Subject: Difference of neutral candidate between Geant4 and Geant3
Posted by donghee on Thu, 31 Oct 2013 09:12:04 GMT
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Dear all,

I am trying to use Geant4 in the simulation, and have seen quite different behaviour for Geant4 and Geant3 at the multiplicity of neutral candidate.

Quote:
PANDAroot apr13 released version.
Beam momentum = 15 GeV
MC : DPM
Cut on the neutral candidate : E > 10 MeV

I compared two cases, one is the charged candidate and another one is the neutral candidate. please find the plot in attachment.

For charged candidate, both Geant3 and Geant4 look pretty much same, but for neutral case, the size of neutral candidates significantly different.
I didn't touch any option in the g4config.C

Which engine describe better for photon simulation?
Do I need some fine tuning from option control to use Geant4?

Best wishes,
Donghee

File Attachments
1) multiplicity_dpm_dc_geant.eps, downloaded 629 times

Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by StefanoSpataro on Fri, 01 Nov 2013 11:41:09 GMT
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Can you please switch off the specialcuts and specialcontrols in your g4config.C, and check again the g4 outcome?

Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by donghee on Mon, 11 Nov 2013 12:46:21 GMT
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Hi Stefano,

Hier is the plot for the multiplicity from single photon of box generator using geant3 and geant4.

There are no difference between them.
Energy distributions are perfectly identical for both.

And then in second page I have tried with 6 different particle sources
with gamma, electron, muon, pion, kaon and proton.
They are produced with box generator, each set have been generated with multiplicity 6.
Every hadron sources make the difference between Geant3 and Geant4, while lepton or photon source show same distribution.

Best wishes,
Donghee

File Attachments

1) Pandaroot_meeting_2.pdf, downloaded 484 times

Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by StefanoSpataro on Mon, 11 Nov 2013 17:04:15 GMT
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Could you please try to remove the special cuts/controls in your gconfig/g4Config.C and try again?

```
TG4RunConfiguration* runConfiguration
      = new TG4RunConfiguration("geomRoot", "QGSP_BERT_EMV", "");
```

Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by donghee on Tue, 12 Nov 2013 09:53:02 GMT
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Hi Stefano,

I tried your suggestion.

Quote:TG4RunConfiguration* runConfiguration = new TG4RunConfiguration("geomRoot",

"QGSP_BERT_EMV", "");

Single pion had been simulated (see attached file).
Same behaviour showed up in the neutral multiplicity(candidate).
6 pion simulation is now running. but assume that will be same.

I think that Geant4 and Geant3 define the cluster differently, specially for the geometrical size of cluster.
Or Geant3 produce more photon from the interaction in the front of EMC at DIRC and DISC.

I hope that this discrepancy is not so big trouble in the analysis level.
I need more time to investigate further.

Ciao,
Donghee

File Attachments

1) multiplicity_for_single_pion_without_option.eps, downloaded 446 times

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Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by donghee on Fri, 15 Nov 2013 14:34:22 GMT
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Hi Stefano,

I have tried to look more detail the dependency of multiplicity with EMC cluster for Geant3 and Geant4 including physics option or excluding options.
Please have a look all distributions in attached file.

Main difference at Multiplicity between Geant3 and Geant4 start already from the EMC cluster size.

With option at Geant4 many of photon production are restricted. but no option produce huge amount of photon mainly due to secondary interaction.
That make main difference at the size of EMC cluster.

I think that this issue is surely related with EMC simulation.
Is someone already reported about Geant4 simulation for EMC part? or will be tested in the future?

Best wishes,
Donghee

File Attachments

1) Pandaroot_meeting_2.pdf, downloaded 451 times

Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by StefanoSpataro on Fri, 15 Nov 2013 15:15:51 GMT
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Hi,
the last try would be to use different physics lists in g4, and see if there are changes. I am not able to understand if the problems are in the vmc side or in our side. As far as I know g4 response was already tested for emc, but is seems there is something wrong somewhere.

Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by Dima Melnychuk on Thu, 06 Feb 2014 10:56:13 GMT
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Hi,

As Stefano suggested I tried to compare the number of neutral candidate between Geant 3 and Geant 4 with different "hadronic process" setting for Geant 3. The default value for "hadronic process" in /gconfig/SetCuts.C is 1.
gMC->SetProcess("HADR",1);

I tried "3" and "5" and with "5" simulation stuck. But actually between "hadronic process" "1" and "3" with respect to number of neutral candidates there is no much difference.

So the results for 15 GeV DPM events.

Multiplicity for Geant 4 is much lower, and almost no difference between different "hadronic process" in Geant3.

Distribution of cluster size (number of crystals per cluster)

indicate 2 times difference in single cluster crystals between Geant3 and Geant4.

And if we consider the multiplicity of neutrals with more than 2 crystals:

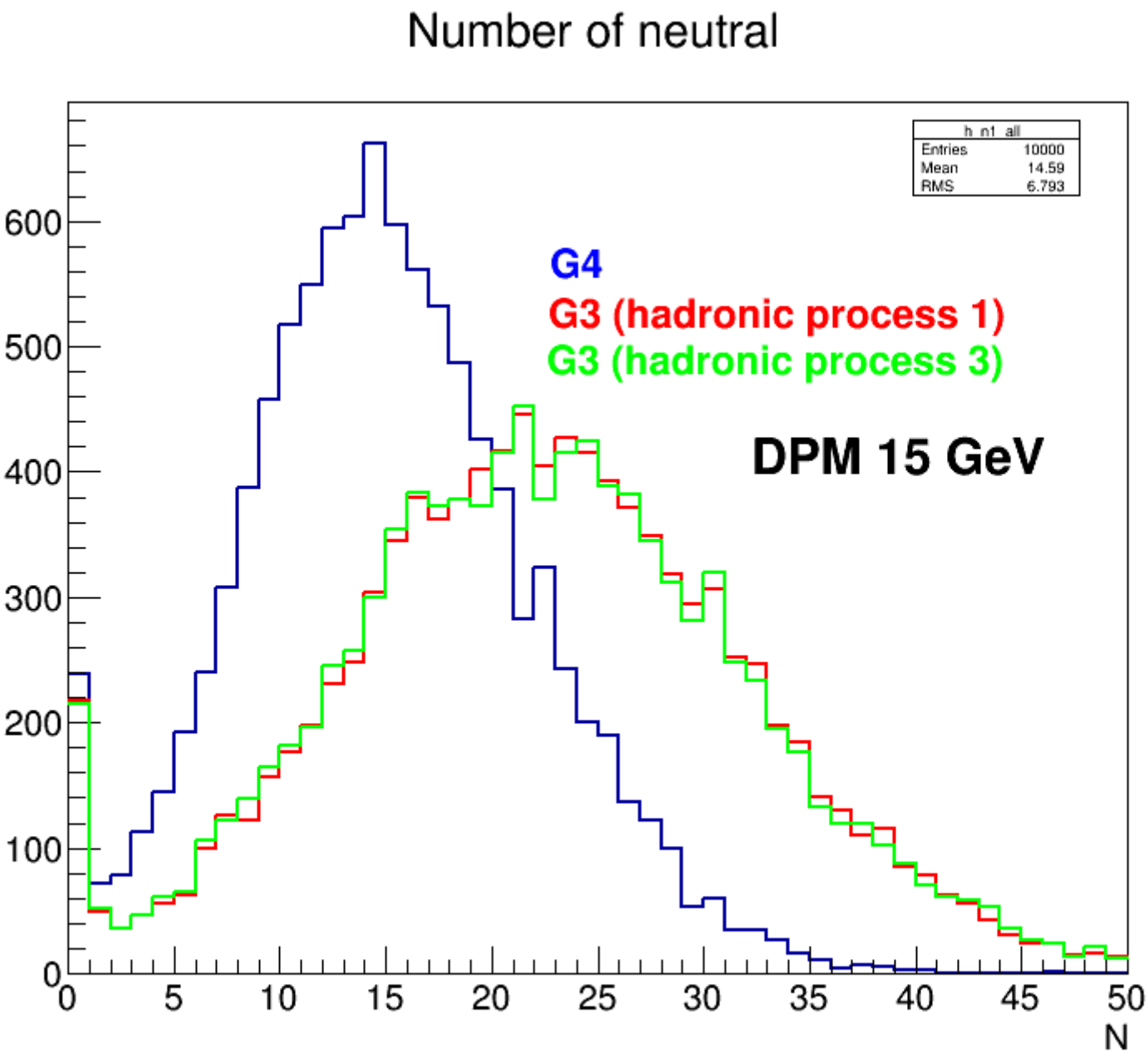
there is already a reasonable agreement between Geant3 and Geant4.

And still there is no conclusion which engine is more correct Geant3 or Geant4.

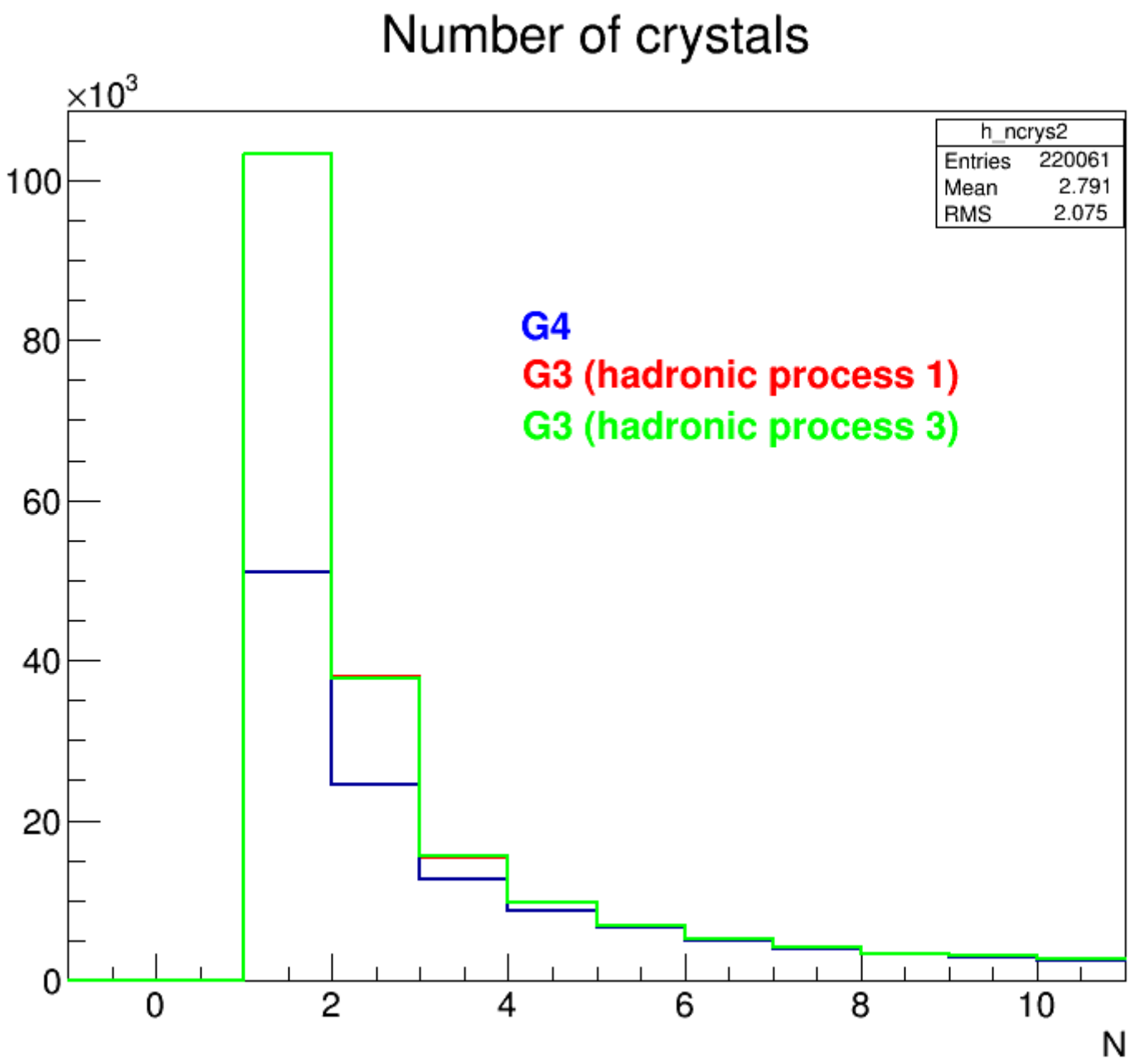
Dima

File Attachments

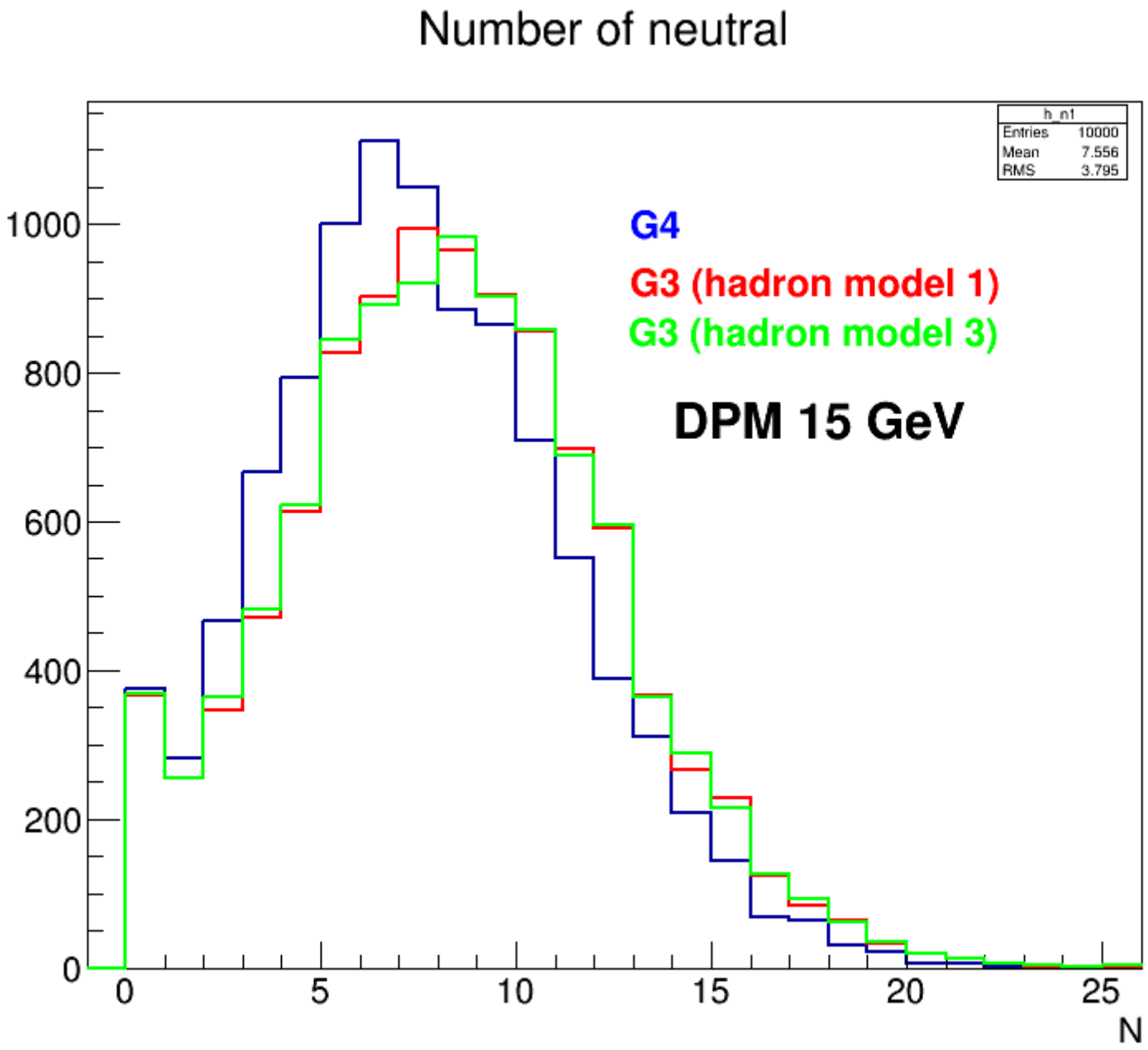
1) number_neutral.png, downloaded 1368 times



2) number_crystals.png, downloaded 1252 times



3) number_neutral_gt2.png, downloaded 1376 times



Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by StefanoSpataro on Fri, 07 Feb 2014 18:46:53 GMT
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Thanks Dima for your check.
I also tried with gcalor (5) and with DPM it stucks at the second event, but with evtgen it goes up to the end.
Maybe there are some problems in gcalr with some kind of particle, maybe.

Subject: Re: Difference of neutral candidate between Geant4 and Geant3
Posted by StefanoSpataro on Fri, 09 Jan 2015 21:21:10 GMT
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Hi,
I did some recent changed triggered by the fact that currently geant4 simulation is faster than geant3.

I simulated the standard psi(2S)->J/psipi+pi- events and compared the emc digi multiplicity with geant3, geant4, and geant4 setting off the "special cuts" and "special controls", i.e. the emulation of geant3 cuts in energy.
This is what I get:

I understand that the lower multiplicity of geant4 comes not from geant itself but from the special cuts in energy that we use by default. If we remove the flag from gconfig/g4Config.C the computing time increases a lot, become a factor 2 slower than g3, and the multiplicity is higher than geant3 as expected.

At the end, I understand this is just a fact of cuts, and only a comparison with experimental data can help to find the better thresholds.

File Attachments

1) emcdigi_mult.gif, downloaded 1430 times