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().

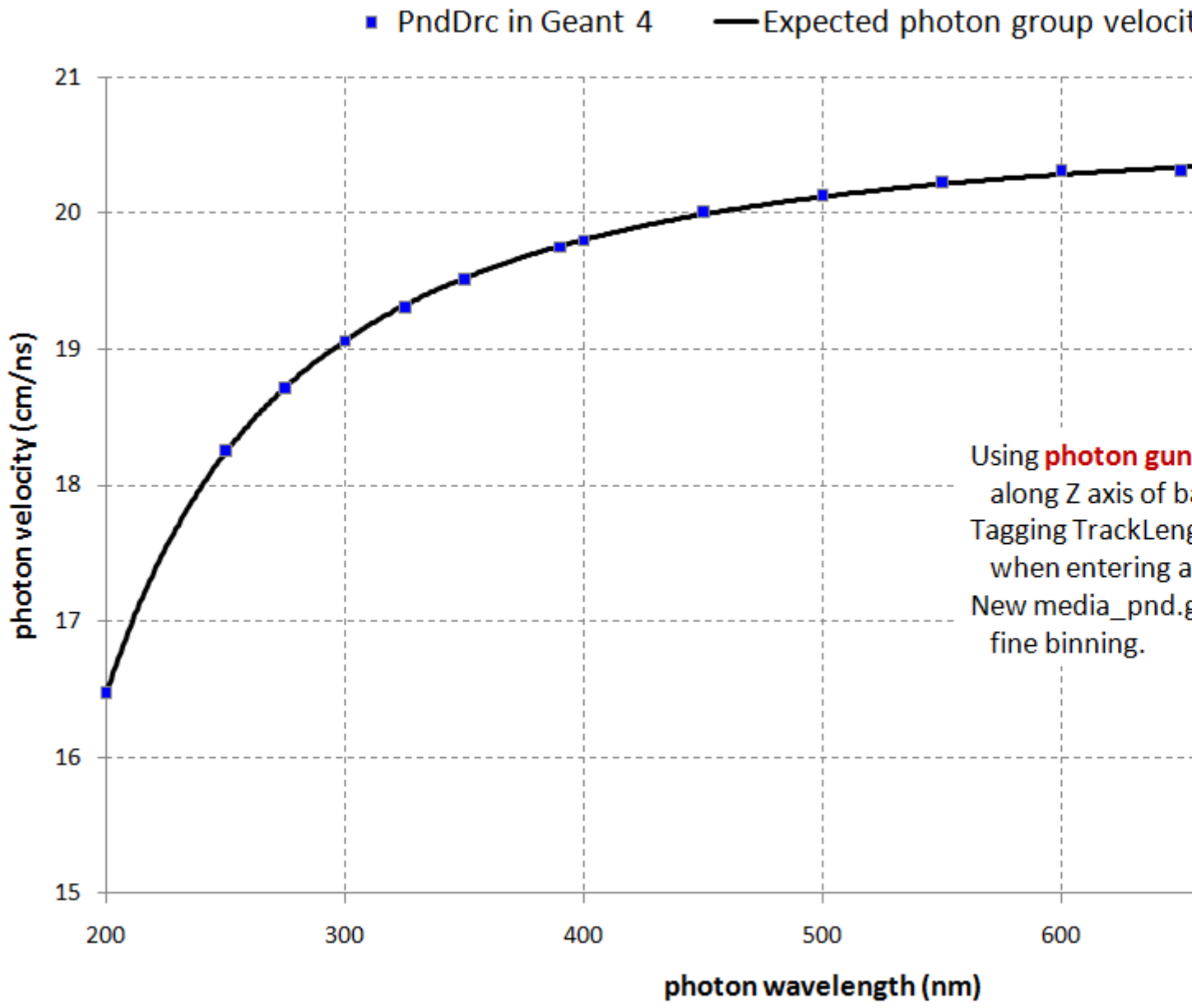
We still need to make sure that the photon velocity is correct in Geant 3 since using Geant 4 to generate event samples is prohibitively slow (more than a factor 10 per-event time). Any ideas for that would be very welcome since generating our DIRC reconstruction look-up tables in G4 and applying it 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 1726 times


PndDrc in Geant 4
Expected photon group velocit
21
20
19
18
17
16
15
photon velocity (cm/ns)
200
300
400
500
600
photon wavelength (nm)
Using photon gun
along Z axis of b
Tagging TrackLeng
when entering a
New media_pnd.g
fine binning.