

Simulations of LGAD detectors with GEANT4: particle transport

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Physics Models

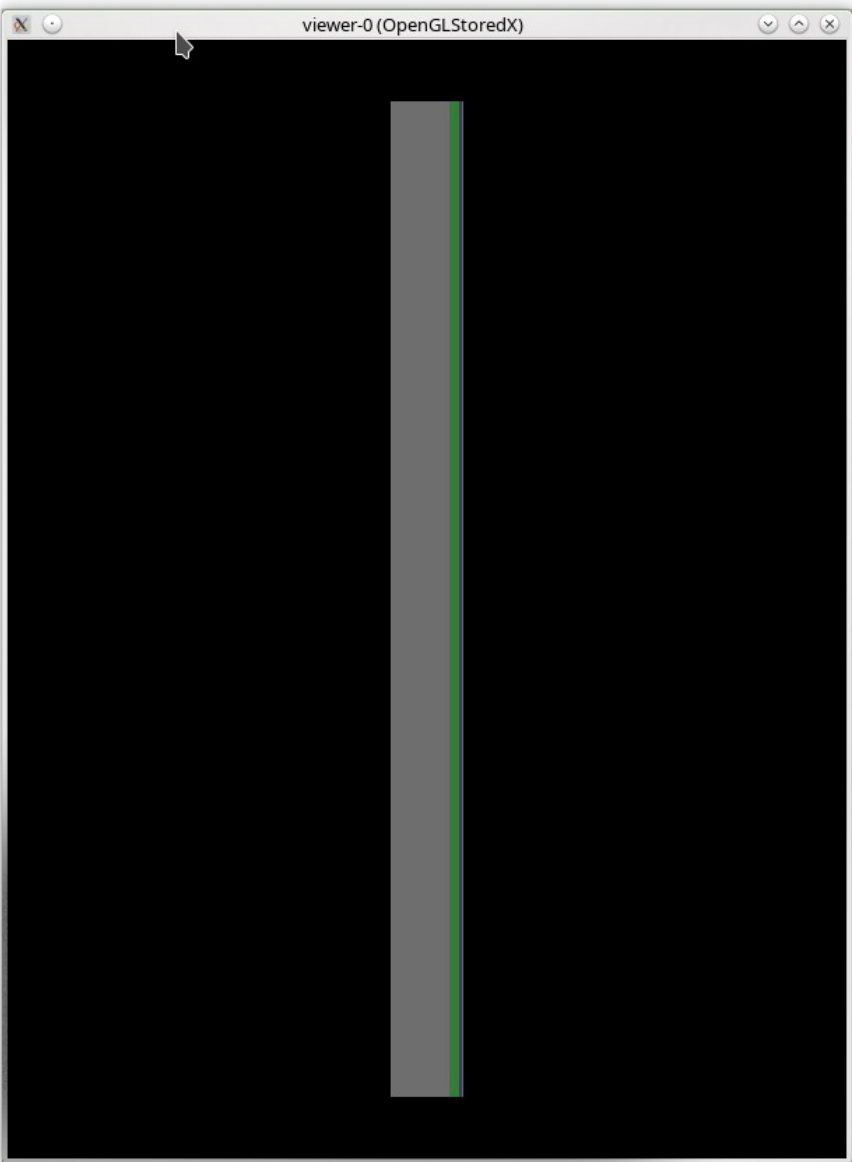
- Imported from the Hadrontherapy example;
- Includes interactions of protons and heavy ions;
- Includes the most detailed models for interactions of photons, electrons and positrons;
- Energy range: 1 keV – 1 TeV.

Geometry

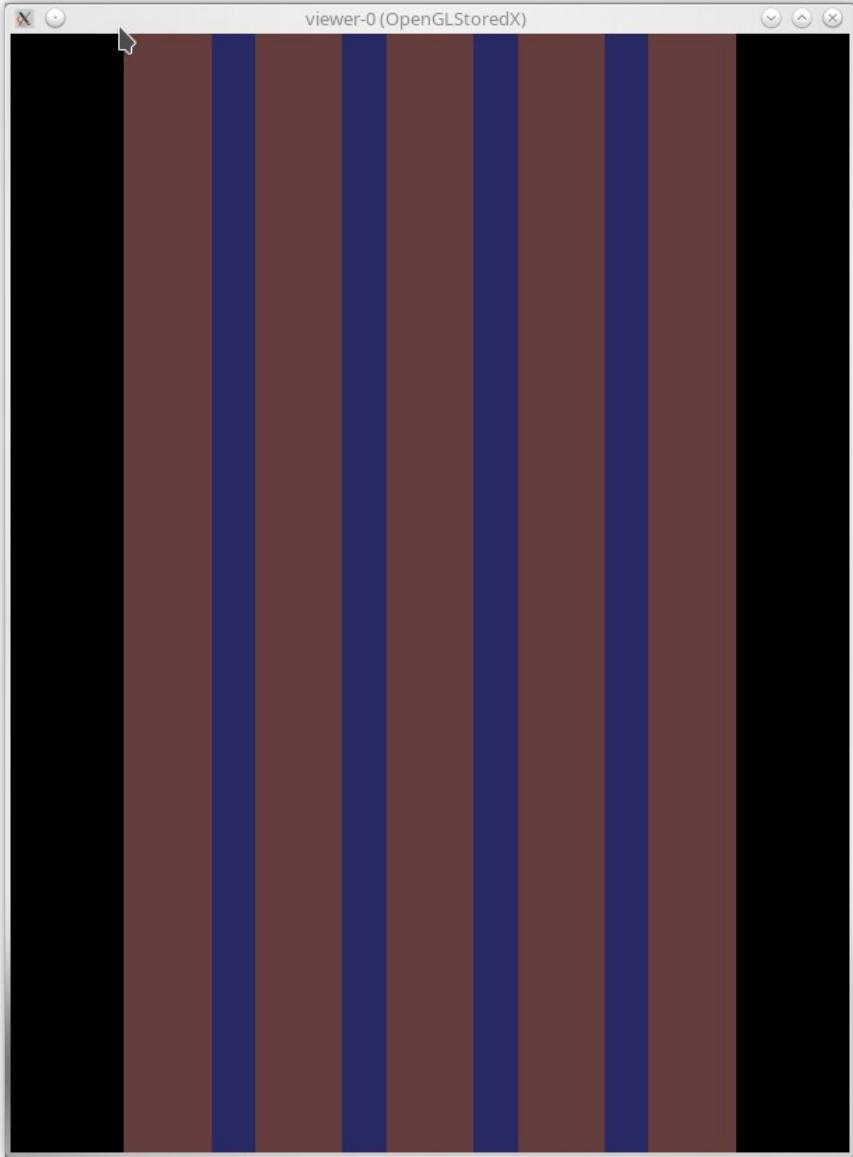
- GDML scheme for volume definition, materials and placement of all detector structures and environment;
- More readable than C++ language;
- Some possibilities for CAD export/importing of geometry definition.

Definition of the LGAD

Detector - thickness view

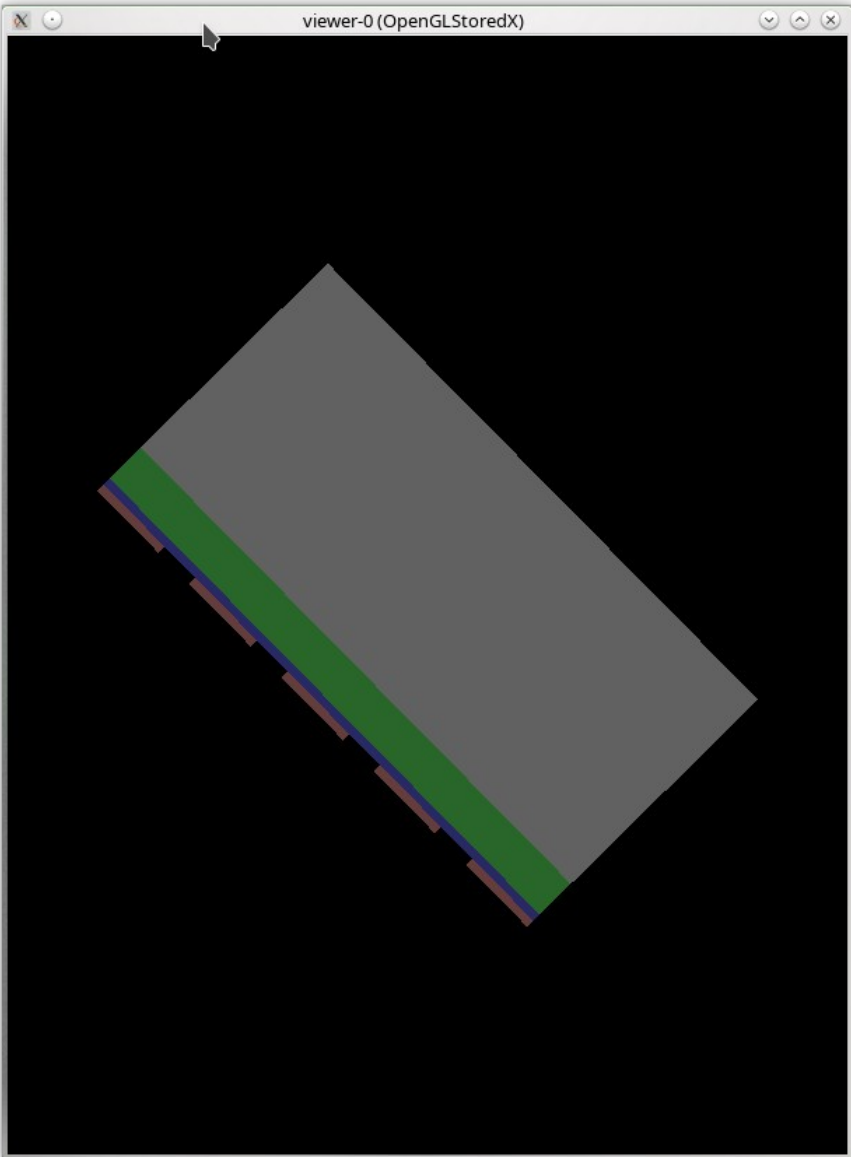


Detector - strips view

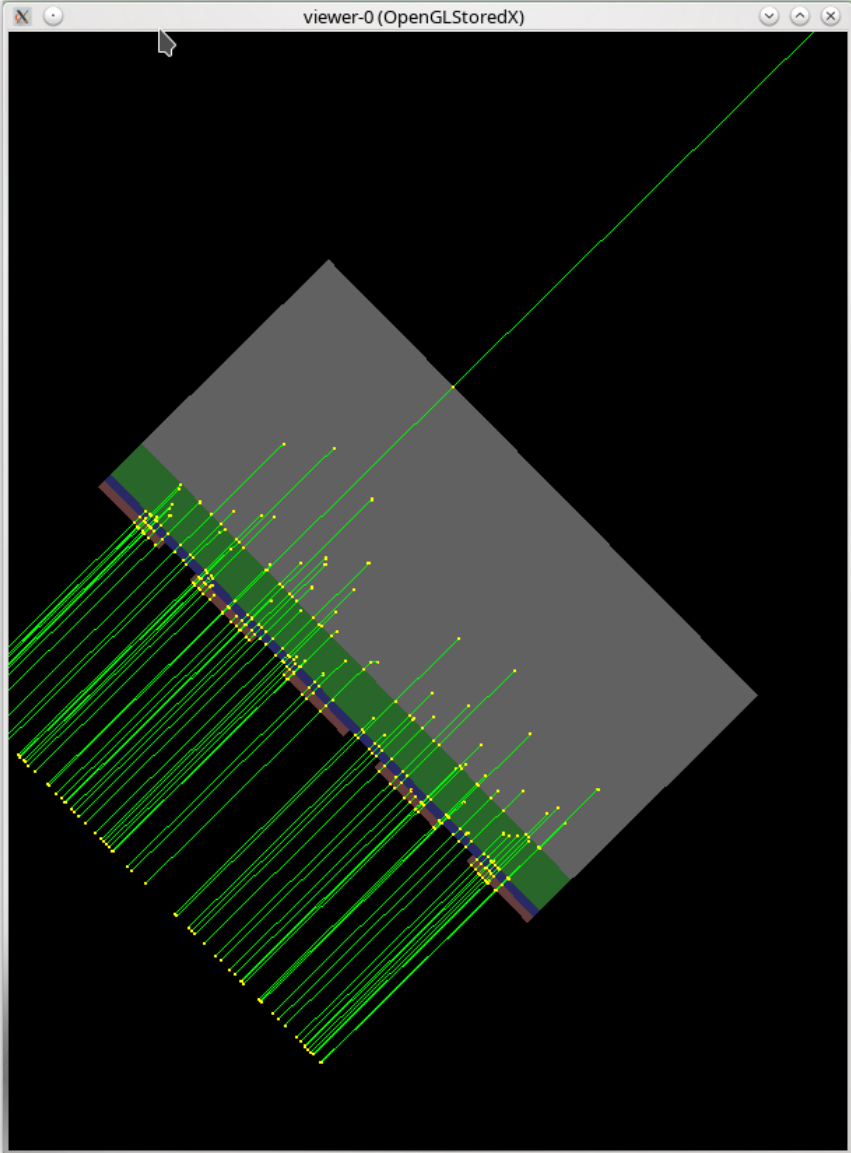


Definition of the LGAD

Detector - top view

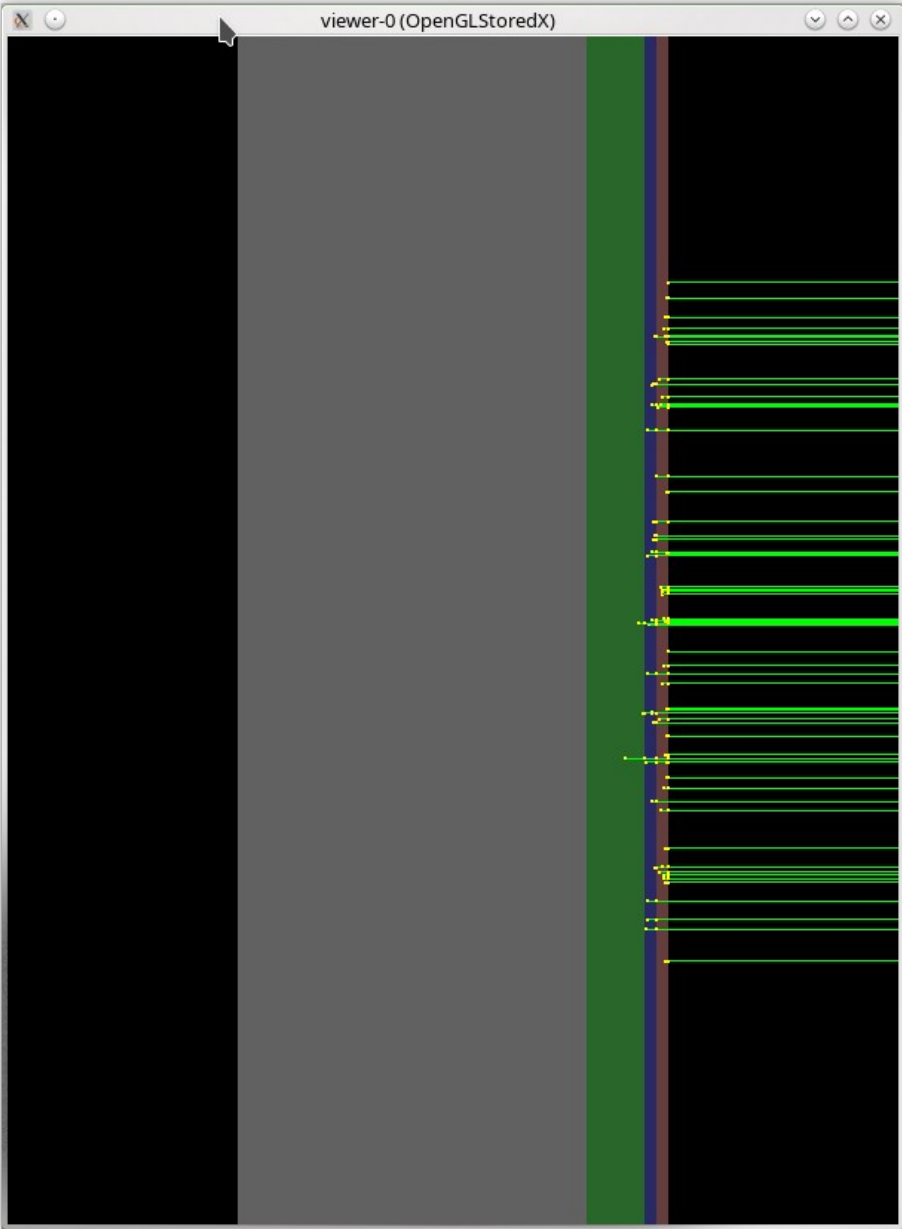


Detector - top view with X-rays (8 keV)

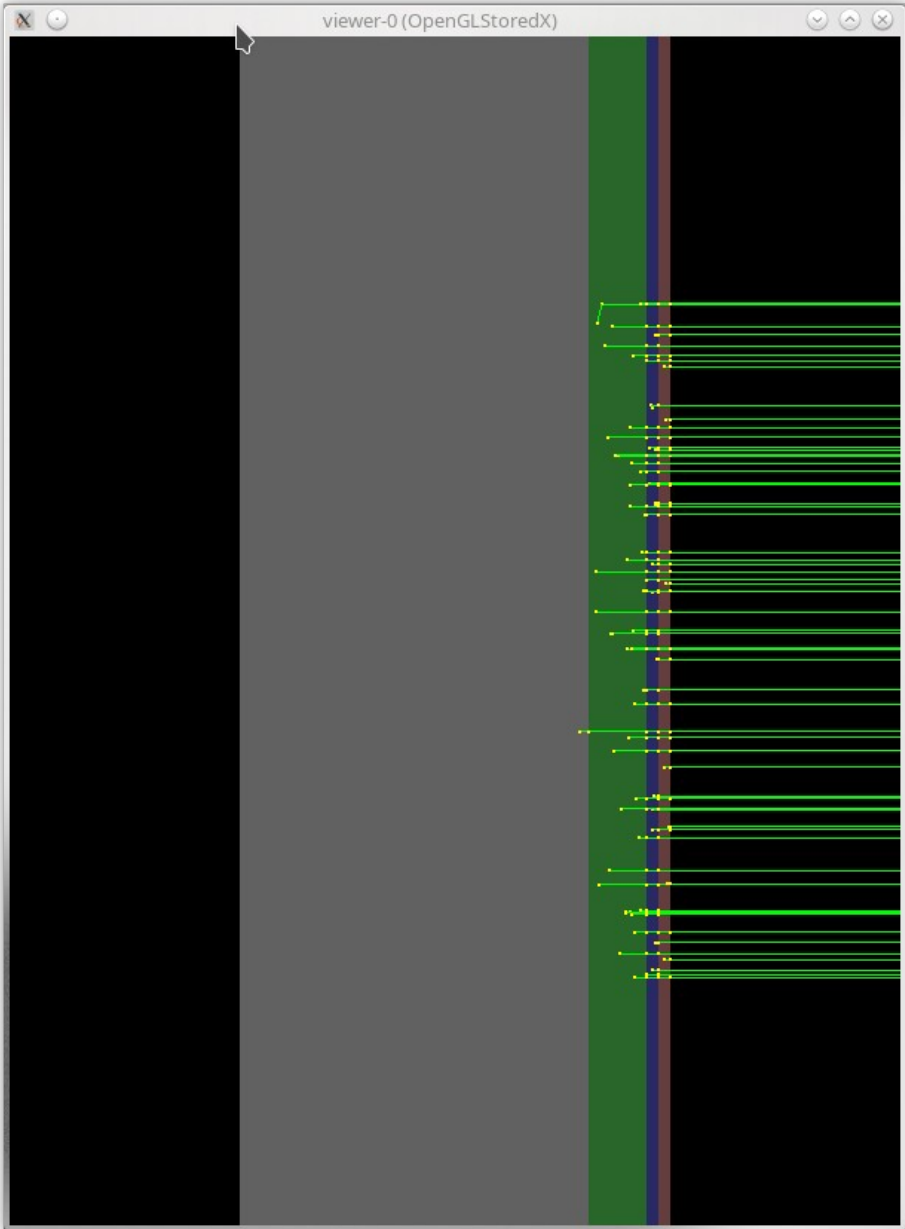


Some results: X-rays

3 keV

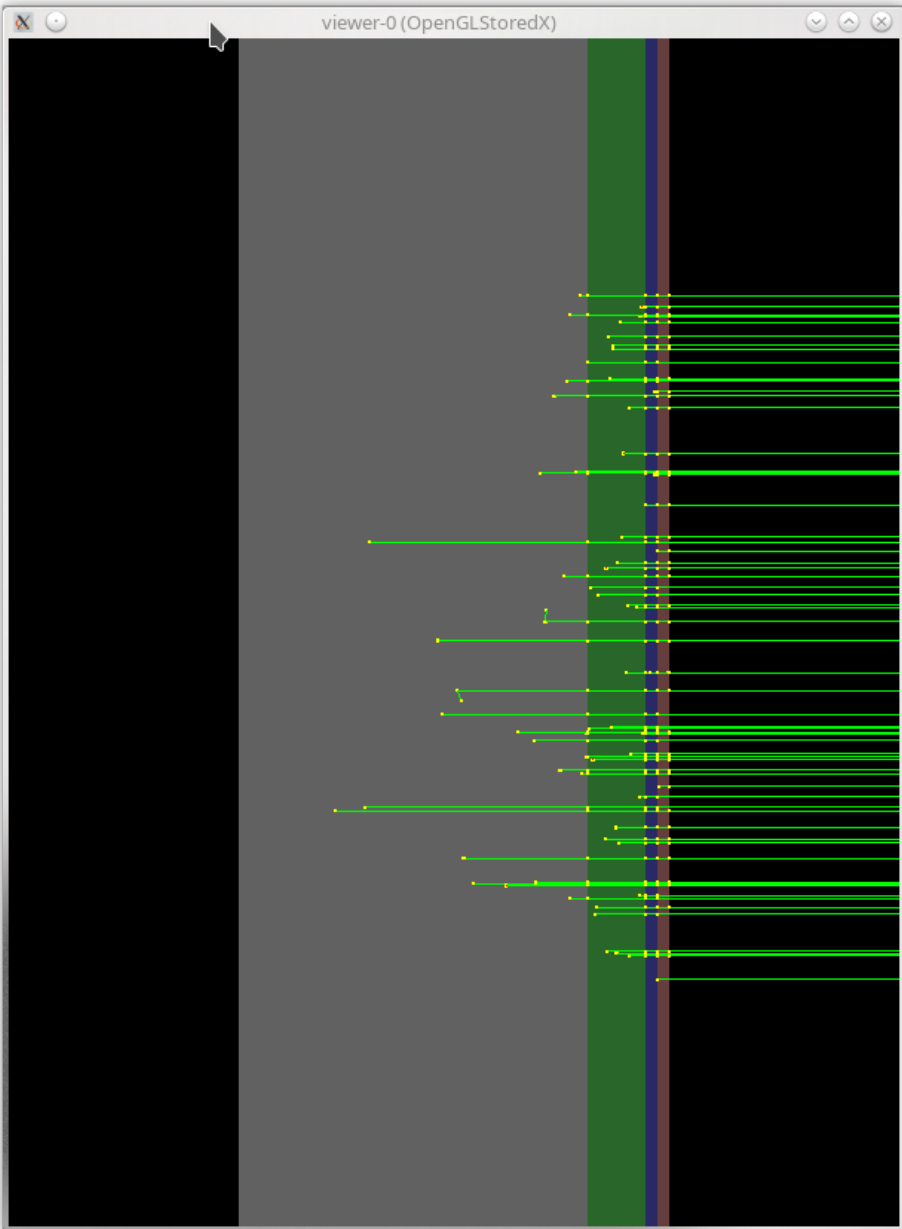


5 keV

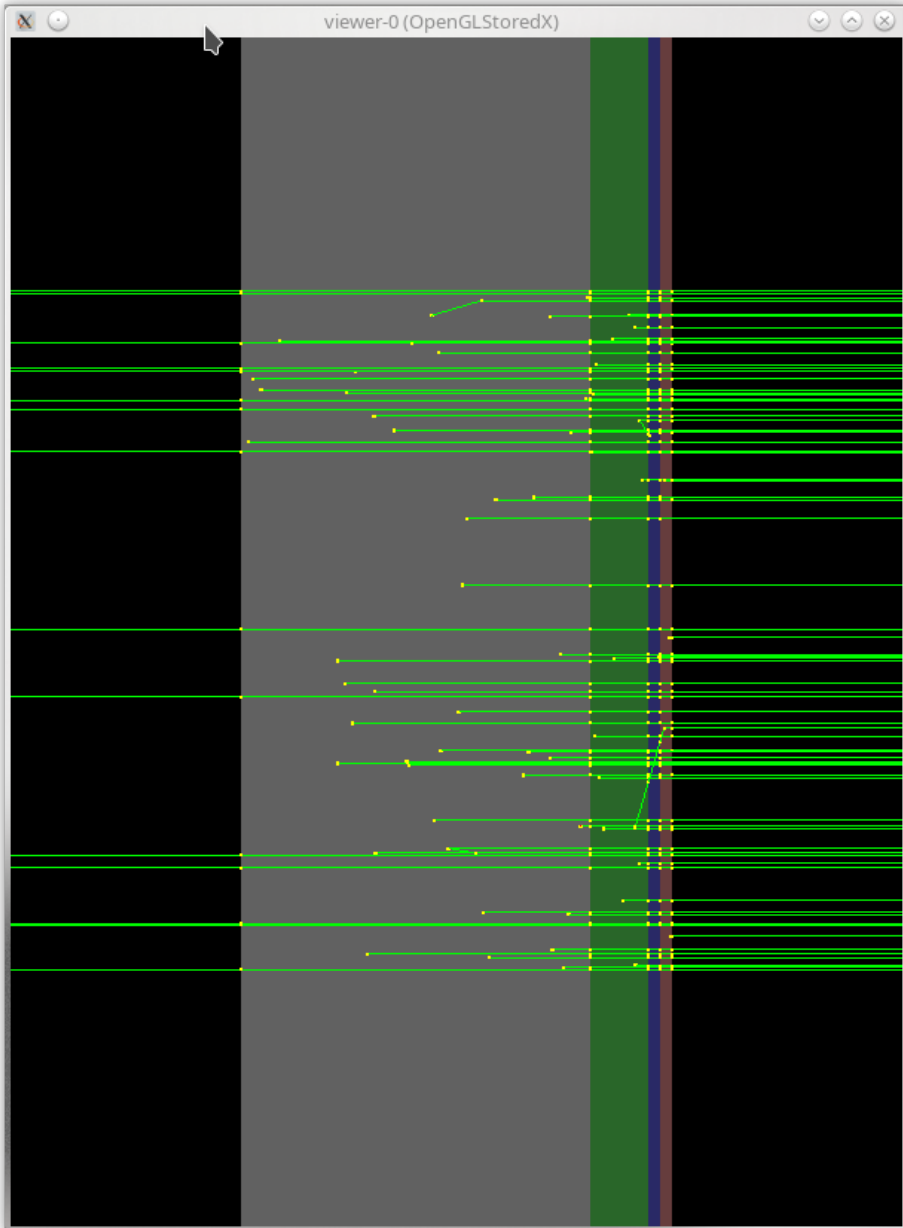


Some results: X-rays

8 keV

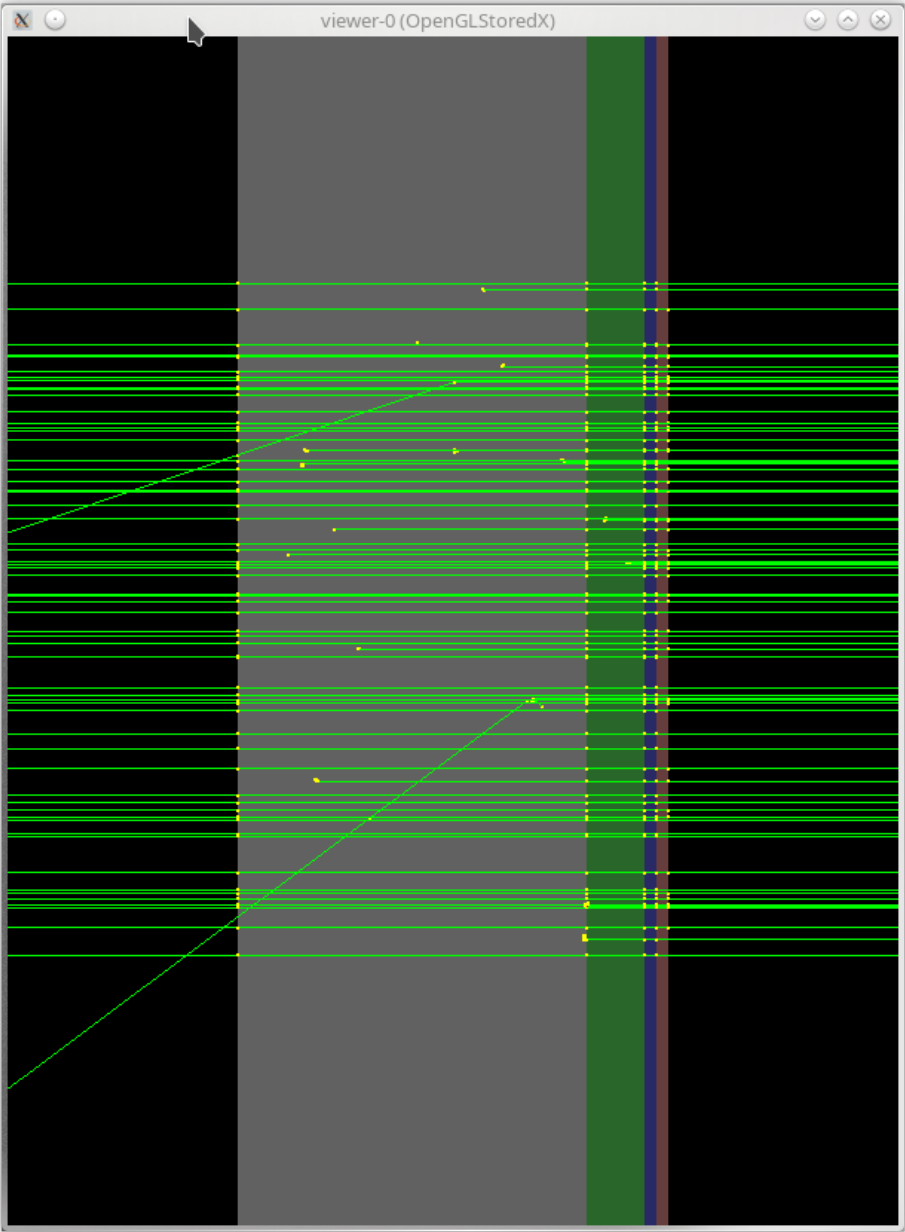


12 keV

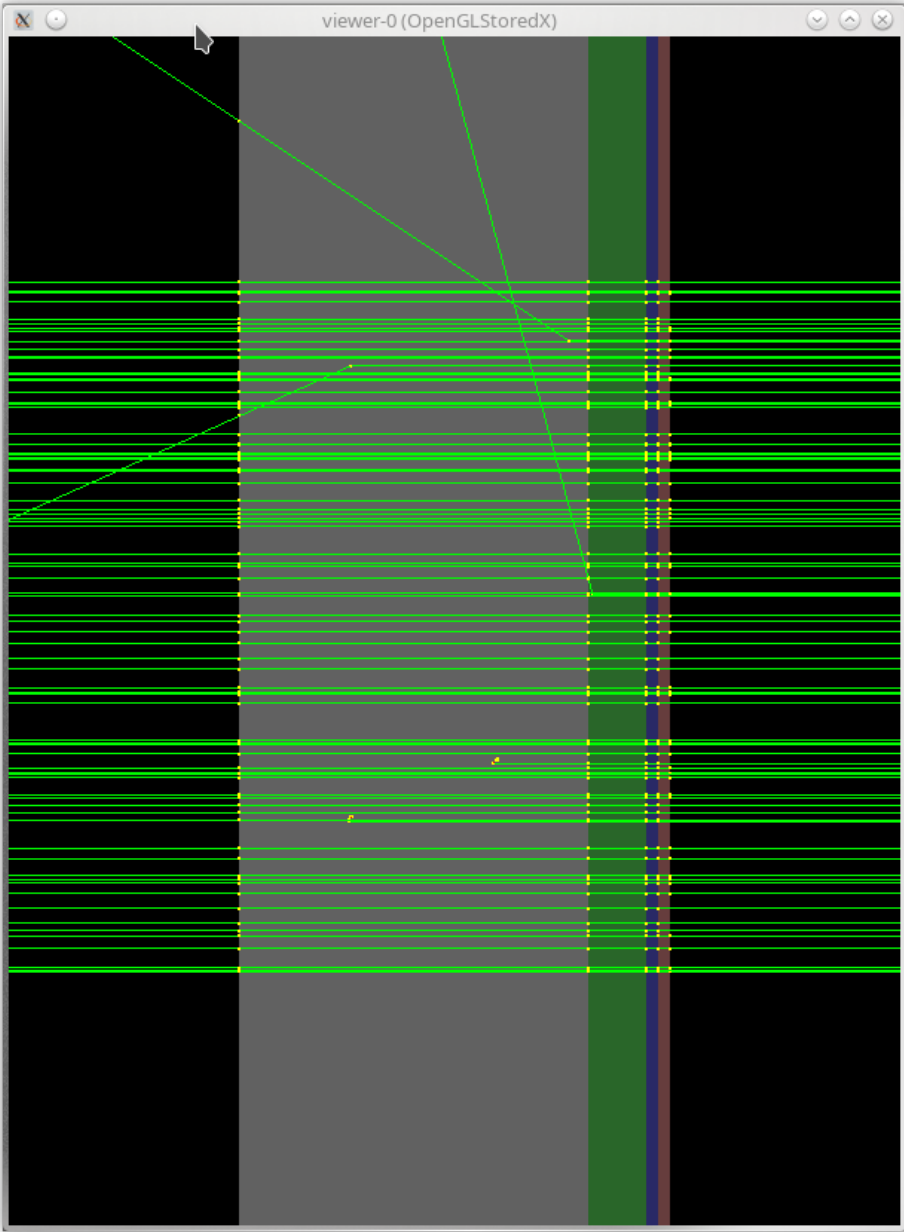


Some results: X-rays

25 keV

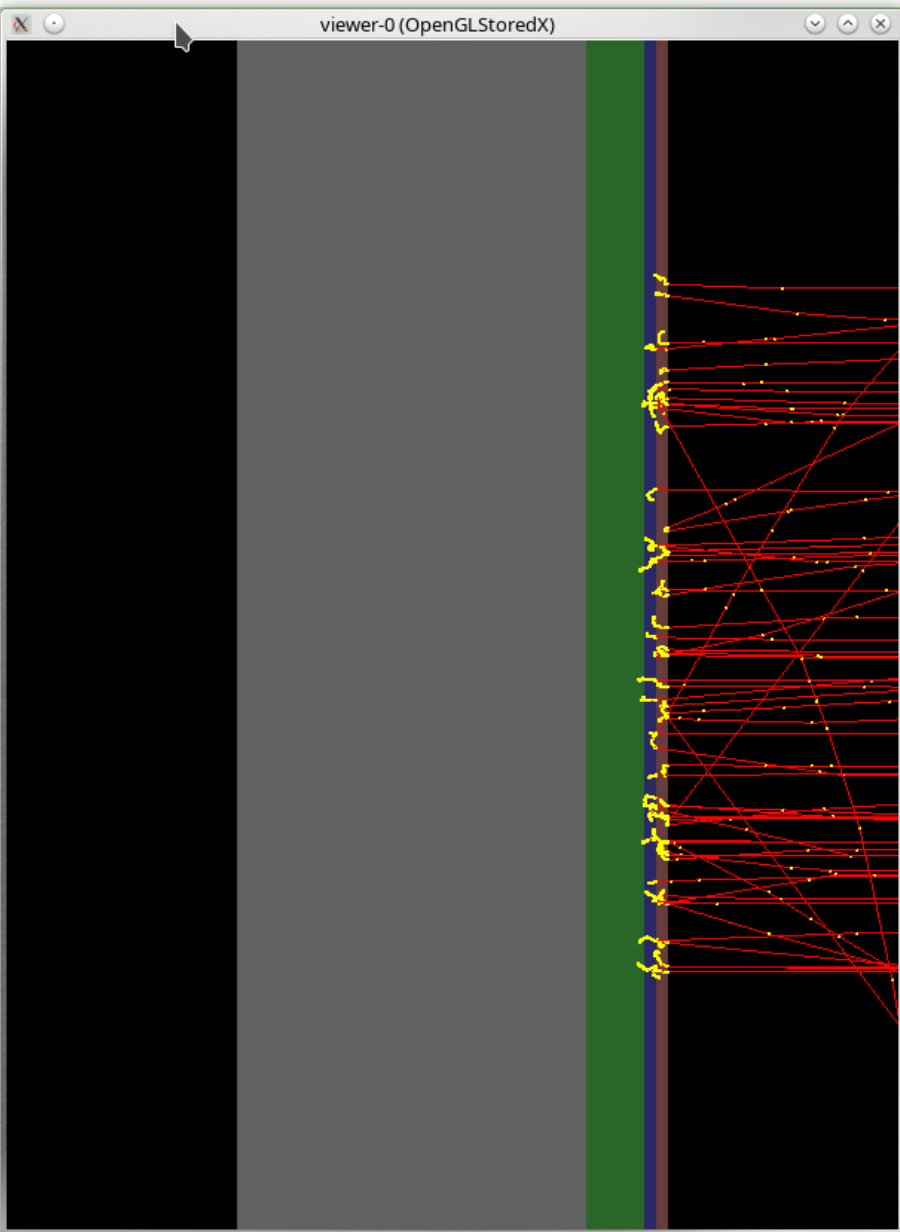


40 keV

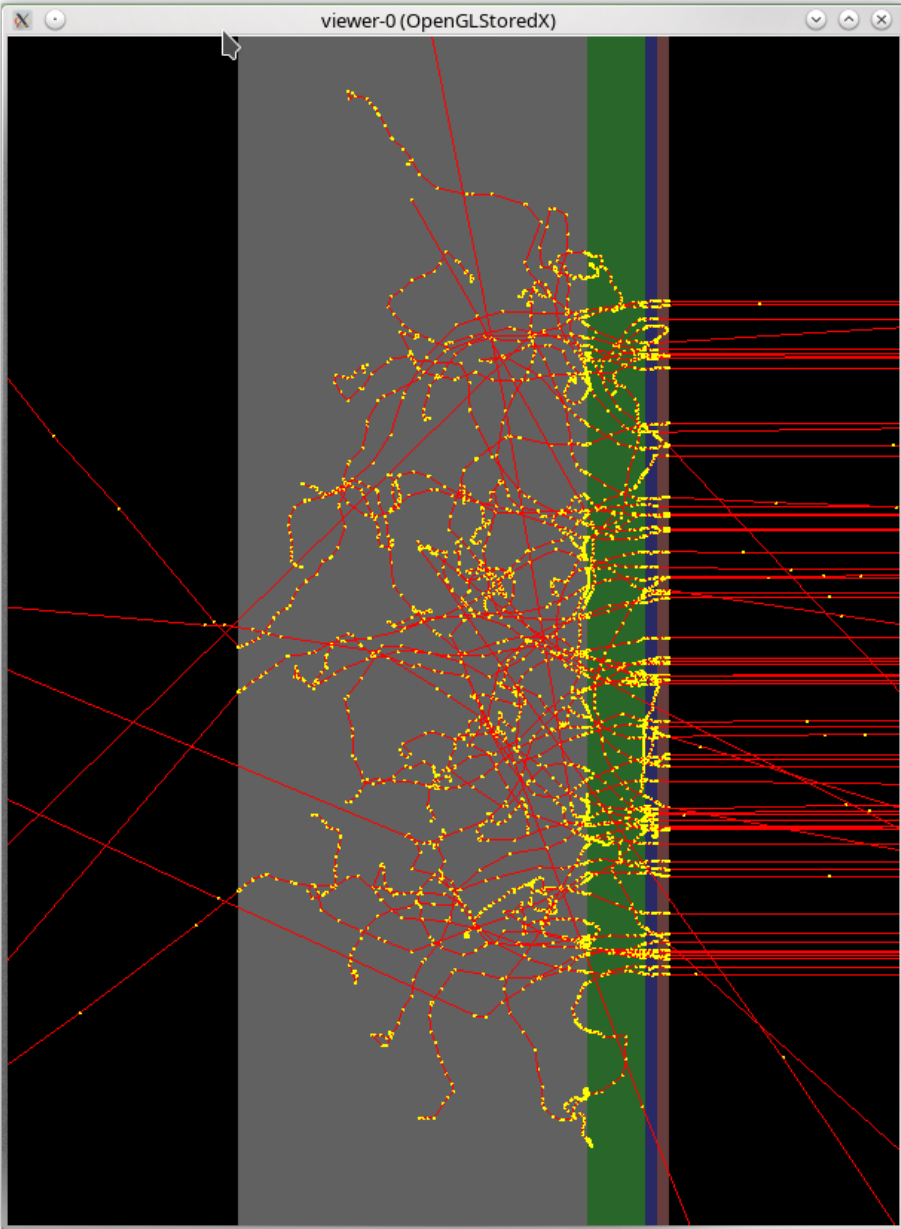


Some results: electrons

50 keV

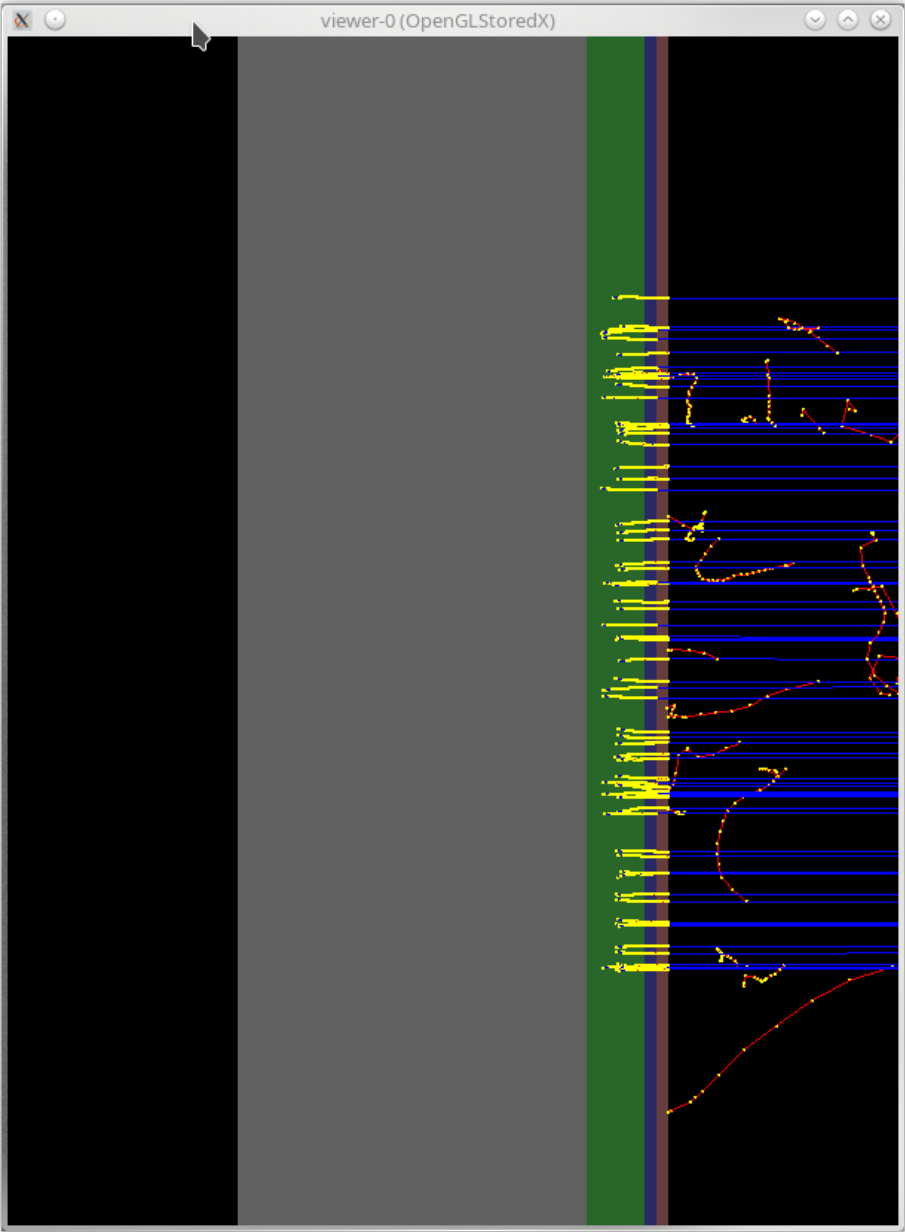


300 keV

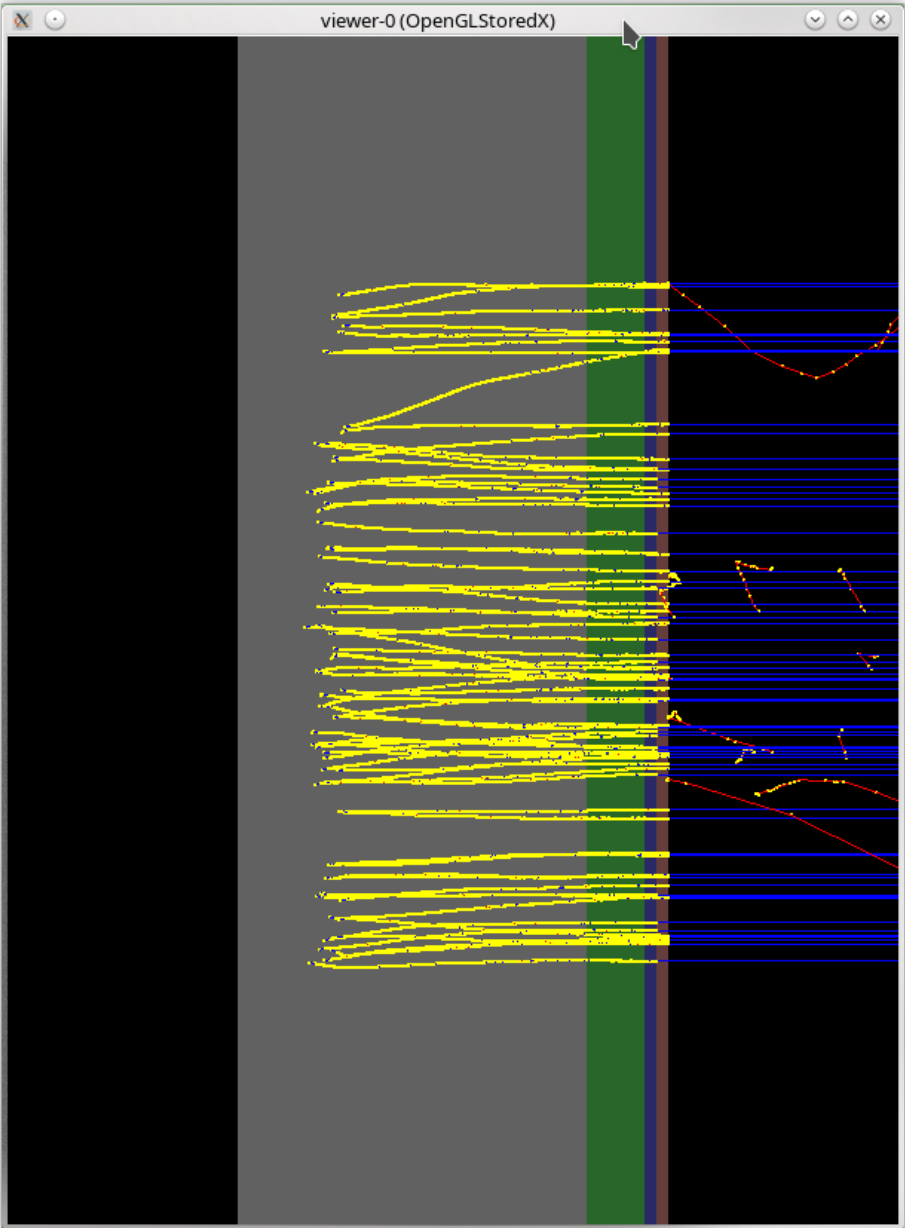


Some results: protons

2 MeV



6 MeV



Particle tracking: X-ray + electron

```
LGAD_02-build : LGAD_02_gdml — Konsole
Arquivo  Editar  Exibir  Favoritos  Configurações  Ajuda

=====  
--> G4TaskRunManager::CreateAndStartWorkers() --> Creating 1 tasks with 1 events/task...  
=====  
  
G4WT0 > ### Run 140 starts on worker thread 0.  
G4WT0 >  
G4WT0 > *****  
*  
G4WT0 > * G4Track Information: Particle = gamma, Track ID = 1, Parent ID = 0  
G4WT0 > *****  
*  
G4WT0 >  
G4WT0 > Step#    X(mm)    Y(mm)    Z(mm) KinE(MeV)  dE(MeV) StepLeng TrackLeng  NextVolume ProcName  
G4WT0 > 0 -0.273  0.119   0.5    0.01    0      0      0      World_PV initStep  
G4WT0 > 1 -0.273  0.119   0.22   0.01    0      0.28   0.28   vstrip_PV Transportation  
G4WT0 > 2 -0.273  0.119   0.21   0.01    0      0.01   0.29   viso_PV Transportation  
G4WT0 > 3 -0.273  0.119   0.2    0.01    0      0.01   0.3    vgain_PV Transportation  
G4WT0 > 4 -0.273  0.119   0.15   0.01    0      0.05   0.35   vbulk_PV Transportation  
G4WT0 > Processing hits ...  
G4WT0 > 5 -0.273  0.119   0.0421 0 0.000152 0.108 0.458 vbulk_PV phot  
G4WT0 > Processing hits ...  
G4WT0 >  
G4WT0 > *****  
*  
G4WT0 > * G4Track Information: Particle = e-, Track ID = 2, Parent ID = 1  
G4WT0 > *****  
*  
G4WT0 >  
G4WT0 > Step#    X(mm)    Y(mm)    Z(mm) KinE(MeV)  dE(MeV) StepLeng TrackLeng  NextVolume ProcName  
G4WT0 > 0 -0.273  0.119   0.0421 0.00985 0      0      0      vbulk_PV initStep  
G4WT0 > 1 -0.273  0.119   0.0422 0.0096 0.00025 0.000128 0.000128 vbulk_PV msc  
G4WT0 > Processing hits ...  
G4WT0 > 2 -0.273  0.118   0.0425 0 0.0096 0.00153 0.00165 vbulk_PV eIoni  
G4WT0 > Processing hits ...  
G4WT0 > [thread 0] Thread-local run terminated.  
G4WT0 > [thread 0] Run Summary  
G4WT0 > [thread 0] Number of events processed : 1  
G4WT0 > [thread 0] User=0.000000s Real=0.000924s Sys=0.010000s [Cpu=1082.6%]  
Run terminated.  
Run Summary  
Number of events processed : 1  
User=0.000000s Real=0.001855s Sys=0.010000s [Cpu=539.0%]  
Idle> █
```

End