
Subject: My puzzle with GEANE cov matrix
Posted by [Ralf Kliemt](#) on Wed, 01 Jun 2011 12:22:58 GMT
[View Forum Message](#) <> [Reply to Message](#)

Hello GEANE experts,

I have a puzzle concerning track parameter propagation and the covariance matrices. I already contacted Lia via mail, but want to share my investigations.

We have the following situation: A track is defined with its first parameter set yielding the following cov matrix:

Start MARS cov (px,py,pz,E,x,y,z):
6x6 matrix is as follows

	0	1	2	3	4	5	
0	4.059e-05	3.814e-05	-9.897e-05	-2.728e-07	-8.99e-07		0
1	3.814e-05	3.77e-05	-9.529e-05	1.051e-06	-2.188e-06		0
2	-9.897e-05	-9.529e-05	0.000248	-2.797e-06	2.073e-06		0
3	-2.728e-07	1.051e-06	-2.797e-06	7.092e-06	5.262e-08		0
4	-8.99e-07	-2.188e-06	2.073e-06	5.262e-08	7.082e-06		0
5	0	0	0	0	0	0	

After propagating the track parameters to the distance of closest approach of the z axis, I get the following cov:

End MARS cov (px,py,pz,E,x,y,z):
6x6 matrix is as follows

	0	1	2	3	4	5	
0	5.94e-05	-1.932e-06	2.146e-05	-0.000288	9.157e-06	-0.0001177	
1	-1.932e-06	5.631e-05	1.295e-05	2.375e-05	-0.000268	-8.752e-05	
2	2.146e-05	1.295e-05	0.0002708	-0.0005018	-0.0004349	-0.0003691	
3	-0.000288	2.375e-05	-0.0005018	0.002029	0.0004619	0.001021	
4	9.157e-06	-0.000268	-0.0004349	0.0004619	0.001822	0.000857	
5	-0.0001177	-8.752e-05	-0.0003691	0.001021	0.000857	0.0007408	

Looking at x,y,z (cols/rows 3,4,5) I get massively increased error values, like from $\sigma_x=27\mu\text{m}$ to $\sigma_x=450\mu\text{m}$.

The residuals look really OK and even the pull distributions for the momenta are well, considering that the beam pipes material blows the cov a bit up.
I can only imagine there is some mismatch between the fortran units and Fairsoft (cm) or a too large contribution of the beam pipe.

I looking forward to some ideas.

Regards. Ralf
