Subject: Stepsize in TPC Simulation with new external packages
Posted by Sebastian Neubert on Tue, 27 Nov 2007 14:40:01 GMT
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Hi!

I have installed the new external packages. Now the G4 simulation does not work anymore as it did before. Specifically I do not get a stepsize limitation in the TPC anymore.
I tried to understand what changed in gconfig but did not get far.

Please Help me!
Sebastian.

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Mohammad Al-Turany on Tue, 27 Nov 2007 15:45:14 GMT
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Hi,

it seems that for some reason which I do not know the minimum step size defind in the geometry is lost in G4! I am trying to find out what is going on! I hope I will find it soon.

regards

Mohammad

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Mohammad Al-Turany on Tue, 27 Nov 2007 19:27:03 GMT
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Hallo Sebastian,

It was the StepLimeter which is not activated in g4Config by default (because we use the SpecialCuts flag). So I added this to the g4Config.C and it is working again (he accept the limits you set in material definition). Just update your gconfig directory and it should work.

regards

Mohammad

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Sebastian Neubert on Tue, 27 Nov 2007 22:50:41 GMT
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Cool! I'll try tomorrow!
Thanx Mohammad!!

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Sebastian Neubert on Wed, 28 Nov 2007 10:35:49 GMT
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Hi!

I just tried with G4 now. There is a stepsize limitation now. But it is 0.005 cm and it appears not to be correlated with what I put into the media file.

Hm... any idea?

Cheers! Sebastian.

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Sebastian Neubert on Wed, 28 Nov 2007 12:30:29 GMT
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Also G3 makes these small steps of only 0.005cm

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Sebastian Neubert on Wed, 28 Nov 2007 14:53:02 GMT
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I have tracked the values for the MaxStep size down into TG4GeometryManager.cxx

Here the G4UserLimit is created:

```
 G4UserLimits* limits = 0;
   if ( stemax > 0 ) {
     limits = new G4UserLimits();
     limits->SetMaxAllowedStep(stemax*cm);
     G4cout<<"MaxAllowedStep="<<stemax*cm<<G4endl;
   }
```

If I put a value of 0.5 in the file, the value of stemax*cm is 5 !!

Sebastian.

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Mohammad Al-Turany on Wed, 28 Nov 2007 16:53:31 GMT
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Hallo Sebastian:

Quote:I just tried with G4 now. There is a stepsize limitation now. But it is 0.005 cm and it

appears not to be correlated with what I put into the media file.

Hm... any idea?

As far as I can see if I change the STEPMAX in the media file I can see it in TGeoManager and Also in TG4GeometryManager. In VMC_G4 only the STEPMAX can be set now, so if it is not enough for you we can ask Ivana about this.

So in my media file I put:

```
TPCmixture   3  20.1797 12.01 15.9994 10. 6. 8. 0.001 0.9  0.0 33 0.067
1 1   20. 0.001
99. 0.0775 0.0001 0.0000777
0
```

then I put this print out in the TG4GeometryManager:

```
G4cout << "Adding medium Id=" << mediumId << " name=" << mediumName  << " limits=" <<
limits << " StepMax " << stemax << " StepMax cm "
 << stemax*cm << G4endl;
```

And As output I get:

```
Adding medium Id=8 name=TPCmixture limits=0x99c07a0 StepMax 0.0775  StepMax cm
0.775
```

which correspond exactly to what I put inside the media, and cm in G4 is 10 so the last number is also ok.

So it seems that it works as it is done. Is this now a problem for you that you cannot set the minimum step size yourself? should we discuss with Ivana about this and why she set only the maximum step?

Mohammad

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Sebastian Neubert on Wed, 28 Nov 2007 19:07:43 GMT
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Hi Mohammad!

Yes! This I do also observe. Setting only the MaxStep is fine! Unfortunately this does not reflect in the data that is produced by geant. There it seems that the step-size is small than 0.05mm. I will post a plot here tomorrow.

Sebastian.

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Sebastian Neubert on Thu, 29 Nov 2007 17:58:18 GMT
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Hi!

It is working now. However I do not understand what went wrong and what I did to make it working. I changed something in the media file which was uncorrelated and now it seems to work. Hm...

Cheers. Sebastian.

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Viola Michael on Fri, 30 Nov 2007 16:17:48 GMT
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Hi!

I have a question concerning the stepsize limitation and the effects on De/dx. I have plotted the MC-Energyloss over Length
(Pion+, Mometum=0.5 Gev/c, 100 Events)
with Options
"specialCuts+specialControls" in G4Config.C, it looks fine to me, like a landau, as expected:

I have plotted the stepsizes, too:

And now my problem: i need stepsize limitation, i turned it on with Option:
"specialCuts+specialControls+stepLimiter" (everything else unchanged)
there is stepsize limitation, like i have befor with the old Release, but my de/dx-MC data is broken:

(stepsize limitation works:)

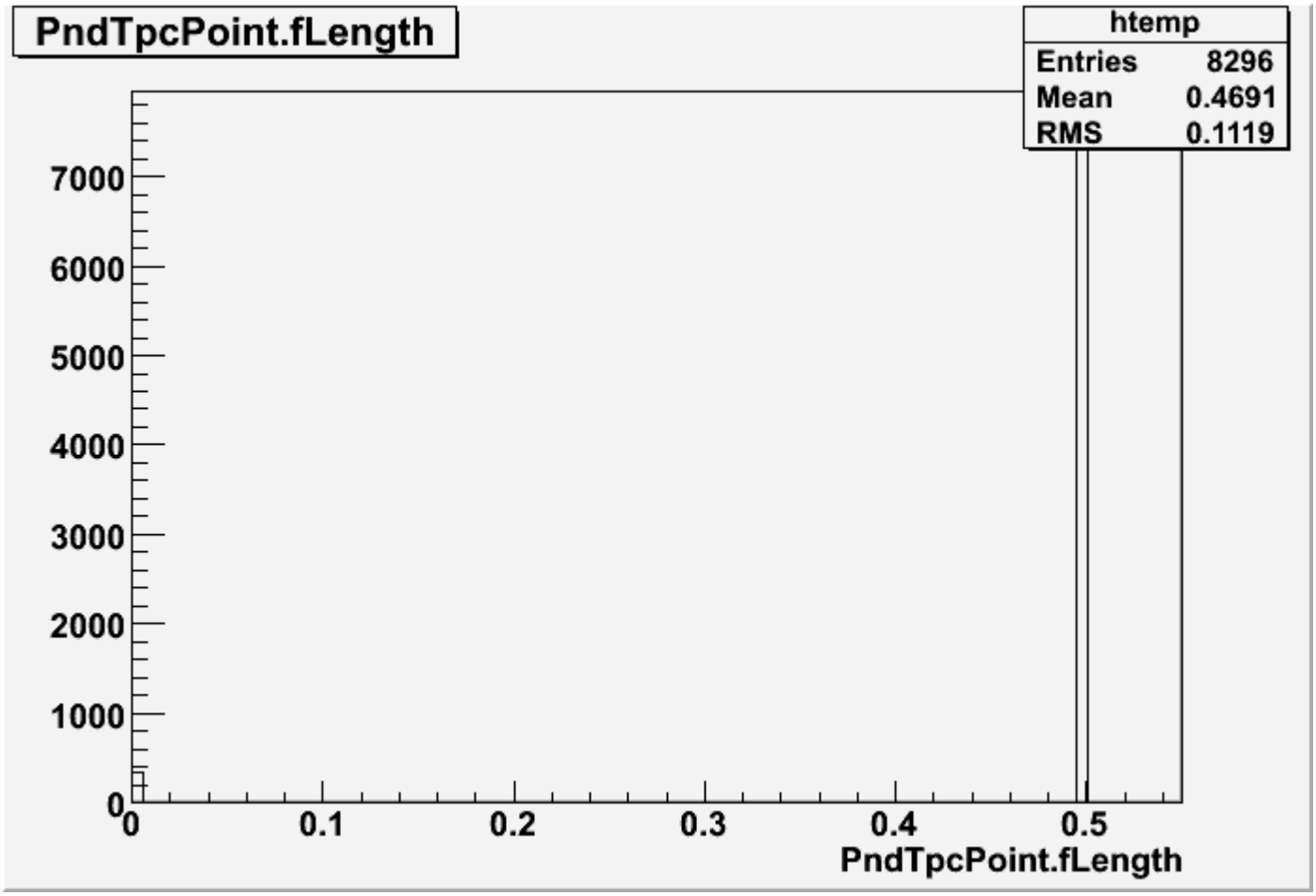
What do i have to do to fix this?

Thanks in advance!

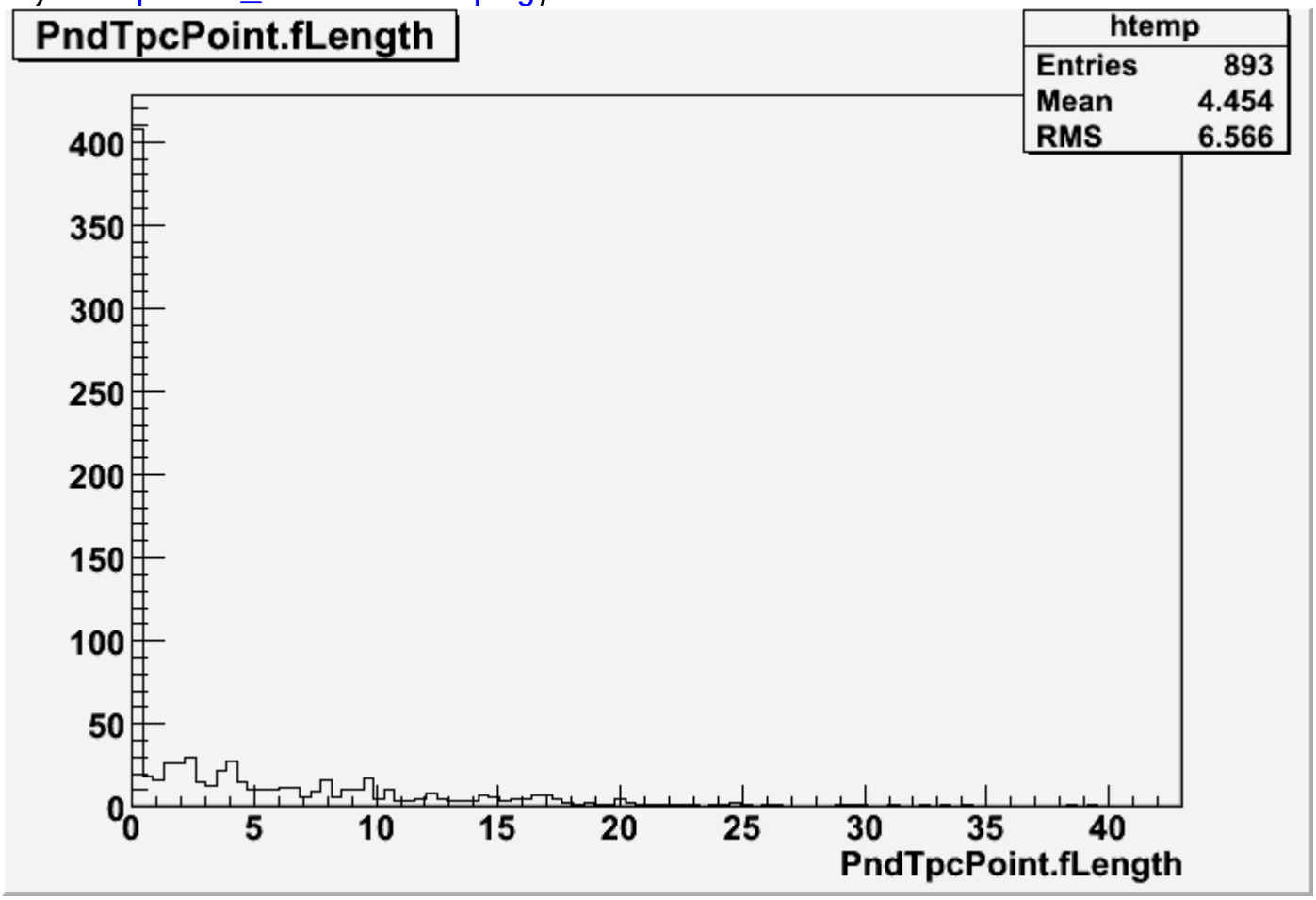
Viola

File Attachments

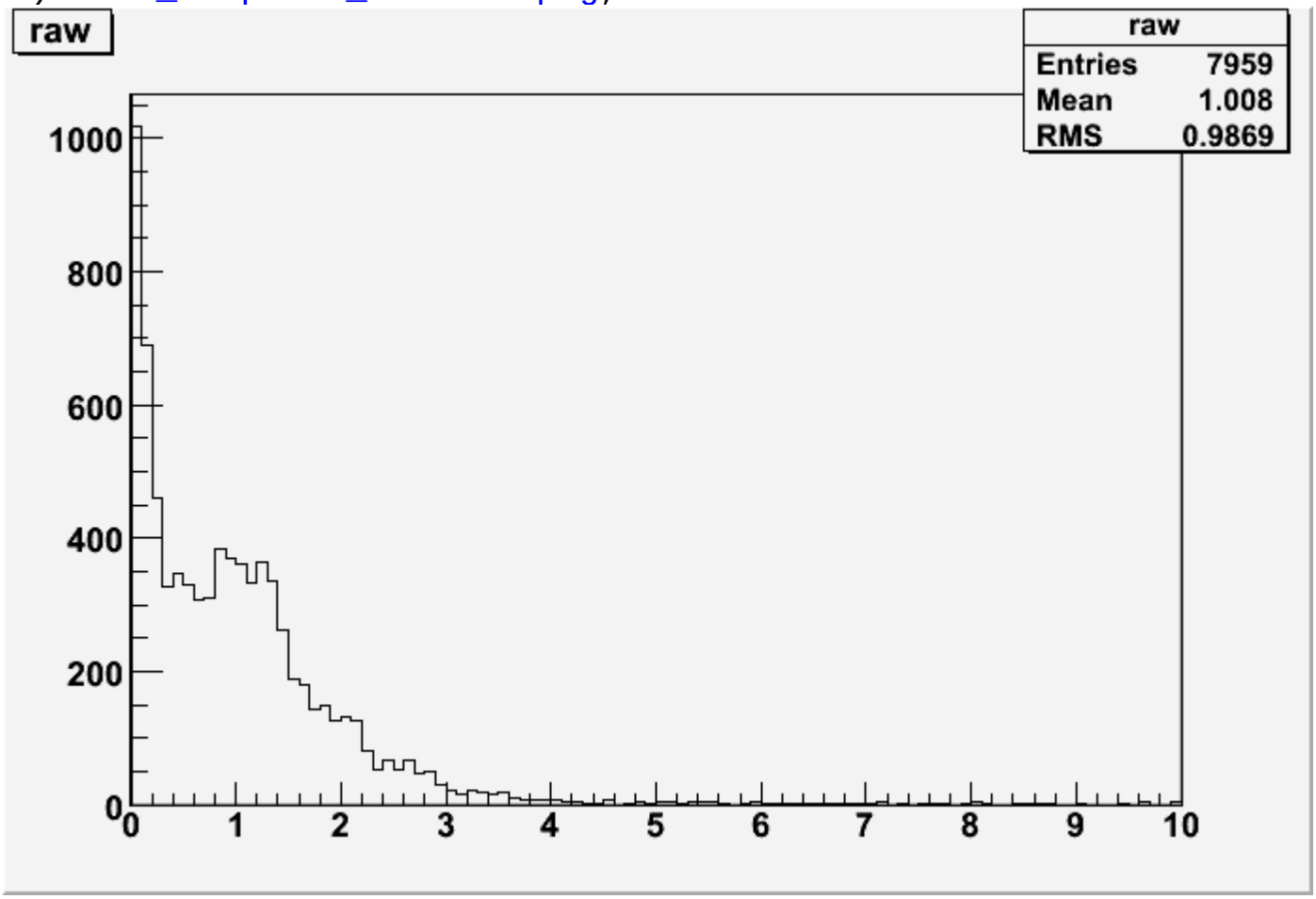
1) stepsize_limited.png, downloaded 1315 times



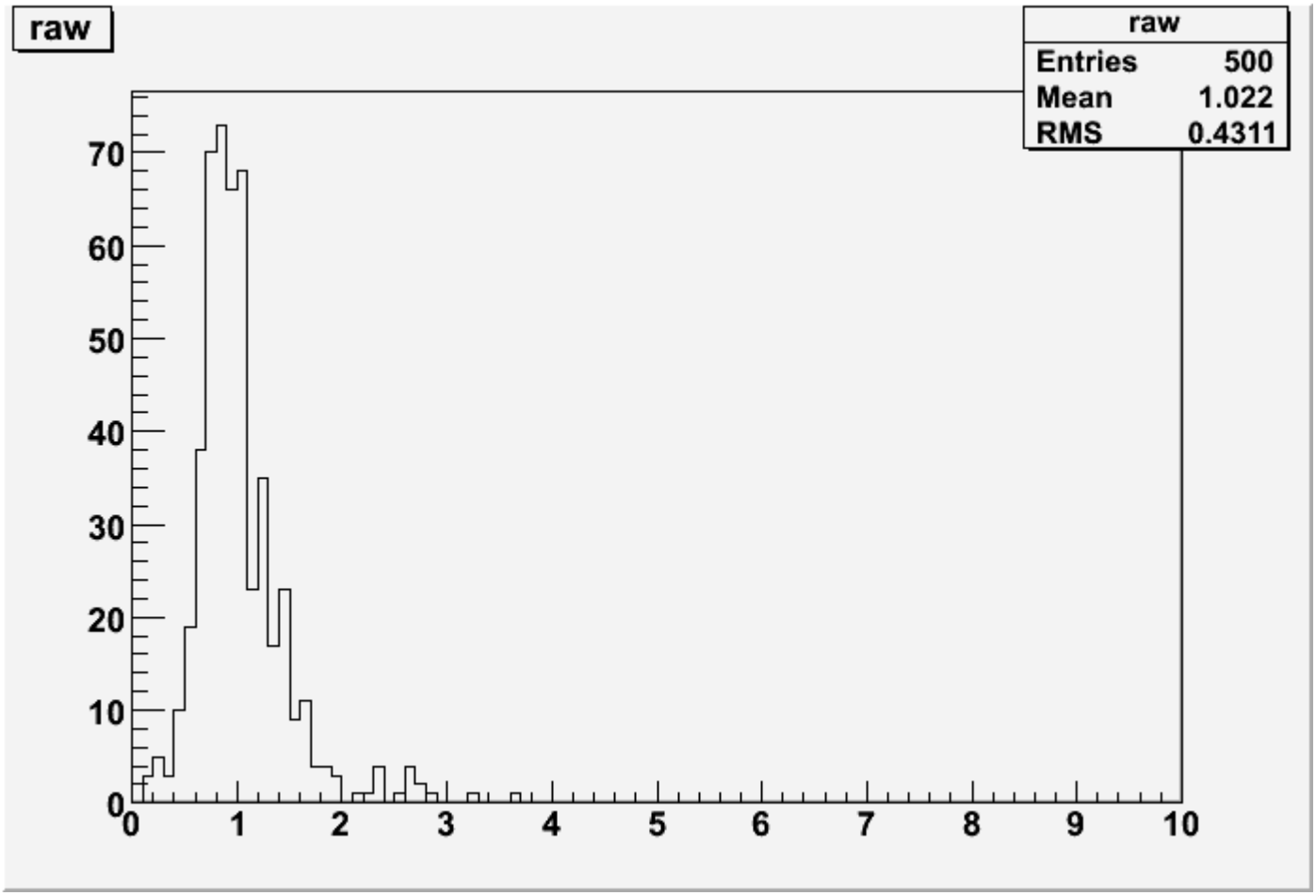
2) stepsize_unlimited.png, downloaded 1309 times



3) with_stepsize_limiter.png, downloaded 1310 times



4) without_stepsize_limiter.png, downloaded 1300 times



Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Mohammad Al-Turany on Mon, 03 Dec 2007 13:28:37 GMT
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Hallo,

I just make the comparison for dedx in the TPC, and what I see also a problem but a little bit deferent than yours! first I compared G3 with and without step limitation and the results where exactly the same. (see attached histograms) To do this I modified the PndTpcDetector.cc so that
1. Sum the energy loss over all steps inside the TPC for each track
2. take the track length at the first step (Entering) and the track length at exiting, and put the difference in the TPCPoint.
3. select on one type of particles

without step limit (remove AUTONULL and extra parameters from media file)

.

and this one with the limits!

So it is the same as expected. Now if I compare with the wonderful state of the art most advanced Monte Carlo engine I have the following plots for:

with step limitation. And the next one without step limitation (remove the StepLimiter from g4Config.C):

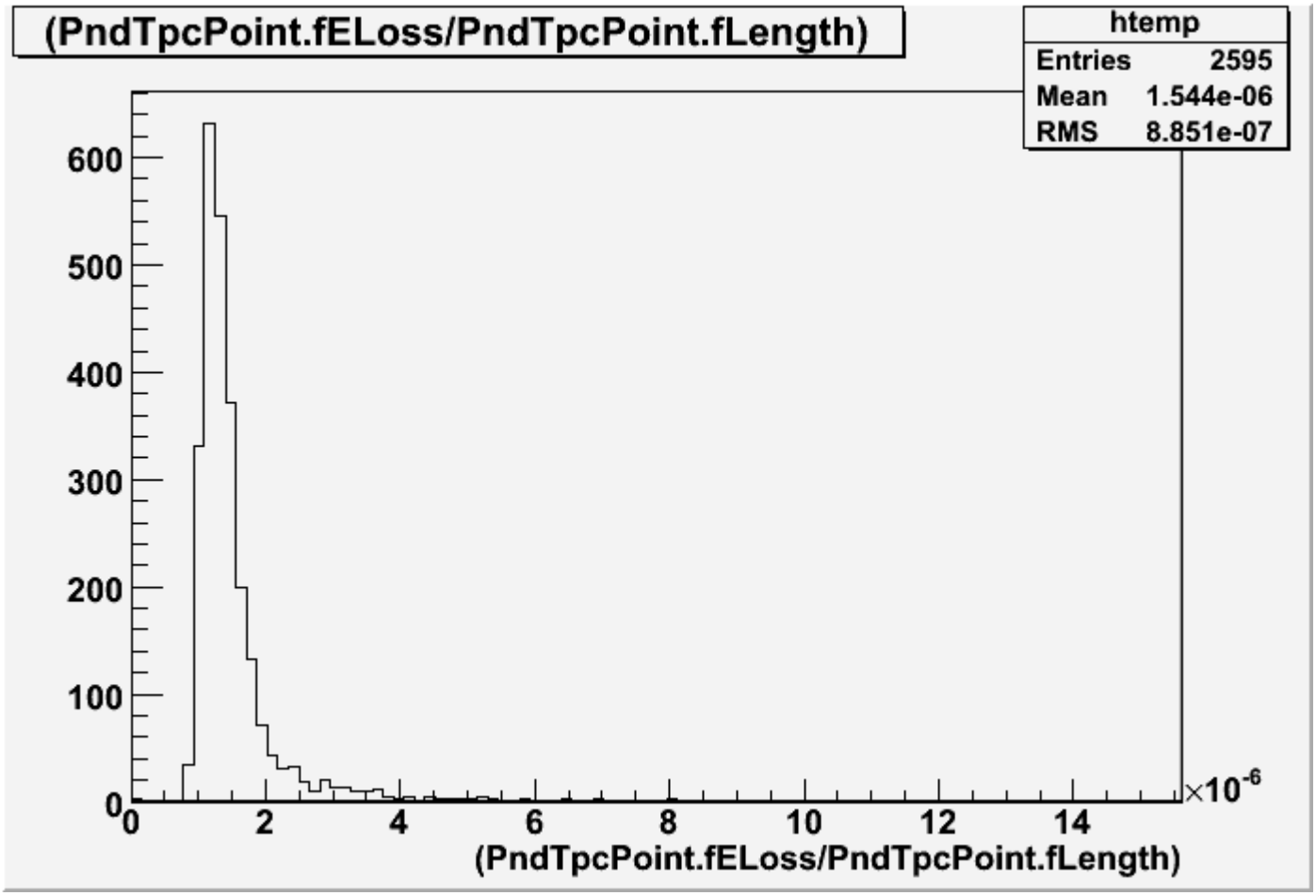
now comparing G4 results with and without step limitation:

and this is not the whole story, if you compare with mu (5000 mu, 0.5 GeV) only G4 with and without step limitation you will see:

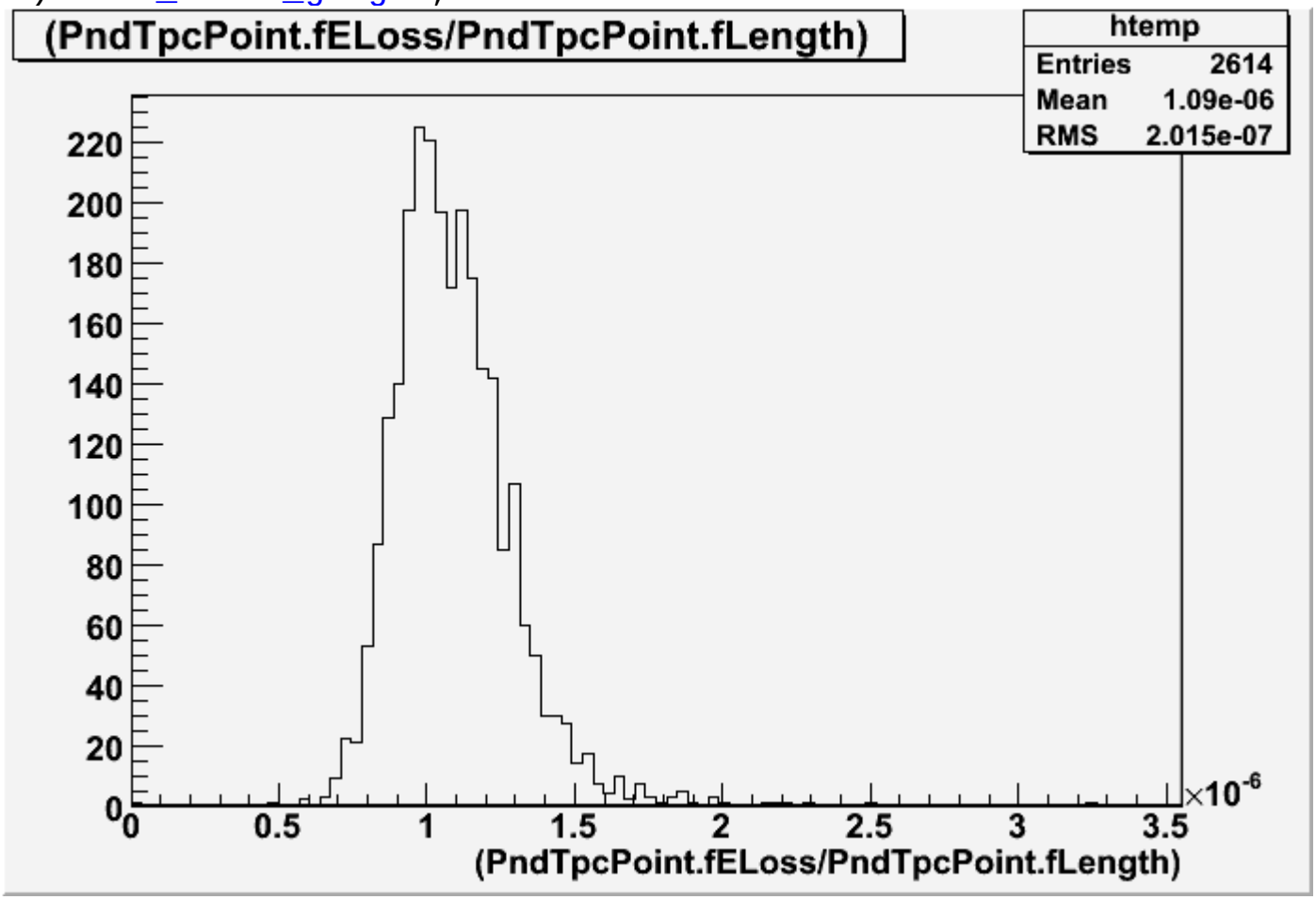
So from all this I would say the shape of dedx is ok, but we have to understand the difference between G3 and G4 and the inconsistence behavior of G4!!

File Attachments

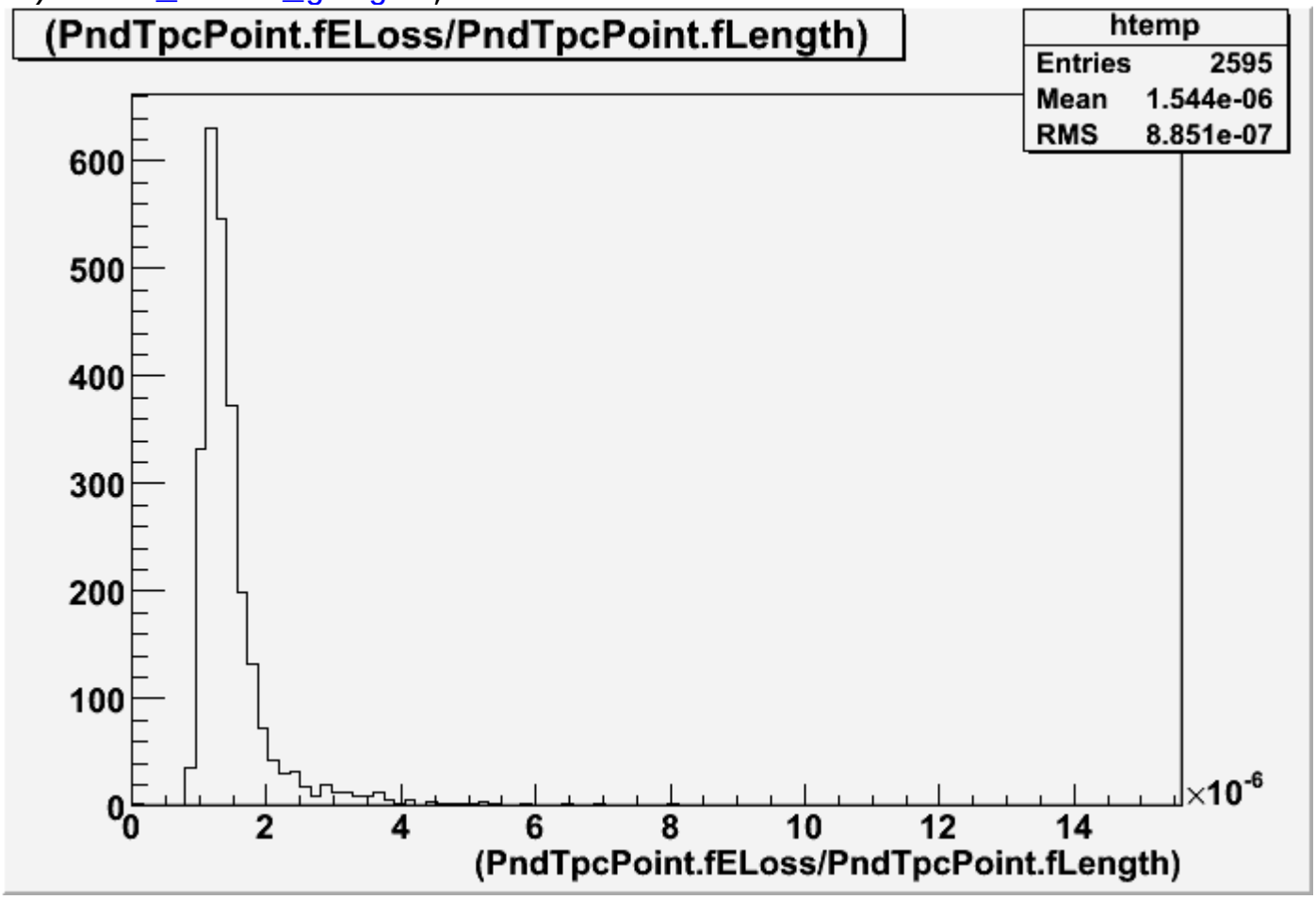
1) dedx_nolimit_g3.gif, downloaded 1231 times



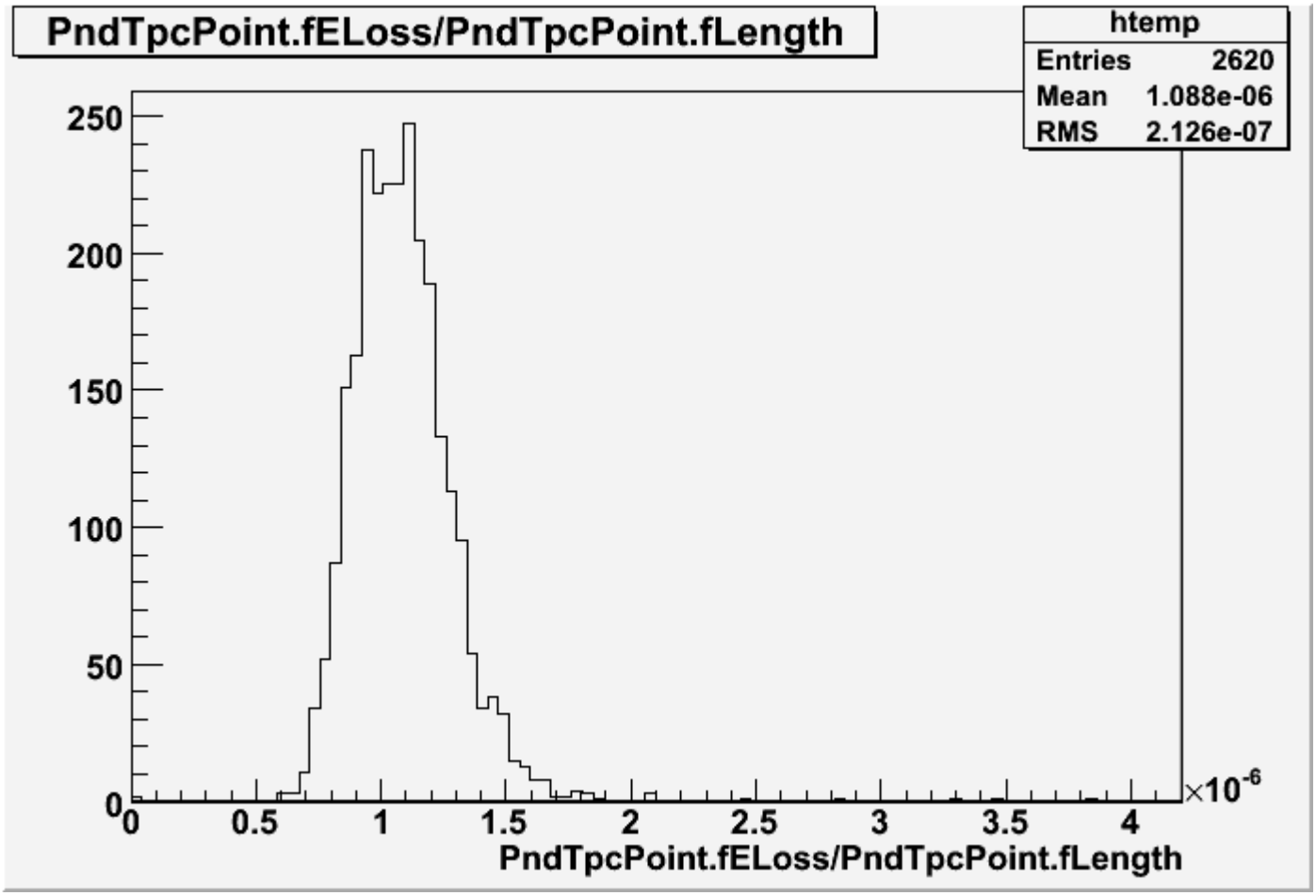
2) dedx_limit_g4.gif, downloaded 1261 times



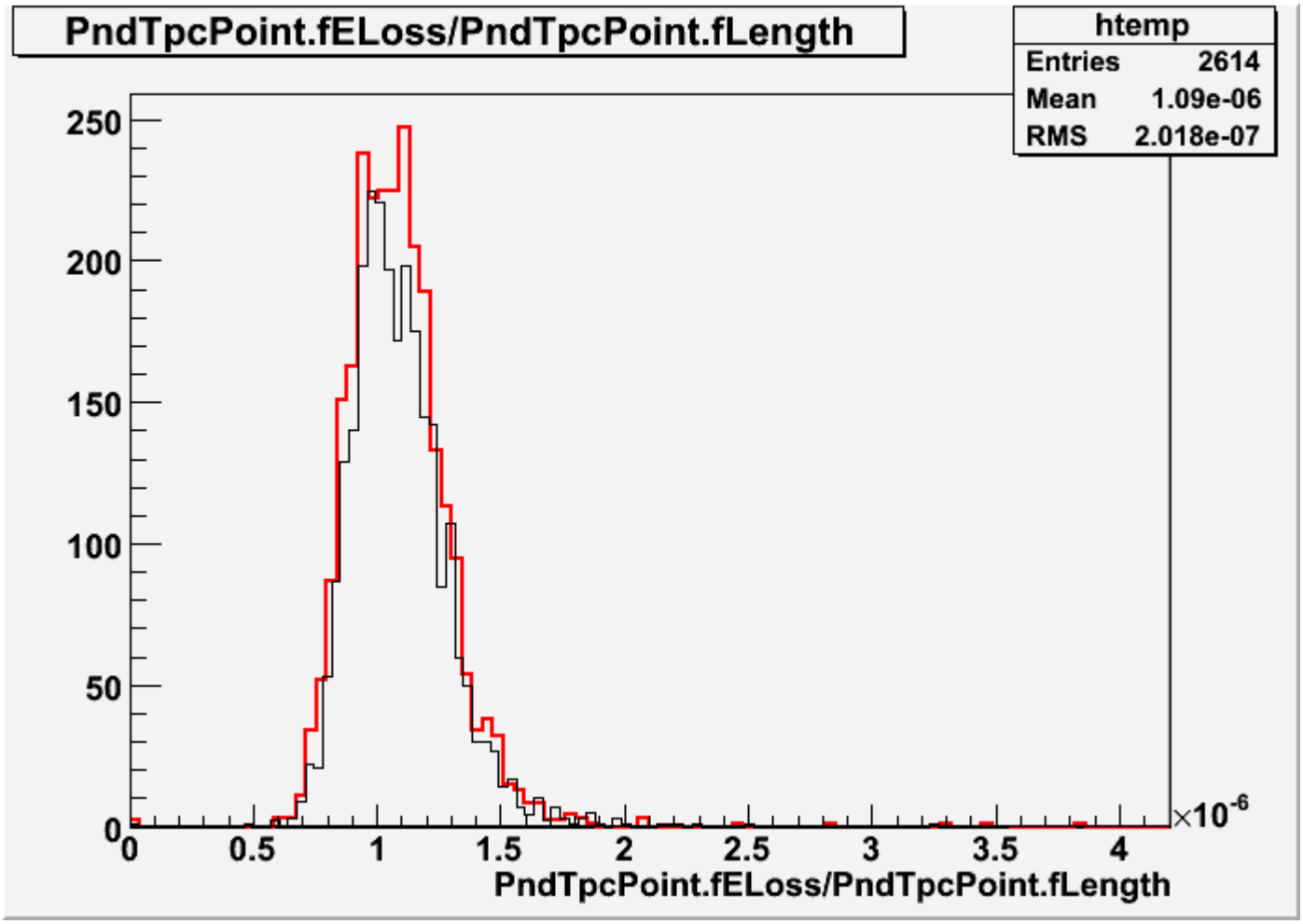
3) dedx_limit_g3.gif, downloaded 1245 times



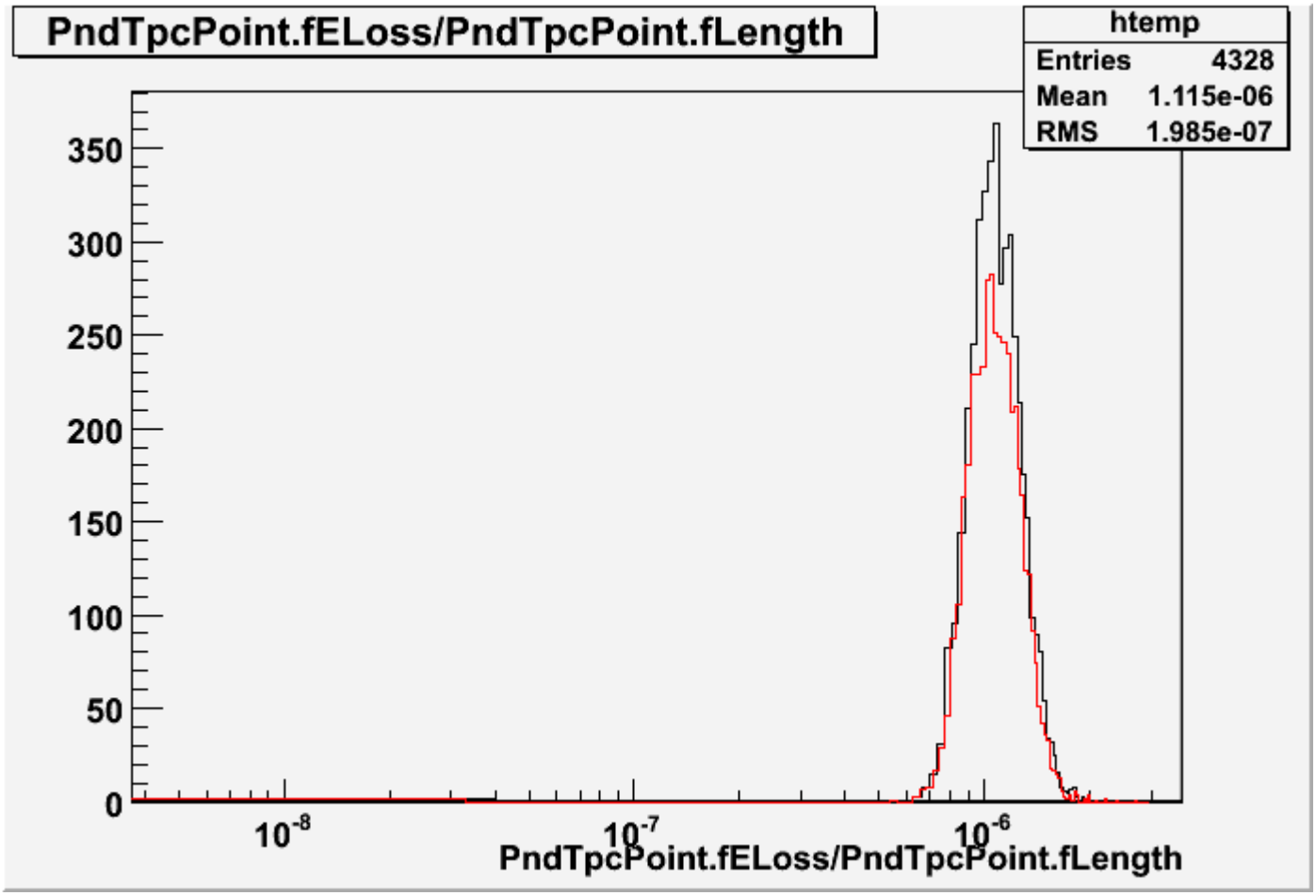
4) dedx_nolimit_g4.gif, downloaded 1292 times



5) g4pi.gif, downloaded 1300 times



6) g4mu.gif, downloaded 1170 times



Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Mohammad Al-Turany on Mon, 03 Dec 2007 15:49:55 GMT
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Hi,

Another intresting feature of G4!

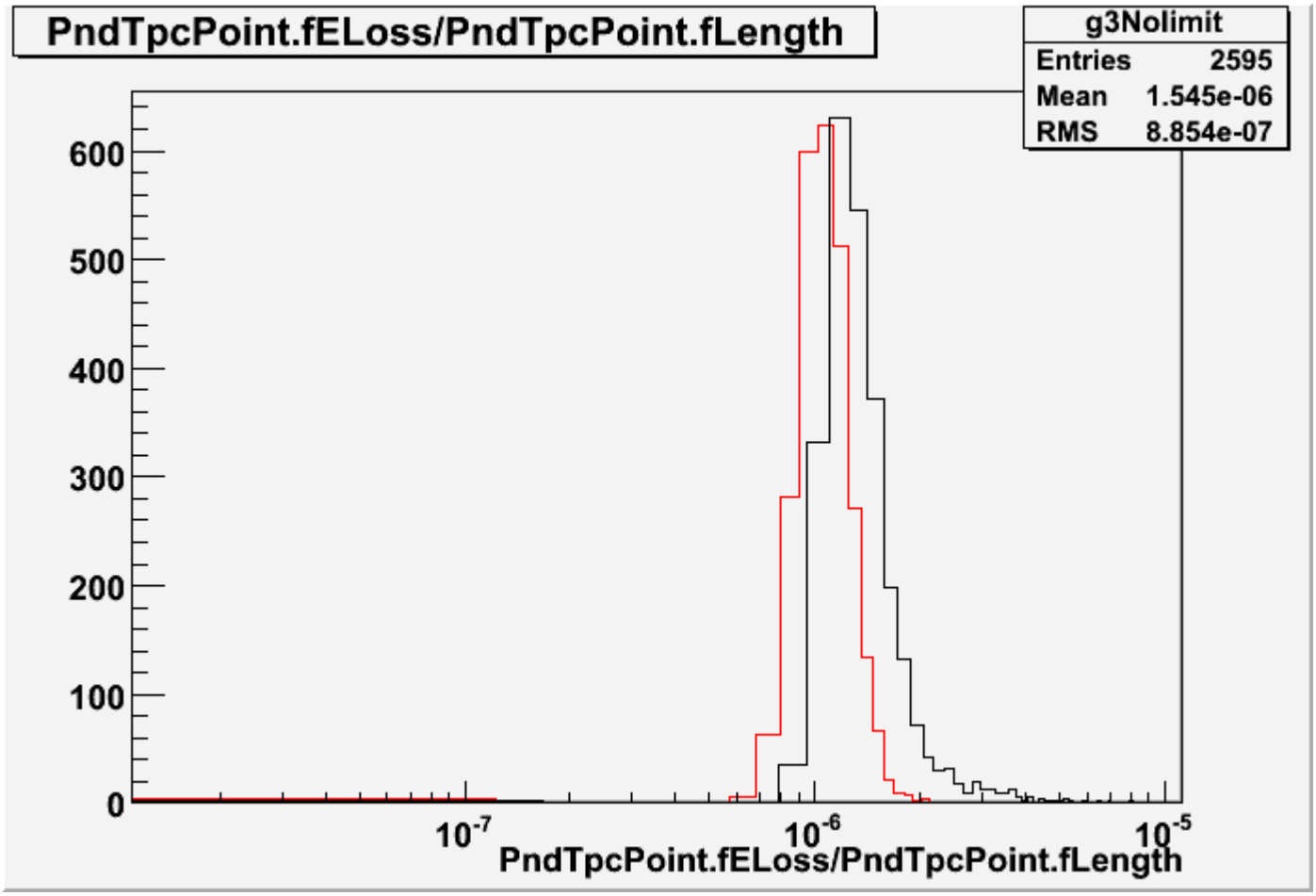
changing the physicslist to QGSP_BERT and comparing

1. To G3 (G4 in Red, No step limit)

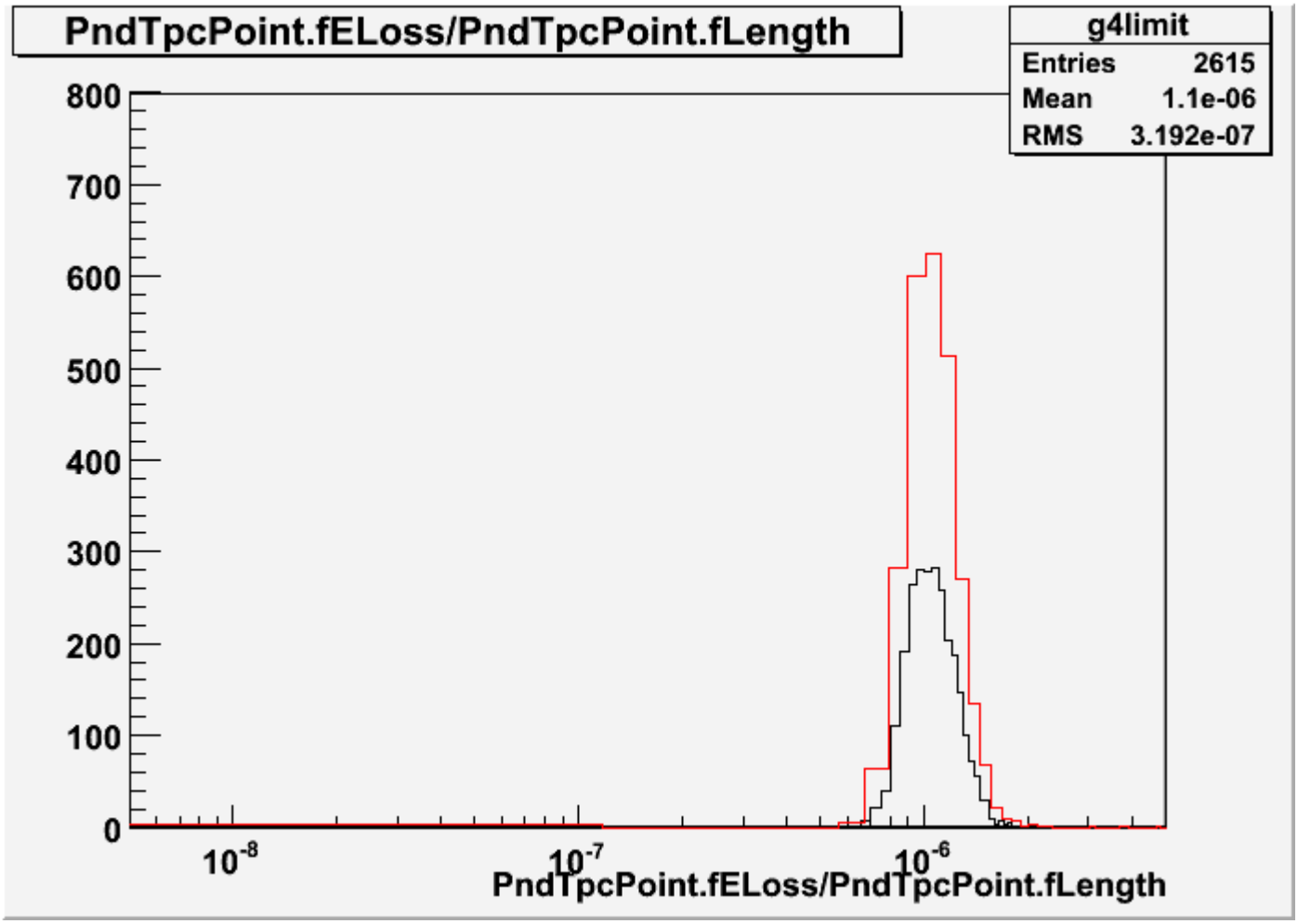
2. To G4 with steplimit: (Steplimit in black)

So it seems that the energy loss of charged particles is physics list dependent in G4??

File Attachments
1) QGSP_BERTvsG3NoStepLimit.gif, downloaded 1307 times



2) QGSP_BERT_log.gif, downloaded 1212 times



Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Sebastian Neubert on Thu, 13 Dec 2007 14:11:55 GMT
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Hi Mohammad!

The difference between G3 and G4 should be investigated. Maybe the G4 community could look at this.

However the way you constructed the TpcPoints is not what we can use. If I understand you correctly you get only the energyloss over the complete track piece in the tpc. What we need is an energy loss information every 5mm!
So please leave TpcDetector as it is and try to reproduce the problem!

What puzzles me is that with the old version of our external packages it worked! So something definitely has changed!

Cheers! Sebastian.

Subject: Re: Stepsize in TPC Simulation with new external packages

Posted by Mohammad Al-Turany on Thu, 13 Dec 2007 14:30:40 GMT
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Hallo Sebastian,

Quote:The difference between G3 and G4 should be investigated. Maybe the G4 community could look at this.

We are also investigating the energy loss in very thin Si layers and we have big differences between G3, G4 and Fluka we are also comparing with data! in this investigation we are already discussing with FLUKA team and some of G4 team who explain us that we should use G4.9 because they have made large corrections So maybe this explain what you see! any way we are still investigating this.

Quote:However the way you constructed the TpcPoints is not what we can use. If I understand you correctly you get only the energyloss over the complete track piece in the tpc. What we need is an energy loss information every 5mm!
So please leave TpcDetector as it is and try to reproduce the problem!

I did not touch your code, I only change it in my local copy so do not worry about this!

Mohammad

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Viola Michael on Thu, 13 Dec 2007 14:45:20 GMT
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Hi!
To illustrate the stepsize dependence of the dedx shape, which is my problem, i have plotted the following:

where red is 0.5 cm maximum stepsize, then comes 1.0, 1.5, 2.0, 2.5, 5.0, and the black line is no step size limitation.

(in the SetCuts.C macro i have set everything to zero expect energy loss)

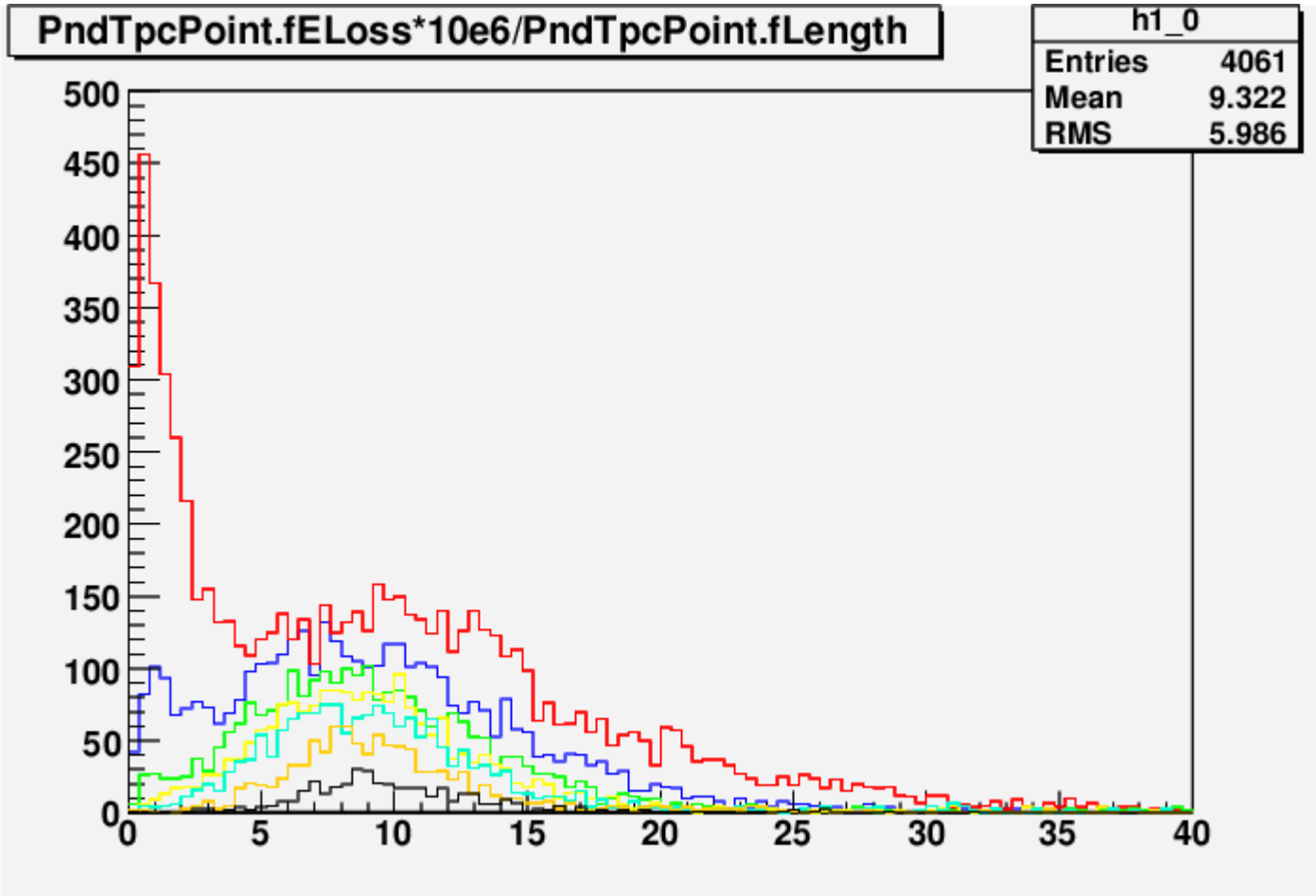
Can there be done done something to avoid this or can someone explain this behaviour to me?

Thanks in advance!

Viola

File Attachments

1) dedx_shape_vs_steplimit.png, downloaded 1190 times



Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Mohammad Al-Turany on Fri, 14 Dec 2007 07:47:18 GMT
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Hallo,

In fact if I understand it well, you rigester in your proccess hit the Edep and flength for each step, and you draw this with the tree draw? if this is true then there is two problems with your plots:

1. Edep is the energy deposition in the volume and not the energy loss! Energy loss and energy deposition in a layer are not necessary equal, because of possible energy leak from the volume. Also you use low cuts, then significant part of energy loss is the production of delta-electrons which need to be counted.

2. fLength: is the track length and not the step length,

if this is true then one can understand your plot, the change in energy deposition (gas in your case)is much smaller than the track length when you change the step size and so with larger steps the whole distribution goes down.

So may be you can register the energy loss instead of deposited energy, which means you have to register the initial energy of your particle at entering a step and the final (at exiting).

You need also to set the cuts back! We use usually 50 keV for delta electron production. and 1 MeV for all other.

regards

Mohammad

Subject: Re: Stepsize in TPC Simulation with new external packages
Posted by Viola Michael on Fri, 14 Dec 2007 11:57:51 GMT
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Hi Mohammed!
thank you very much for you replies. Yes, i do use Edep, but i do not use flength. I use gMC->TrackStep() instead of TrackLength(). When i look at the distribution of PndTpcPoint.fLength almost all have a length of 0.5cm (for a step limit of 0.5).

With the delta electrons: Perhaps they are the problem: they take energy with them and so there is little dE left for the step. And the energy left goes done the shorter the step is. But i tried to go up with the cuts, i tried to turn the delta-rays off, but the low energy losses stays and only goes up when increasing step size.

I don't understand the part with the possible energy leak from the volume?

Perhaps this could solve my problem:
"So may be you can register the energy loss instead of deposited energy, which means you have to register the initial energy of your particle at entering a step and the final (at exiting)."
... but i have no idea how to do it (i only know the entering and exiting functions for a whole track) Can you please give a hint?

Thanks in advance!

Viola
