Subject: Cherenkov photons generation (FairBoxGenerator) updated!
Posted by Maria Patsyuk on Wed, 18 Aug 2010 09:03:17 GMT
View Forum Message <> Reply to Message

Hi,

I'd like to generate cherenkov photons as primaries to study the detector response (DIRC).
I tryied to use FairBoxGenerator for this purpose (generate particles with PDG = 5000050), but the simulation crashes at generation stage (see errors below).

Dose anybody know any ways to generate cherenkov photons with given properties originating from, say (49., 11., 0.)cm ??

Thanks.

==========
There was a crash (kSigFloatingException).
This is the entire stack trace of all threads:
==========
#0 0xffffe410 in __kernel_vsyscall ()
#1 0xb6d162f3 in waitpid () from /lib/tls/i686/cmov/libc.so.6
#2 0xb6cbe669 in strtold_l () from /lib/tls/i686/cmov/libc.so.6
#3 0xb6dc5add in system () from /lib/tls/i686/cmov/libpthread.so.0
#4 0xb79f9c0b in TUnixSystem::Exec (this=0x81017a8,
shellcmd=0xa34c0f8 "/misc/cbmsoft/Etch32/jan10/fairsoft/tools/root/etc/gdb-backtrace.sh 13104 1>&2") at core/unix/src/TUnixSystem.cxx:1978
#5 0xb79f8f42 in TUnixSystem::StackTrace (this=0x81017a8) at core/unix/src/TUnixSystem.cxx:2188
#6 0xb79fc12a in TUnixSystem::DispatchSignals (this=0x81017a8, sig=kSigFloatingException)
at core/unix/src/TUnixSystem.cxx:1106
#7 0xb79fc257 in SigHandler (sig=kSigFloatingException) at core/unix/src/TUnixSystem.cxx:350
#8 0xb79f2024 in sighandler (sig=8) at core/unix/src/TUnixSystem.cxx:3428
#9 <signal handler called>
#10 0xaf61a218 in gtreveroot_ () at gtrak/gtreveroot.F:107
#11 0xaf7ab2b1 in gutrev_ () at TGeant3/TGeant3gu.cxx:578
#12 0xaf79036d in jumpt0_ (iadr=0xaf8c9b20) at minicern/jumptn.c:74
#13 0xaf4eb448 in g3trig_ () at gbase/gtrig.F:62
#14 0xaf7a2dd3 in TGeant3::Gtrig (this=0x8c13d20) at TGeant3/TGeant3.cxx:3177
#15 0xaf79a6d0 in TGeant3::ProcessEvent (this=0x8c13d20) at TGeant3/TGeant3.cxx:6300
#16 0xaf79cc3b in TGeant3::ProcessRun (this=0x8c13d20, nevent=1) at TGeant3/TGeant3.cxx:6270
#17 0xb40a5aeb in FairMCApplication::RunMC (this=0x8b881e8, nofEvents=1)
at /u/mpatsyuk/PANDA/trunk/base/FairMCApplication.cxx:238
#18 0xb40bd28b in FairRunSim::Run (this=0x815e318, NEvents=1, NotUsed=0)
at /u/mpatsyuk/PANDA/trunk/base/FairRunSim.cxx:367
#19 0xb410436e in G__FairDict_746_0_5 (result7=0xbfefe810, funcname=0x88f57e8 "\001", libp=0xbfef41cc, hash=0) at /u/mpatsyuk/PANDA/build_Etch32/base/FairDict.cxx:11208
#20 0xb71b630c in Cint::G__ExceptionWrapper (funcp=0xb4104284 <G__FairDict_746_0_5>, result7=0xbfefe810, funcname=0x88f57e8 "\001", libp=0xbfef41cc, hash=0)

at cint/cint/src/Api.cxx:385

Subject: Re: Cherenkov photons generation (FairBoxGenerator)
Posted by Maria Patsyuk on Fri, 20 Aug 2010 15:46:26 GMT
View Forum Message <> Reply to Message

The general idea of my study is to make a "photon gun" to investigate the response of cherenkov detector (DIRC) on photons with different initial angles.

I also tried to use FairBoxGenerator with normal photons (PGD = 22) with shifted from (0.,0.,0.) production point, but they don't behave like cherenkov photons and seem to be absorbed (their trajectory in the eventDisplay looks like a point).

Could you give me some hint about how to produce cherenkov photons (or photons that behave like cherenkov in GEANT) in an arbitrary point inside my detector ??

Thanks.

Subject: Re: Cherenkov photons generation (FairBoxGenerator)
Posted by StefanoSpataro on Sat, 21 Aug 2010 10:35:27 GMT
View Forum Message <> Reply to Message

Hi,
to have cherenkov photons you should use pid code "50000050", and not "22". But I suppose you could have interaction to materials (i.e. air), if you shoot it from 0,0,0.
Your crash could be due to the fact that cherenkov propagation maybe is switched off by deafult. Please check your gconfig/g3Config.C and be sure that geant3->SetCKOV(1) is ON.

To change the particle vertex, you can just check wiki, on event generators -> uniform generator:

boxGen->SetXYZ(0., 0., 0.); // vertex coordinates [cm]

If you have still problem, maybe it is better to tell exactly which macro are you using, your changes, so that it is possible to crosscheck your crashes.

Bye

Subject: Re: Cherenkov photons generation (FairBoxGenerator)
Posted by Maria Patsyuk on Tue, 24 Aug 2010 11:44:27 GMT
View Forum Message <> Reply to Message

Hi,
thank you for the answer!

I checked I had cherenkov propagation on in gconfig/g3Config.C.
I tried sim_dirc.C macro with pid code 500000050 and

boxGen->SetXYZ(49.8906, 11.6258, 0.)

which is supposed to be inside the quartz DIRC bar, but the simulation crushed again.

I'm using the macro sim_dirc.C (is in /u/mpatsyuk/PANDA/trunk/macro/drc/work1/sim_dirc.C) with the following options:

no magnetic field,
detectors - Cave, Pipe, DIRC,
box generator

```
FairBoxGenerator* boxGen = new FairBoxGenerator(50000050, 1);
boxGen->SetPRange(0.000000003,0.000000003); // GeV/c
boxGen->SetPhiRange(13., 13.);
boxGen->SetThetaRange(110., 110.);
boxGen->SetXYZ(49.8906, 11.6258, 0.); //  cm
```

What could be wrong this time?

Subject: Re: Cherenkov photons generation (FairBoxGenerator) updated!
Posted by Jochen Schwiening on Tue, 24 Aug 2010 14:02:41 GMT
View Forum Message <> Reply to Message

Hi Stefano,

what Maria and I want to do is shoot photons towards the DIRC photodetector plane and have Geant perform the propagation and optics - focusing, deflection and reflection at optical interfaces - and the registration of hits on the detector pixels.
We want to scan a range of polar and azimuth angles for the "primary" photons so that we hit all possible pixels that can be viewed from one bar.
Then, we want to produce histograms of the production photon angles for each detector pixel so that we know which angles reach which pixels for a given bar.
All this is in the context of testing a fast reconstruction approach for the DIRC, inspired by what we did at BaBar.

When I run sim_dirc.C from the macro/drc directory I get the usual response from the DIRC in event display. If I use, for instance, pions or muons as primary particle I get hits and "rings". This works from the 0,0,0 IP or from a displaced position inside a DIRC bar, for example at 50.5,11.6,-110. If I switch to primary particle photon (22) at the IP or displaced, I see the photon interact, sometimes create secondaries, which in turn will create Cherenkov photons, and then hits, if I select the option in g3Config. If I lower the energy of the photon I still see some reaction but somewhere below 1 MeV/c momentum the photon becomes invisible in event display (absorbed or G3-killed, not sure). And in no case do I get a hit registered by the DIRC photon detector, instead the photon penetrates the detector plane and continues on if it makes it that far.

As soon as I chose a primary Cherenkov photon (50000050) for the gun, ROOT crashes as Maria explained. Doesn't matter which momentum or location I pick for the photon gun.

Any ideas on how to shoot photons from inside a DIRC bar at the detector plane and register hits would be welcome.

Thanks, Jochen

Subject: Re: Cherenkov photons generation (FairBoxGenerator) updated!
Posted by StefanoSpataro on Tue, 24 Aug 2010 15:22:26 GMT
View Forum Message <> Reply to Message

Hi,
few comments:

I have seen that by default, in g3Config.C, there is:

geant3->SetCKOV(0);

This should be set to "1" to have Cherenkov propagation ON. Are you sure it is "1"?

Second, in SetCuts.C, all the cuts are set to 1 MeV, then of course all your photons/particles below 1 MeV will be stopped. You should change "cut1" to something below 1 MeV to see low energetic particles.

Third, I would comment out the Pipe, because maybe there are still some overlaps with DIRC, I am not sure.

Fourth, maybe the too much low momentum (boxGen->SetPRange(0.000000003,0.000000003)) is interfering with g3 cuts, nobody has ever tried to use g3 in this way.

Fifth, have you tried to run geant4? In this case, you should turn on optical physics lists in g4Config.C -> "QGSP_BERT_EMV+optical", maybe this does not crash. You could also try to remove the specialCuts/specialControls commands, to use complete geant4.

Good luck.

Subject: Re: Cherenkov photons generation (FairBoxGenerator) updated!
Posted by Jochen Schwiening on Tue, 24 Aug 2010 15:48:55 GMT
View Forum Message <> Reply to Message

Hi Stefano,

thank you for your helpful response.

I can confirm that we are using Geant 3 and that we set geant3->SetCKOV(1); as you mention.

You identified the reason for the vanishing primary gamma (22). If I lower the cut to 1 eV then the photon propagates a bit until it vanishes inside the quartz or the oil as it goes. If I try to go

to 0.1 eV it crashes. Either way it never makes it to the photon detector and it never registers as a hit.

Regarding Geant 4, Dipanwita told me that the DIRC code currently does not work in G4, crashes for an undetermined reason.

Not sure if there's anything else we can test...

Thanks, Jochen

Subject: Re: Cherenkov photons generation (FairBoxGenerator) updated!
Posted by Jochen Schwiening on Wed, 15 Sep 2010 12:51:47 GMT
View Forum Message <> Reply to Message

After getting Geant 4 to propagate Cherenkov photons inside of the DIRC bar I was able to tackle the photon gun issue.
The happy news is that this also appears to work in Geant 4.
We should, however, keep this topic open until a) we have verified that the G4 results make sense, and b) the experts had a chance to try and fix the problem in G3 (I don't know enough about G3).

I am attaching a snapshot of an event with 1000 photons, each 390 nm wavelength, generated over a wide theta/phi range, propagated inside the bar from a gun location close to the end of the bar, and registered by our photon detectors. The cbmsim ntuple contains information that appears, at first glance, to be meaningful. We have to do some studies, not the least of which is to compare the DIRC response for "normal events" between G3 and G4, before we can declare the issue fixed but it's definitely progress.

Cheers, Jochen

File Attachments

1) dirc_geant4_photon_gun_ok.png, downloaded 1040 times

