Subject: backward endcap time consuming
Posted by Dmitry Khaneft on Fri, 30 Apr 2010 11:29:38 GMT
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Dear all,

I met a problem that simulations with my geometry of the EMC backward endcap go quite slow.

I tried different combinations of EMC geometry including very old ascii and one done by Ola and I found out that ascii geometry works much faster than mein or Ola's.

After asking some people what could be wrong I got an answer that problem could because of too complicated ProcessHit function in PndEmc.cxx. It has a lot of if() operators which could cause the problem.

As I understood this function is called each step in simulation for each particle. Thus if it could consume a lot of time in case of electromagnetic shower in EMC.

1. My first question is: where is the code responsible for processing events when ascii geometry is used? I think it should be inside ProcessHit function but I can't identify it. May be I could take a look in and than correct my code correspondingly. Because geometry in all cases should be essentially the same just the size and the position of crystals are different.

Another observation I done shows that in all cases there are error or warning(see below) + one of another kind which appears only in my case. In case of ascii geometry it appears not so often as in Ola's and in Ola's geometry it apperas less than in mine. I think it is the main problem because these warnigs take a lot of time compare to events processing.

2. What are this messages are and what can I do?

P.S. I tried to change max step number to different values up to 30000 but it changes nothing.

This warning appears in all cases and in different cases it gives different coordinates.
>>> Event 5
*** Particle reached max step number (10000). ***
10002 329 -56.7 -663 2.29 0 0 31.3
cave Transportation
10003 329 -56.7 -663 2.29 0 0 31.3
CrystalVol Transportation
10004 329 -56.7 -663 2.29 0 0 31.3
cave Transportation
10005 329 -56.7 -663 2.29 0 0 31.3
CrystalVol Transportation
*** Particle reached max step number (10000). ***

****
* G4Track Information: Particle = gamma, Track ID = 60, Parent ID = 59
****

This kind of warnings appear only in my case.
++++++++++++++++++++++++

No physical volume found at track vertex: (1.08019e+06,753627,-1.92401e+06)
++++ TG4Warning: ++++
   TG4TrackingAction::UserProcessHits:

Cannot locate track verrtex.
++++++++++++++++++++++

++++ TG4Warning: ++++
   TG4SpecialControlsV2::SetSwitch:
   No limits defined in BoxVol
++++++++++++++++++++++

best regards,
Dmitry

Subject: Re: backward endcap time consuming
Posted by Dima Melnychuk on Fri, 30 Apr 2010 11:44:50 GMT
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Hi,

In case of ascii geometry the following part of code works in hit processing, which defines the volume where hit took place

```
401    if (nam.BeginsWith("emc"))
402      {
403        sscanf(nam,"emc%dr%dc%d", &nMod, &nRow, &nCrys);
404
405        // Crys 1-5000; copyNo 1-20; nRow 1-100, nMod 1-6
406        if ((nMod==1) || (nMod==2))
407          id = gMC->CurrentVolOffID(2,copyNo);
408        if ((nMod==3) || (nMod==4)|| (nMod==6))
409          id = gMC->CurrentVolOffID(1,copyNo);
410        // 1 -because the pad stays inside flayer4 (Emc4), so only "1" as inheritance.
411        // In barrel part one pad stays into Emc1 which stays inside Emc12 (and after Emc12
is
412        // copied and rotated -> the inheritance level is "2"
413      }
```

whereas the lines 126-389 with a lot of if statements works for root geometry.

And after that from line

```
432    fVolumeID = nMod*100000000 + nRow*1000000 + copyNo*10000 + nCrys;
```

and code is universal for ascii and root geometry.

Concerning the warning I have no suggestions at the moment.

Best regards,

Dima

Subject: Re: backward endcap time consuming
Posted by Dima Melnychuk on Thu, 06 May 2010 10:04:23 GMT
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Hi Dmitry,

It seems that I partially solved the problem with time consumption with EMC endcaps simulation with root geometry.

The following lines of code in PndEmc::ProcessHits() were executed at each hit but results were not used. However these calculation were rather time consuming.

```
244     Int_t daughtQuar = gMC->NofVolDaughters(namQuar);
245     Int_t daughtSub  = gMC->NofVolDaughters(namSub);
246     Int_t daughtBox  = gMC->NofVolDaughters(namBox);
247     Int_t daughtCrys = gMC->NofVolDaughters(namCrys);
```

Equivalent lines of code were for forward endcap also. So I have removed them with rev. 8554. As a results simulations with Geant4, energy=0.7 GeV, theta=155 deg., phi=45 deg. were at least 4 times faster.

To identify the problem I used callgrind profiler.

valgrind --tool=callgrind root.exe sim_emc.C

And the output can be viewed with kcachegrind.

Best regards,

Dima

Subject: Re: backward endcap time consuming
Posted by Dmitry Khaneft on Mon, 10 May 2010 08:28:38 GMT
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Thank you Dima,

it works much faster now.

Actually when there are no warnings it works very fast but sometimes there are a lot of them.

Best regards,
Dmitry