Subject: Re: Group velocity for Cherenkov photon propagation in G3/G4
Posted by Jochen Schwiening on Fri, 28 Jan 2011 20:33:16 GMT
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Hi Oliver,

I like your suggestion to check individual photons without
reflections and other potential complications, Stefano had
suggested it as well.
To do this I used a photon gun placed inside the fused silica
radiator bar, close to the forward end of the bar, and shot
the photon along the Z axis of the bar towards the readout end,
recording the production time and bar exit time as well as
the path.

I created 10 photons with a fixed wavelength and varied the
wavelength in 14 runs from 200nm to 700nm. I see that all
10 photons always have the exact same wavelength, path, time,
and velocity.
The attached plot shows that the calculated velocity in Geant 4
is pretty much right on top of the calculated group velocity.

Unfortunately I cannot use the photon gun in Geant 3 because
the photon gun does not work for us in Geant 3 (still the
floating point exception crash when we select a 50000050 photon
as primary particle) but at least for Geant 4 your test and my
check suggests that the observed scatter of photon velocities
is not due to a problem with the group velocity calculation
in Geant (4) but due to incorrectly assigned paths or times
from TrackLength() and/or TrackTime().

We still need to make sure that the photon velocity is correct
in Geant 3 since using Geant 4 to generate event samples is
prohibitively slow (more than a factor 10 per-event time). Any
ideas for that would be very welcome since generating our DIRC
reconstruction look-up tables in G4 and applying it to G3 tracks
without being able to cross-check G3 with G3 and G4 with G4 is
not great. (Plus, since Peter says that the velocity is wrong in
Geant 3, that only the phase velocity is used, it's important
that we verify and correct this mistake.)

Have a great weekend,

  Jochen

File Attachments
1) geant_vgroup_photon_gun.png, downloaded 1318 times

Using **photon gun**
   along Z axis of b...
Tagging TrackLeng...
   when entering a...
New media_pnd.g...
   fine binning.