

Basic Form of My Macro

for

Neutron Gun Simulation

##### G4 Physics / Tracking commands #####

```
/glg4debug/glg4param omit_muon_processes 1.0  
/glg4debug/glg4param omit_hadronic_processes 0.0  
/glg4debug/glg4param physicsList 2  
/glg4debug/glg4param omit_veto_pmts 0  
/glg4debug/glg4param omit_optical_surfaces 0  
/glg4debug/glg4param omit_support 0  
/glg4debug/glg4param omit_buffer_support 0  
/glg4debug/glg4param omit_GC_support 0
```

```
/run/initialize
```

```
/process/inactivate DeferTrackProc all  
/process/inactivate Cerenkov  
/glg4scint/off
```

```
/grdm/verbose 0  
/grdm/fBeta 1
```

```
/generator/rates 3 1e-6  
/generator/gun neutron 220 220 3750 0 0 0 14.0 0 0 0  
/generator/event_window 1e8
```

```
#####  
##### Generator Setting #####  
#####
```

```
/generator/rates 3 1e-6  
/generator/gun neutron 220 220 3750 0 0 0 14.0 0 0 0  
/generator/event_window 1e8
```

```
#####  
##### Output File #####  
#####
```

```
/event/output_file ./DATA/TargetGd/Movie/1e3/run05  
/output/store/particles/PDG 2112  
/output/store/particles/PDG 22  
/output/store/particles HADRONIC  
/output/store/tracks/PDG 2112  
/output/store/particles/PDG 22  
/output/store/tracks HADRONIC
```

```
/feedback/drawPlots 0
```

```
/run/beamOn 1000
```

# Problems in Neutron Simulation

- Unexpected termination of an event simulation  
(Failing to pass a new track to G4StackManager)
- Missing a capture gamma in C13 + n process  
(Phys. Process NeutronInelastic)
- Missing a track of nucleus after neutron capture  
(Maybe too low energy to be tracked?)

I will show tracking verbosity output as an example of the 1st and 3rd issue.

# Example of Good Track

```
*****
* G4Track Information: Particle = neutron, Track ID = 1, Parent ID = 0
*****

Step#  X(mm)  Y(mm)  Z(mm)  KinE(MeV)  dE(MeV)  StepLeng  TrackLeng  NextVolume  ProcName
  29    19.6   -13.6   -27.6  7.99e-08   0         0         383 TargetInteriorPhys  initStep
G4ProcessTable::Insert : arguments are 0 pointer
G4ProcessTable::Insert : arguments are 0 pointer
G4ProcessTable::Insert : arguments are 0 pointer
G4ProcessTable::Insert : arguments are 0 pointer
  30    15.2   -14.1   -31.8   0         0         6.08     389 TargetInteriorPhys  HadronCapture
:----- List of 2ndaries - #SpawnInStep= 11(Rest= 0,Along= 0,Post=11), #SpawnTotal= 11 -----
:   15.2   -14.1   -31.8   2.42      gamma
:   15.2   -14.1   -31.8   1.25      gamma
:   15.2   -14.1   -31.8   2.18      gamma
:   15.2   -14.1   -31.8   0.437    gamma
:   15.2   -14.1   -31.8   0.834    gamma
:   15.2   -14.1   -31.8   0.451    gamma
:   15.2   -14.1   -31.8   0.38     gamma
:   15.2   -14.1   -31.8   0.297    gamma
:   15.2   -14.1   -31.8   0.149    e-
:   15.2   -14.1   -31.8   0.089    gamma
:   15.2   -14.1   -31.8   1.78e-05 Gd156[0.0]
:----- EndOf2ndaries Info -----

Track (trackID 1, parentID 0) is processed with stopping code 2
A new track 0xab636a8 (trackID 31, parentID 1) is passed to G4StackManager.
A new track 0xab63750 (trackID 32, parentID 1) is passed to G4StackManager.
A new track 0xab637f8 (trackID 33, parentID 1) is passed to G4StackManager.
A new track 0xab638a8 (trackID 34, parentID 1) is passed to G4StackManager.
A new track 0xab63948 (trackID 35, parentID 1) is passed to G4StackManager.
A new track 0xabeb200 (trackID 36, parentID 1) is passed to G4StackManager.
A new track 0xabeb2a8 (trackID 37, parentID 1) is passed to G4StackManager.
A new track 0xabeb350 (trackID 38, parentID 1) is passed to G4StackManager.
A new track 0xabeb3f8 (trackID 39, parentID 1) is passed to G4StackManager.
A new track 0xabeb4a8 (trackID 40, parentID 1) is passed to G4StackManager.
A new track 0xabeb548 (trackID 41, parentID 1) is passed to G4StackManager.
### pop requested out of 11 stacked tracks.
Selected G4StackedTrack : 0xab63af0 with G4Track 0xabeb548 (trackID 41, parentID 1)
Track 0xabeb548 (trackID 41, parentID 1) is passed to G4TrackingManager.
```

It has **Capture Nucleus** + **gamma**

- Unexpected termination of an event simulation  
(Failing to pass a new track to G4StackManager)

```
*****  
* G4Track Information: Particle = neutron, Track ID = 1, Parent ID = 0  
*****  
  
Step#   X(mm)   Y(mm)   Z(mm) KinE(MeV)  dE(MeV) StepLeng TrackLeng  NextVolume ProcName  
   38    -232    -153    -49.2  6.13e-08     0         0        614 TargetInteriorPhys initStep  
   39    -243    -160    -53.8     0         0        14.1       628 TargetInteriorPhys HadronCapture  
  
Track (trackID 1, parentID 0) is processed with stopping code 2  
### pop requested out of 0 stacked tracks.  
### 0 waiting tracks are re-classified to  
    0 urgent tracks and 0 waiting tracks.  
NULL returned from G4StackManager.  
Terminate current event processing.
```

## Example of Termination

- Missing a track of nucleus after neutron capture  
(Maybe too low energy to be tracked?)

```

*****
* G4Track Information: Particle = neutron, Track ID = 1, Parent ID = 0
*****
Step#   X(mm)   Y(mm)   Z(mm) KinE(MeV)  dE(MeV) StepLeng TrackLeng  NextVolume ProcName
  17    -31.7    24    -0.117  2.78e-08     0     0     132 TargetInteriorPhys initStep
  18    -31.7    24     1.15     0     0     1.27     133 TargetInteriorPhys HadronCapture
:----- List of 2ndaries - #SpawnInStep= 2(Rest= 0,Along= 0,Post= 2), #SpawnTotal= 2 -----
:   -31.7    24     1.15     4.95           gamma
:   -31.7    24     1.15     3.68           gamma
:----- EndOf2ndaries Info -----

Track (trackID 1, parentID 0) is processed with stopping code 2
A new track 0x484ec00 (trackID 19, parentID 1) is passed to G4StackManager.
A new track 0xab63750 (trackID 20, parentID 1) is passed to G4StackManager.
### pop requested out of 2 stacked tracks.
Selected G4StackedTrack : 0xab63a18 with G4Track 0xab63750 (trackID 20, parentID 1)
Track 0xab63750 (trackID 20, parentID 1) is passed to G4TrackingManager.

```

Example of No Capture Nucleus

# Questions About DCGLG4sim UI Command

- Can we set seed to generate a random number from computer clock? (seed 0 doesn't seem to do this job)

- For visualization, we have found G4PhysVolume of...

ShieldInteriorPhys

InnerVetoInteriorPhys

BufferInteriorPhys

GammaCatcherInteriorPhys

TargetInteriorPhys

Can we make the dorm/rock visualization?

- Is ConstructDoubleCHOOZ.cc right place to look at calculation for geometry?