Subject: Different x-y resolutions
Posted by Simone Bianco on Tue, 19 Jul 2011 11:16:58 GMT
View Forum Message <> Reply to Message

Dear Tracking experts,

I am simulating simple events with 4 pions (2pi+ and 2 pi-) with a momentum of 1GeV/c, which are propagated from (0,0,0). I am generating these particles with an homogeneus distribution in phi and in theta (where theta is restricted to the range [20,140]°).
The simulations are performed with all the detectors in, but I set as active only the MVD, the Stt, the GEMs and the forward tracer.
I perform my reconstruction using:
PndMvdRiemannTrackFinderTask,PndSttTrackFinderReal,PndSttMvdTracking,Pnd RecoKalmanTask,PndMCTrackAssociator,PndPidCorrelator (with pion hypothesis),PndPidIdealAssociatorTask.
At the end of this chain I am running some analysis using the PndVtxPoca vertex finder.
I fill histograms with the three components of the reconstructed vertices. As you can see in the attached figures I get a significantly different sigmas for x and y.

X always looks worse (even with different momenta and theta ranges).
I have already tried with different topologies like using two particles instead of four, or using pions of the same charge, but I always get worse results for X.
I tried with different vertexing tools (POCA, Ralf's fast fitter, another implementation of the POCA) and I always noticed this behaviour. It really seems to come from previous steps since if I try to rotate of 90° the tracks just before running the POCA vertex finder I obtain symmetrical results (worse Y than X, see the second figure attached).

Does any of you have an idea about possible reasons of this effect?

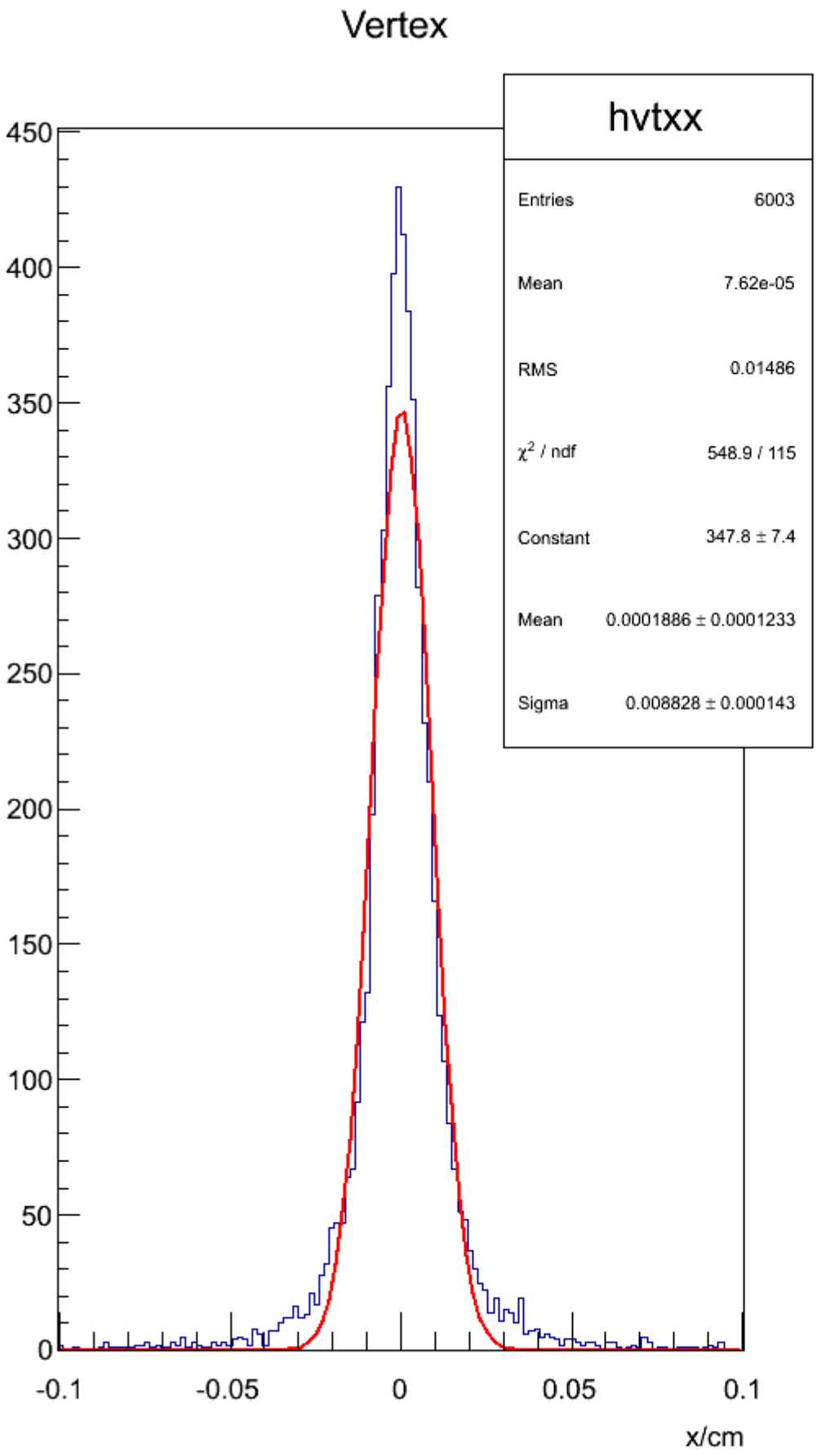
Thanks in advance.

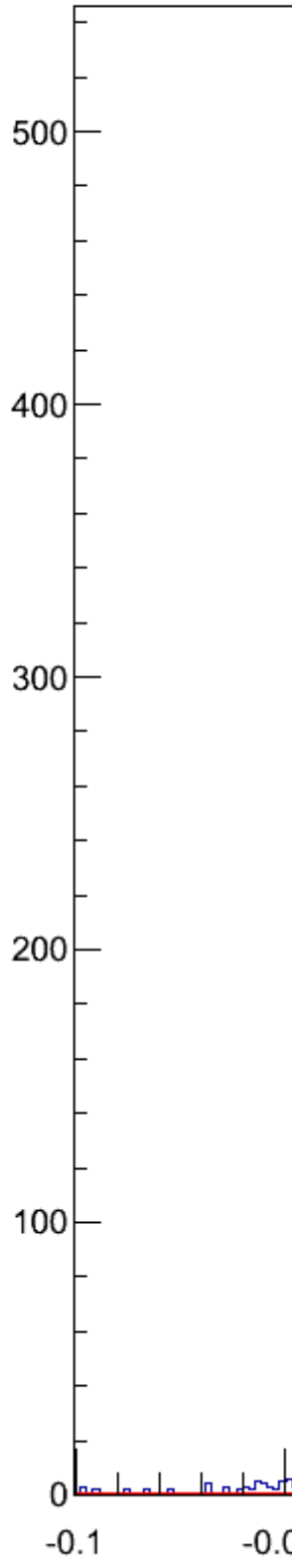
Cheers,

Simone

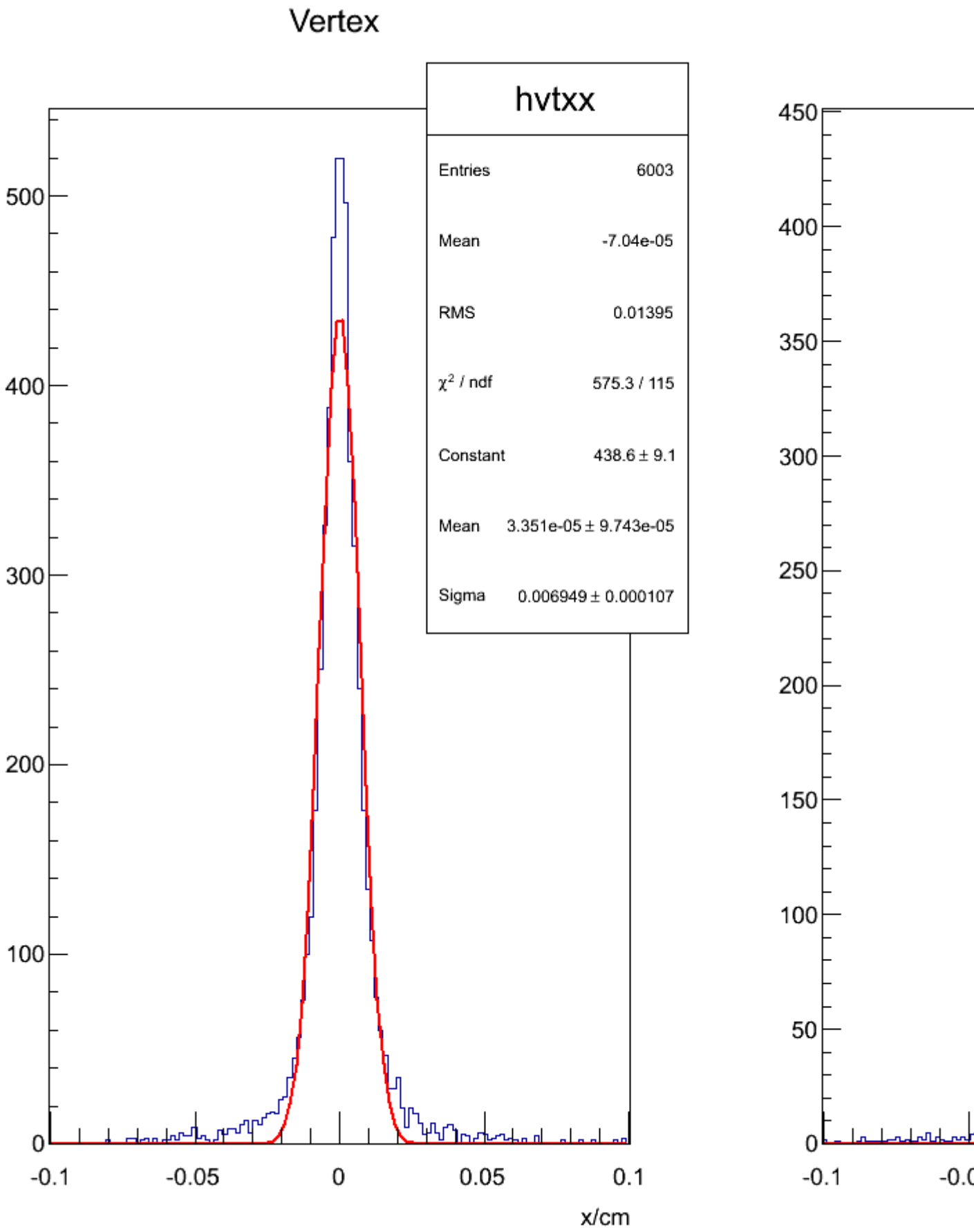
File Attachments

1) Vtx-0-0-0-1GeV-4Pions.png, downloaded 1500 times


Vertex
hvtxx
Entries 6003
Mean 7.62e-05
RMS 0.01486
χ² / ndf 548.9 / 115
Constant 347.8 ± 7.4
Mean 0.0001886 ± 0.0001233
Sigma 0.008828 ± 0.000143
450
400
350
300
250
200
150
100
50
0
-0.1
-0.05
0
0.05
0.1
x/cm


500
400
300
200
100
0
-0.1

2) Rotation-Vtx-0-0-0-1GeV-4Pions.png, downloaded 1545 times



Subject: Re: Different x-y resolutions
Posted by StefanoSpataro on Tue, 19 Jul 2011 11:25:32 GMT
View Forum Message <> Reply to Message

Have you tried the PndKinVtxFitter? There I do not see strong differencies.

Subject: Re: Different x-y resolutions
Posted by Simone Bianco on Tue, 19 Jul 2011 16:10:04 GMT
View Forum Message <> Reply to Message

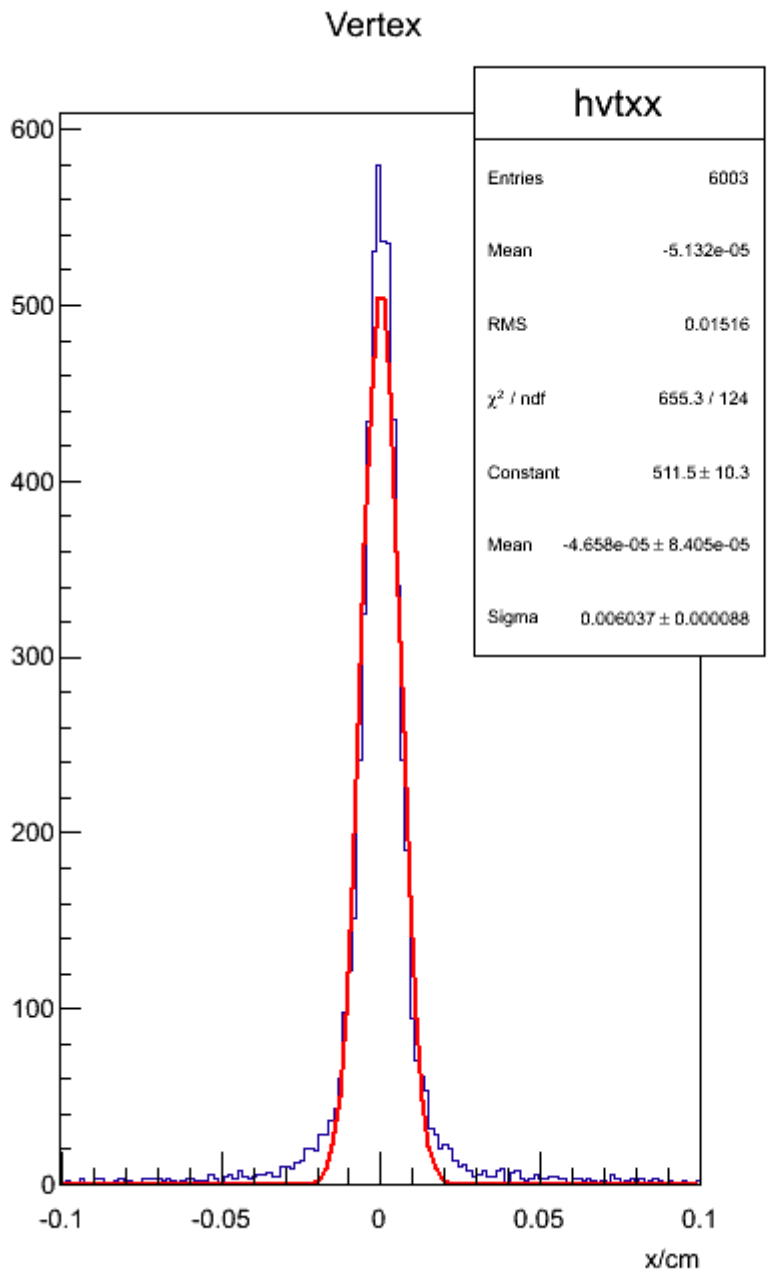
I have not done it yet. I will try this now and report about the results I obtain. Thanks for your hint

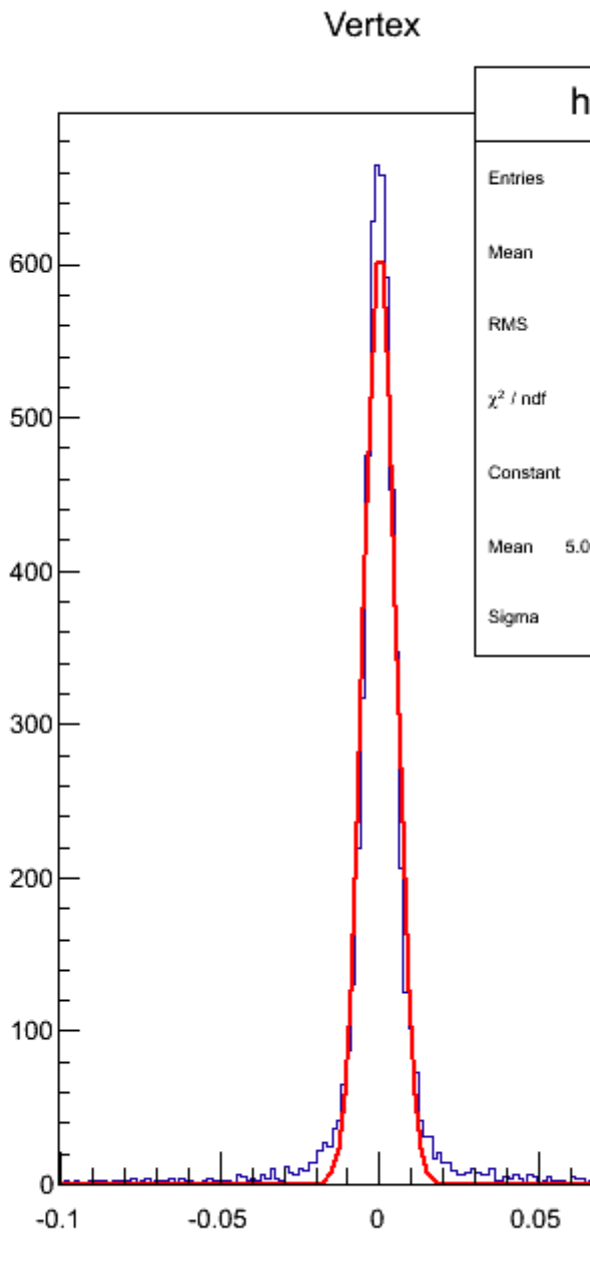
Subject: Re: Different x-y resolutions
Posted by Simone Bianco on Tue, 19 Jul 2011 19:52:09 GMT
View Forum Message <> Reply to Message

Hi again, this is what I get using the PndKinVtxFitter:

X is still significantly worse than Y

File Attachments
1) PndKinVtx.png, downloaded 1300 times





Subject: Re: Different x-y resolutions
Posted by Jens Sören Lange on Wed, 20 Jul 2011 06:40:37 GMT
View Forum Message <> Reply to Message

Hi Simone,
one idea: which field are you using?
PndMultifield("FULL") or PndMultifield("SOLENOID") only?
(i.e. can you maybe try to switch off the dipole field?)
best regards, Soeren

Subject: Re: Different x-y resolutions
Posted by Simone Bianco on Wed, 20 Jul 2011 09:13:16 GMT
View Forum Message <> Reply to Message

Hi Soeren,

I have never tried this before, so I am now sorprized to see that setting in the simulation macro:

PndMultiField *fField= new PndMultiField("SOLENOID");
fRun->SetField(fField);

I get really bad results: I nearly never get all the four pions reconstructed and anyway their momentum is not the one set in the particle generator. This sounds really strange to me since I am shooting the pions in the theta range [20,140], so I would expect the dipole not to play any role in their reconstruction.
What am I doing wrong?

File Attachments

1) runSimPGun.C, downloaded 472 times

Subject: Re: Different x-y resolutions
Posted by Jens Sören Lange on Wed, 20 Jul 2011 14:22:25 GMT
View Forum Message <> Reply to Message

Hi Simone,

1.) my idea, that it could have something to do with the B field, came from the X and Y differences which were observed for luminosity monitor (which was to my knowledge the only time, that any azimuthal asymmetry was reported). Now I re-checked, and I found that I was wrong: it was not the dipole field generating the effect, but the aperture. See

http://forum.gsi.de/index.php?t=tree&goto=9206&rid=0&S=77db7
7666b257eeb980ffbd17eec1d35&srch=Jost#msg_9206

However, same as the dipole field, the effect should be forward peaked.

2.) HOWEVER, your result shows, that there is an effect even in your polar angle range.

After all, there might be an effect which was probably never seen before because you are looking at very small track DCA resolutions (50-60 um), but the B field grid is (if I remember correctly) in the central region 4 cm point-to-point distance (with linear interpolation between the points).

I checked field/PndMultiField.cxx

```
if (Map=="FULL") {

        PndTransMap *map_t= new PndTransMap("TransMap", "R");
          PndDipoleMap *map_d1= new PndDipoleMap("DipoleMap1", "R");
```

```
        PndDipoleMap *map_d2= new PndDipoleMap("DipoleMap2", "R");
        PndSolenoidMap *map_s1= new PndSolenoidMap("SolenoidMap1", "R");
        PndSolenoidMap *map_s2= new PndSolenoidMap("SolenoidMap2", "R");
        PndSolenoidMap *map_s3= new PndSolenoidMap("SolenoidMap3", "R");
        PndSolenoidMap *map_s4= new PndSolenoidMap("SolenoidMap4", "R");

        AddField(map_t);
        AddField(map_d1);
        AddField(map_d2);
        AddField(map_s1);
        AddField(map_s2);
        AddField(map_s3);
        AddField(map_s4);

    }else if (Map="DIPOLE") {
        PndDipoleMap *map_d1= new PndDipoleMap("DipoleMap1", "R");
        PndDipoleMap *map_d2= new PndDipoleMap("DipoleMap2", "R");

        AddField(map_d1);
        AddField(map_d2);

    }else if (Map=="SOLENOID") {

        PndSolenoidMap *map_s1= new PndSolenoidMap("SolenoidMap1", "R");
        PndSolenoidMap *map_s2= new PndSolenoidMap("SolenoidMap2", "R");
        PndSolenoidMap *map_s3= new PndSolenoidMap("SolenoidMap3", "R");
        PndSolenoidMap *map_s4= new PndSolenoidMap("SolenoidMap4", "R");

        AddField(map_s1);
        AddField(map_s2);
        AddField(map_s3);
        AddField(map_s4);
    }
```

so when you change from "FULL" to "SOLENOID", it means:
it is the SAME solenoid maps, but only the dipole map and the trans map IN ADDTION (!).

In the moment, I don't understand why you see such a strong effect for the dipole field. The best would be to switch off the B field completely, but then of course the track fitter does not work for straight tracks. I have the feeling that the track fitter also uses the field map, and then fails if B field in Geant and fitter are different. But I don't know where to set the field map for the fitter. I hope that someone else has a clever idea.

Soeren

Subject: Re: Different x-y resolutions
Posted by Elisa Fioravanti on Wed, 20 Jul 2011 15:12:23 GMT
View Forum Message <> Reply to Message

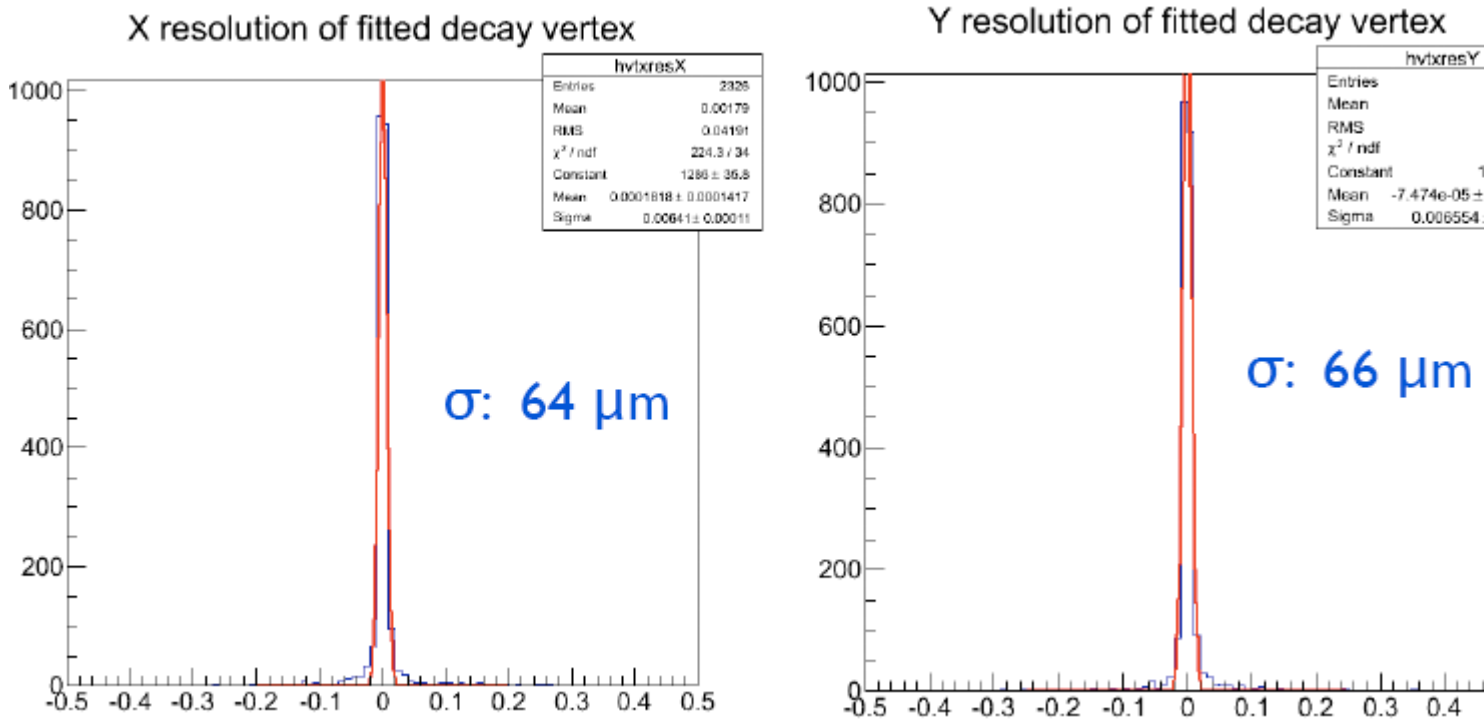
Hello Simone,

I'm studing the pi+pi-pi+pi- analysis with the dataset available on GRID (pandaroot version july11).
I would like to show you the resolution that I have with the PndKinVtxFitter, in the STT case.
As you can see, in my case the X and Y resolution are almost the same.

best
Elisa

File Attachments

1) vertex.png, downloaded 1013 times



Subject: Re: Different x-y resolutions
Posted by Simone Bianco on Wed, 20 Jul 2011 15:17:11 GMT
View Forum Message <> Reply to Message

Hi Elisa,

I suppose there you have a forward boost for the system, which theta range do your pions span? Are these tracks measured with the mvd/stt/gems only or you use the forward tracker as well?

Cheers,

Simone

Subject: Re: Different x-y resolutions
Posted by Elisa Fioravanti on Wed, 20 Jul 2011 15:41:16 GMT
View Forum Message <> Reply to Message

Hello Simone,

I used EvtGen and the four pions are simulated with phase space distribution.
And the tracks are measured with stt/mvd/gem only

Elisa

Subject: Re: Different x-y resolutions
Posted by Simone Bianco on Wed, 20 Jul 2011 16:34:24 GMT
View Forum Message <> Reply to Message

Dear Soeren,

I performed one test: I ran the simulation with the full field, but setting the fBeamMom to a small value, so that the map chosen for the dipole field is the least intense. With this setup I see no differences with the case in which fBeamMom was bigger (leading to a different dipole map). I would expect this change to show some effects if the x-y difference is in some way due to the dipole, but this doesn't seem to be the case. I will keep on investigating, thanks for your help!

Best regards,

Simone

Subject: Re: Different x-y resolutions
Posted by Tobias Stockmanns on Thu, 21 Jul 2011 07:25:18 GMT
View Forum Message <> Reply to Message

Hi Simone,

it is possible to set the magnetic field to a constant value without using the field maps. This is done in PndConstField.

Maybe you can try this method to exclude any effects of an asymmetric magnetic field.

Cheers,

Tobias

Subject: Re: Different x-y resolutions
Posted by Simone Bianco on Thu, 21 Jul 2011 15:54:46 GMT
View Forum Message <> Reply to Message

Thanks Tobias, the constant field worked fine. Using the same parameters as before I got really similar results:

So, this should exclude effects of asymmetries in the magnetic field.

I tried to select smaller theta ranges and what I notice is that in the "forward" part everything works fine. For example here you see what I obtained (always with four pions of 1GeV/c) limiting the theta range to teh range [30,40]°:

Increasing theta the situation gets worse. This is what I obtained in the range [60,70]:

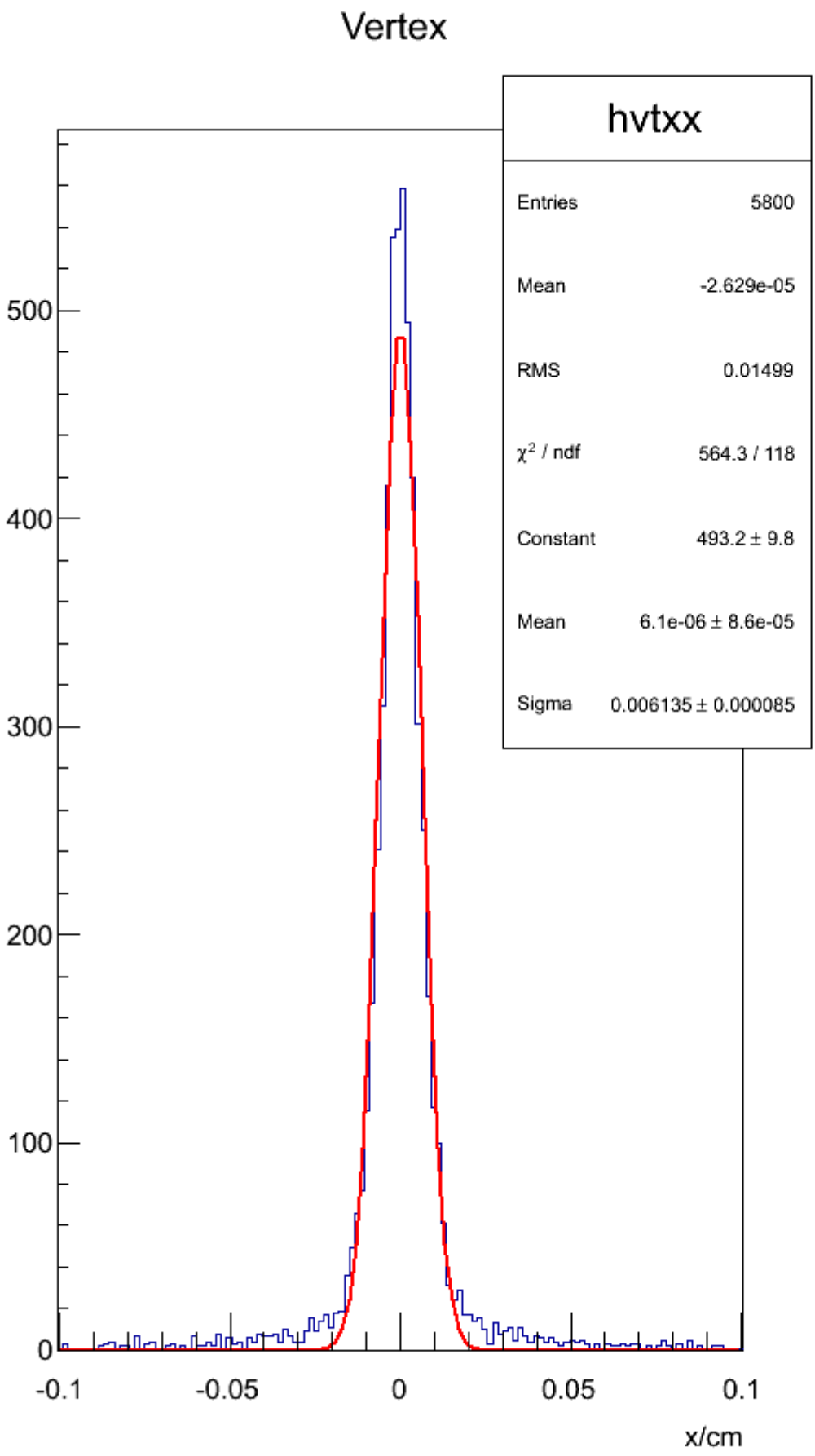
Cheers,

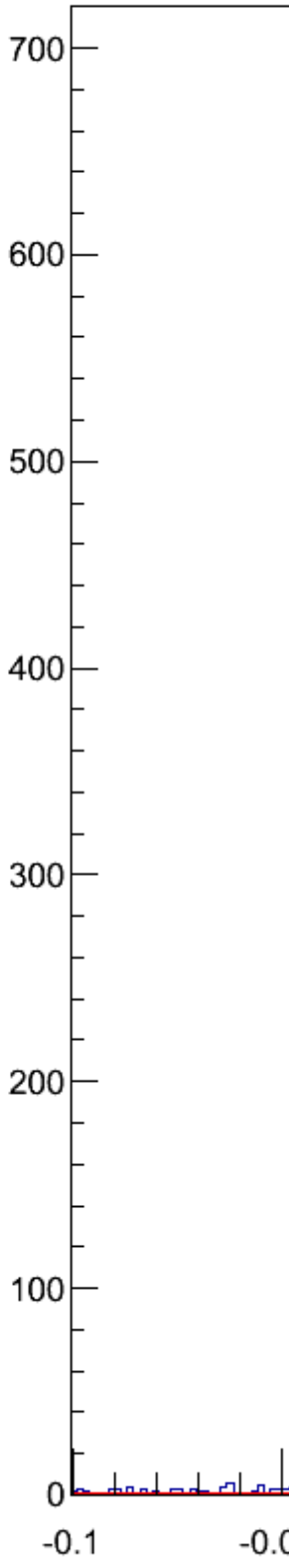
Simone

PS: all these plots were obtained using the POCA vertex finder

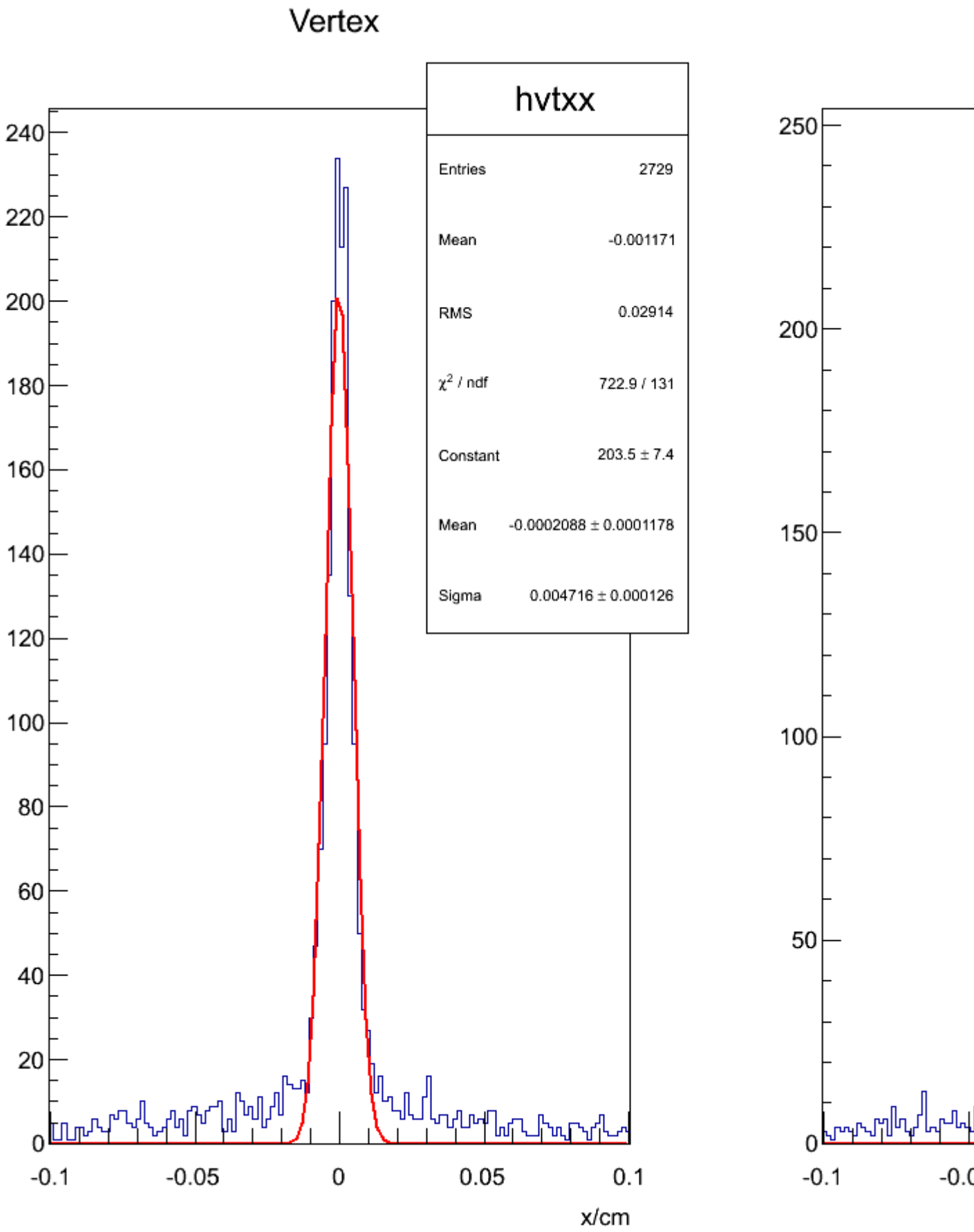
File Attachments

1) ConstField_20_140deg.png, downloaded 1365 times


Vertex
hvtxx
Entries 5800
Mean -2.629e-05
RMS 0.01499
χ² / ndf 564.3 / 118
Constant 493.2 ± 9.8
Mean 6.1e-06 ± 8.6e-05
Sigma 0.006135 ± 0.000085
500
400
300
200
100
0
-0.1
-0.05
0
0.05
0.1
x/cm


700
600
500
400
300
200
100
0
-0.1

2) ConstField_30_40deg.png, downloaded 1419 times



3) ConstField_60_70deg.png, downloaded 1265 times

