Subject: Lhe tracking results: reconstruction error for transverse momenta <= 1 GeV/c, all five particles
Posted by David Pohl on Tue, 23 Nov 2010 17:09:32 GMT
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Hallo everybody,

I just want to show you some results for the reconstruction error of the transverse momentum. The following simulation parameters are used:

- Panda Root trunk version, revision 10334
- Geant3
- Boxgenerator with vertex (0,0,0)
- theta = 60°, phi = 0:360°
- one primary track per event, only primary tracks are taken into account in the analyses
- 1e4 events
- Lhe tracking package: ideal track finder + helix prefit + kalman task with correct particle hypothesis
- MVD+TPC+GEM tracking detectors, new MVD geometry: Mvd-2.1_AddDisks_FullVersion
- used particles: electrons, pions, myons, kaons and protons
- transverse momenta: 0,1; 0,2; 0,3; 0,4; 0,5; 0,6; 0,7; 0,8; 0,9; 1 GeV/c

The following plot shows the relative reconstruction error ||pt_MC|-|pt_reco||/|pt_MC| in percent:

Every point is a Gausfit for the reconstructed transverse track momentum. The error bars are the sigmas of the fits.
Some examples are attached to this message.

One can see that the reco error for protons@300MeV/c pt and for kaons@200MeV/c is bad. The reason is a failed kalman fit.
This I already mentioned in the thread 'GENFIT for transverse momenta < 200 GeV/c strange?!'.

Also there was no track reconstruction for kaons and protons with a momentum <200MeV/c possible.
I think the low momentum particles stuck in the detector material and do not create enough hits?

Another interesting thing is a systematic offset of the reconstructed momentum for electrons:

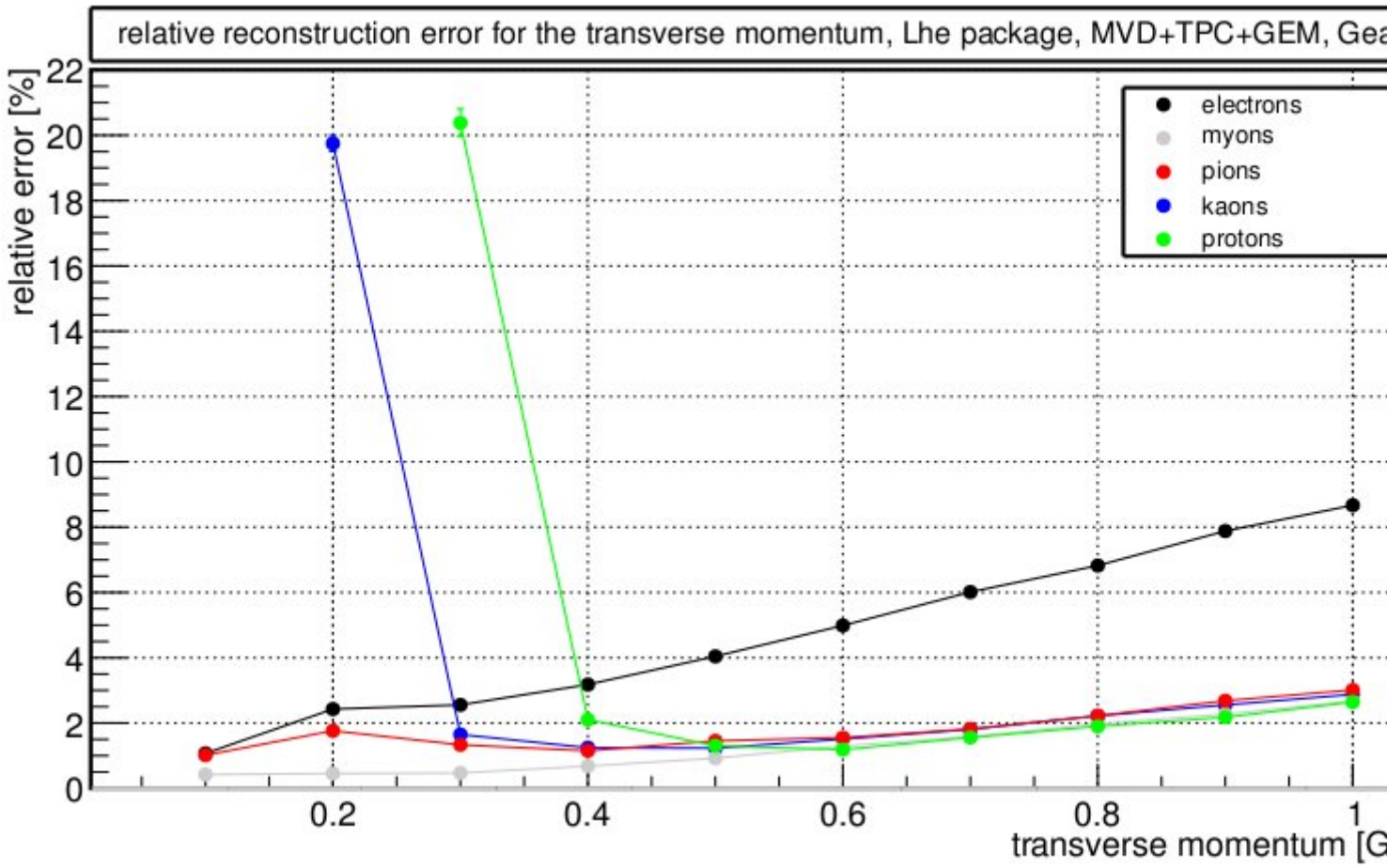
All offsets should be around zero. Especially this is not the case for lower momenta. Do you have an explanation for this?

By the way the kalman output for electrons doesn't look better than the helix prefit.

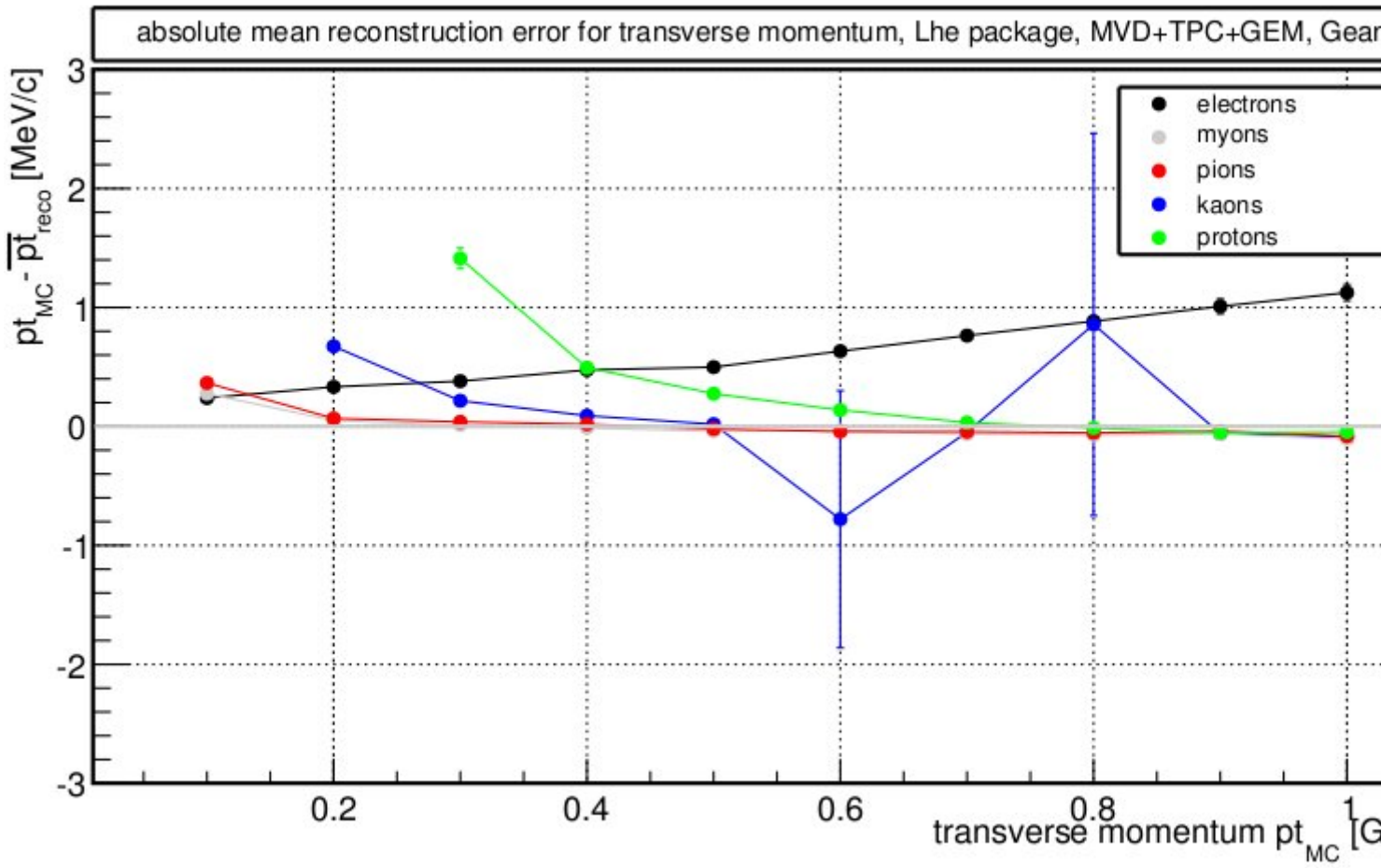
greetings
David

File Attachments

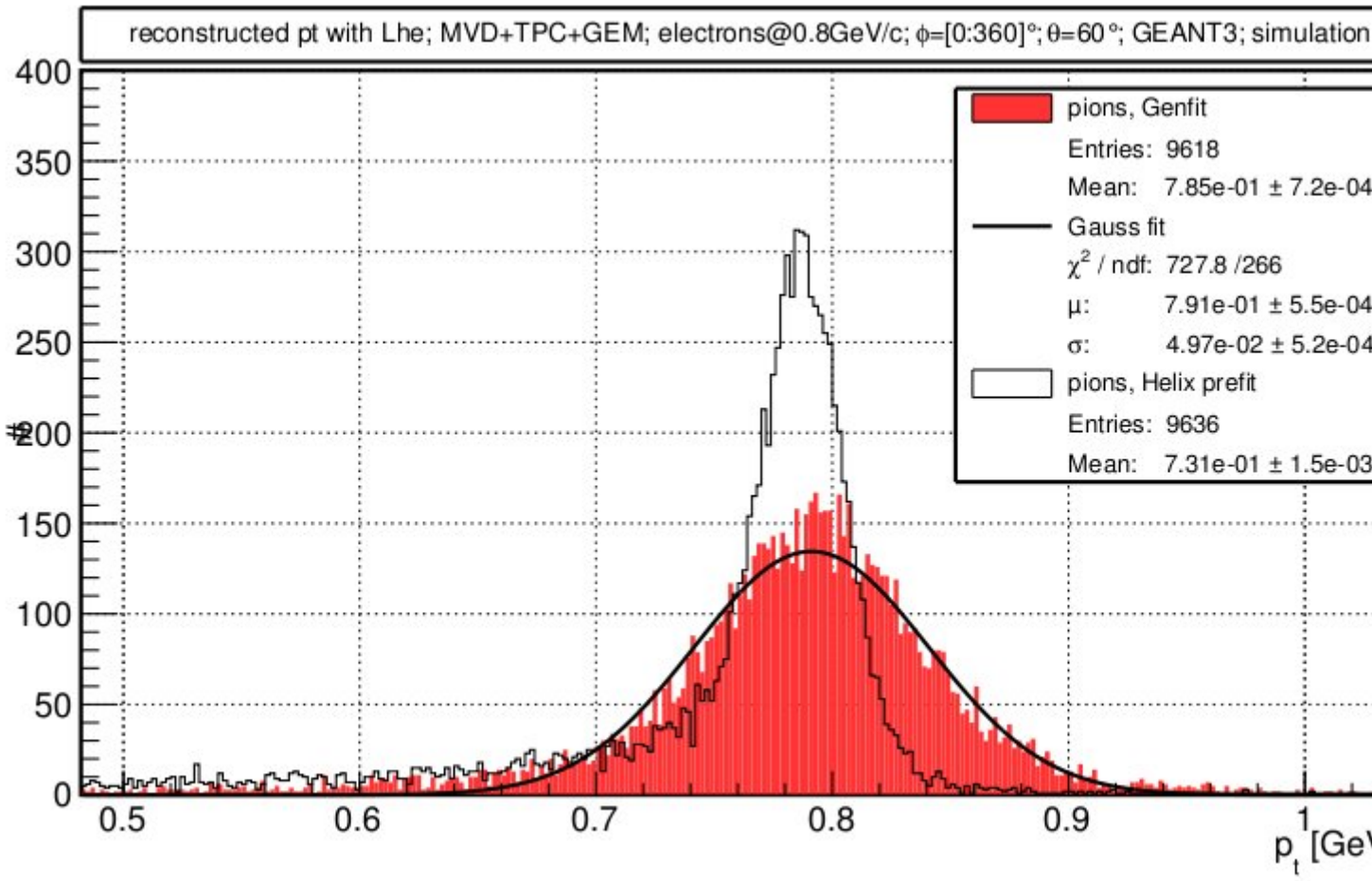
1) trackrecoerror_graph.jpg, downloaded 532 times



2) trackrecoerrorabs_graph.jpg, downloaded 501 times



3) pt_reco_tpc_400_myons.pdf, downloaded 224 times
4) pt_reco_tpc_200_electrons.pdf, downloaded 228 times
5) pt_reco_tpc_400_electrons.pdf, downloaded 245 times
6) pt_reco_tpc_300_protons.pdf, downloaded 227 times
7) pt_reco_tpc_200_kaons.pdf, downloaded 224 times
8) pt_reco_tpc_100_myons.pdf, downloaded 228 times
9) pt_reco_tpc_600_protons.pdf, downloaded 238 times
10) pt_reco_tpc_800_electrons.jpg, downloaded 527 times



Subject: Re: Lhe tracking results: reconstruction error for transverse momenta <= 1 GeV/c, all five partic
Posted by StefanoSpataro on Tue, 23 Nov 2010 22:30:35 GMT
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Hi,
about the systematic shift of the electron residual, I think this could be correlated to bremsstrahlung, then the MC momentum is higher than the reconstructed one.
About bad resolution for protons and kaons, maybe you could try to plot the LheHit Y vs X so see if they are really helix or if they are too curly.
You shouls also check the angle resolution. If maybe the helix momentum is fine, but the theta is wrong, maybe the kalman is not able to fit the track properly.
Just trying to guess, I have never checked the reconstruction for other particles different from muons.

Subject: Re: Lhe tracking results: reconstruction error for transverse momenta <= 1 GeV/c, all five partic
Posted by David Pohl on Wed, 24 Nov 2010 12:57:34 GMT
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Hi Stefano,

okay. This means that the Kalman task does not take the bremsstrahlung correctly into account?

The x-y plane plots for the LheHits are not to easy to judge.
I think to recognize cirlces is not easy for the human brain .

On the first view one can assume that the kaons for 200 MeV/c transverse momenta do not lie on a circle.
Especially in the outer regions:

Corresponding reconstructed transverse momenta:

For 300 MeV/c transverse momenta the kaon tracks do not look that bent:

Corresponding reconstructed transverse momenta:

For electrons its an issue of the Kalman task I think:

Corresponding reconstructed transverse momenta:

Honestly I am at the moment quite busy with writing my thesis and have no time to do dedicated "bug search".
I just wanted to show this issue to inform the tracking experts.

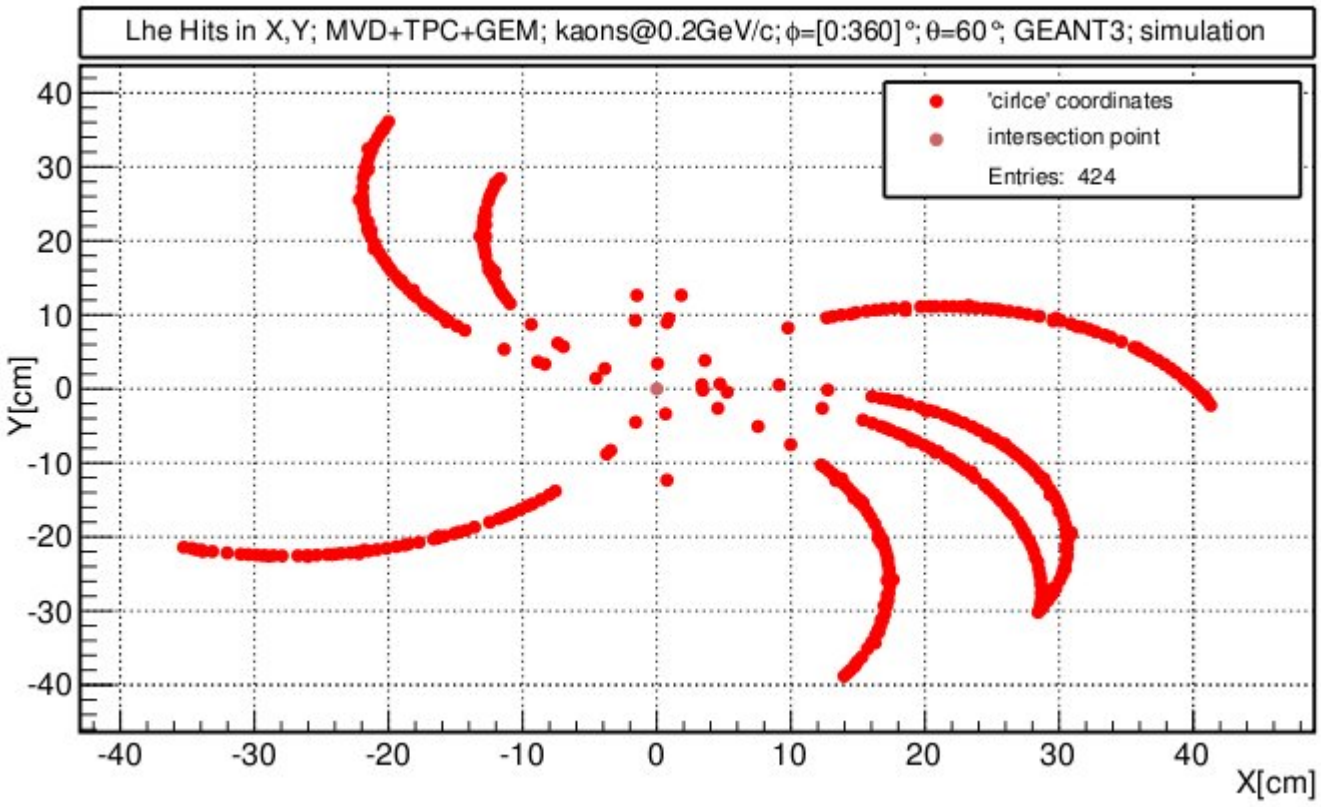
greetings,
David

p.s.: the plots in conformal mapping space are better to judge:
little bit bent

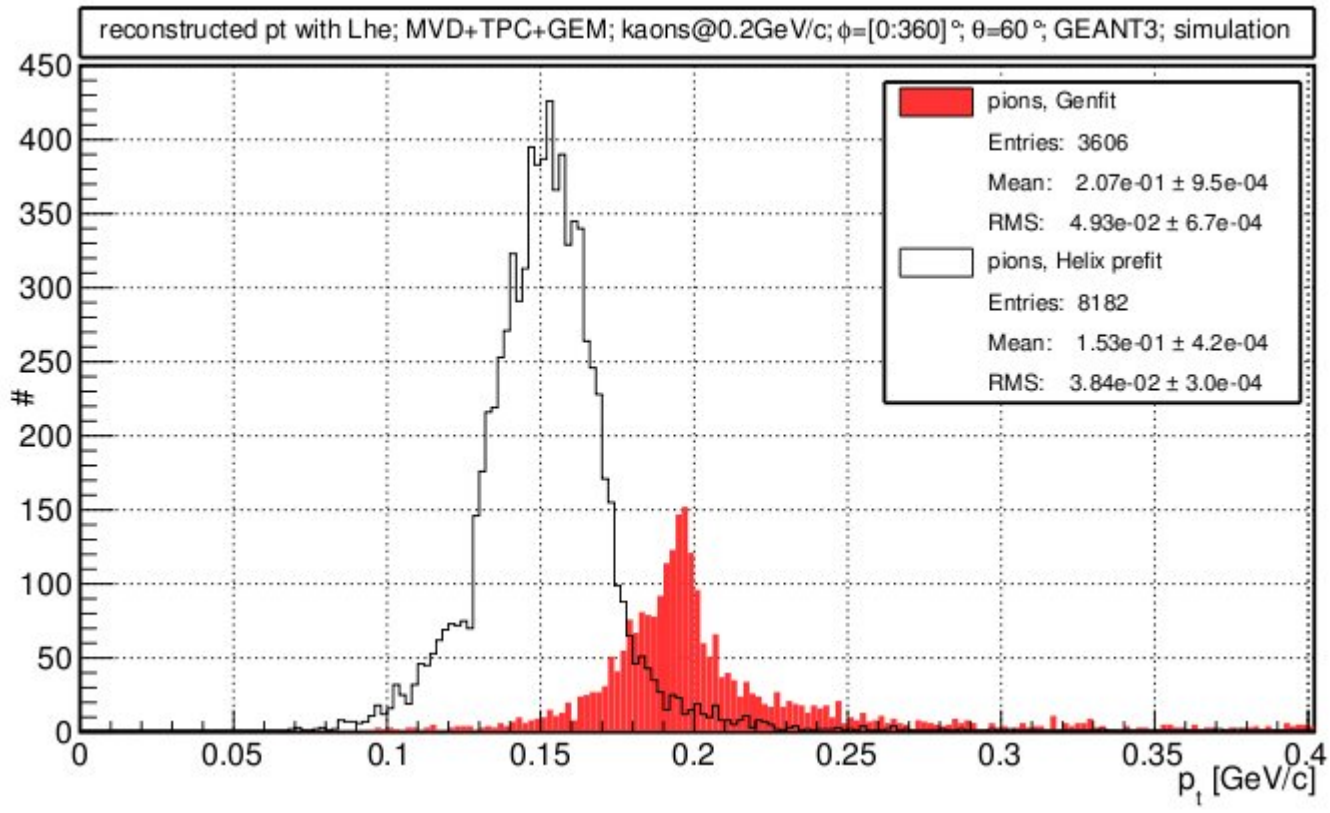
straight line

File Attachments

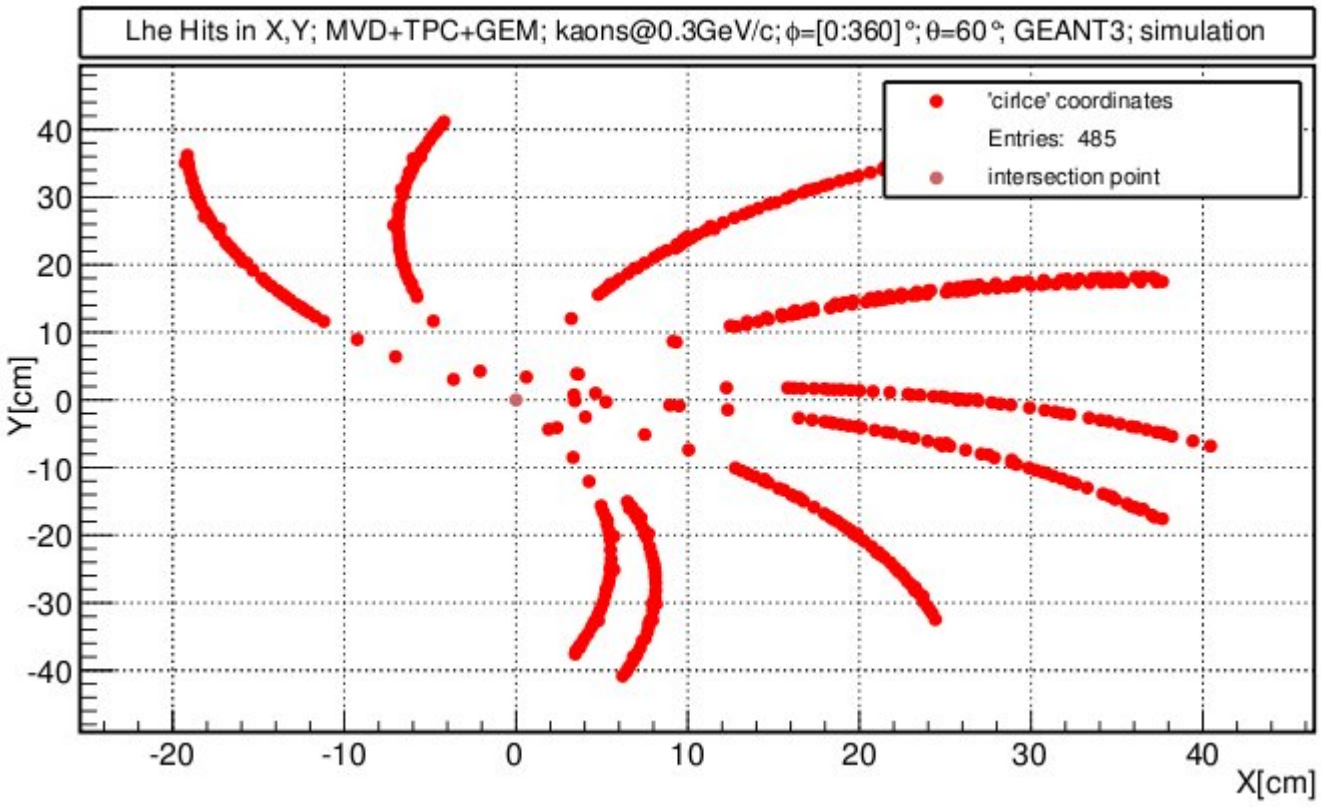
1) LHEhelix_reco_tpc_200_kaons.jpg, downloaded 436 times



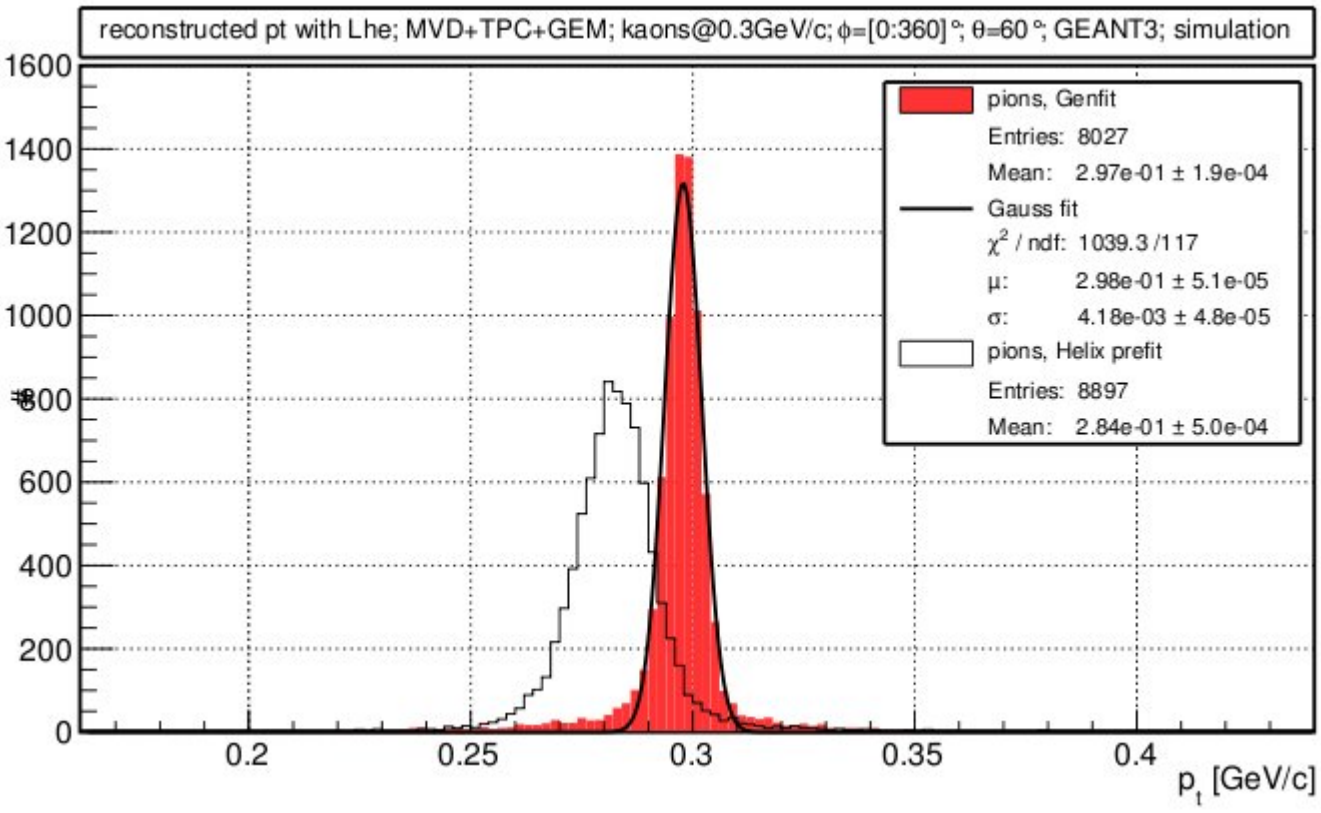
2) pt_reco_tpc_200_kaons.jpg, downloaded 439 times



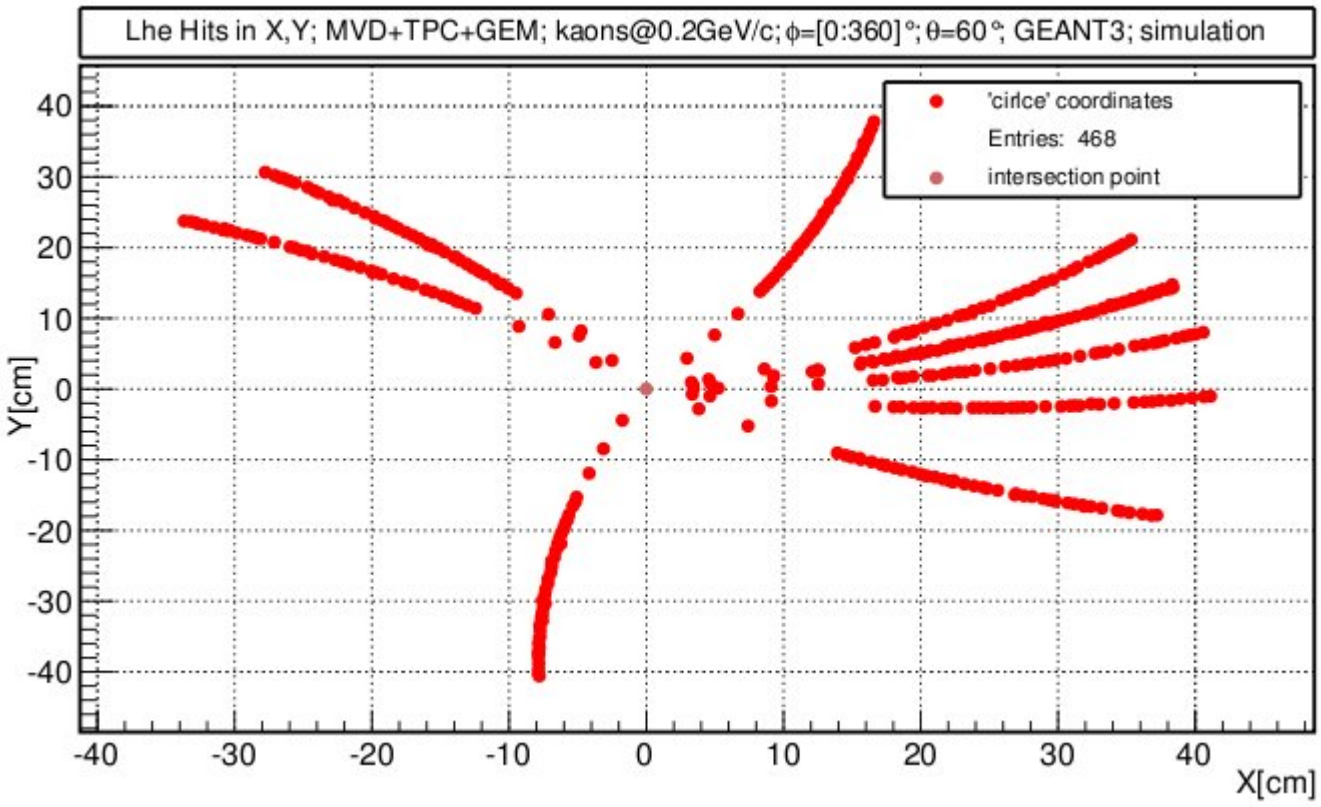
3) LHEhelix_reco_tpc_300_kaons.jpg, downloaded 431 times



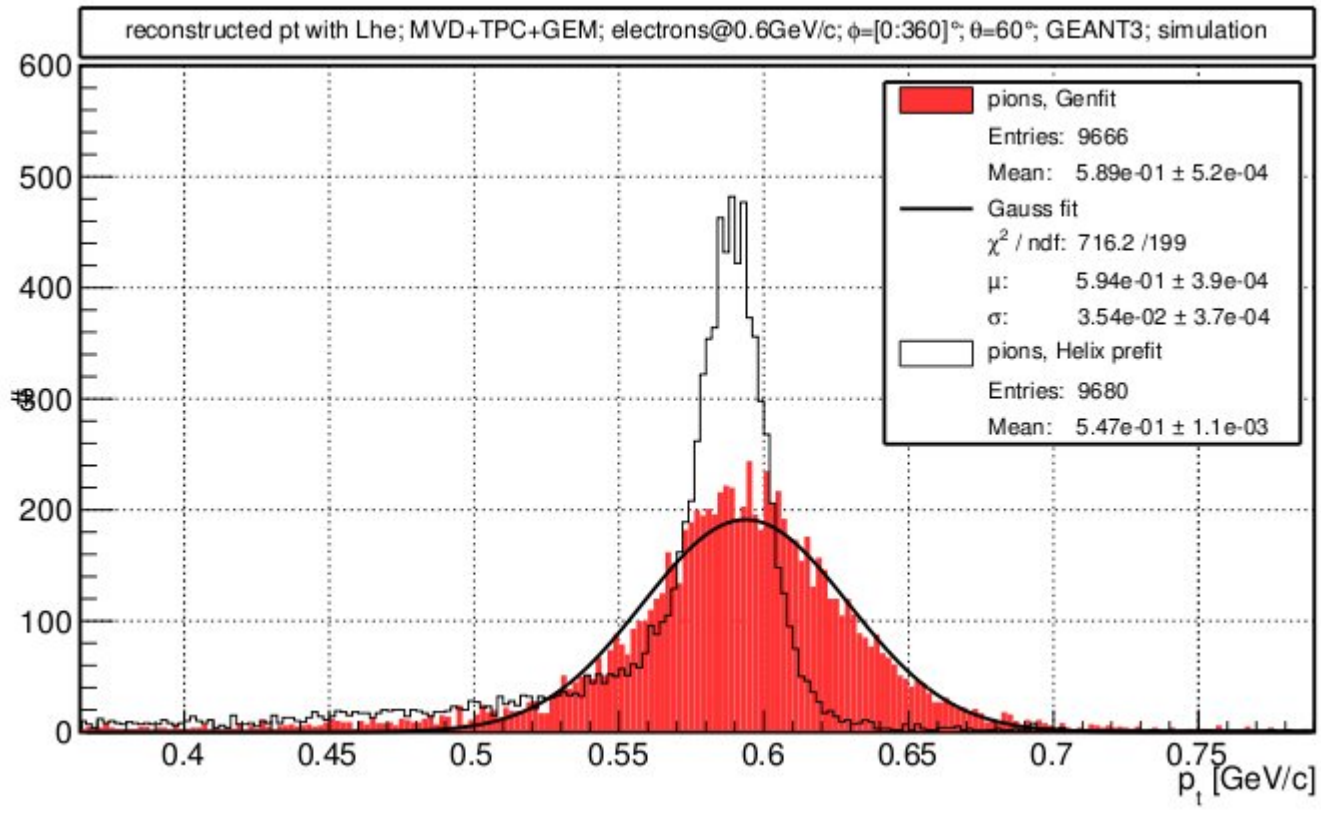
4) pt_reco_tpc_300_kaons.jpg, downloaded 433 times



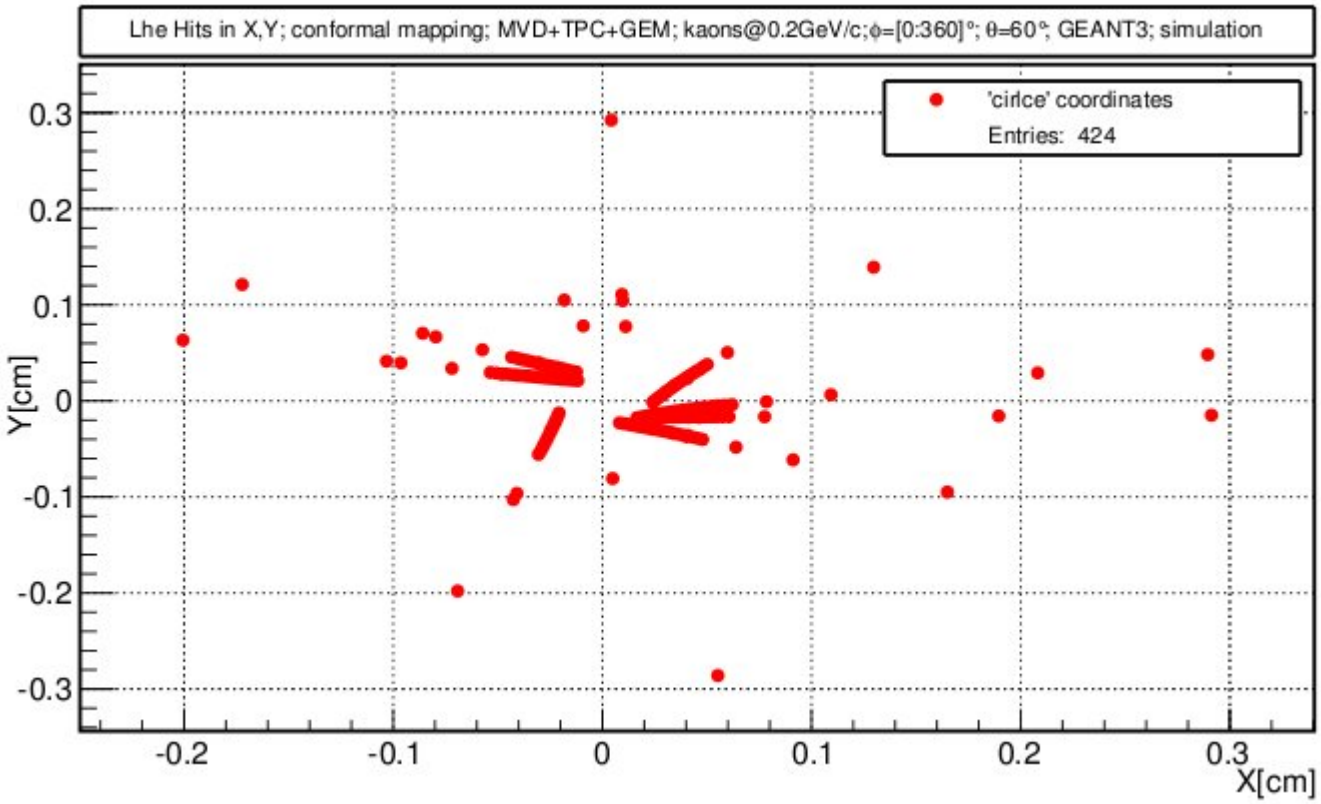
5) LHEhelix_reco_tpc_600_electrons.jpg, downloaded 426 times



6) pt_reco_tpc_600_electrons.jpg, downloaded 413 times



7) LHEhelixConfMap_reco_tpc_200_kaons.jpg, downloaded 328 times



8) LHEhelixConfMap_reco_tpc_300_kaons.jpg, downloaded 396 times