Visualisation

New or improved features 2007

Smooth trajectories

Event keeping

Picking in OGLX

Smooth trajectories

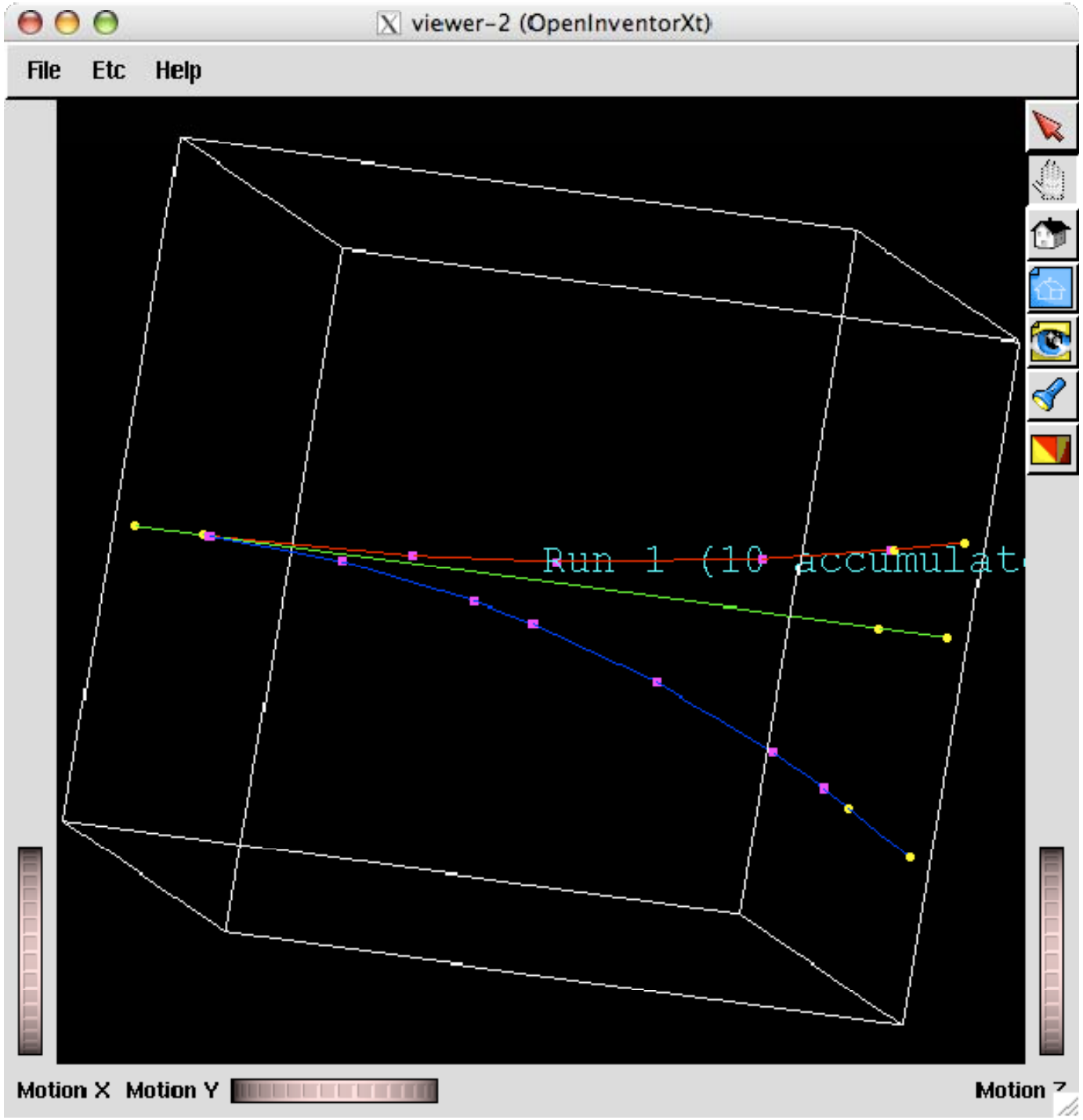
- `/vis/scene/add/trajectories smooth`
- Tracking manager instantiates `G4SmoothTrajectory`
- “Auxiliary” points added during tracking of charged particles through a field

Electron-positron pair

e^-:red
e^+: blue
γ: green

Normal step points: yellow circles

Additional "auxiliary" points: magenta squares

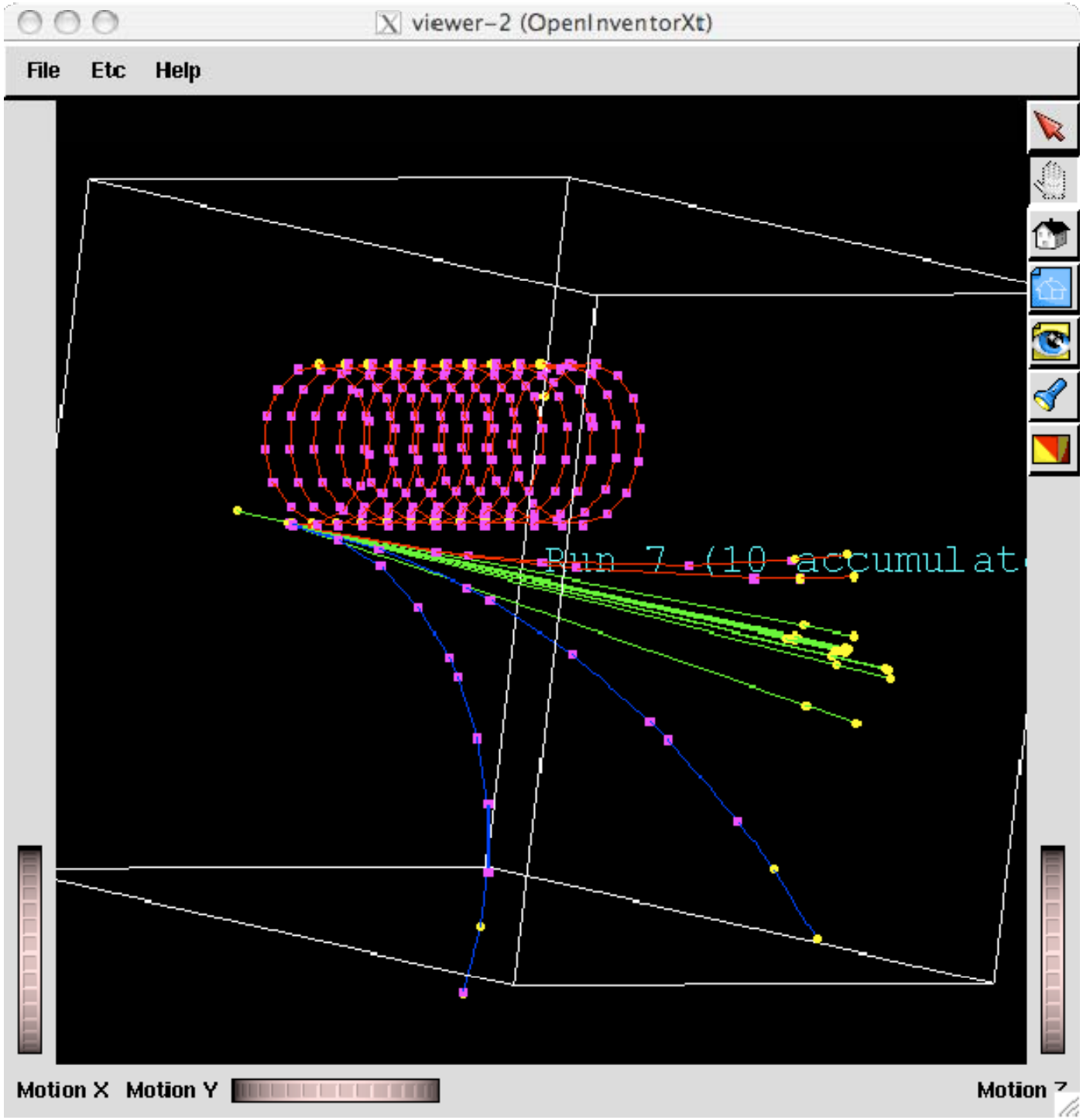


Pairs and a spiraller

e^-:red
e^+: blue
γ: green

Normal step points: yellow circles

Additional "auxiliary" points: magenta squares

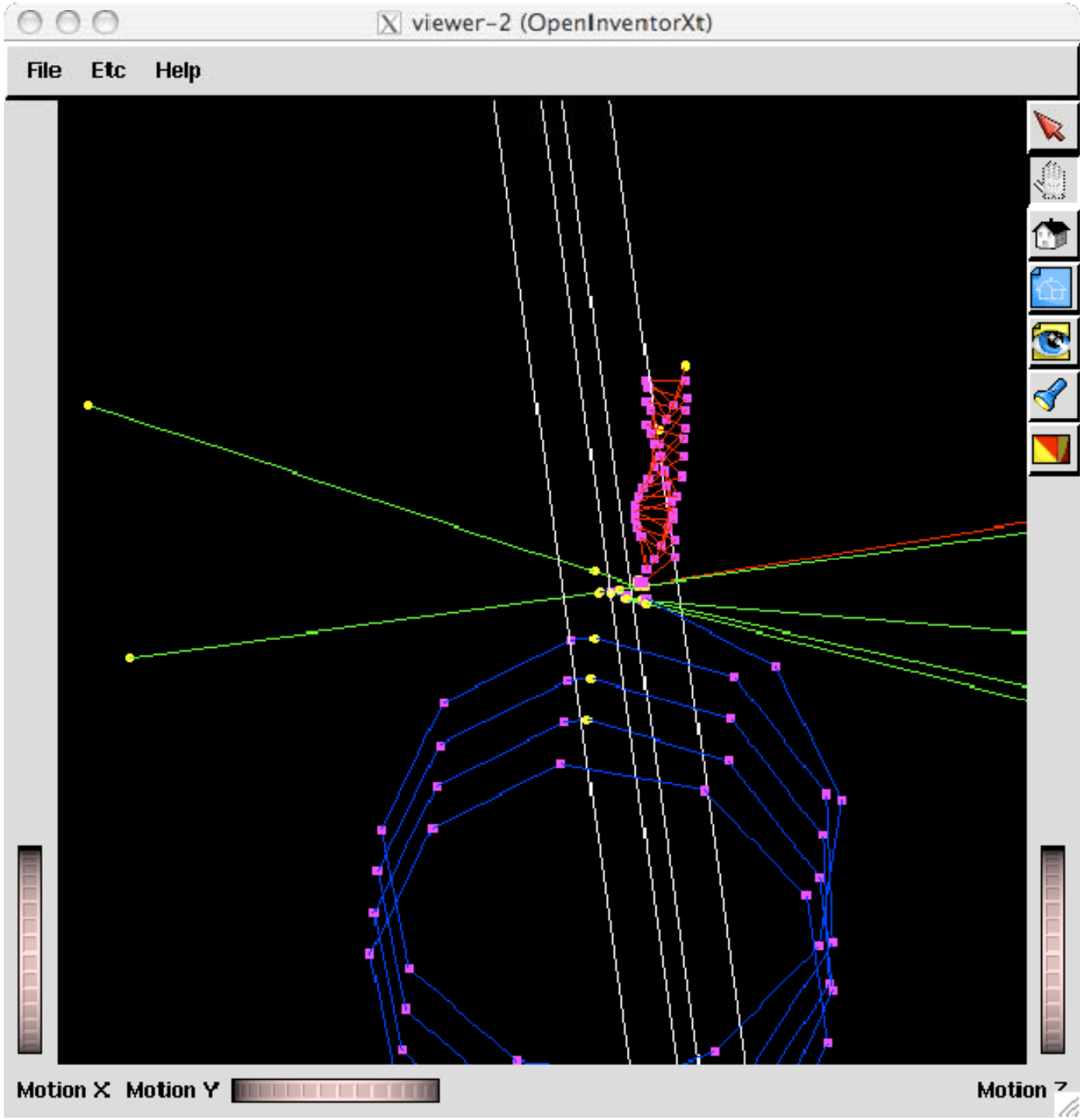


A stuck electron

e^-:red
e^+: blue
γ: green

Normal step points: yellow circles

Additional “auxiliary” points: magenta squares

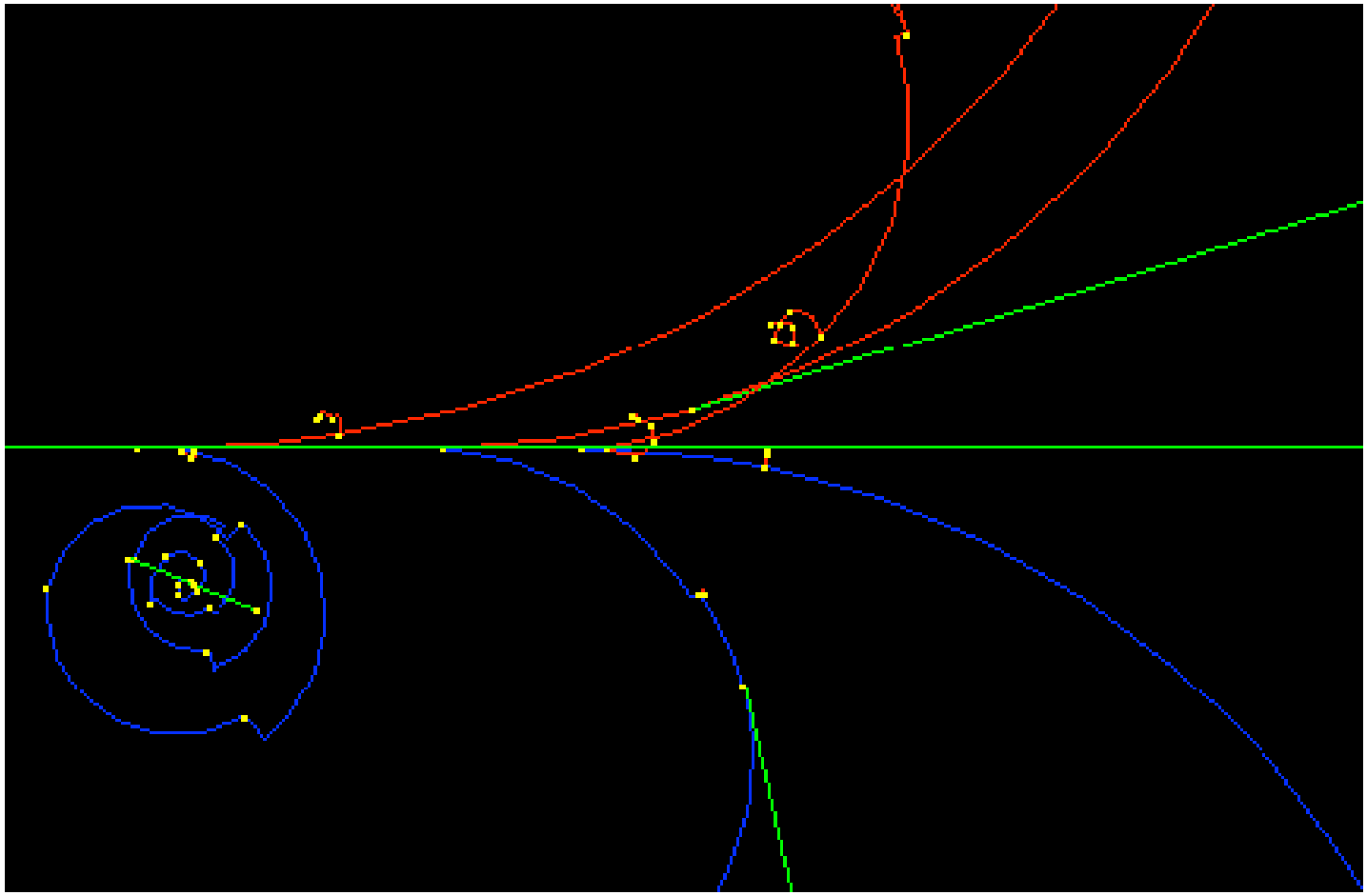


Pair production in liquid hydrogen

100 50 MeV gammas

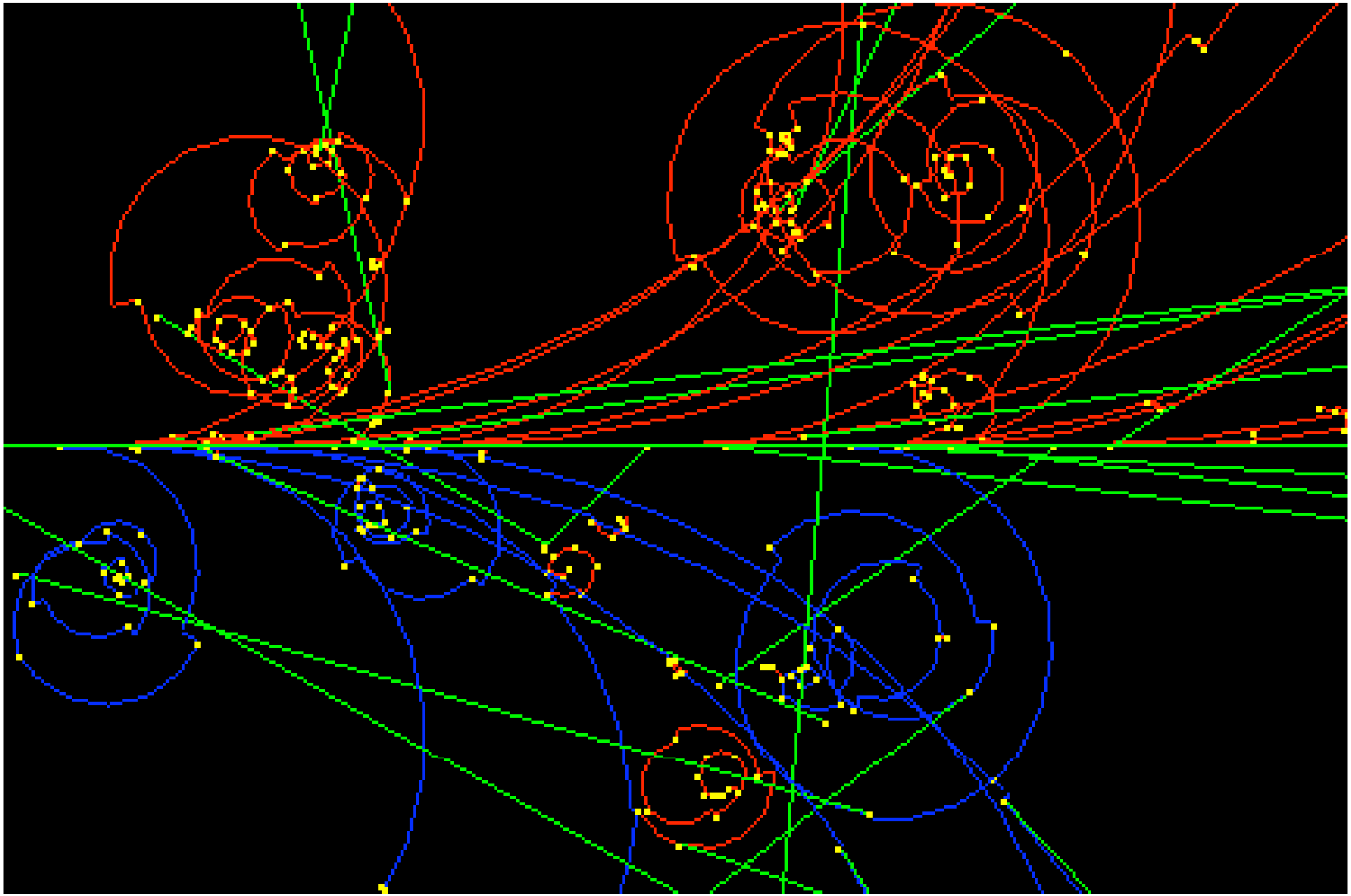
e^-:red
e^+: blue
γ: green

Normal step points: yellow circles



Without smooth trajectories, tracks would be drawn with straight lines connecting step points (yellow circles).

Notice displacement at end of steps - this is the multiple scattering displacement.



10 MeV gammas in liquid hydrogen

Event keeping

Put something like this in EndOfEventAction:

```
if (energyDepositedThisEvent) {
   G4EventManager* em = G4EventManager::GetEventManager();
   em->KeepTheCurrentEvent();
}
```

At end of run, this is printed (`/vis/verbose confirmations`):

```
WARNING: 170 events have been kept for refreshing and/or reviewing.
To see all events: "/vis/scene/endOfEventAction accumulate".
To see events individually: "/vis/reviewKeptEvents".

Idle> /vis/reviewKeptEvents
Drawing event : 0.  At EndOfEvent, enter any command, then
"cont[inue]"...
  Useful commands might be:
    "/vis/viewer/..." to change the view (zoom, set/viewpoint,...).
    "/vis/oglx/printEPS" to get hard copy.
    "/vis/open" to get alternative viewer.
    "/vis/abortReviewKeptEvents", then "cont[inue]", to abort.
```

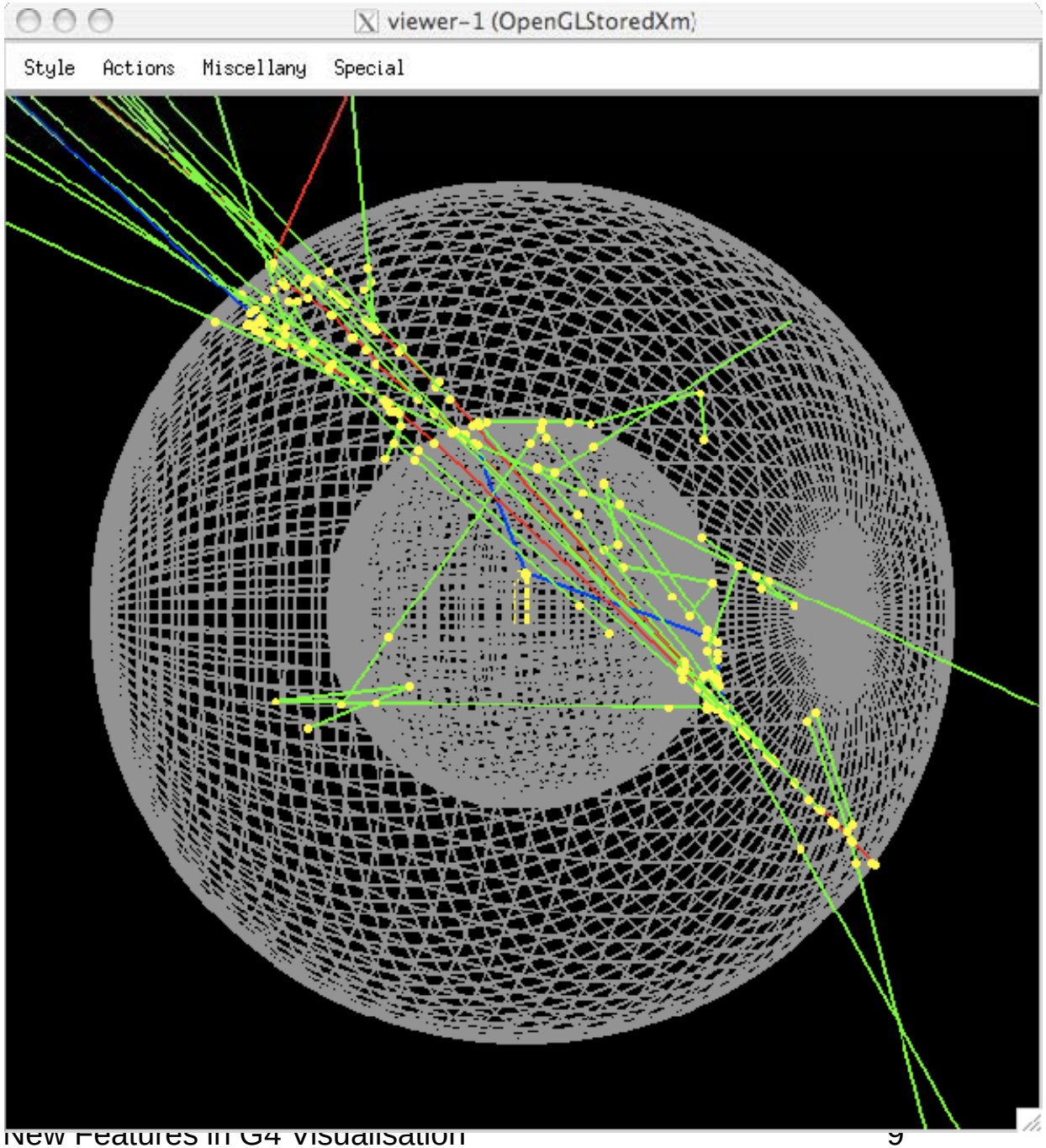
Hollow aluminium sphere

Silicon detector in centre (vertical yellow line)

A 500 MeV electron enters at 5 o'clock, showers

Positron (blue) produced near inner radius, scatters of detector

Event approx. 1 in 10,000 caught by event keeping



Picking in OGLX

- Picking has been available in Open Inventor for some time
- Information now augmented
- Extended to OpenGL X Windows (not Xm nor Win32 at present)

```
/vis/open OGLSX
/vis/viewer/set/picking
/run/beamOn
/vis/viewer/flush
Window activated for picking (left-mouse), exit
(middle-mouse)
```

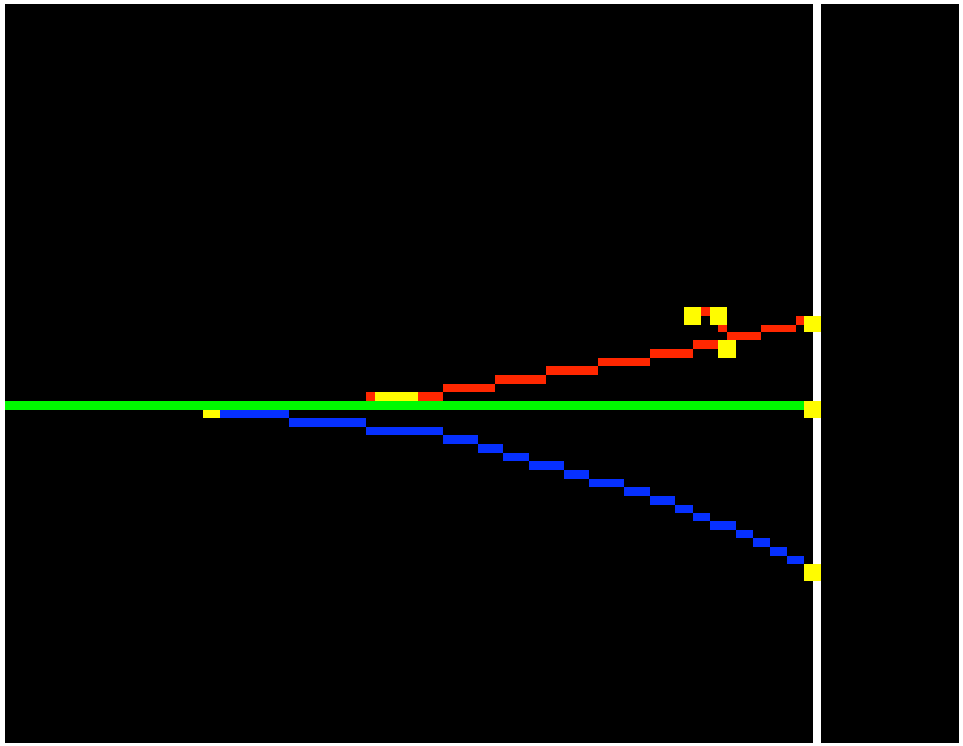
Picking a geometry item

```
G4PhysicalVolumeModel:
Physical Volume Path (PVPath): World:0
Logical Volume (LVol): World
Solid Name (Solid): World
Entity Type (EType): G4Box
Dump of Solid properties (DmpSol):
-------------------------------------------------------------
    *** Dump for solid - World ***
    ================================================
 Solid type: G4Box
 Parameters:
    half length X: 90 mm
    half length Y: 60 mm
    half length Z: 60 mm
-------------------------------------------------------------

Transformation of volume (Trans):
         1         0         0         0
         0         1         0         0
         0         0         1         0
= translation:
         0         0         0
* rotation:
         1         0         0
         0         1         0
         0         0         1
* scale:
         1         1         1
Transformed axes:
x': (1,0,0)
y': (0,1,0)
z': (0,0,1)

Material Name (Material): LiqH
Material Density (Density): 70.8 mg/cm3 (G4BestUnit)
Material State (enum undefined,solid,liquid,gas) (State): 2
Material Radiation Length (Radlen): 8.92265 m   (G4BestUnit)
Cuts Region (Region): DefaultRegionForTheWorld
Root Region (0/1 = false/true) (RootRegion): 1
```

Picking a trajectory



```
G4SmoothTrajectory:
Track ID (ID): 3
Parent ID (PID): 1
Particle Name (PN): e+
Charge (Ch): 1 (e+)
PDG Encoding (PDG): -11
Momentum of track at start of trajectory (IMom): 19.3297 -0.453169 -0.0373853 MeV (G4BestUnit)
Magnitude of momentum of track at start of trajectory (IMag): 19.3351 MeV (G4BestUnit)
No. of points (NTP): 4
G4SmoothTrajectoryPoint:
Step Position (Pos): 6.10648 0 0 cm  (G4BestUnit)
G4SmoothTrajectoryPoint:
Step Position (Pos): 6.10648 0 0 cm  (G4BestUnit)
G4SmoothTrajectoryPoint:
Auxiliary Point Position (Aux): 7.21394 -0.122231 -0.00215702 cm  (G4BestUnit)
Auxiliary Point Position (Aux): 8.30189 -0.440266 -0.00435151 cm  (G4BestUnit)
Auxiliary Point Position (Aux): 8.98888 -0.756201 -0.00581442 cm  (G4BestUnit)
Step Position (Pos): 8.98888 -0.756201 -0.00581442 cm  (G4BestUnit)
G4SmoothTrajectoryPoint:
Step Position (Pos): 9 -0.762237 -0.00590675 cm  (G4BestUnit)
```