Subject: One question about tracking efficiency
Posted by Yutie Liang on Wed, 21 Apr 2010 15:51:38 GMT
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Dear all,

I met one problem when I use the PandaRoot to do one simple study. The decay chain of my study is: Psi(3770) -> D+ D- ->(k- pi+ pi+)(k+ pi- pi-)
I simulated 10k signals, but only 300~400 events survived.
I think this efficiency is too low.

The following is the detailed infomation of one event from generator. TrackIDs of (k-, pi+, pi+, k+, pi-, pi-) are always (0,1,2,3,4,5). So, I use this trackID as PID in this study.

---
0 9
N Id Ist M1 M2 DF DL px py pz E t x y z
0 40443 2 -1 -1 1 2 0.00000000 -0.00000000 6.57879835 7.58363969 0.00000000 0.00000000 0.00000000 0.00000
000
1 411 2 0 0 3 5 -0.02342460 -0.12417095 3.72753839 4.17190509 0.00000000 0.00000000 -0.00000000 0.000
00000
2 -411 2 0 0 6 8 0.02342460 0.12417095 2.85125996 3.41173460 0.00000000 0.00000000 -0.00000000 0.00000
000
3 -321 1 1 1 -1 -1 -0.41376210 0.45311777 0.95670547 1.23916104 6.38056669 -0.03582590 -0.18990870 5.700
94639
4 211 1 1 1 -1 -1 0.25929310 -0.57261601 2.59179905 2.67058498 6.38056669 -0.03582590 -0.18990870 5.700
94639
5 211 1 1 1 -1 -1 0.13104440 -0.00467271 0.17903387 0.26215907 6.38056669 -0.03582590 -0.18990870 5.700
94639
6 321 1 2 2 -1 -1 0.01936009 -0.00991458 0.09054525 0.50238581 1.18131702 0.00811080 0.04299434 0.98725
203
7 -211 1 2 2 -1 -1 0.24342156 0.42046406 1.79061469 1.86059797 1.18131702 0.00811080 0.04299434 0.987252
03
8 -211 1 2 2 -1 -1 -0.23935704 -0.28637852 0.97010002 1.04875082 1.18131702 0.00811080 0.04299434 0.9872
5203

I checked, and found that the tracking efficiency of (k-, pi+, pi+, k+, pi-, pi-) is only about 50~60%, when MC trackID' match is required. this low efficiency of each track could explain the low efficiency of this channel.
but, when I did single track study, the tracking efficiency of pi+ with MCtrackID match is close to 80%. This is also low, but still acceptable considering McID match.

It seems that when there are multiple tracks, 6 in my case, the tracking efficiency will become worse. Is this the problem?
I hope that's only one bug of my analysis.

Thanks

yutie

Subject: Re: One question about tracking efficiency
Posted by StefanoSpataro on Wed, 21 Apr 2010 17:36:51 GMT
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Do you have maybe a plot of the phase space coverage (i.e. MC_p vs MC_theta) separated for all the particle types? Maybe there is one particle which is always going in the forward spectrometer and that we are missing, or maybe at low momenta.

Subject: Re: One question about tracking efficiency
Posted by Yutie Liang on Thu, 22 Apr 2010 08:14:31 GMT
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Hi,

The following are the momentum distributions of 6 particles.

Particles name:
pip1: first pi+, pip2: 2nd pi+; pim1: 1st pi-; pim2: 2nd pi-
kp: K+; km: K-

Four plots in one picture: momentum, theta, phi, and momentum:theta;

Plots of 1st pi+

Plots of 2nd pi+

Plots of 1st pi-

Plots of 2nd pi-

Plots of K+

Plots of K-

Thanks

File Attachments

1) first_piplus.jpg, downloaded 350 times
2) first_piminus.jpg, downloaded 302 times
3) second_piplus.jpg, downloaded 324 times
4) second_piminus.jpg, downloaded 339 times
5) kplus.jpg, downloaded 326 times
6) kminus.jpg, downloaded 333 times

Subject: Re: One question about tracking efficiency
Posted by StefanoSpataro on Thu, 22 Apr 2010 09:26:12 GMT
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Hi,
I have found a bug in the EvtGen reader, that maybe could affect your analysis.
EvtGen manual says that the vertex position is expressed in mm, but PndEvtGenGenerator is giving the position to the VMC as cm.

I have modified PndEvtGenGenerator, to use is you should update your "pgenerator" folder, and then rerun your simulation (not evtgen, but from the "sim" macros up to the end).

This could exlain maybe your problem. In your event, particles 3 4 and 5 are emittet at 6 mm from the vertex, but if they are propagated as 6cm, then the track finder will fail.

In this case, you should modify in your sim macro:

FairEvtGenGenerator -> PndEvtGenGenerator

Could you please try and let me know if it improves your results?
Fair stays with the old code, while Pnd should be the fixed one.
(crossing our fingers).

Subject: Re: One question about tracking efficiency
Posted by Yutie Liang on Thu, 22 Apr 2010 12:42:34 GMT
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Hi,

I tried with your new code, which I saw the conversion of cm/mm.
It does improve my result, but not very much.

I only tested with 200 events, and got 12 signals. I will test with more statistic later.
The total efficiency of this channel ~ 6%, is better than the former 3-4%. It's still too low.

I think there could be some other prolems.
I listed the tracks info of several events.

To survive the analysis program, the MctrackID should contain 0,1,2,3,4,5 at least. In the following, only event 194 passed this, but failed the mass cut.

---
event: 194
mom: (-0.276957, 0.489483, 1.41229) MctrackID: 4
mom: (0.547624, -0.518, 1.18875) MctrackID: 3
mom: (4.74344, 1.18262, 3.54849) MctrackID: 2
mom: (1.73905, 0.298494, 2.67836) MctrackID: 2
mom: (-0.890036, -0.0107261, 1.80312) MctrackID: 1
mom: (-0.100752, -0.205479, 0.654262) MctrackID: 5
mom: (-0.127335, -0.0098834, 0.799576) MctrackID: 0
mass of dp: 5.29566
mass of dp: 3.10414
mass of dm: 1.78799
dp: 0 dm: 1
event: 195
mom: (-0.714914, -0.0269411, 0.979918) MctrackID: 4
mom: (0.779887, -0.125705, 1.85668) MctrackID: 3
mom: (0.259352, 0.166287, 1.226) MctrackID: 2
mom: (0.397058, -0.224433, 0.460777) MctrackID: 0
mom: (-0.0066277, -0.179322, 0.835163) MctrackID: 1
event: 196
mom: (0.757172, 0.107102, 1.45513) MctrackID: 5
mom: (-0.269729, -0.0472028, 0.835738) MctrackID: 4
mom: (-0.0532711, -0.646725, 1.03129) MctrackID: 0
mom: (1.77291, 2.69191, 3.89288) MctrackID: 2
mom: (0.625281, 0.877034, 0.994429) MctrackID: 2
mom: (-2.25023, -0.892301, 1.50073) MctrackID: 2
mom: (0.298023, 0.639753, 1.01819) MctrackID: 2
mom: (-0.176344, 0.110833, 0.639549) MctrackID: 4
mom: (-0.100674, -0.0839868, 0.826197) MctrackID: 1
event: 197
mom: (0.366878, -0.291604, 1.02965) MctrackID: 5
mom: (-0.346555, 0.366326, 0.323261) MctrackID: 4
mom: (0.0505044, -0.0861833, 0.401847) MctrackID: 1
mom: (5.3789, -1.86377, 11.1783) MctrackID: -1
event: 198
mom: (-0.346544, 0.413518, 1.98112) MctrackID: 3
mom: (0.0704105, -0.270733, 0.279589) MctrackID: 4
mom: (1.74562, 0.732808, 5.13812) MctrackID: 2
event: 199
mom: (-0.186931, -0.370772, 0.620371) MctrackID: 4
mom: (0.232215, -0.590434, 1.37189) MctrackID: 0
mom: (0.386676, 5.02008, 2.315) MctrackID: 5
event: 200
mom: (0.569166, 0.378718, 1.23879) MctrackID: 5
mom: (-0.406435, -0.291732, 1.41973) MctrackID: 4
mom: (-76.9758, -12.678, 384.064) MctrackID: 0
mom: (0.274015, 1.52483, 0.010232) MctrackID: 2
mom: (-0.126436, -0.296277, 0.736622) MctrackID: 3
---

regards

Subject: Re: One question about tracking efficiency
Posted by StefanoSpataro on Thu, 22 Apr 2010 16:05:56 GMT
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Just to understand,
which macros are you using for your analysis?

Subject: Re: One question about tracking efficiency
Posted by Yutie Liang on Thu, 22 Apr 2010 16:51:12 GMT
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I copied them from one of my colleage.

pls see the attachment.

File Attachments
1) run_ana_tpccombi.C, downloaded 220 times
2) run_digi_tpccombi.C, downloaded 205 times
3) run_pid_tpccombi.C, downloaded 205 times
4) run_reco_tpccombi.C, downloaded 218 times
5) run_sim_tpccombi.C, downloaded 213 times

Subject: Re: One question about tracking efficiency
Posted by StefanoSpataro on Thu, 22 Apr 2010 17:04:55 GMT
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Macros seem fine. I suppose the best way could be to loop inside MCTrack, and count the events where you are able to reconstruct all the 6 particles with theta > 10* and p > 0.2GeV. This number you could compare with your reconstructed events.

Another thing could be that the MCtrack association is faulty, in some part of the code. Before version 8394 there was a small bug in the MCTrack id propagation for genfitted tracks, which is solved from 8394. But I suppose you are suing the last version of pandaroot, if you have the uodated PndEvtGenGenerator.
Then maybe you are crossing the "wrong" kpipi combination. Is it possible? Maybe you coudl try to plot everything, without pid, to see if you are able to see and count your signal, just to be sure.

Subject: Re: One question about tracking efficiency

Posted by Yutie Liang on Thu, 22 Apr 2010 17:40:34 GMT
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1. I checked MCTracks, and about 30% events passed the cut for all the 6 particles with theta > 10* and p > 0.2GeV.
If simply take this into account, the total efficiency will be 6% / 30% = 20%.
I will try to only simulate those events which could pass the theta and momentum cut.

2.
In fact, I didn't update PndEvtGenGenerator in the way you think of.
I don't know how to update. So I just modify the file
PndEvtGenGenerator comparing with your modification. (cm->mm)

If I don't use Pid, there will be too many combinations. Especially there are more than 6 reconstructed tracks for most of events. I can barely see the psi3770 peak.

File Attachments

1) c1.jpg, downloaded 348 times