Subject: Bug fixed in PndKinFitter read-in covariance matrix
Posted by Lu Cao on Thu, 29 Sep 2016 14:33:51 GMT
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Dear all,

I just found a bug in RhoKinFitter::ReadMatrix(), when the original cov matrix is re-arranged from (X, Y, Z, Px, Py, Pz, E) basis to (Px, Py, Pz, E, X, Y, Z).
For example, the origianal cov matrix of a photon in (X, Y, Z, Px, Py, Pz, E) is

	0	1	2	3	4	5	6
0	0.2111	0.008221	-0.02881	0.0002914	1.135e-05	-3.977e-05	0
1	0.008221	0.2217	0.02912	1.135e-05	0.0003061	4.02e-05	0
2	-0.02881	0.02912	0.008063	-3.977e-05	4.02e-05	1.113e-05	0
3	0.0002914	1.135e-05	-3.977e-05	3.203e-06	-2.683e-06	1.97e-05	2.013e-05
4	1.135e-05	0.0003061	4.02e-05	-2.683e-06	3.022e-06	-1.897e-05	-1.939e-05
5	-3.977e-05	4.02e-05	1.113e-05	1.97e-05	-1.897e-05	0.0001393	0.000142
6	0	0	0	2.013e-05	-1.939e-05	0.000142	0.0001447

but the re-arranged one in (Px, Py, Pz, E, X, Y, Z) is

	0	1	2	3	4	5	6
0	3.203e-06	-2.683e-06	1.97e-05	2.013e-05	1.135e-05	-3.977e-05	0
1	-2.683e-06	3.022e-06	-1.897e-05	-1.939e-05	0.0003061	4.02e-05	0
2	1.97e-05	-1.897e-05	0.0001393	0.000142	4.02e-05	1.113e-05	0
3	2.013e-05	-1.939e-05	0.000142	0.0001447	0	0	0
4	0.0002914	1.135e-05	-3.977e-05	0	0.2111	0.008221	-0.02881
5	1.135e-05	0.0003061	4.02e-05	0	0.008221	0.2217	0.02912
6	-3.977e-05	4.02e-05	1.113e-05	0	-0.02881	0.02912	0.008063

.

One can notice that some elements in the new cov matrix are wrongly filled, eg. the new (0,4) should be equel to the old (3,0)=0.0002914 rather than 1.135e-05. Since the new cov matrix is not symmetric, the whole fitting procedure will be badly influenced. This is caused by a bug in the code:

```
272 //Change to px,py,pz,E,x,y,z
273     for(int i=0; i<7; i++) {
274       for(int j=0; j<7; j++) {
275         if(i>=3) {
276           if(j>=3) {
277             p4Cov[i-3][j-3] = p3Cov[i][j];
278           } else { p4Cov[i-3][j+3] = p3Cov[i][j]; }
279         } else {
280           if(j>=3) {
281             p4Cov[i+4][j-3] = p3Cov[i][j];
282           } else { p4Cov[i+4][j+4] = p3Cov[i][j]; }
283         }
284       }
```

```
285   }
.
```

The line #278,
Quote: p4Cov[i-3][j+3] = p3Cov[i][j] should be p4Cov[i-3][j+4] = p3Cov[i][j].

I've studied the pull distributions of befor & after fixing, combining with another bug fixed in this fitter recetly (trk 29480), with my Ds semileptonic decay chain. The result shows several issues regarding to the covariane matrix itself and the fitter, and seems may evoke a long and detailed discussion. For a more efficent and direct communication, I would prefer to present the plots in the upcoming software meeting on 4th Oct..

BTW, the fixed code is attached. (No right to commit...)

Best regards,
Lu

File Attachments

1) RhoKinFitter.cxx, downloaded 446 times