IP

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IP package
-introduction

- IP is in the Calibration Framework.

- It includes two steps (required by the cal. framework):
  1. Inherit ***CalibrationCollectorModule;***
     A ***IPCollectorModule*** to find the event *ip*;
     Store the *ip* (etc.) info. into **ntuple.**

  2. Inherit ***CalibrationAlgorithm***;
     a file named ***IPAlgorithm*** to fit the event *ip* distribution (the **ntuple** is input);
     Store the para.s in DB (temporary a .tex file)

- via ***IPCollectorModule*** (in the step 1), we finish

1. Event selection
2. Find the event *ip*

Previously, a vertexing algorithm made by ourselves to find event ip

- The code Get some critisizes/comments (the pull request related to BII-1996)

This PR does

- duplicate lots of code from framework and tracking
- due to duplication might have the wrong track parametrization
- seems to have its own vertex fitter

I suggest to have a look at vertex fitters. Try `vertexTree` (Kalman Filter) and `tagV` (weighted Kalman Filter). Both have a geometric extraction including the full covariance. Bianca Scavino V0 finder might be even better for this task because it can fit on hit level.

Reply · Create task · Create JIRA issue · Like · Sam Cunliffe likes this · 25 Jun 2018

Updates

1. Documentation

There was not clear explanation in the code (hard read) before.
We added.

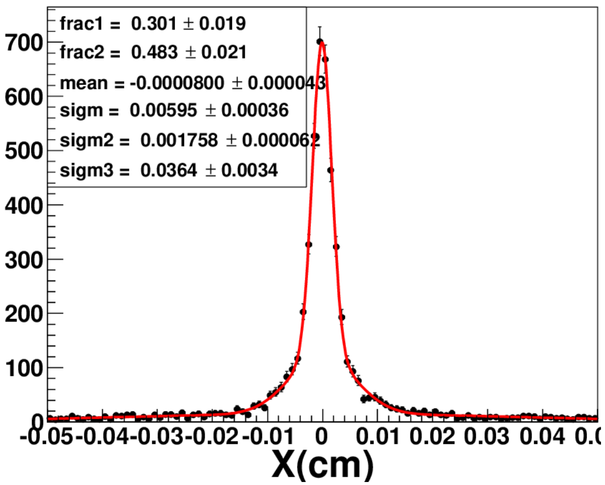
2. Use existing function

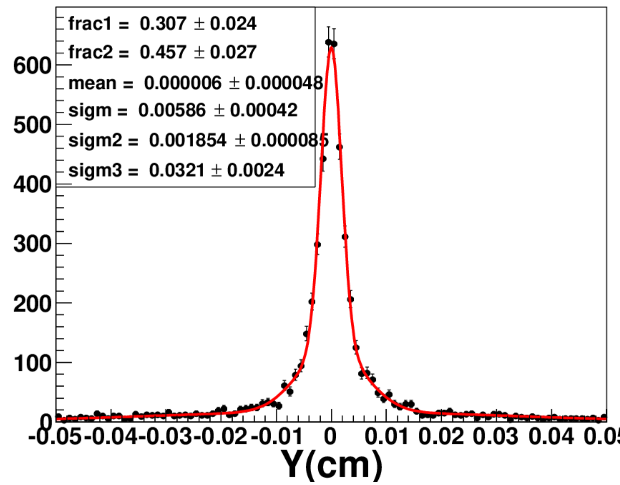
We used a few ourown functions (or class, e.g. Helix, vertex)
We removed them, replaced with existing functions

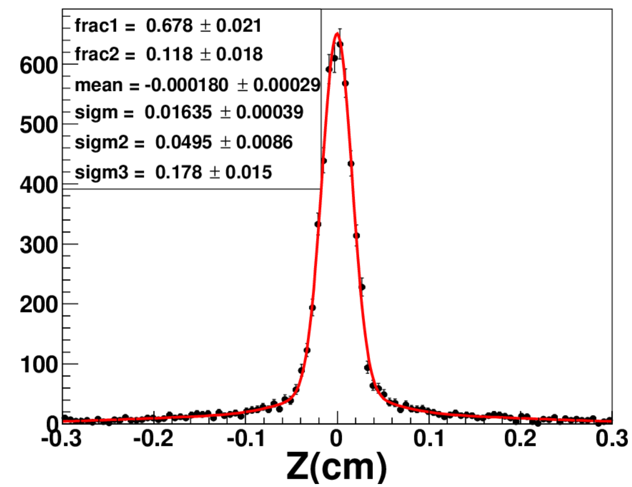
3. The vertexing (there are a few options)

1) V0: have 4 hypotheses of the mother particle (Ks, Λ, Λbar, γ)
(modify the module/refitting when have muon pair ...   Thanks to **Banica**...)
2) VertexFitter: (*thank Jo.)*
RaveVertexFitter   **... (below use this) ...**
3) TagV:

(Three one dimensional fit) from ***Roofit***

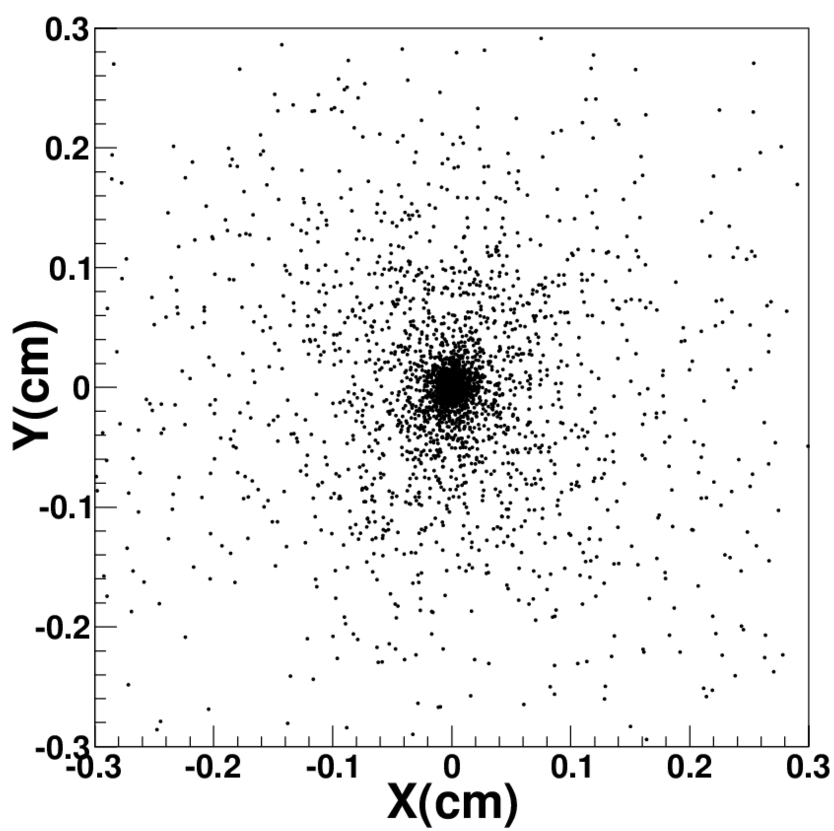






Results:

Plot the **y.vs.x** use generated Ntuple



3 Dimentional fit (use RooFit)

X: 3 Gaussian

Y: 3 Gaussian

Z: 3 Gaussian

PDF(XYZ)=PDF(X)*PDF(Y)*PDF(Z)

Assume the x,y,z independent

Results in next page.

COVARIANCE MATRIX CALCULATED SUCCESSFULLY

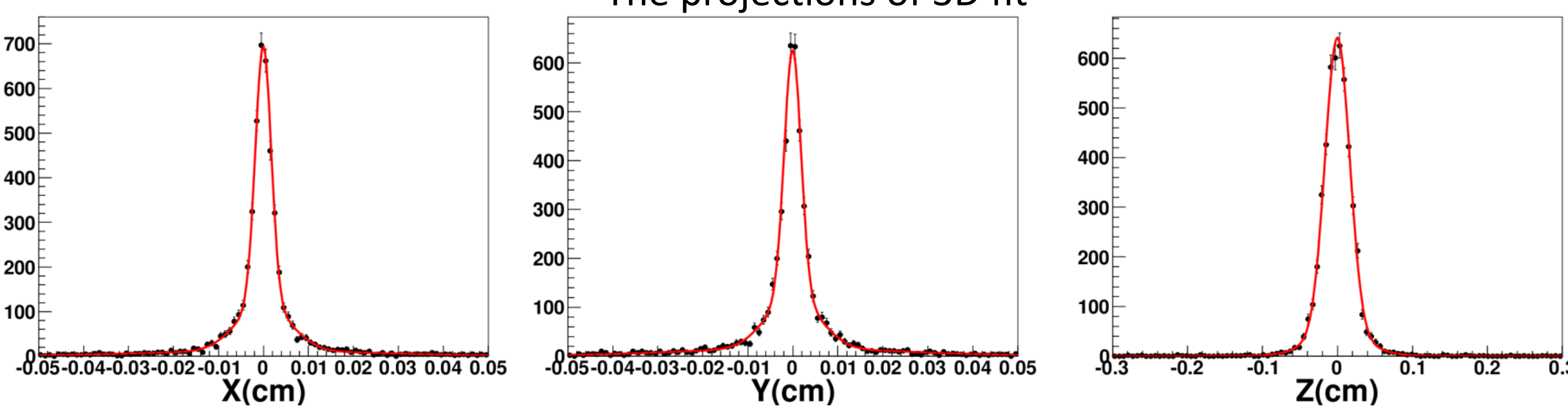
FCN=-47303.1 FROM HESSE   STATUS=OK   187 CALLS   1444 TOTAL

EDM=2.81544e-05   STRATEGY= 1   ERROR MATRIX ACCURATE

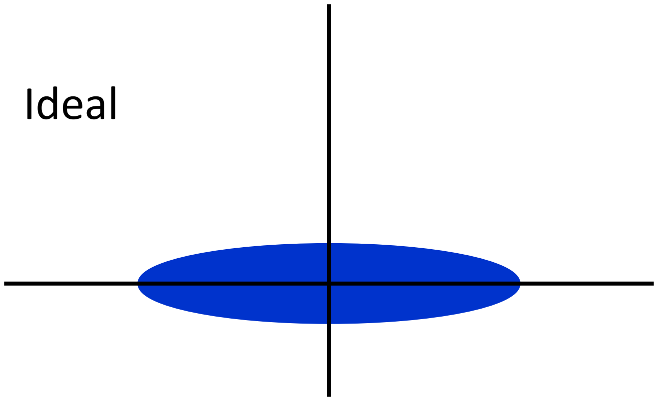
EXT PARAMETER NO.	NAME		VALUE	ERROR	INTERNAL STEP SIZE	INTERNAL VALUE
1	mean		-4.45155e-05	3.17592e-05	4.75822e-06	-2.22578e-04
2	xfrac1		5.30715e-01	2.28248e-02	7.47556e-05	6.14695e-02
3	xfrac2	X	3.20831e-01	2.01971e-02	9.03074e-05	-3.66488e-01
4	xsigm		1.77424e-03	6.25716e-05	6.27328e-05	-7.01223e-01
5	xsigm2		5.89642e-03	3.57812e-04	2.23648e-04	1.80258e-01
6	xsigm3		2.75902e-02	2.13534e-03	3.57751e-04	1.03794e-01
7	yfrac1		4.87305e-01	2.71956e-02	8.16369e-05	-2.53923e-02
8	yfrac2	y	3.20874e-01	2.38323e-02	1.01536e-04	-3.66395e-01
9	ysigm		1.86287e-03	8.04412e-05	7.04020e-05	-6.78243e-01
10	ysigm2		5.84724e-03	4.00531e-04	2.31052e-04	1.70269e-01
11	ysigm3		2.62780e-02	1.66193e-03	2.76386e-04	5.11405e-02
12	zfrac1		8.37605e-01	4.05534e-02	4.05039e-05	7.41250e-01
13	zfrac2		1.44879e-01	3.91384e-02	4.37874e-05	-7.89842e-01
14	zsigm	Z	1.63268e-02	4.84246e-04	1.57907e-05	-1.20739e+00
15	zsigm2		3.63150e-02	3.87366e-03	4.83415e-05	-1.14139e+00
16	zsigm3		2.01479e-01	6.25190e-02	7.81716e-04	-5.19333e-01

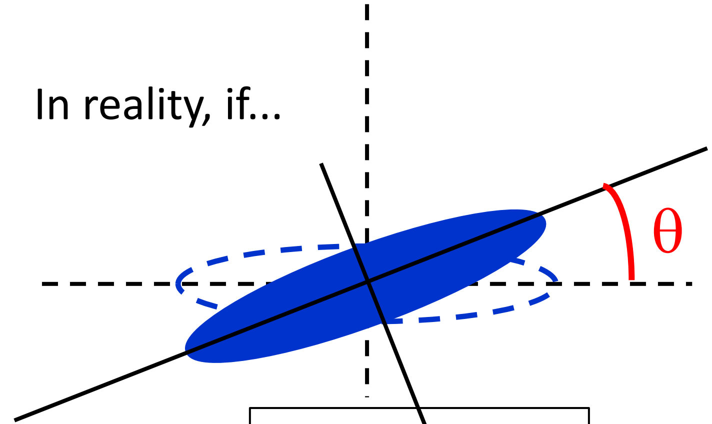
NO.	GLOBAL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.06977	1.000	0.025	-0.018	0.032	0.029	0.014	-0.049	0.045	-0.059	-0.044	-0.014	-0.004	0.004	-0.003	-0.003	-0.000
2	0.96230	0.025	1.000	-0.869	0.764	0.777	0.326	-0.001	0.001	-0.001	-0.001	-0.000	-0.000	0.000	-0.000	-0.000	-0.000
3	0.93773	-0.018	-0.869	1.000	-0.694	-0.505	0.023	0.001	-0.001	0.001	0.001	0.000	0.000	-0.000	0.000	0.000	0.000
4	0.77047	0.032	0.764	-0.694	1.000	0.609	0.245	-0.002	0.001	-0.002	-0.001	-0.000	-0.000	0.000	-0.000	-0.000	-0.000
5	0.85912	0.029	0.777	-0.505	0.609	1.000	0.552	-0.001	0.001	-0.002	-0.001	-0.000	-0.000	0.000	-0.000	-0.000	-0.000
6	0.72068	0.014	0.326	0.023	0.245	0.552	1.000	-0.001	0.001	-0.001	-0.001	-0.000	-0.000	0.000	-0.000	-0.000	-0.000
7	0.96834	-0.049	-0.001	0.001	-0.002	-0.001	-0.001	1.000	-0.881	0.819	0.812	0.342	0.000	-0.000	0.000	0.000	0.000
8	0.94369	0.045	0.001	-0.001	0.001	0.001	0.001	-0.881	1.000	-0.753	-0.561	-0.009	-0.000	0.000	-0.000	-0.000	-0.000
9	0.82350	-0.059	-0.001	0.001	-0.002	-0.002	-0.001	0.819	-0.753	1.000	0.665	0.267	0.000	-0.000	0.000	0.000	0.000
10	0.88158	-0.044	-0.001	0.001	-0.001	-0.001	-0.001	0.812	-0.561	0.665	1.000	0.553	0.000	-0.000	0.000	0.000	0.000
11	0.72361	-0.014	-0.000	0.000	-0.000	-0.000	-0.000	0.342	-0.009	0.267	0.553	1.000	0.000	-0.000	0.000	0.000	0.000
12	0.99812	-0.004	-0.000	0.000	-0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000	0.000	1.000	-0.996	0.872	0.920	0.313
13	0.99785	0.004	0.000	-0.000	0.000	0.000	0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.996	1.000	-0.873	-0.901	-0.257
14	0.87600	-0.003	-0.000	0.000	-0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000	0.000	0.872	-0.873	1.000	0.770	0.243
15	0.93825	-0.003	-0.000	0.000	-0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000	0.000	0.920	-0.901	0.770	1.000	0.438
16	0.70254	-0.000	-0.000	0.000	-0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000	0.000	0.313	-0.257	0.243	0.438	1.000

The projections of 3D fit



Possible rotation





Paramterize
(X: 2~3 Gauss)
(Y: 2~3 Gauss)
(Z: 2~3 Gauss)

Parameters:
(X: 2~3 Gauss)
(Y: 2~3 Gauss)
(Z: 2~3 Gauss)
(X: θ_x)
(Y: θ_y)
(Z: θ_z)

Un-normalized function:

$$\begin{pmatrix}1 & 0 & 0\\ 0 & \cos\theta_x & -\sin\theta_x\\ 0 & \sin\theta_x & \cos\theta_x\end{pmatrix}\cdot\begin{pmatrix}\cos\theta_y & 0 & \sin\theta_y\\ 0 & 1 & 0\\ -\sin\theta_y & 0 & \cos\theta_y\end{pmatrix}\cdot\begin{pmatrix}\cos\theta_z & -\sin\theta_z & 0\\ \sin\theta_z & \cos\theta_z & 0\\ 0 & 0 & 1\end{pmatrix}\cdot\begin{pmatrix}F1(x\\ F2(y\\ F3(z,\end{pmatrix}$$

$$\frac{\left(-\frac{e^{-\frac{(mz-Z)^2}{2\,wz^2}}(-1+\text{fracz1}+\text{fracz2})}{wz}+\frac{e^{-\frac{(mz-Z)^2}{2\,wz1^2}}\,\text{fracz1}}{wz1}+\frac{e^{-\frac{(mz-Z)^2}{2\,wz2^2}}\,\text{fracz2}}{wz2}\right)\sin[\text{they}]+\cos[\text{they}]\left(\left(-\frac{e^{-\frac{(mx-X)^2}{2\,wx^2}}(-1+\text{fracx1}+\text{fracx2})}{wx}+\frac{e^{-\frac{(mx-X)^2}{2\,wx1^2}}\,\text{fracx1}}{wx1}+\frac{e^{-\frac{(mx-X)^2}{2\,wx2^2}}\,\text{fracx2}}{wx2}\right)\cos[\text{thez}]+\left(\frac{e^{-\frac{(my-Y)^2}{2\,wy^2}}(-1+\text{fracy1}+\text{fracy2})}{wy}-\frac{e^{-\frac{(my-Y)^2}{2\,wy1^2}}\,\text{fracy1}}{wy1}-\frac{e^{-\frac{(my-Y)^2}{2\,wy2^2}}\,\text{fracy2}}{wy2}\right)\sin[\text{thez}]\right)}{\sqrt{2\pi}}$$

$$=\begin{pmatrix}
\frac{1}{\sqrt{2\pi}}\left(-\left(-\frac{e^{-\frac{(mz-Z)^2}{2\,wz^2}}(-1+\text{fracz1}+\text{fracz2})}{wz}+\frac{e^{-\frac{(mz-Z)^2}{2\,wz1^2}}\,\text{fracz1}}{wz1}+\frac{e^{-\frac{(mz-Z)^2}{2\,wz2^2}}\,\text{fracz2}}{wz2}\right)\cos[\text{they}]\sin[\text{thex}]+\left(-\frac{e^{-\frac{(mx-X)^2}{2\,wx^2}}(-1+\text{fracx1}+\text{fracx2})}{wx}+\frac{e^{-\frac{(mx-X)^2}{2\,wx1^2}}\,\text{fracx1}}{wx1}+\frac{e^{-\frac{(mx-X)^2}{2\,wx2^2}}\,\text{fracx2}}{wx2}\right)(\cos[\text{thez}]\sin[\text{thex}]\sin[\text{they}]+\cos[\text{thex}]\sin[\text{thez}])+\right. \\
\left.\left(-\frac{e^{-\frac{(my-Y)^2}{2\,wy^2}}(-1+\text{fracy1}+\text{fracy2})}{wy}+\frac{e^{-\frac{(my-Y)^2}{2\,wy1^2}}\,\text{fracy1}}{wy1}+\frac{e^{-\frac{(my-Y)^2}{2\,wy2^2}}\,\text{fracy2}}{wy2}\right)(\cos[\text{thex}]\cos[\text{thez}]-\sin[\text{thex}]\sin[\text{they}]\sin[\text{thez}])\right) \\
\frac{1}{\sqrt{2\pi}}\left(\left(-\frac{e^{-\frac{(mz-Z)^2}{2\,wz^2}}(-1+\text{fracz1}+\text{fracz2})}{wz}+\frac{e^{-\frac{(mz-Z)^2}{2\,wz1^2}}\,\text{fracz1}}{wz1}+\frac{e^{-\frac{(mz-Z)^2}{2\,wz2^2}}\,\text{fracz2}}{wz2}\right)\cos[\text{thex}]\cos[\text{they}]+\left(-\frac{e^{-\frac{(mx-X)^2}{2\,wx^2}}(-1+\text{fracx1}+\text{fracx2})}{wx}+\frac{e^{-\frac{(mx-X)^2}{2\,wx1^2}}\,\text{fracx1}}{wx1}+\frac{e^{-\frac{(mx-X)^2}{2\,wx2^2}}\,\text{fracx2}}{wx2}\right)(-\cos[\text{thex}]\cos[\text{thez}]\sin[\text{they}]+\sin[\text{thex}]\sin[\text{thez}])+\right. \\
\left.\left(-\frac{e^{-\frac{(my-Y)^2}{2\,wy^2}}(-1+\text{fracy1}+\text{fracy2})}{wy}+\frac{e^{-\frac{(my-Y)^2}{2\,wy1^2}}\,\text{fracy1}}{wy1}+\frac{e^{-\frac{(my-Y)^2}{2\,wy2^2}}\,\text{fracy2}}{wy2}\right)(\cos[\text{thez}]\sin[\text{thex}]+\cos[\text{thex}]\sin[\text{they}]\sin[\text{thez}])\right)
\end{pmatrix}$$

Now we are normalizing the function ➔ PDF

Thomas Kuhr suggested *"Then fit a three dimensional Gaussian to the vertex positions taking into account their covariance matrices.... "*

If the fit succeeds, he will be satisfied it? Then how?

In plans:

1. Normalize the function, change it to PDF.
2. Perform fit.
3. Merge to master.
4. Run skimmed data.
5. Compare the IP from other process .
6. …