PID) and it found that TPC and STT show similar performance.
Vertex resolution for D+ and D- are found to be level of 100 micro meter for z and 60 micro meter for x and y position.
Mass resolutions are roughly 10-20 MeV for D mesons with both STT and TPC mode.

Please have a look this note, and welcome any comments and suggestions for further analysis.
Marius is main analyzer of psi(3770) channel, it might be useful to get a confirmation of this analysis from him, whether all results are reasonable or not.

Thank you...
Donghee

File Attachments

1) Psi-tdr-draft-02.pdf, downloaded 380 times

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Wed, 17 Aug 2011 13:32:57 GMT
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Dear panda users,

I have a question about charged track numbers in STT and TPC reconstruction.

STT and TPC have quite different charged track distributions in psi(3770) channel.
One question naturally arise where this difference came from.
Does it depends only on the reconstruction scheme or pure detector performance according to some limitation of threshold at certain detector variables?

Maybe it should be mixed up together?

Best wishes,
Donghee

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Felix Boehmer on Wed, 17 Aug 2011 13:47:04 GMT

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Hi Donghee,

the difference lies within the pattern recognition and how prone this algorithm is to track splitting / finding of ghost tracks.

I saw in your slides that you define the efficiency as # rec. events / # simulated events. It would be very interesting to see the plot of slide 5 if you only consider events that left all 6 charged tracks inside the volume of the CT on MC level.

In the case of the TPC, the best thing would be to limit the selection of events to only those where all 6 charged tracks have at least 100 MC points, as the pattern recognition is based in tracks found in the TPC alone that have a certain minimum length (10 clusters).

Cheers

Felix

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Wed, 17 Aug 2011 14:09:36 GMT
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Hi Felix,

OK, That is clear to me that STT mode has been done with global reconstruction with MVD+GEM+STT, but TPC dosen't.
Then difference of global efficiency can be understood.
So you mean that I need to require some STT hits in the analysis sample to make real comparison.

Then, next question is how many hits would be reasonable in the STT sample 2,4,or 10? or even more?

I think for TPC the final sample surely have more than 100 MC points for summed up all 6 charged tracks.(of course I will check with data)
thank you for you comments.

Best wishes,
Donghee

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Lars Schmitt on Wed, 17 Aug 2011 15:37:03 GMT
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Hi Donghee,

From previous discussions I got the impression, that in the analysis cutting on the number of hits is not possible, just a fiducial volume requirement. If that is not so and one cut on hits I would be very curious to see the same plots for 1, 5 and 10 hits to see some trend. Would that be possible? Understanding the degree to which the results with STT and TPC can be compared is one of our major headaches at the moment.

Cheers,

Lars

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Wed, 17 Aug 2011 15:59:57 GMT
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Hi Lars,

So now I'm clear(?), the reconstruced tracks, specially in STT mode,
I have to check whether tracks are passing through the STT physical volume or not, explicitly.

Then it means that technically I can require at least one hit on STT, which must be revealed in the defined tracklet of psi product, otherwise STT didn't join to tracking stage.
If it so, that is easy to handle it. Those events will be easily rejected.

But if you meaned soem test volume itself, I have to think about it. How can be done...

If there some other clever or efficient way to do that, please let me know.

Cheers,
Donghee

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Felix Boehmer on Wed, 17 Aug 2011 16:16:15 GMT
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Hi Donghee,

the recipe which we could agree upon for the GRID analysis was to require at least one reconstructed STT hit for each track of the event. For the TPC, you have an additional, implicit cut on something like 7.5 cm track-length inside the TPC volume due to how the pattern recognition was configured.

It would be very interesting to play with the cut on the number of STT hits and see what happens.

Cheers

Felix

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Thu, 18 Aug 2011 08:49:27 GMT
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Hi Felix,

This is the study of dependence on the requirement of STT hits.
For each individual track different number of hits on STT are tested upto 10 STT hits.

By the way, how can I access track length of TPC from pid file.
Is there a function to take it?

Thanks,
Donghee

File Attachments
1) Psi-tdr-draft-03.pdf, downloaded 268 times

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Lars Schmitt on Thu, 18 Aug 2011 09:24:42 GMT
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Dear Donghee,

Your results are very instructive. This means that the efficiencies of TPC and STT in reconstructing tracks are actually similar, since the TPC asks for a minimal track length. If this would correspond to something like 7 hits in the STT the resulting efficiencies would be the same.

Let's see what Felix answers.

One more thing: Could you please simply insert your plot 3 into the set of slides you have posted previously and attach it here in the forum. I will then add these slides to our wiki page.

Thank you very much for the work you did.

Cheers,

Lars

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Thu, 18 Aug 2011 09:31:54 GMT
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Hello Lars,

Could you wait until tomorrow?
I found some bug in the track resolution part.
Pion1 and Pion2 are mixed up in current presentation, which I posted previously.

I want to fix it today after including the application of TPC part from Felix.

Best wishes,
Donghee

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Lars Schmitt on Thu, 18 Aug 2011 09:51:14 GMT
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Hi Donghee,

Sure. Tomorrow is fine as well. Please go ahead and
check the things you mentioned.

Thanks for your work.

Regards,

Lars

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Felix Boehmer on Thu, 18 Aug 2011 10:21:08 GMT
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Hi Donghee,

there is no direct way to get the track length. The best possibility would be to go back to the MC file (if you have it) and count the MC hits (PndTpcPoints) of a track. On average we create 15 MC hits per cm.

Another method would be to look directly at the cluster positions of the TPC track, or take the track momentum and start position inside the TPC volume and calculate the track length.

Thanks for looking into it, I find your results very interesting!

Cheers

Felix

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Thu, 18 Aug 2011 10:28:46 GMT
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Hi Felix,

I think that I have got enough info from your answer.
Thanks, then now it's my turn....

Best wishes,
Donghee.

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Gianluigi Boca on Thu, 18 Aug 2011 11:09:47 GMT
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Hi Donghee, Lars and others.

I have a request to Donghee and a comment to Lars and all the other TPC guys.

Donghee, do you have time to plot the effective masses for the Stt in the cases when you have 2, 3, 4, ..., 10 hits minimum?
I am curious to see if the mass resolution changes with the number of hits.

Comment to Lars and the TPC guys.

If I understand how the TPC works, it is necessary to have a certain track length in the TPC for the reconstruction, otherwise it doesn't work (am I right Felix ?)

The STT can work also with less points (actually in PR at least 2).

Instead of banging all the time on the number of hits in the Stt, why don't we have the results of TPC+Mvd to compare with Stt+Mvd ? That makes more sense instead of trying to reduce 'artificially' the STT efficiency with hits requests and complaining that we quote the STT+Mvd pattern recognition.

On the other hand, if the TPC people think they are better off not using the Mvd system, then it is their choice and they must live with their track length requirement.

Nevertheless some day we need to see how the TPC+MVD system works. We need also to see how well the matching TPC/Mvd works in realistic conditions and with which efficiency.

Last remark : I am modifying the code to turn off (if the user wants) the part of the STT+MVD Pattern Recognition that starts from Mvd hits and goes to STT.
This part of the code was criticized lately, so soon users can not use it if they want.

Gianluigi

Lars Schmitt wrote on Thu, 18 August 2011 11:24Dear Donghee,

Your results are very instructive. This means that the efficiencies of TPC and STT in reconstructing tracks are actually similar, since the TPC asks for a minimal track length. If this would correspond to something like 7 hits in the STT the resulting efficiencies would be the same.

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Felix Boehmer on Thu, 18 Aug 2011 11:29:57 GMT
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Hello Gianluigi,

I think you mis-interpret the motivation behind this effort. The goal is simply to make a direct comparison with what we have, not "artificially" reduce the performance of the STT system. Now to your comments:

Quote:f I understand how the TPC works, it is necessary to have a certain track length in the TPC for the reconstruction, otherwise it doesn't work (am I right Felix ?)

The STT can work also with less points (actually in PR at least 2).

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On the other hand, if the TPC people think they are better off not using the Mvd system, then it is their choice and they must live with their track length requirement.

If we had the time to implement another PR approach that directly involves found hits/tracks in the MVD or GEMs, the TPC would also "work" with a single hit (even though the use of this single hit is quite debatable) - there is no conceptual advantage that I see that would make this approach any more effective for the STT system. I agree, then we could directly compare the two complete tracking detector setups, however under the assumption that the CT will never play a role in the trigger decision.

However, we chose a different approach that emphasizes the TPC as a stand-alone tracking system that is also capable of contributing to the trigger decision, since there are cases where there is information that is only available in the CT (V0's in the CT acceptance for instance).

I have never seen this effort from the STT side. The hard reliance on information from other detectors on the pattern recognition level is NOT an advantage! Also, reducing the central tracker to a mere supportive role for track property extraction should not be the basis of a pure comparison of the central tracker options in my opinion.

It will be necessary to have a clear list of requirements for the CT especially in terms of trigger decision and DAQ philosophy at some point before we can take the decision.

Best Regards,

Felix

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Thu, 18 Aug 2011 12:00:00 GMT
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Dear Gianluigi,

Of course, I have time to do that, I will try it.

Best regards,
Donghee

Quote:
Donghee, do you have time to plot the effective masses for the Stt in the cases when you have 2, 3, 4, ..., 10 hits minimum?
I am curious to see if the mass resolution changes with the number of hits.

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Gianluigi Boca on Thu, 18 Aug 2011 12:42:36 GMT
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Felix Boehmer wrote on Thu, 18 August 2011 13:29Hello Gianluigi,

I think you mis-interpret the motivation behind this effort. The goal is simply to make a direct comparison with what we have, not "artificially" reduce the performance of the STT system. Now to your comments:

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the MVD or GEMs, the TPC would also "work" with a single hit (even though the use of this single hit is quite debatable) - there is no conceptual advantage that I see that would make this approach any more effective for the STT system. I agree, then we could directly compare the two complete tracking detector setups, however under the assumption that the CT will never play a role in the trigger decision.

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I have never seen this effort from the STT side. The hard reliance on information from other detectors on the pattern recognition level is NOT an advantage! Also, reducing the central tracker to a mere supportive role for track property extraction should not be the basis of a pure comparison of the central tracker options in my opinion.

It will be necessary to have a clear list of requirements for the CT especially in terms of trigger decision and DAQ philosophy at some point before we can take the decision.

Best Regards,

Felix

Hi Felix, I don't understand.
Don't forget that the STT role in the Pattern Recognition is essential, since we start from STT to decide the tracks that are good or not.
The fraction of tracks found from Mvd going to SST has always been negligible and mainly ghost tracks.
Also for the trigger point of view I don't understand your remark at all. If you are referring to the fact that the V0 code for STT is not final yet, that I agree. You should aknowledge on the same way that there hasn't been extensive presentations on the V0 code of the TPC.

Gianluigi

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Fri, 19 Aug 2011 10:14:01 GMT
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Hi Gianluigi,

Here is the mass distributions of D+,D-, and Psi with different stt hits requring for final sample.

I don't see any strong change of shape.

Best wishes,
Donghee

File Attachments

1) test_stt_mass_dminus.eps, downloaded 307 times

2) test_stt_mass_dplus.eps, downloaded 291 times
3) test_stt_mass_psi.eps, downloaded 322 times

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Sun, 21 Aug 2011 14:00:13 GMT
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Hello Lars,

Here is the material for Psi channel including resolutions for decay products. I'm sorry too late action.

During last two days, I coudln't put some modified scripts into pandagrid due to disk server problem for some grid user.
So,resolutions for pions was analyzed only with part of statistics before this trouble.
That will be updated soon with total statistics after fix the grid disk. But just pion part is not completed, rest of analysis parts are shown already with full statistics.

One remarkable thing is about the application of TPC volume cut.
TPC 7,5 ~ 7.66cm length from number of points are applied into the final psi data sample.
you can find total hit distribution for both tracker in slide 12.
TPC is not affected from the cut on more than 100 points introduced by felix.

Best wishes,
Donghee

File Attachments
1) Psi-tdr-draft-04.pdf, downloaded 261 times

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Felix Boehmer on Sun, 21 Aug 2011 20:45:09 GMT
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Hi Donghee,

I am confused now - how exactly did you introduce the cut?

Cheers

Felix

Hi Felix,

I will try to explain for TPC first.

step 1.
Let assume that we have only 6 tracks in final psi sample.
I have only 6 final tracks after psi vertex fitting and have compared all 6 tracks with MC true index.

step II,
As you suggested, PndTpcPoints for identified each tracks are counted for 6 individual tracks.
Then I required each point for 6 tracks have to have more than 100 points.(see in detail below).
If I made some mistake, please just correct me.

Remark, STT case we have an information about hits directly at pid file.
Therefore, I could access it from MicroCandidate.
But TPC has no same info in pid file.
So PndTpcPoint from *.sim.root file has been accessed and asked whether psi final tracks are associated with true one.
Most of them are correlated with true one, then required points cut for each track component.

Quote:

```
  int fmcid[6];
  fmcid[0]  = fvtxkmfit ->GetMcIdx();
  fmcid[1]  = fvtxpp1fit->GetMcIdx();
  fmcid[2]  = fvtxpp2fit->GetMcIdx();
  fmcid[3]  = fvtxkpfit ->GetMcIdx();
        fmcid[4]  = fvtxpm1fit->GetMcIdx();
  fmcid[5]  = fvtxpm2fit->GetMcIdx();


              //loop over tpc points to make counting!
  int tpc_counter[6];
  tpc_counter[0] =0;
  tpc_counter[1] =0;
  tpc_counter[2] =0;
     tpc_counter[3] =0;
  tpc_counter[4] =0;
  tpc_counter[5] =0;

             //cout<< "TPC hits = "<< tpc_hit->GetEntriesFast()<<endl;
             for (Int_t ll=0; ll<tpc_hit->GetEntriesFast(); ll++)
        {
                int trackID = ((PndTpcPoint*)tpc_hit->At(ll))->GetTrackID();
     if(trackID < 0) continue;
                if(trackID == mcid[0]) tpc_counter[0] ++;
     if(trackID == mcid[1]) tpc_counter[1] ++;
```

```
            if(trackID == mcid[2]) tpc_counter[2] ++;
            if(trackID == mcid[3]) tpc_counter[3] ++;
            if(trackID == mcid[4]) tpc_counter[4] ++;
            if(trackID == mcid[5]) tpc_counter[5] ++;
        }
        if( (tpc_counter[0] >= 100) && (tpc_counter[1] >= 100) && (tpc_counter[2] >= 100) &&

(tpc_counter[3] >= 100) && (tpc_counter[4] >= 100) && (tpc_counter[5] >= 100)){
            histograms.....here
         }
```

Best wishes,
Donghee

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Felix Boehmer on Mon, 22 Aug 2011 11:56:08 GMT
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Hi Donghee,

if I understand your procedure correctly, you start from the fitted tracks. This means the pattern recognition has already found those tracks and the implicit cut on the track length has already been made (>9 clusters).

In this way it is no surprise that all the tracks are above the 100 MC point cut. But from your distribution we can learn what the actual cut corresponds to in terms of # MC points.

We lowered the cut to 5 clusters (instead of 10) some while ago, but unfortunately this is not in the data produced on the grid. This lower cut would enhance the TPC efficiency quite a bit. It would therefore be very nice if somebody could launch a run with updated tpc and tpc/tpcreco folders.

Thanks for your work, Donghee!!

Cheers

Felix

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Mon, 22 Aug 2011 12:04:37 GMT
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Hi Felix,

If I remember correctly, I have seen 56 or below 100 points in some track, when I had a look

the sample before final cut, i.e., without strict cut.

I think that track candidate itself can have below 100 points in principle.

Best wishes,
Donghee

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by StefanoSpataro on Mon, 22 Aug 2011 13:44:48 GMT
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Hi,
I don't well understand the strange theta distributions for TPC, in slide 18. It seems they are not so continuous such as in the STT case (22) but thereis a sort of step. Do you have an idea on what is happening there?

Moreover, your D invariant mass plots for STT have a sort of tail which is not present in the case of Marius analysis. Which are the main differences between the two analyses?

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by Felix Boehmer on Mon, 22 Aug 2011 13:53:00 GMT
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Hi Stefano,

I have also wondered about this. I think 2 effects might contribute here:

1) the standalone PR will not be able to find tracks below a certain theta since the track-length becomes too short, but this should happen well below 20 degrees. However, as I also stated in another post, we reduced the minimum track-length cut by 50% for future studies (hint).

2) The abrupt change at about 20 degrees hints towards a problem with the GEM-correllator. It is usually configured not to throw away any tracks that could not be matched to GEM hits, but it looks like there was an error (maybe a wrong setting in the macro?) that actually caused this to happen.

If you plan on rerunning anything please let me know so I can once again check the macros and the code at that spot.

Cheers

Felix

Subject: Re: Psi analysis as a cross check from donghee kang
Posted by donghee on Wed, 24 Aug 2011 20:43:26 GMT
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Dear panda,

I have corrected and updated few slides in this note.
Some binnings are readjusted and pion resolutions are completed with full statistics.

please find the new version of material for psi analysis.
Good nights.
Donghee

File Attachments

1) Psi-tdr-draft-05.pdf, downloaded 274 times