Subject: Vertex fitters' problems
Posted by StefanoSpataro on Thu, 06 Jun 2013 10:40:24 GMT
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Dear all,
Laura and me are checking the features of our vertex fitters,
with the trunk version 20077. In the latest trunk the function GetMcTruth() returns null pointer, than the trunk cannot be used.

We have simulated 10k ppbar->D*+D*-->D0pi+D0barpi-->k-pi+pi+k+pi-pi-, we have used MC truth index to identify the kaon- and the pion+ of the D0 (we have not touched the d0bar).
We have uploaded all the relevant macros, you have only to modify the path of the DEC file in the sim macro.

We run PndKinVtxFitter, PndVtxPoca and PndVtxPRG and compared the results. We were able to find a tutorial only for PndKinVtxFitter. The tutorial for PndVtxPoca and PndVtxPRG is missing then we hope we are using them in the proper way.

Please check the code.

Vertex residuals reco - mc (in cm) and chi2 for PndKinVtxFitter:

Vertex residuals reco - mc (in cm) and chi2 for PndVtxPoca:

Vertex residuals reco - mc (in cm) and chi2 for PndVtxPRG:

These are the obtained resultion values:

	X res	Y res	Z res
PndKinVtxFitter	2um	2um	wrong and asymmetric
PndVtxPoca	400um	400um	400um
PndVtxPRG	60um	60um	100um

Then...

PndKinVtxFitter is obtaining very very very narrow distributions on X and Y. How is it possible?
Z distribution is screwed. Chi2 is very low.
PndVtxPoca has too large resolution values, does not work. Decent chi2 maybe.
PndVtxPRG has more reasonable values, even if I believe they are a bit large. It is much slower than the others, most probably because of the 10 iterations, but w/o a tutorial we were not sure about which number to use. Chi2 too low.

Still not checked composite particles (i.e. D*)

Then...

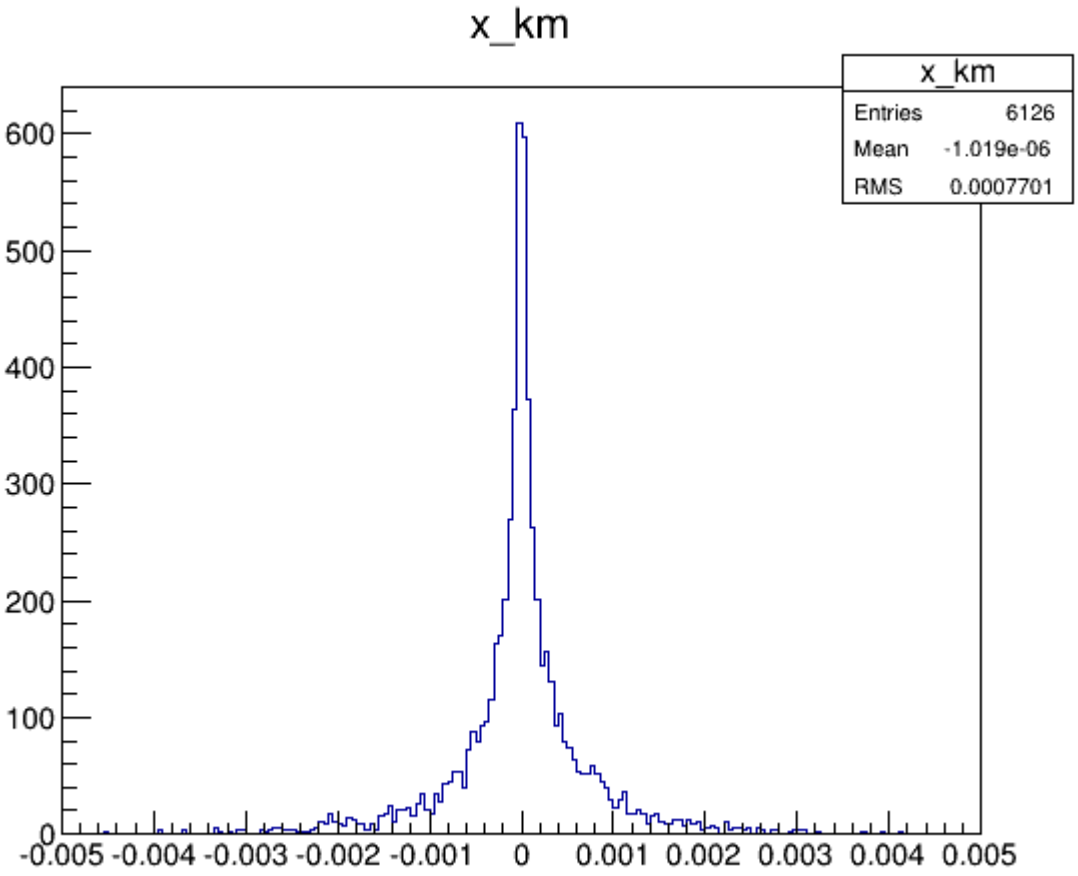
What to use? Could you please take a look?

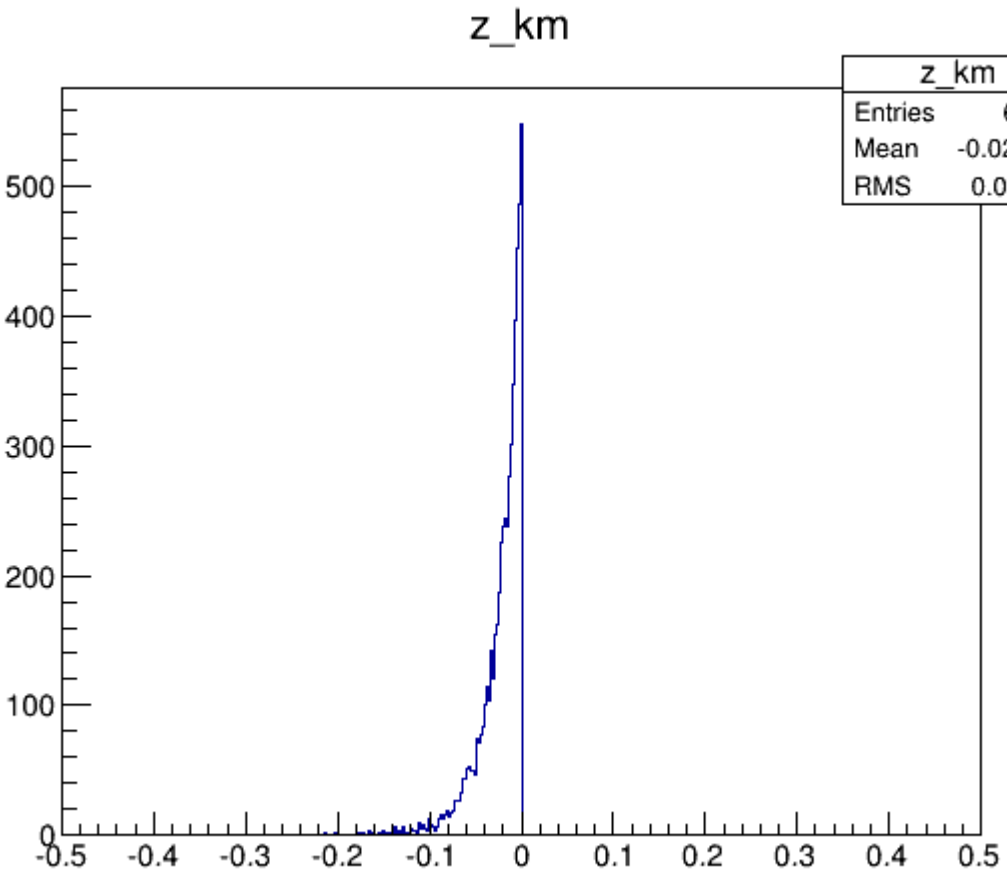
Many tanks in advance.

Laura and Stefano

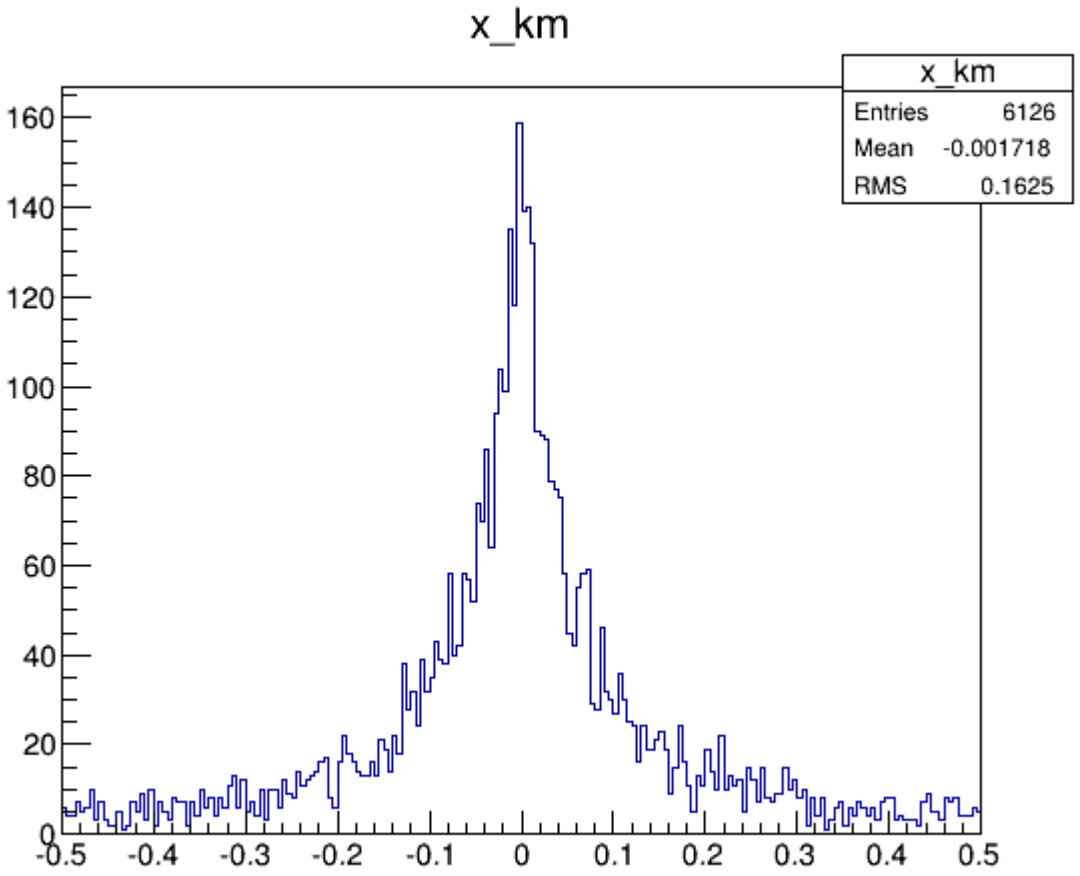
File Attachments

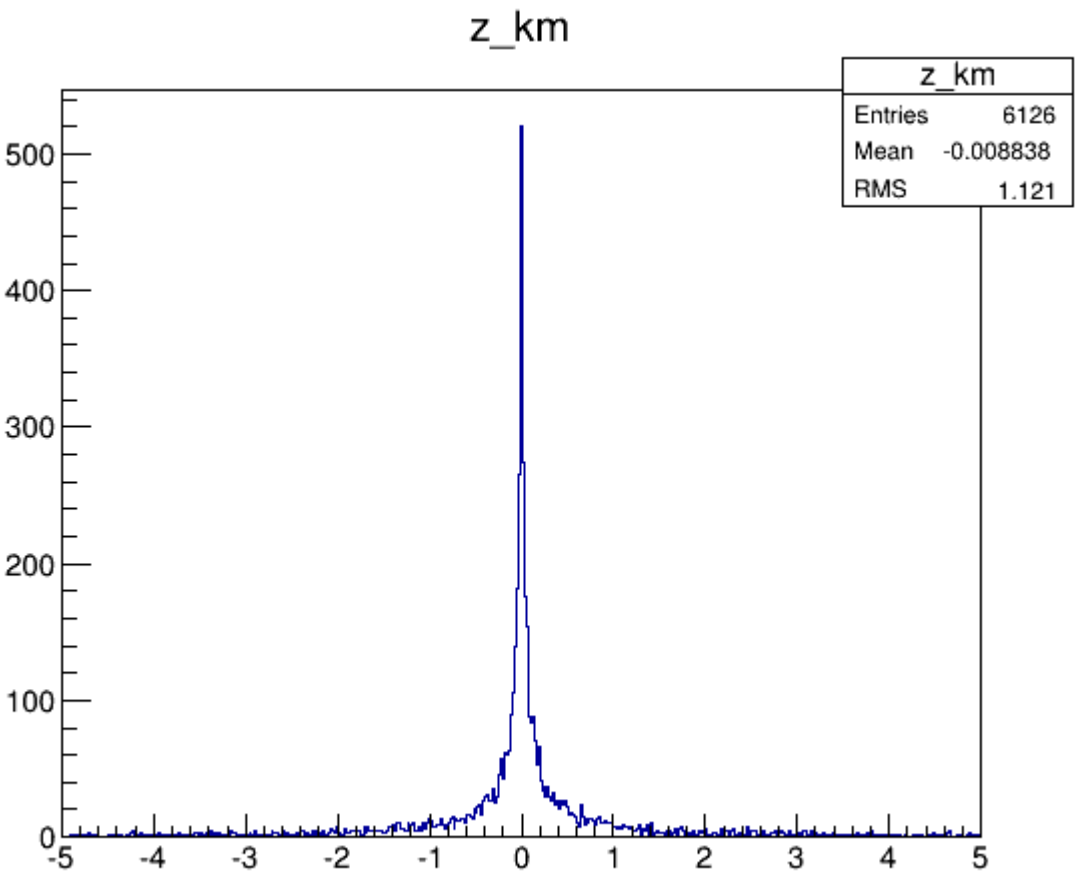
1) PSI4040.DEC, downloaded 531 times
2) sim_complete.C, downloaded 531 times
3) digi_complete.C, downloaded 504 times
4) reco_complete.C, downloaded 532 times
5) pid_complete.C, downloaded 502 times
6) match_kinvtx.C, downloaded 503 times
7) vtx_kinvtx.gif, downloaded 1750 times


x_km
x_km
Entries 6126
Mean -1.019e-06
RMS 0.0007701
600
500
400
300
200
100
0
-0.005 -0.004 -0.003 -0.002 -0.001 0 0.001 0.002 0.003 0.004 0.005

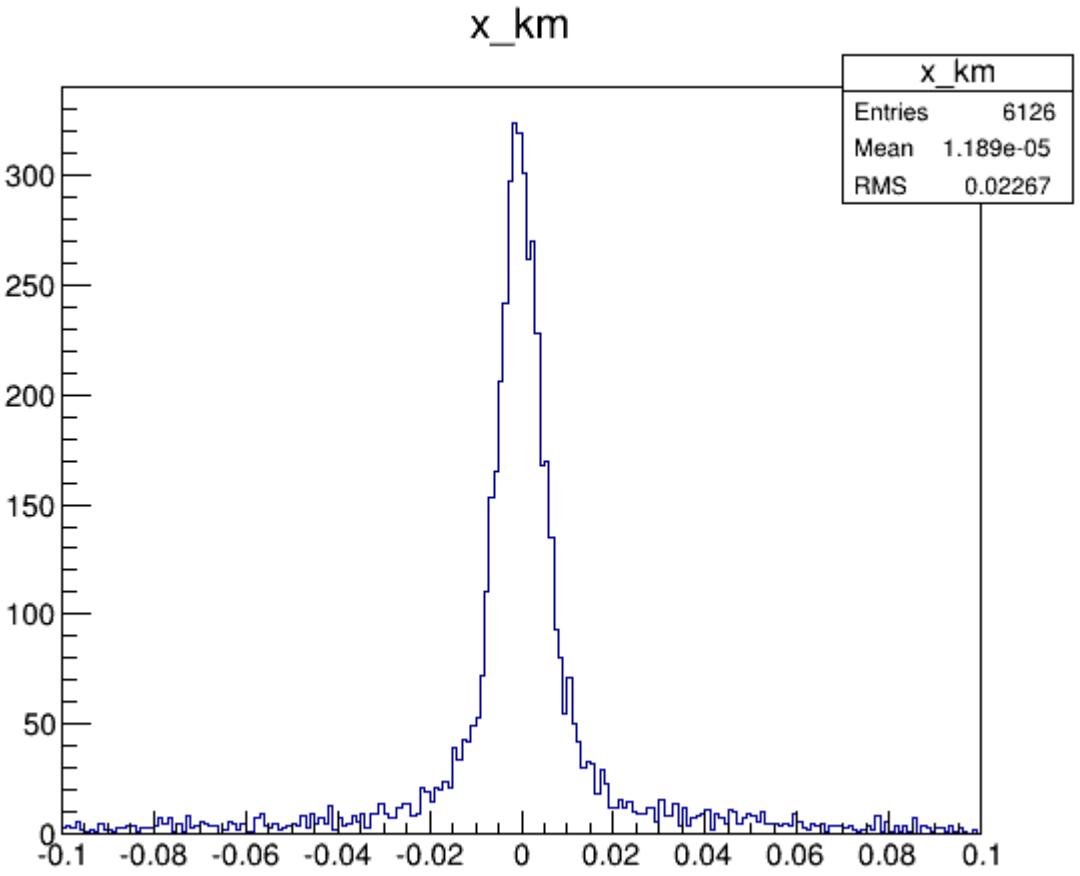

z_km
z_km
Entries 6126
Mean -0.02333
RMS 0.02411
500
400
300
200
100
0
-0.5 -0.4 -0.3 -0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5

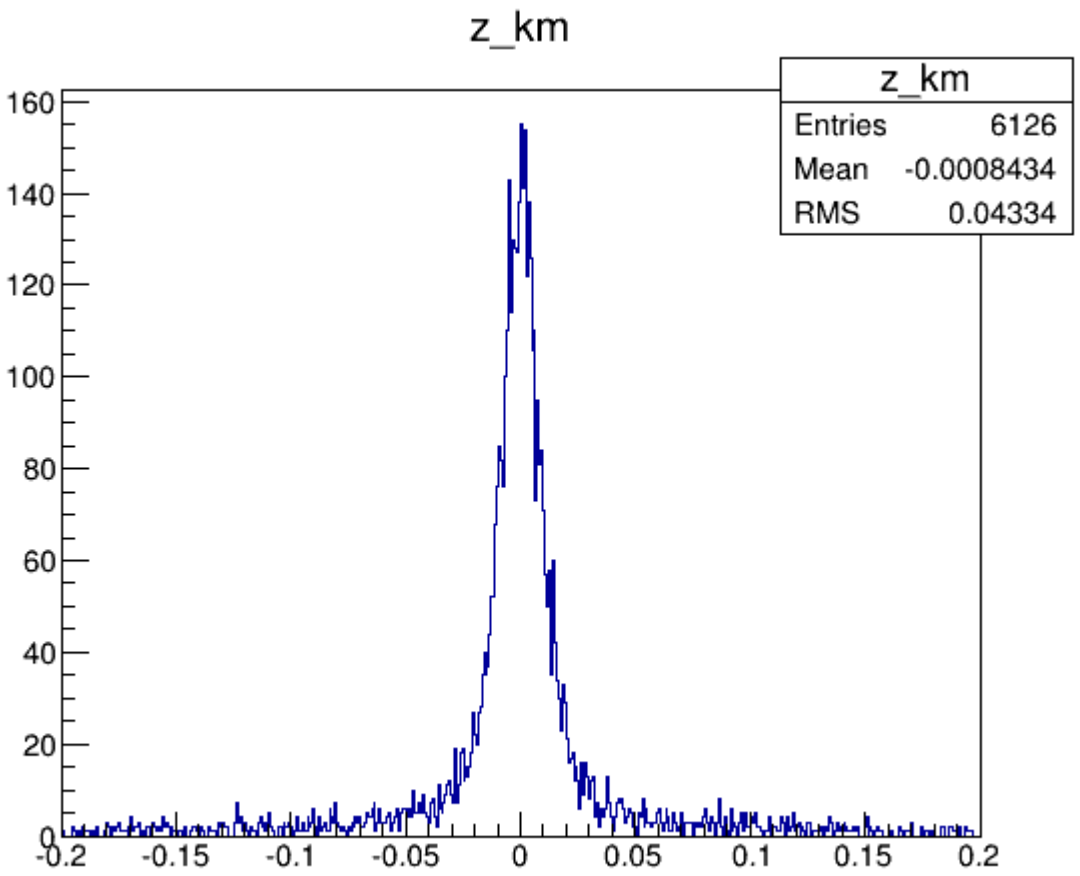
8) vtx_poca.gif, downloaded 1808 times


x_km
x_km
Entries 6126
Mean -0.001718
RMS 0.1625


z_km
z_km
Entries 6126
Mean -0.008838
RMS 1.121

9) vtx_prg.gif, downloaded 1814 times


x_km
x_km
Entries 6126
Mean 1.189e-05
RMS 0.02267
300
250
200
150
100
50
0
-0.1
-0.08
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
0.08
0.1


z_km
z_km
Entries 6126
Mean -0.0008434
RMS 0.04334
160
140
120
100
80
60
40
20
0
-0.2
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2

Subject: Re: Vertex fitters' problems
Posted by Ralf Kliemt on Thu, 06 Jun 2013 11:02:23 GMT
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Hi,

I'm on the Monte-Carlo list filling thing right now.

As for the fitters, I wonder how the 2um are possible.
The 400um of the POCA may be normal, as it is a coarse approximation.
The PRG fitter is limited in its precision as the algorithm itself is designed to be faster.

Ralf

Subject: Re: Vertex fitters' problems
Posted by Simon Reiter on Thu, 06 Jun 2013 15:09:27 GMT
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Hi,

I'm working on similar simulations and was also planning to compare these three fitter. But I'm wondering what RhoCandidate is. I'm using TCandidate. What are the differences? I could not even find it.

Greetings Simon

Subject: Re: Vertex fitters' problems
Posted by StefanoSpataro on Thu, 06 Jun 2013 15:11:47 GMT
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TCandidate if you are using release apr13 and before. RhoCandidate if you are using code after apr13 release.

Subject: Re: Vertex fitters' problems
Posted by Ralf Kliemt on Thu, 20 Jun 2013 13:47:58 GMT
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Hi.

I did some fixes to Rho and the fitters. We had deeply hidden bugs...

Now, I ran the same simulations just as you did and modified the analysis macro to my liking (attached). The outcome is strange BUT:
A) ChiVtx and KinVtx give somewhat similar vertex resolutions. They should as these are the same (P.Avery) Algorithm programmed by different colleagues.
B) POCA is comparable to the fitters above - because it is the seed value for them. I looked it up and the KinVtx actually converges, so I blame the few excess energy available in your

system. Both the kaon and pion tracks will almost move along with the CMS.
C) The PRG fitter (Billoir algorithm) produces better results. Wonderous to me but there we go; maybe its in the algorithm. Both fast and full fit give the same resolution where I would blame the kinematics again.

I hope I could solve the issues now.

Cheers
Ralf

PS: The overly good resolutions of the KinVtx came from the fact that the vertex vector was always zero and the negative MC coordinates were plotted.

File Attachments

1) vtxtest_ChiVtx.pdf, downloaded 478 times
2) vtxtest_KinVtx.pdf, downloaded 431 times
3) vtxtest_Poca.pdf, downloaded 466 times
4) vtxtest_FastPrg.pdf, downloaded 465 times
5) vtxtest_FullPrg.pdf, downloaded 464 times
6) match_kinvtx.C, downloaded 484 times

Subject: Re: Vertex fitters' problems
Posted by L. Zotti on Fri, 21 Jun 2013 16:43:34 GMT
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Dear Ralf,
thanks for your helping.
Looking in your analysis macro, I found you just missed one "break" at line 273. Actually with this modification, I got some better results from the ChiVtx fitter.
Moreover, cleaning the sample looking at the FitStatus flag, I got the following resolution:

PndChiVtxFitter x:32um y:52um z:138
PndVtxPRG (full) x:61um y:60um z:103um
PndVtxPRG (fast) x:60um y:61um z:103um

Plots for PndChiVtxFitter:

Plots for PndKinVtxFitter:

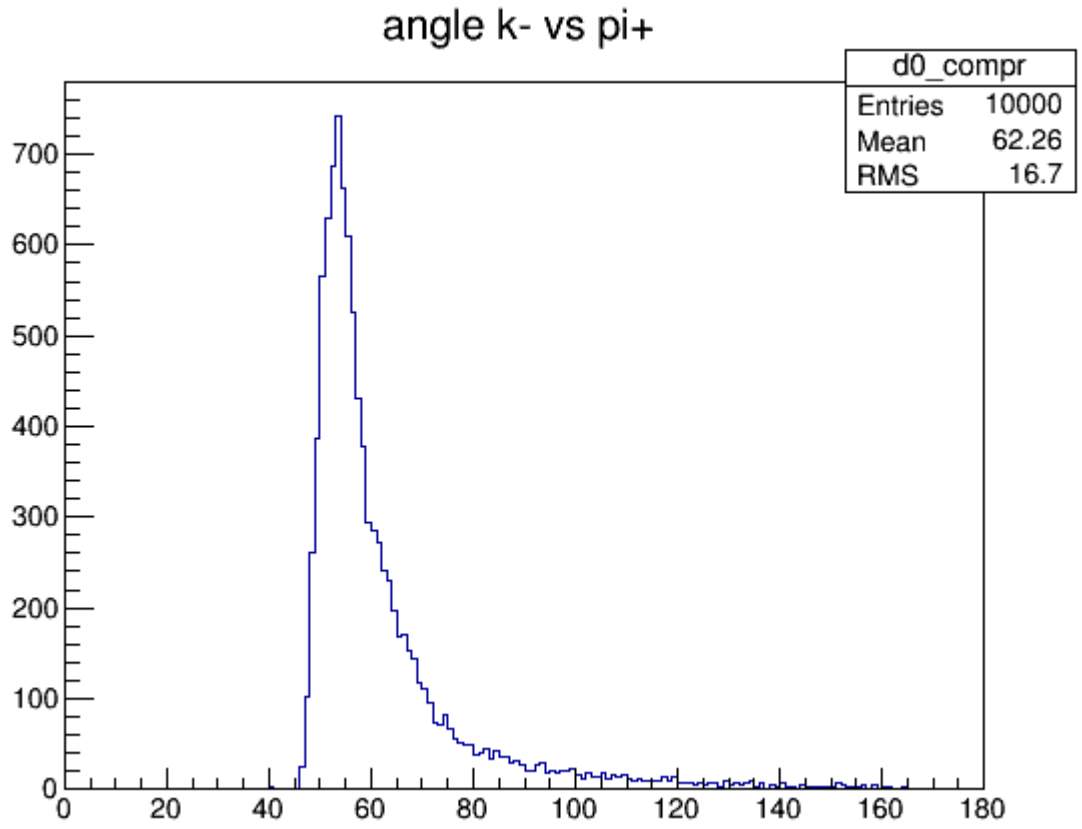
Plots for PndVtxPoca

Plots for PndVtxPRG
1)fast:
2)full:

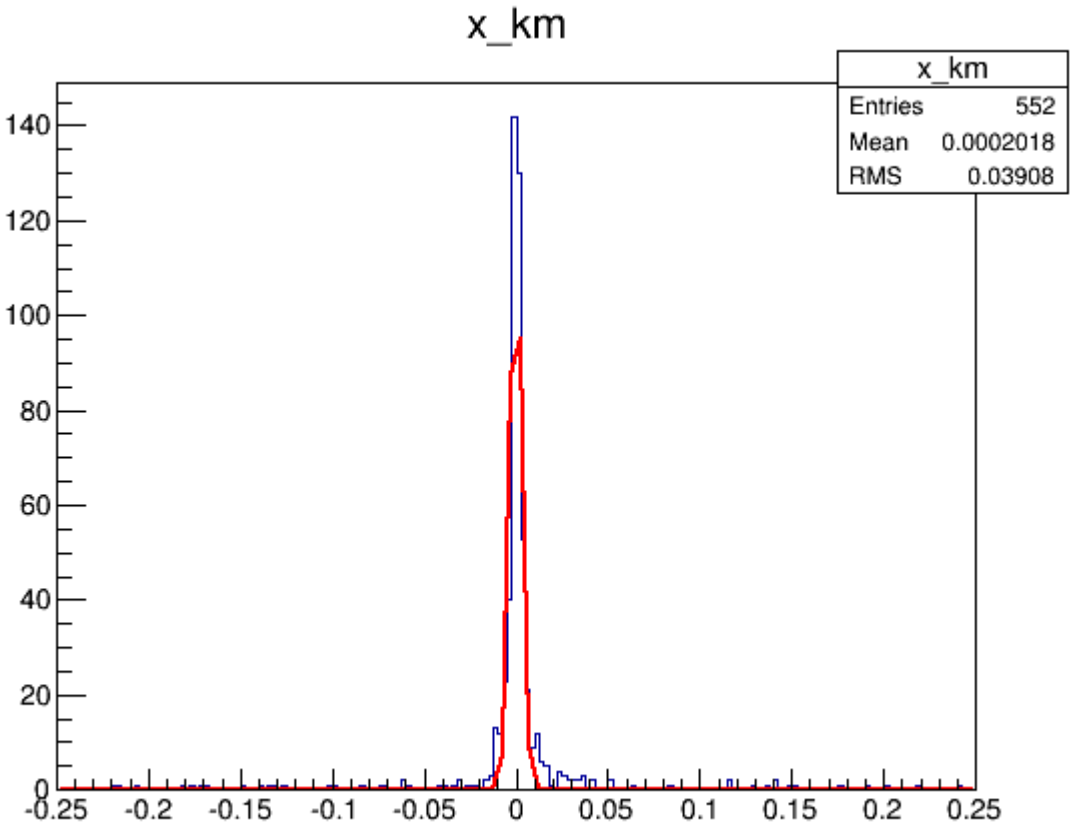
Still to be understood why resolution are different in x and y for the PndChiVtxFitter.
Do you think this results are reliables?
The KinVtxFitter and the Poca one still give strange results.
For what concern the kinematics, actually the kaons and the pions from the d0-meson are well separated in angle, how you can see here:

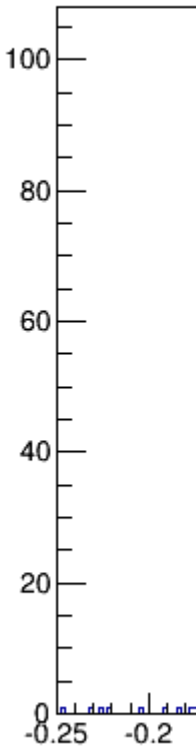
File Attachments

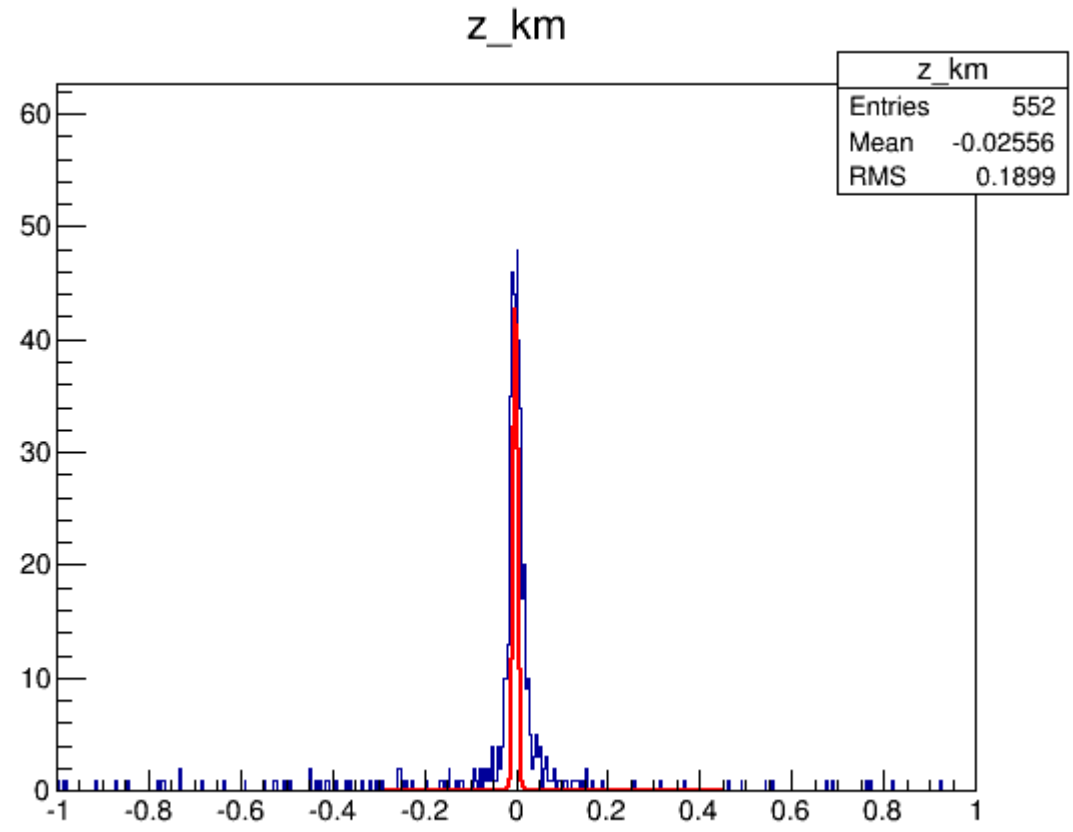
1) opening_angle.png, downloaded 1413 times

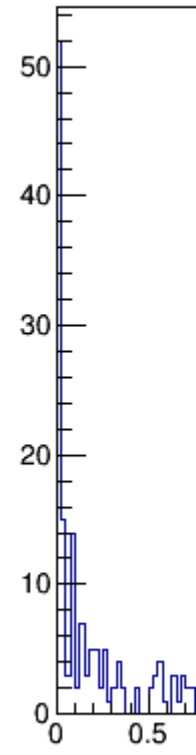


2) ChiVtx.png, downloaded 1467 times

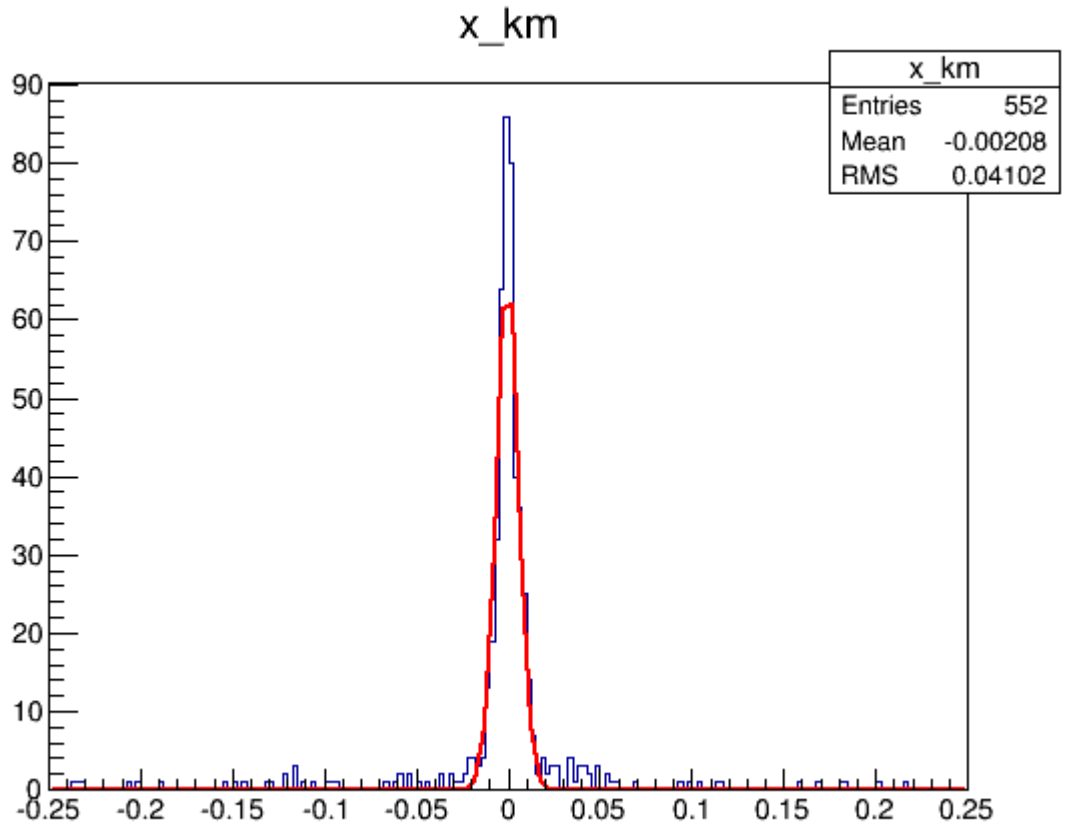


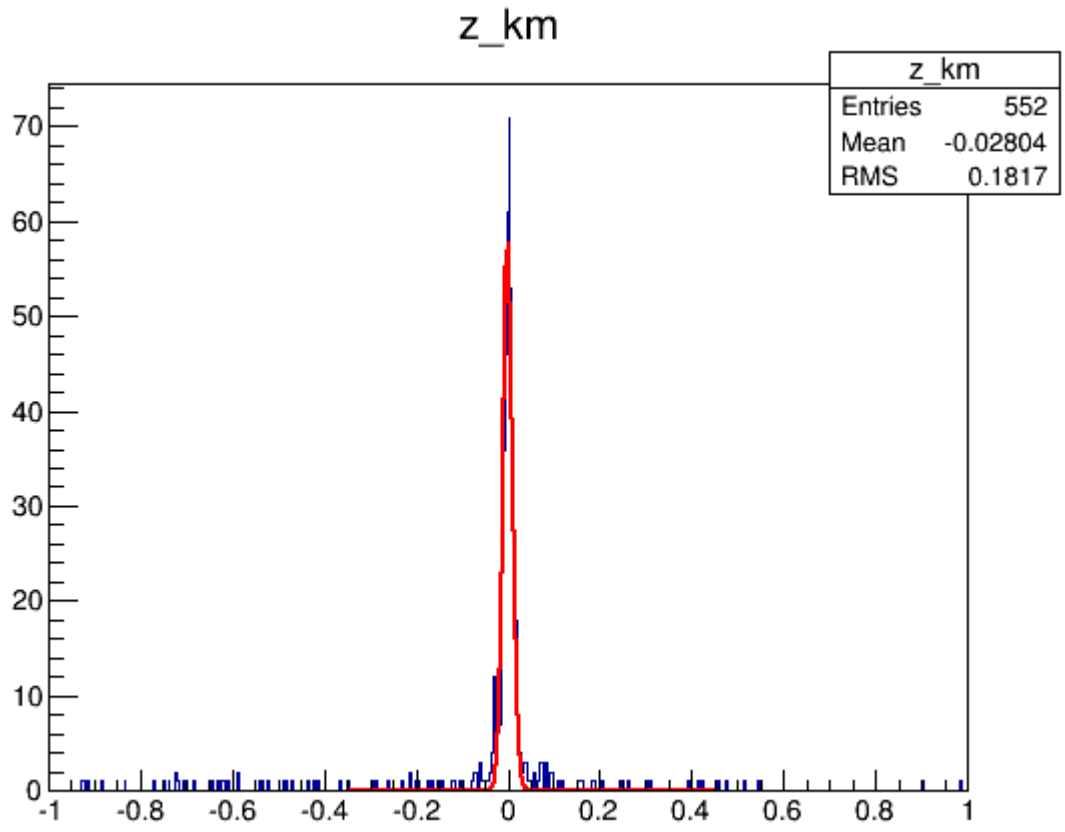




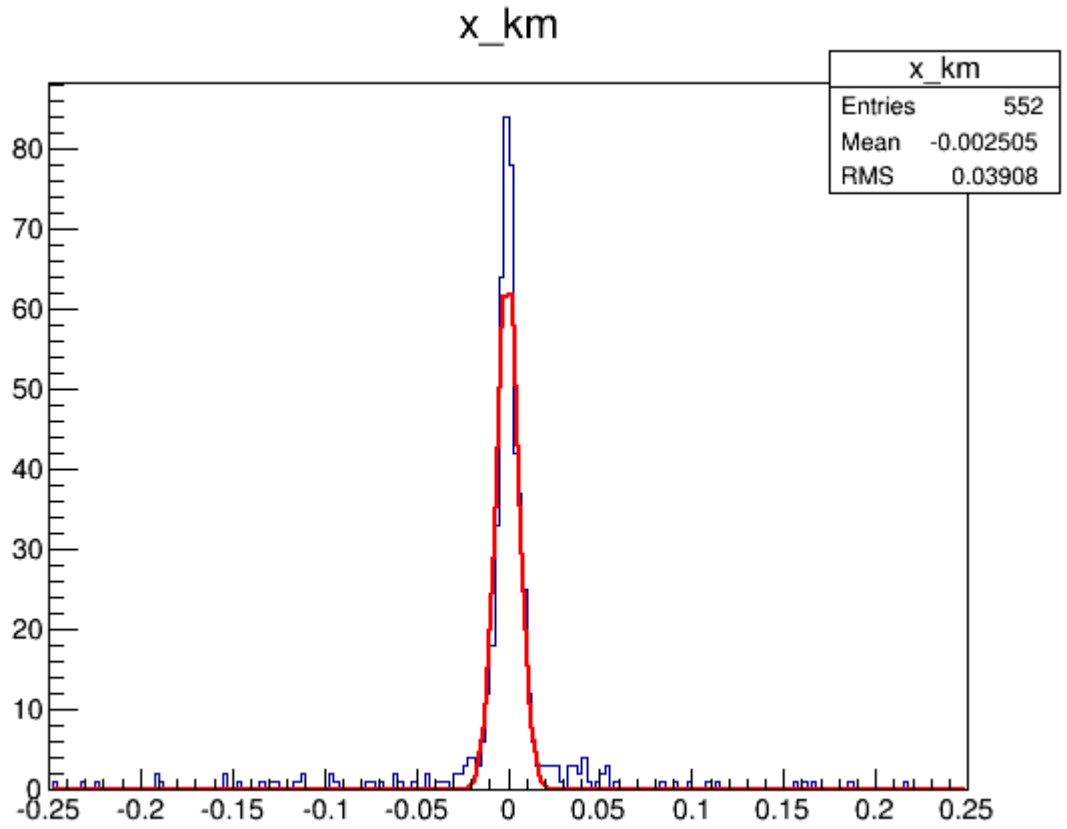


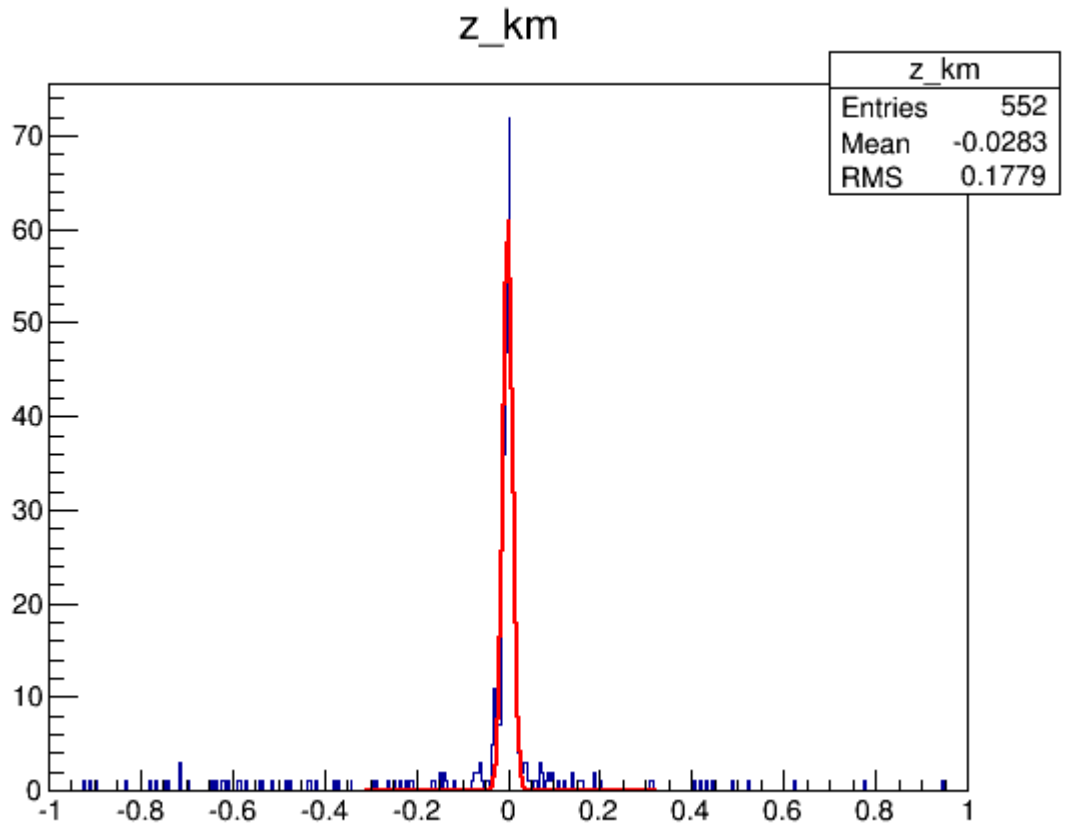
3) FastVtx.png, downloaded 1415 times



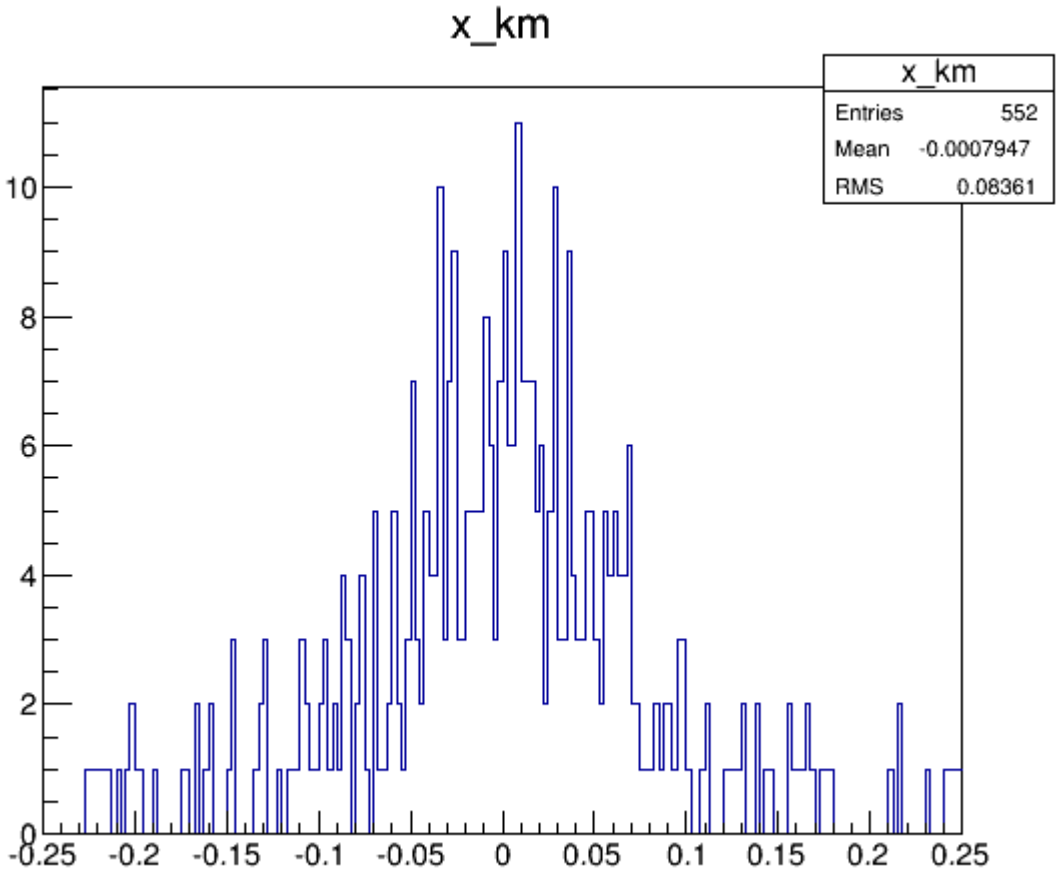


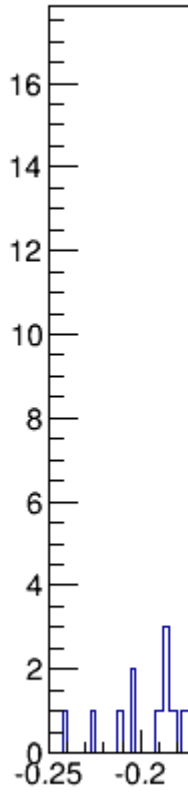
4) FullVtx.png, downloaded 1457 times

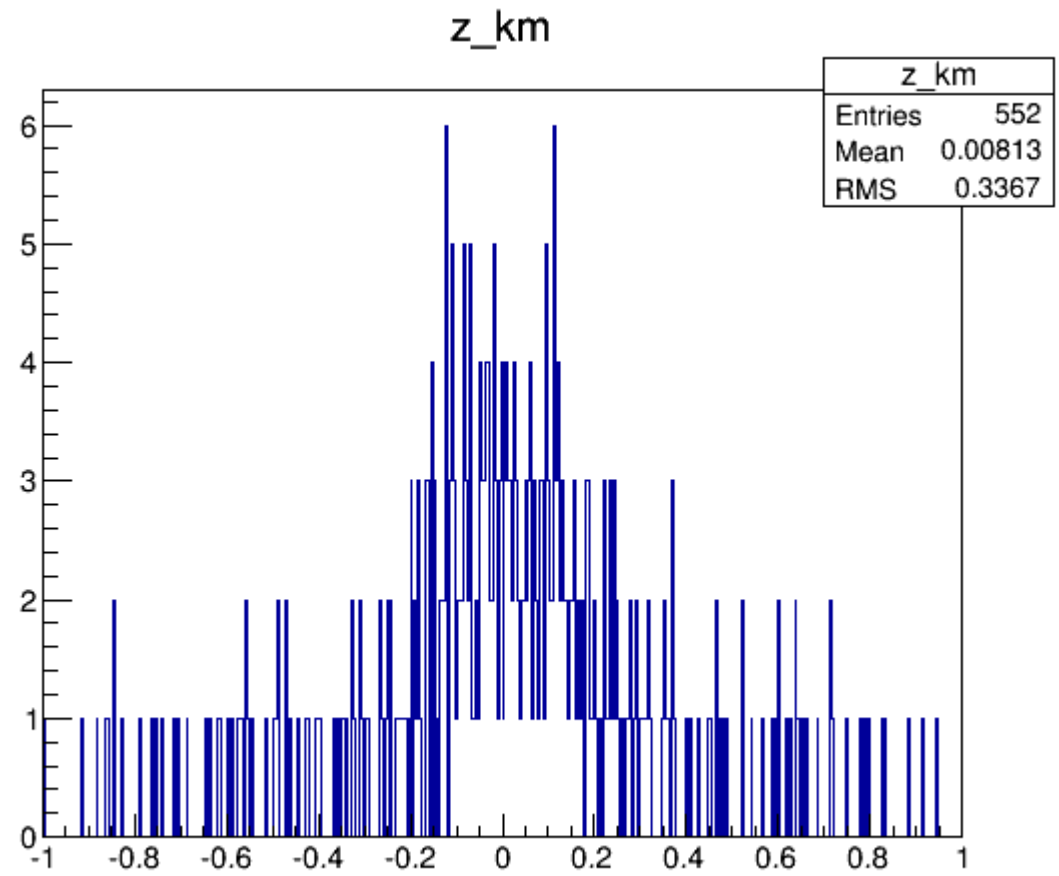


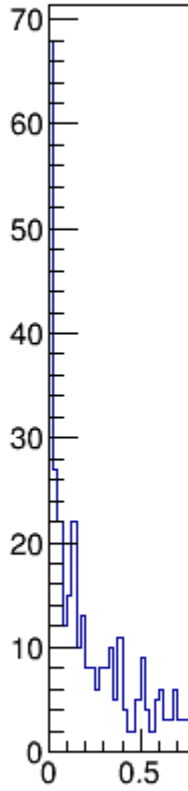


5) KinVtx.png, downloaded 1314 times

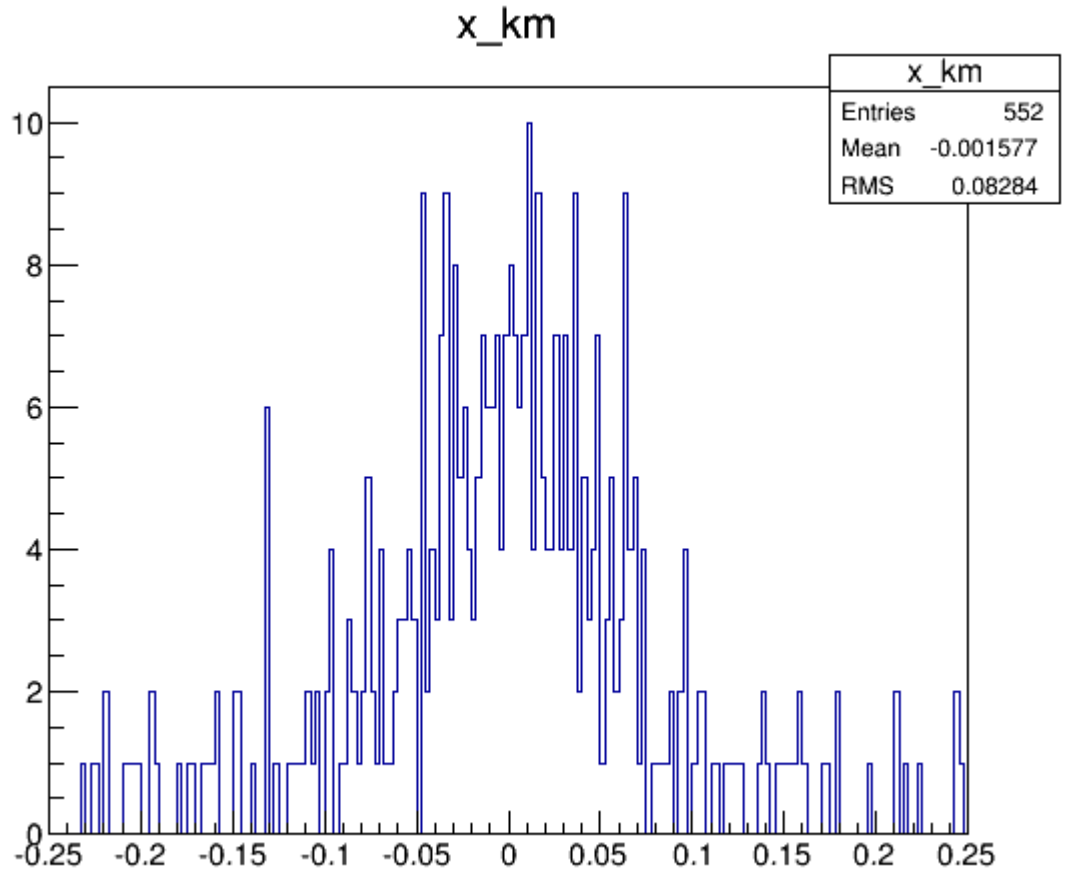

x_km
x_km
Entries 552
Mean -0.0007947
RMS 0.08361
10
8
6
4
2
0
-0.25 -0.2 -0.15 -0.1 -0.05 0 0.05 0.1 0.15 0.2 0.25

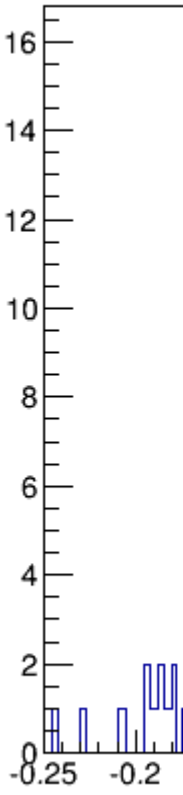

16
14
12
10
8
6
4
2
0
-0.25 -0.2

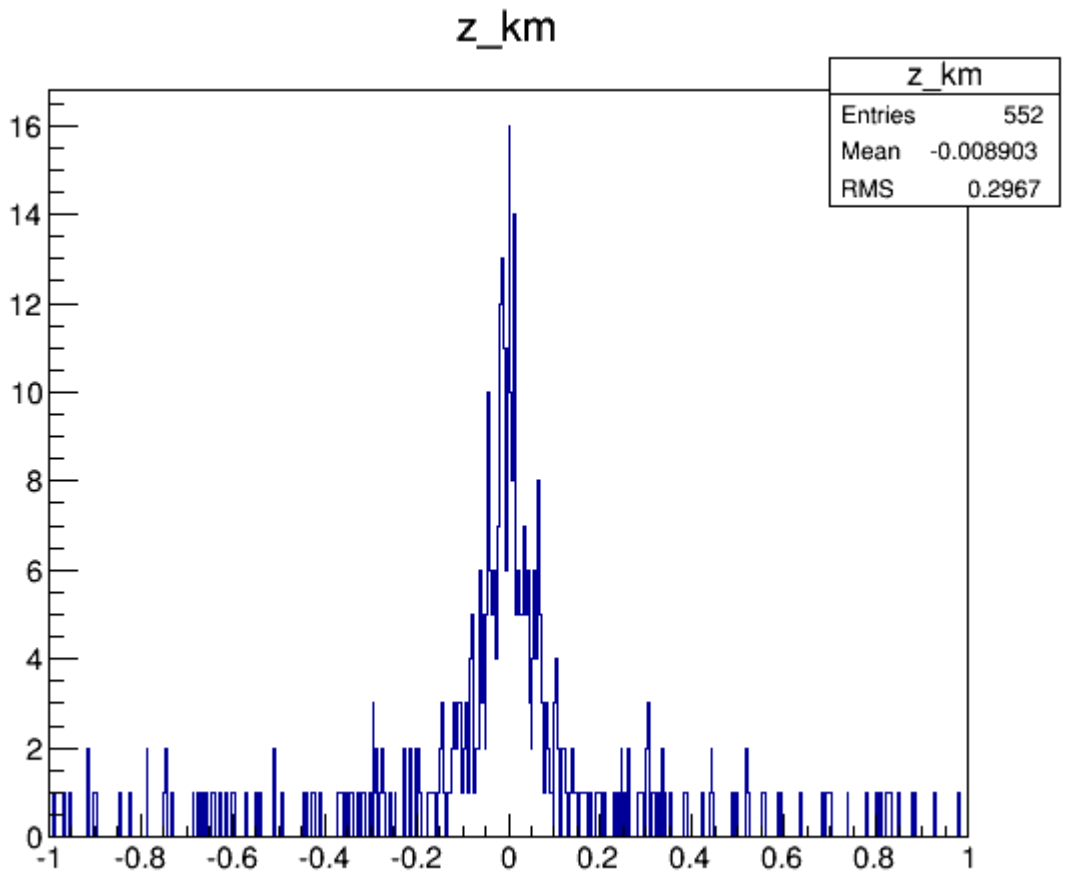

z_km
z_km
Entries 552
Mean 0.00813
RMS 0.3367
6
5
4
3
2
1
0
-1 -0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8 1

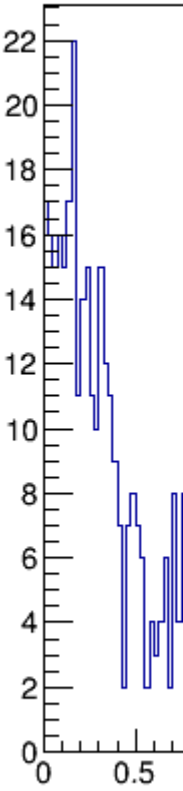

70
60
50
40
30
20
10
0
0 0.5

6) PocaVtx.png, downloaded 1413 times


x_km
x_km
Entries 552
Mean -0.001577
RMS 0.08284
10
8
6
4
2
0
-0.25
-0.2
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25


16
14
12
10
8
6
4
2
0
-0.25
-0.2


z_km
z_km
Entries 552
Mean -0.008903
RMS 0.2967
16
14
12
10
8
6
4
2
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1


22
20
18
16
14
12
10
8
6
4
2
0
0
0.5

Subject: Re: Vertex fitters' problems
Posted by L. Zotti on Thu, 25 Jul 2013 14:22:11 GMT
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Dear All,
in the detailed investigation that I'm carring out on the vertex-fit, I found an error in the class PndChiVtxFitter.cxx at line 255 in the definition of a TVector3.
Please can you upload the correction? (here in attachment).
Moreover, I found a lot of negative chi2..... Does somebody of you know how can this be possible and can have a look on this problem?

Thanks in advance,
Regards
Laura

File Attachments
1) PndChiVtxFitter.cxx, downloaded 503 times

Subject: Re: Vertex fitters' problems
Posted by StefanoSpataro on Fri, 26 Jul 2013 11:26:46 GMT
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Very interesting...

root [0] TVector3 e(1,2,3)
root [1] TVector3 f=(1,2,3)
root [2] e.Print()
TVector3 A 3D physics vector (x,y,z)=(1.000000,2.000000,3.000000)
(rho,theta,phi)=(3.741657,36.699225,63.434949)
root [3] f.Print()
TVector3 A 3D physics vector (x,y,z)=(3.000000,0.000000,0.000000)
(rho,theta,phi)=(3.000000,90.000000,0.000000)
root [4] TVector3 d
root [5] d=(1,2,3)
(class TVector3)41869040
root [6] d.Print()
TVector3 A 3D physics vector (x,y,z)=(3.000000,0.000000,0.000000)
(rho,theta,phi)=(3.000000,90.000000,0.000000)

and without a single complain...

Subject: Re: Vertex fitters' problems
Posted by StefanoSpataro on Fri, 26 Jul 2013 12:48:48 GMT
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I have committed the modified class (there were a couples of such bad init).
Could you please check now if it produces "good" results?

Subject: Re: Vertex fitters' problems
Posted by Simon Reiter on Fri, 26 Jul 2013 12:55:16 GMT
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Without CINT's optimization it worked

I'm trying to look at that chi2, but will take me some time..

Subject: Re: Vertex fitters' problems
Posted by L. Zotti on Mon, 29 Jul 2013 09:11:16 GMT
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Dear All,
after the last modification of the PndChiVtxFitter.cxx
these are the main results that I got.
Resolution on x: 32 micron

Resolution on y: 54 micron, why is it different from x?

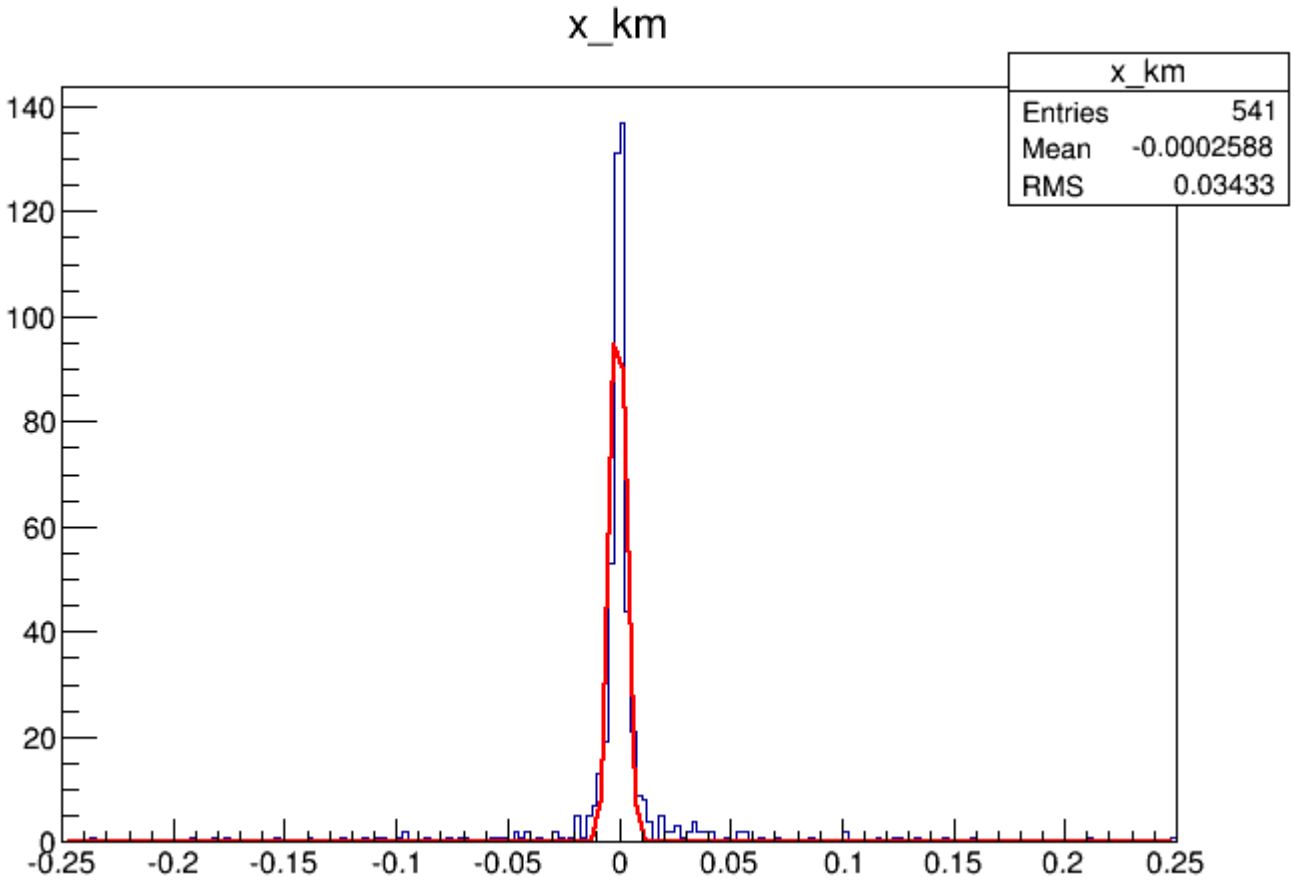
Resolution on z: 113 micron.

Chi2 still some negative values: do you have suggestions on how to decide what is the best candidate in case of combinatorials?

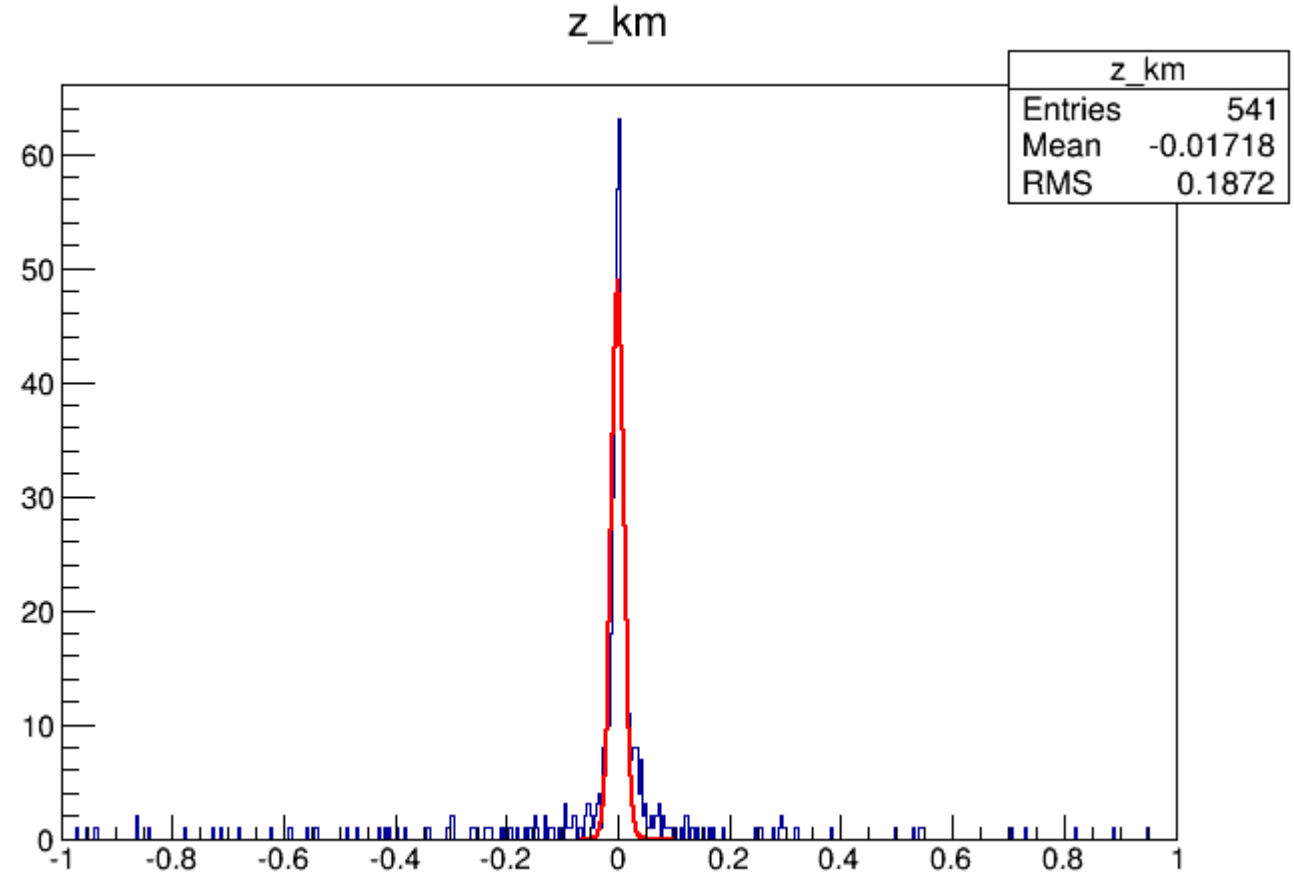
Mass of the D0 before and after the fit: after the fit we got a low number of D0 under the central peak

Best regards,
Laura

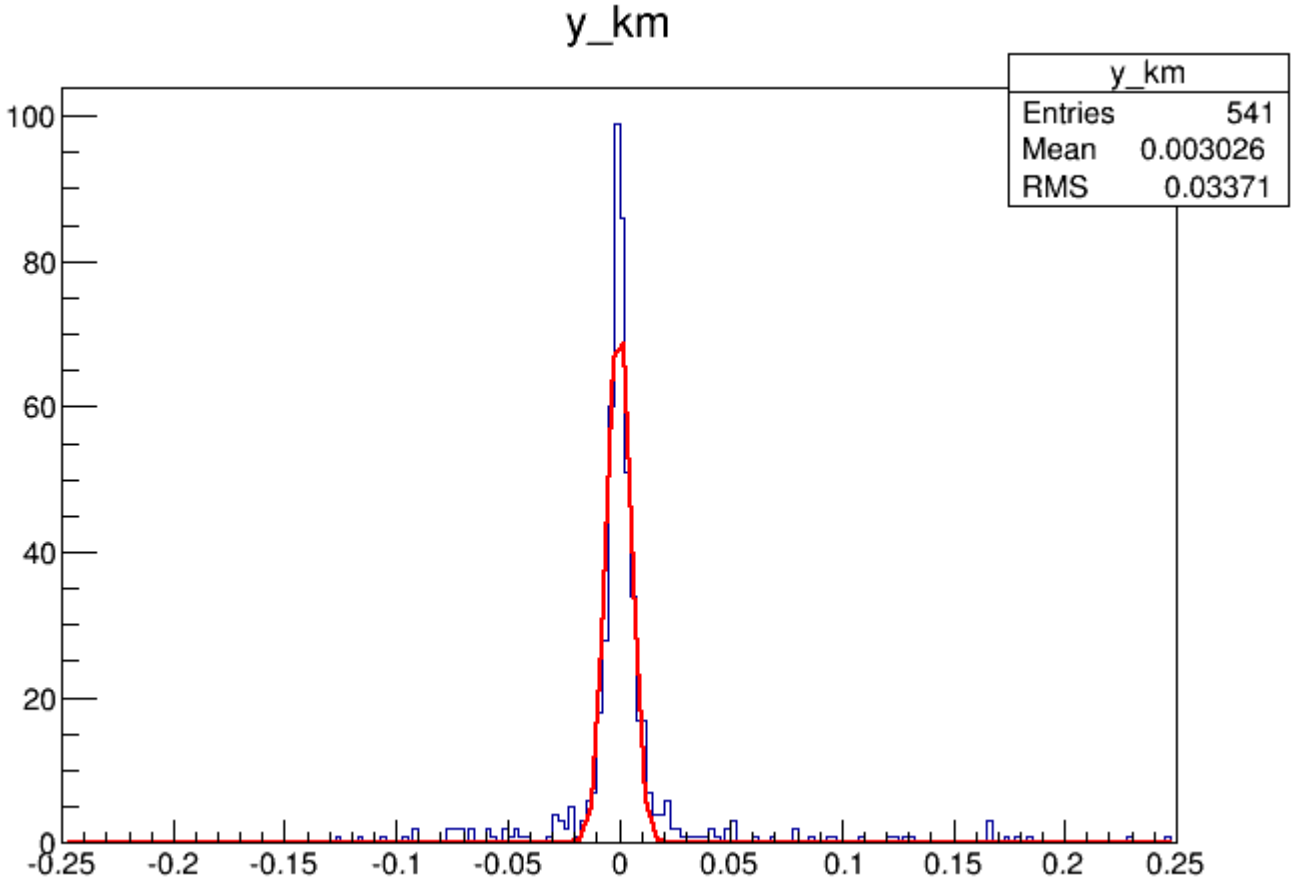
File Attachments
1) x.png, downloaded 1450 times



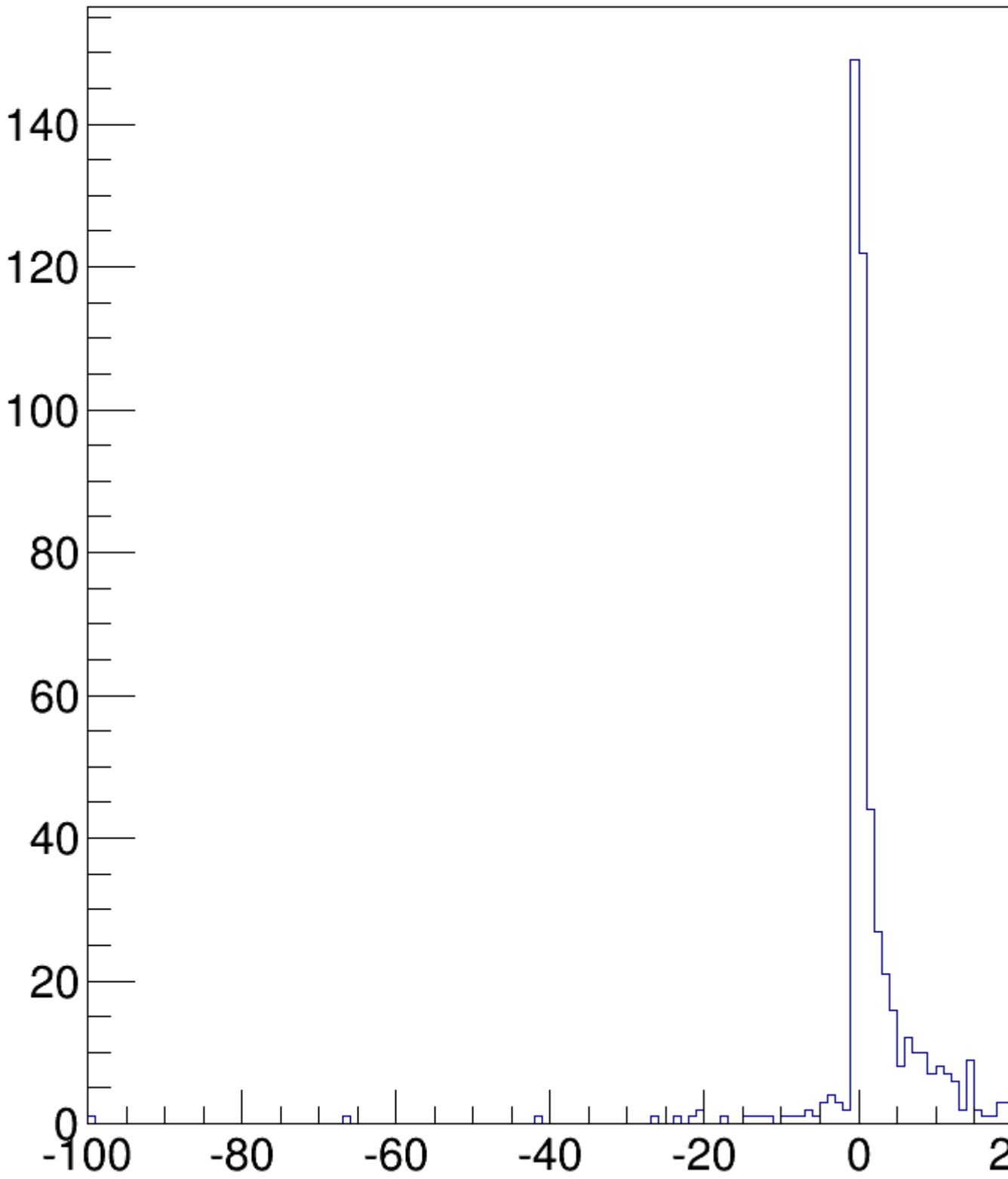
2) z.png, downloaded 1469 times



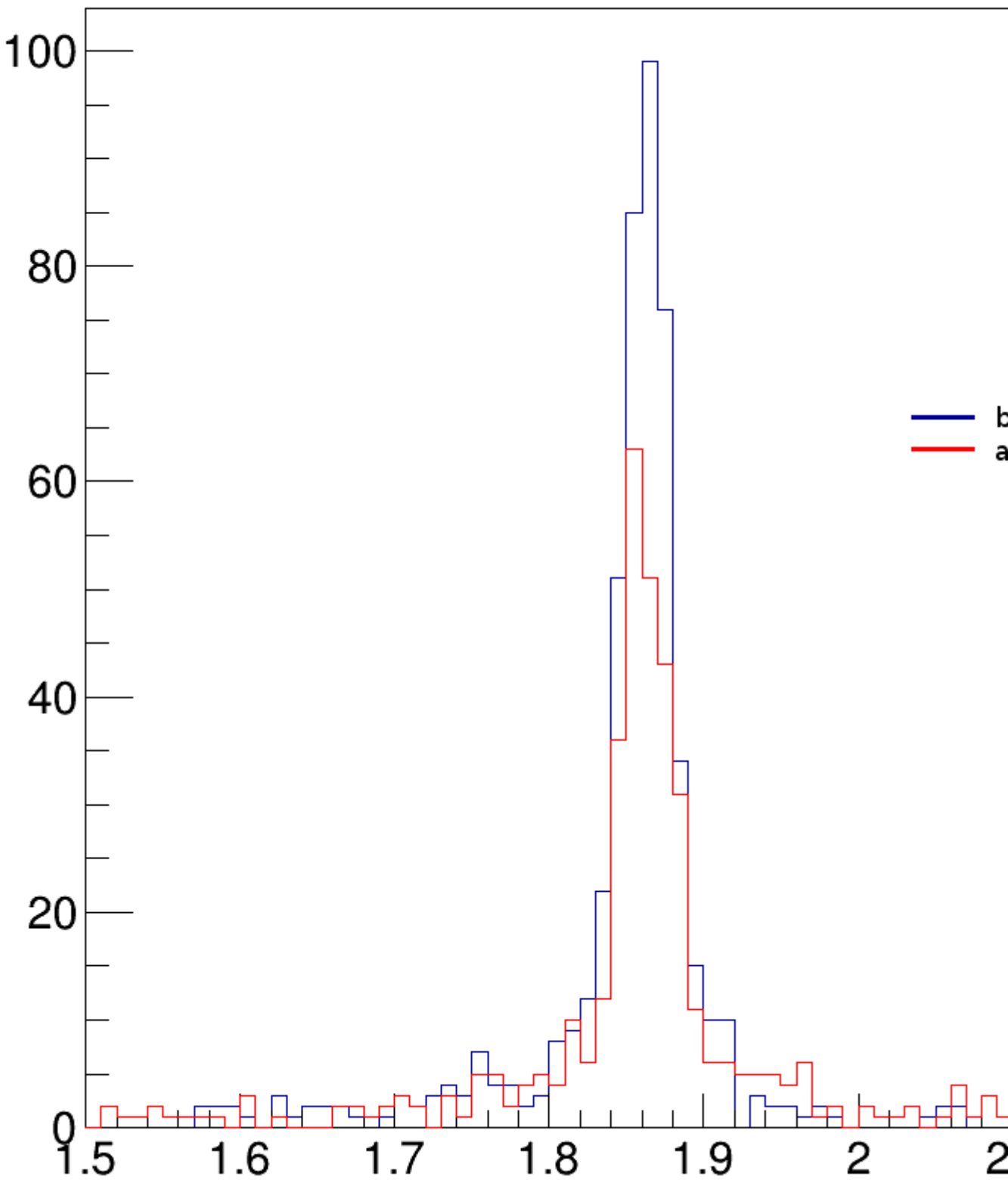
3) y.png, downloaded 1401 times



4) chi2.png, downloaded 1423 times



5) mass_d0.png, downloaded 1374 times


D0
100
80
60
40
20
0
1.5
1.6
1.7
1.8
1.9
2
b
a