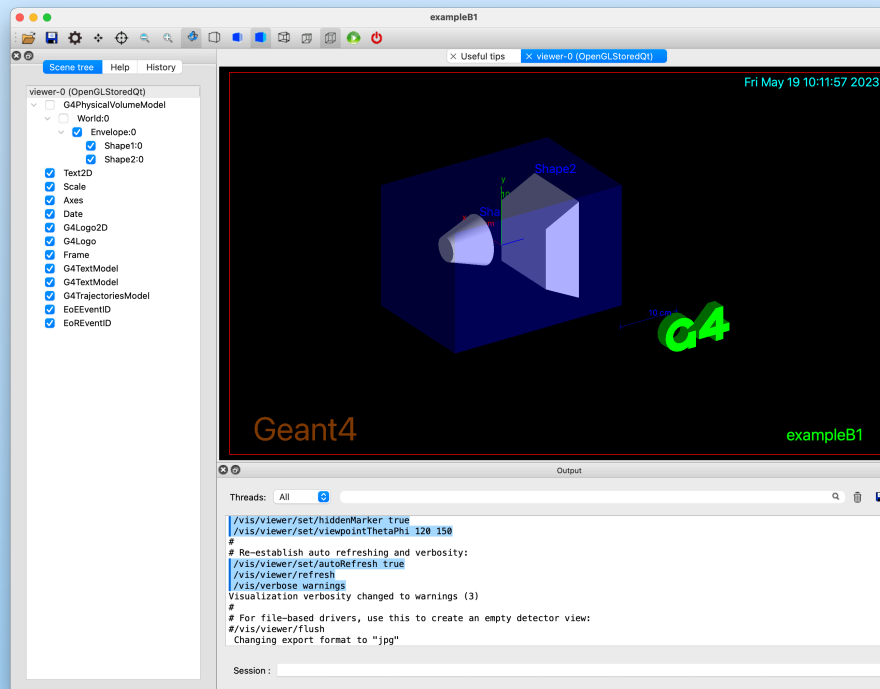


Introduction to Qt driver



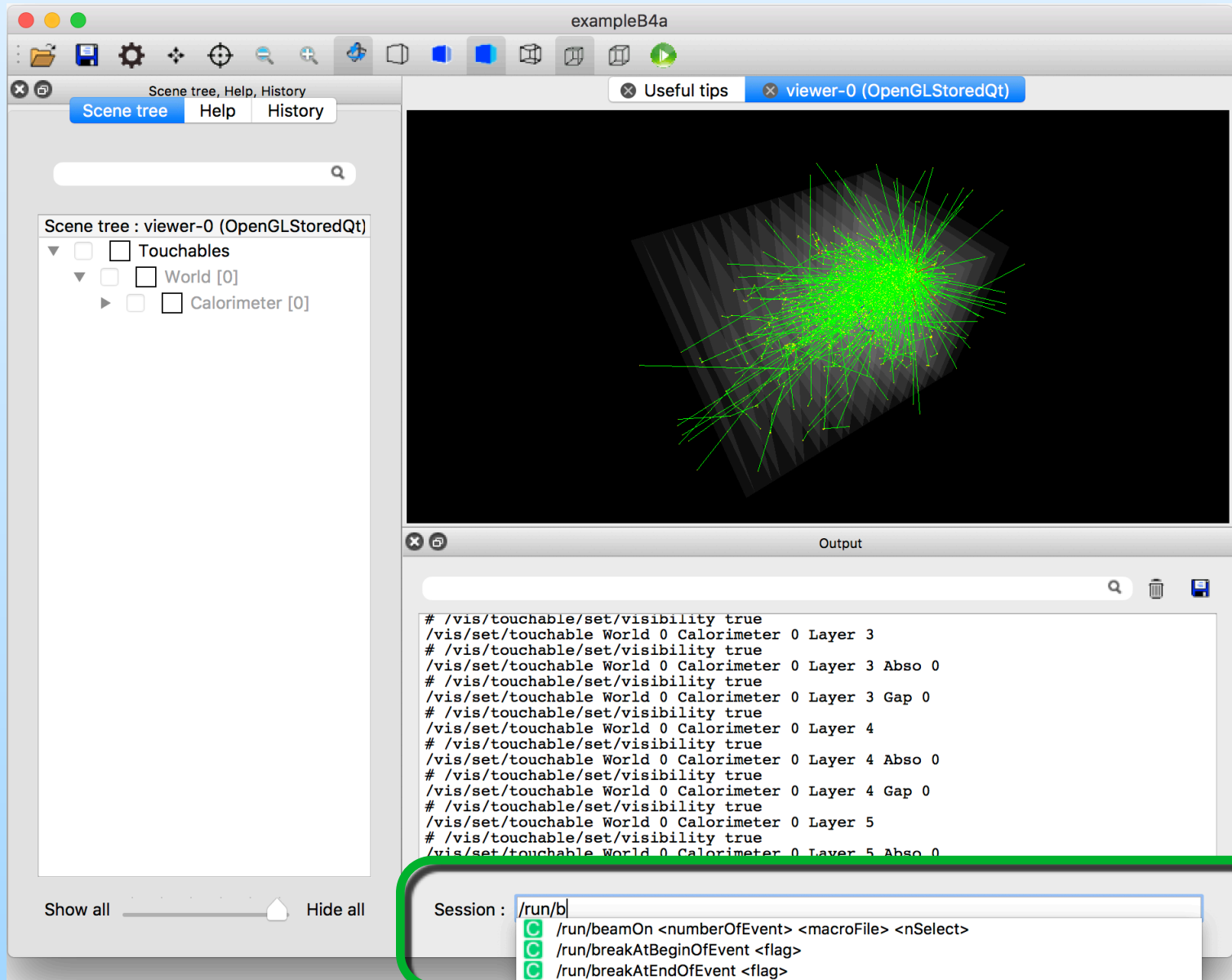
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Slides from Laurent GARNIER
IRISA / INS2I / CNRS



Qt driver - Command line

« Tab » is a useful way to complete a command



The screenshot displays the Qt driver interface for a calorimeter simulation. The main window, titled "exampleB4a", features a toolbar with various navigation and rendering tools. On the left, a "Scene tree" panel shows the hierarchy: Touchables, World [0], and Calorimeter [0]. The central 3D view shows a complex structure of green lines and points, representing the calorimeter's internal structure. Below the 3D view is an "Output" window displaying a list of commands and their parameters, such as visibility settings and layer configurations. At the bottom, a terminal window shows the command prompt "Session : /run/b" and a list of available commands: /run/beamOn, /run/breakAtBeginOfEvent, and /run/breakAtEndOfEvent. A green rounded rectangle highlights the terminal window and its dropdown menu.

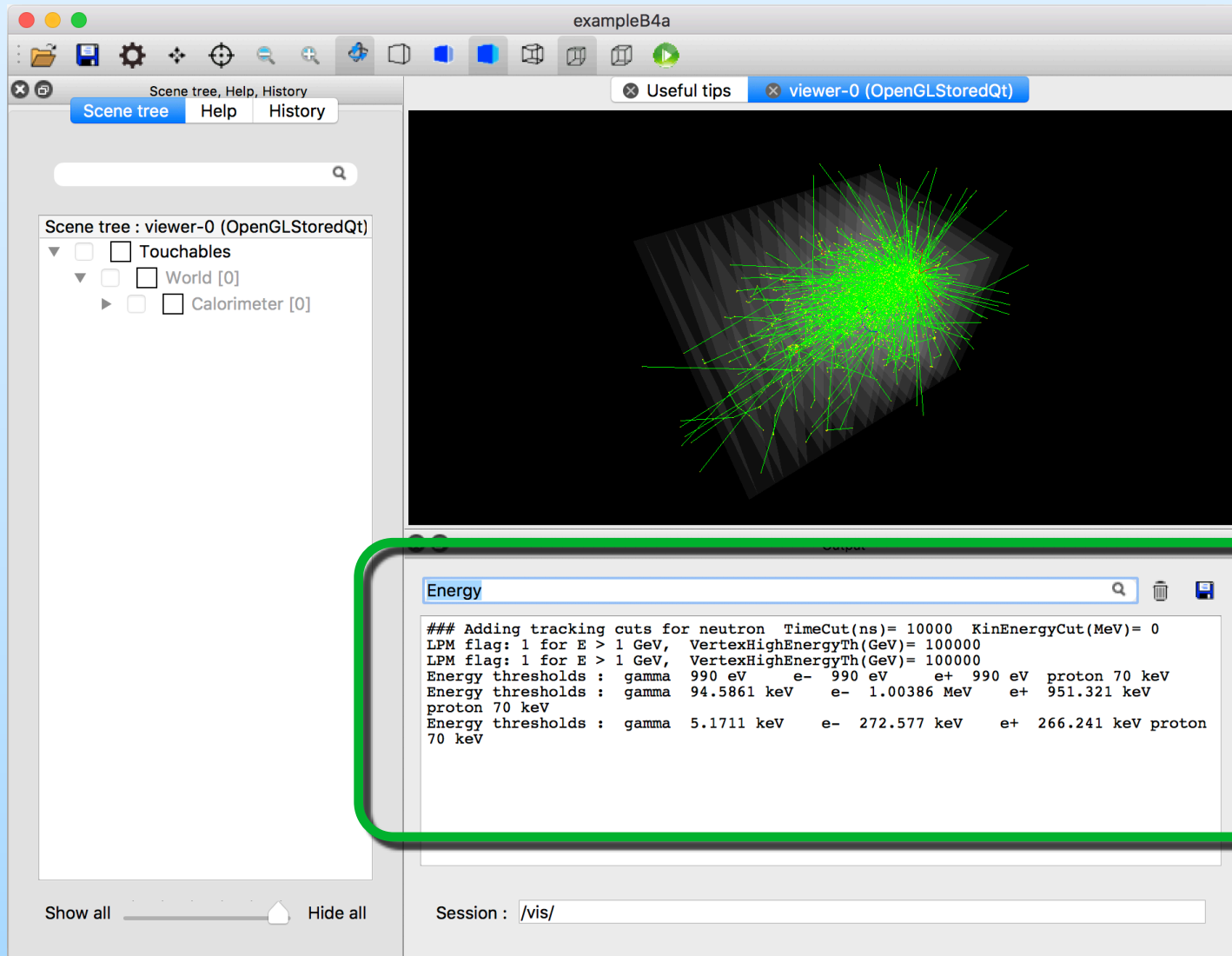
```
# /vis/Touchable/set/visibility true
/vis/set/Touchable World 0 Calorimeter 0 Layer 3
# /vis/Touchable/set/visibility true
/vis/set/Touchable World 0 Calorimeter 0 Layer 3 Abso 0
# /vis/Touchable/set/visibility true
/vis/set/Touchable World 0 Calorimeter 0 Layer 3 Gap 0
# /vis/Touchable/set/visibility true
/vis/set/Touchable World 0 Calorimeter 0 Layer 4
# /vis/Touchable/set/visibility true
/vis/set/Touchable World 0 Calorimeter 0 Layer 4 Abso 0
# /vis/Touchable/set/visibility true
/vis/set/Touchable World 0 Calorimeter 0 Layer 4 Gap 0
# /vis/Touchable/set/visibility true
/vis/set/Touchable World 0 Calorimeter 0 Layer 5
# /vis/Touchable/set/visibility true
/vis/set/Touchable World 0 Calorimeter 0 Layer 5 Abso 0
```

Session : /run/b

- /run/beamOn <numberOfEvent> <macroFile> <nSelect>
- /run/breakAtBeginOfEvent <flag>
- /run/breakAtEndOfEvent <flag>

Qt driver - Output

See all outputs, you can add filter



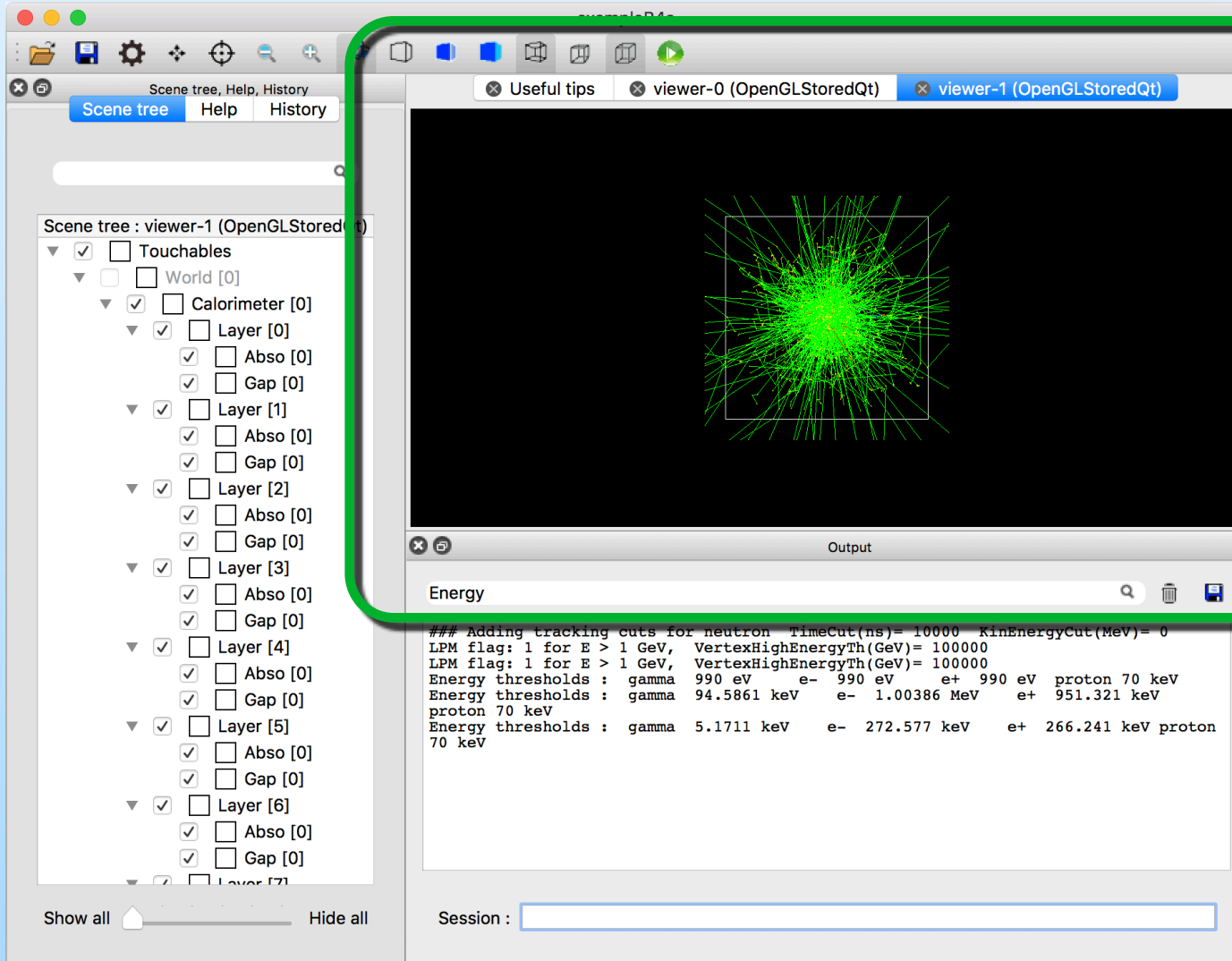
The screenshot displays the Qt driver interface for a simulation. The main window, titled "exampleB4a", features a toolbar with various icons for file operations and navigation. Below the toolbar, there are tabs for "Scene tree, Help, History" and "Useful tips". The "Scene tree" tab is active, showing a hierarchical view of the scene objects: "Touchable", "World [0]", and "Calorimeter [0]". The main visualization area shows a 3D scene with a central cluster of green lines representing particle tracks, set against a dark background with a grid. A console window at the bottom, titled "Energy", is highlighted with a green border and contains the following output:

```
### Adding tracking cuts for neutron TimeCut(ns)= 10000 KinEnergyCut(MeV)= 0
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
Energy thresholds : gamma 990 eV e- 990 eV e+ 990 eV proton 70 keV
Energy thresholds : gamma 94.5861 keV e- 1.00386 MeV e+ 951.321 keV
proton 70 keV
Energy thresholds : gamma 5.1711 keV e- 272.577 keV e+ 266.241 keV proton
70 keV
```

At the bottom of the interface, there is a "Session" field with the value "/vis/".

Qt driver - Visualization

Visualization window, one tab by viewer



Qt driver - Toolbar

Toolbar is controlled by default icons. You can add your own icons by providing a macro file

The screenshot displays the Qt driver interface. At the top, a toolbar is highlighted with a green oval, containing various icons for file operations, settings, navigation, and visualization. Below the toolbar, the interface is divided into several panels:

- Scene tree:** A hierarchical tree view showing the structure of the scene. It includes a search bar and a list of objects with checkboxes for visibility. The tree structure is as follows:
 - Touchables (checked)
 - World [0] (unchecked)
 - Calorimeter [0] (checked)
 - Layer [0] (checked)
 - Abso [0] (checked)
 - Gap [0] (checked)
 - Layer [1] (checked)
 - Abso [0] (checked)
 - Gap [0] (checked)
 - Layer [2] (checked)
 - Abso [0] (checked)
 - Gap [0] (checked)
 - Layer [3] (checked)
 - Abso [0] (checked)
 - Gap [0] (checked)
 - Layer [4] (checked)
 - Abso [0] (checked)
 - Gap [0] (checked)
 - Layer [5] (checked)
 - Abso [0] (checked)
 - Gap [0] (checked)
 - Layer [6] (checked)
 - Abso [0] (checked)
 - Gap [0] (checked)
 - Layer [7] (checked)

- 3D Visualization:** A central window showing a 3D visualization of a particle detector. It features a dense cluster of green lines radiating from a central point, representing particle tracks or energy deposits within a detector geometry.
- Output:** A window displaying the output of the simulation. It includes a search bar and a list of energy thresholds for different particles. The output text is:

```
### Adding tracking cuts for neutron TimeCut(ns)= 10000 KinEnergyCut(MeV)= 0
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
Energy thresholds : gamma 990 eV e- 990 eV e+ 990 eV proton 70 keV
Energy thresholds : gamma 94.5861 keV e- 1.00386 MeV e+ 951.321 keV
proton 70 keV
Energy thresholds : gamma 5.1711 keV e- 272.577 keV e+ 266.241 keV proton
70 keV
```
- Session:** A text input field at the bottom of the output window for entering the session name.

Qt driver - Help

Help tree browser, you can search for a word inside command help

Search : export

| Command | Match |
|--------------------------|-------|
| vis/viewer/interpolate | |
| vis/ogl/set/exportFormat | |
| vis/ogl/export | |

Guidance : Interpolate views defined by the first argument, which can contain Unix-shell-style pattern matching characters such as '*', '?' and '[' - see "man sh" and look for "Pattern Matching". The contents of each file are assumed to be "/vis/viewer" commands that specify a particular view. The files are processed in alphanumeric order of filename. The files may be written by hand or produced by the "/vis/viewer/save" command. The default is to search the working directory for files with a .q4view extension. Another

| | Parameter | Guidance | Type | Ommitable | D |
|---|--------------|--------------------------------------|------|-----------|------|
| 1 | pattern | Pattern that defines the view files. | s | True | *.q4 |
| 2 | no-of-points | Number of interpol... | i | True | 50 |
| 3 | wait-time | Wait time per interpol... | s | True | 20. |
| 4 | time-unit | | s | True | mill |
| 5 | export | | s | True | no |

Energy

```
### Adding tracking cuts for neutron TimeCut(ns)= 10000 KinEnergyCut(MeV)= 0
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
Energy thresholds : gamma 990 eV e- 990 eV e+ 990 eV proton 70 keV
Energy thresholds : gamma 94.5861 keV e- 1.00386 MeV e+ 951.321 keV
proton 70 keV
Energy thresholds : gamma 5.1711 keV e- 272.577 keV e+ 266.241 keV proton
70 keV
```

Session :

Qt driver - History

History : Double clic on a item to send it to Command line session

The screenshot displays the Qt driver interface for 'exampleB4a'. The interface includes a toolbar at the top with various icons for file operations and viewing. Below the toolbar, there are tabs for 'Useful tips', 'viewer-0 (OpenGLStoredQt)', and 'viewer-1 (OpenGLStoredQt)'. The main area is divided into three sections:

- History Panel (left):** A panel with tabs for 'Scene tree', 'Help', and 'History'. The 'History' tab is active, showing a list of commands: `/run/beamOn 100` and `/vis/open OGL`. This panel is highlighted with a green rounded rectangle.
- Viewer (center):** A 3D visualization window showing a complex, starburst-like structure of green lines and points, representing particle tracks or a detector response.
- Output Window (bottom):** A text area displaying the output of the simulation. The text includes configuration parameters and energy thresholds for different particles.

The Output window content is as follows:

```
Energy
### Adding tracking cuts for neutron TimeCut(ns)= 10000 KinEnergyCut(MeV)= 0
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
Energy thresholds : gamma 990 eV e- 990 eV e+ 990 eV proton 70 keV
Energy thresholds : gamma 94.5861 keV e- 1.00386 MeV e+ 951.321 keV
proton 70 keV
Energy thresholds : gamma 5.1711 keV e- 272.577 keV e+ 266.241 keV proton
70 keV
```

At the bottom of the interface, there is a 'Session:' label followed by an empty input field.

Qt driver - Volume tree

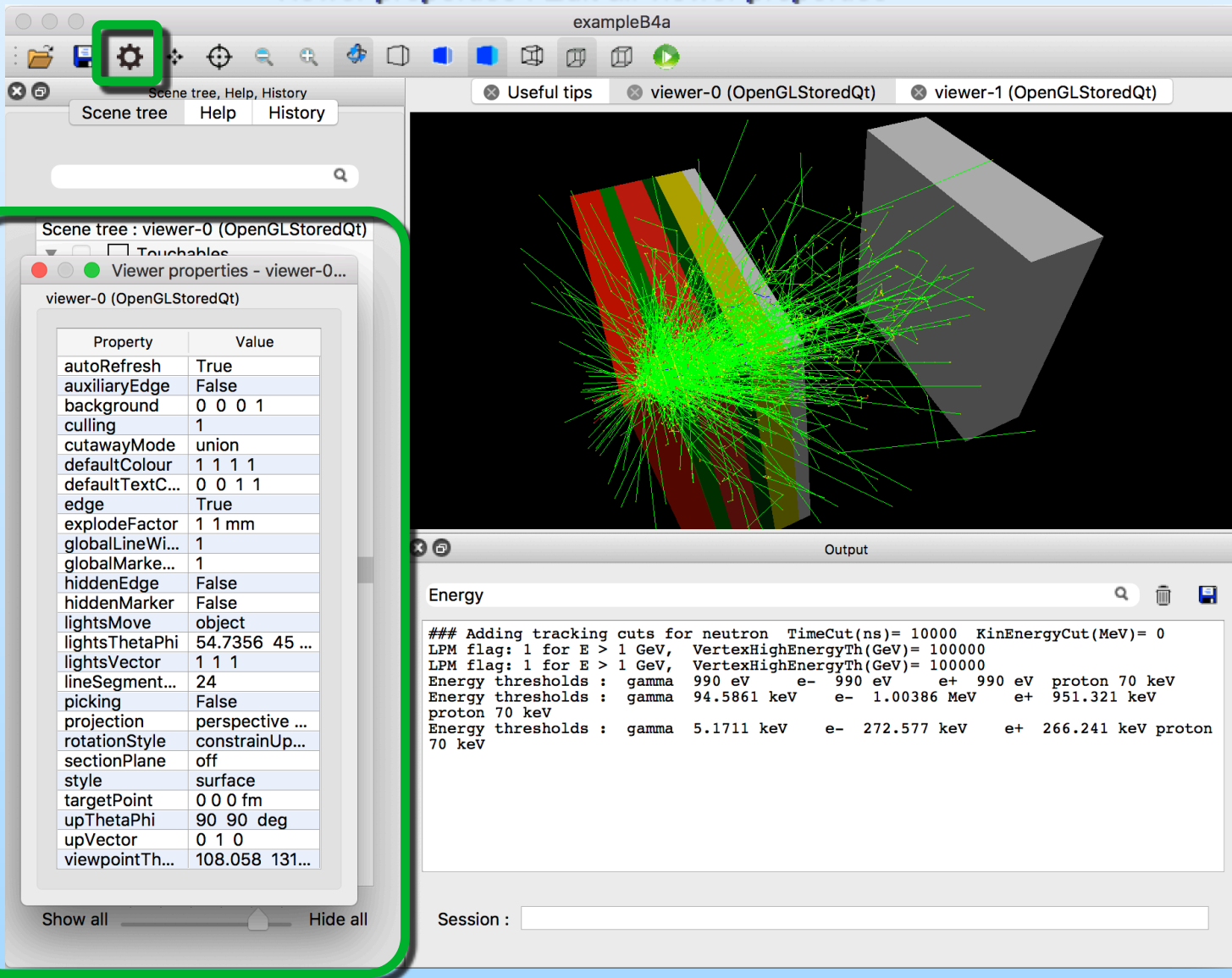
Scene tree : you can set visible/unvisible, change color or transparency on volumes

The screenshot displays the Qt driver interface for a simulation. On the left, the 'Scene tree' panel is visible, showing a hierarchical structure of volumes. The tree includes 'Touchable', 'World [0]', 'Calorimeter [0]', and seven 'Layer' objects (Layer [0] to Layer [7]). Each layer contains 'Abso [0]' and 'Gap [0]' sub-volumes. The 'Abso [0]' sub-volumes are checked and colored (red, green, yellow, etc.), while the 'Gap [0]' sub-volumes are unchecked. A tooltip 'double-click to change the color' is shown over the 'Calorimeter [0]' node. The main 3D viewer shows a grey cube and a central point source emitting a dense cloud of green particle tracks. Below the viewer is an 'Output' window displaying simulation parameters and energy thresholds for various particles.

```
### Adding tracking cuts for neutron TimeCut(ns)= 10000 KinEnergyCut(MeV)= 0
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
Energy thresholds : gamma 990 eV e- 990 eV e+ 990 eV proton 70 keV
proton 70 keV
Energy thresholds : gamma 94.5861 keV e- 1.00386 MeV e+ 951.321 keV
proton 70 keV
Energy thresholds : gamma 5.1711 keV e- 272.577 keV e+ 266.241 keV proton
70 keV
```


Qt driver - Volume tree

Viewer properties : Edit all viewer properties



exampleB4a

Scene tree, Help, History

Useful tips viewer-0 (OpenGLStoredQt) viewer-1 (OpenGLStoredQt)

Scene tree Help History

Scene tree : viewer-0 (OpenGLStoredQt)

Viewer properties - viewer-0...

| Property | Value |
|-----------------|-----------------|
| autoRefresh | True |
| auxiliaryEdge | False |
| background | 0 0 0 1 |
| culling | 1 |
| cutawayMode | union |
| defaultColour | 1 1 1 1 |
| defaultTextC... | 0 0 1 1 |
| edge | True |
| explodeFactor | 1 1 mm |
| globalLineWi... | 1 |
| globalMarke... | 1 |
| hiddenEdge | False |
| hiddenMarker | False |
| lightsMove | object |
| lightsThetaPhi | 54.7356 45 ... |
| lightsVector | 1 1 1 |
| lineSegmen... | 24 |
| picking | False |
| projection | perspective ... |
| rotationStyle | constrainUp... |
| sectionPlane | off |
| style | surface |
| targetPoint | 0 0 0 fm |
| upThetaPhi | 90 90 deg |
| upVector | 0 1 0 |
| viewpointTh... | 108.058 131... |

Show all Hide all

Output

Energy

```
### Adding tracking cuts for neutron TimeCut(ns)= 10000 KinEnergyCut(MeV)= 0
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
Energy thresholds : gamma 990 eV e- 990 eV e+ 990 eV proton 70 keV
Energy thresholds : gamma 94.5861 keV e- 1.00386 MeV e+ 951.321 keV
proton 70 keV
Energy thresholds : gamma 5.1711 keV e- 272.577 keV e+ 266.241 keV proton
70 keV
```

Session :

Qt driver - Volume tree

Picking widget: Pick a scene object and see all its properties

The screenshot displays the Qt driver interface for a 3D visualization. The main window, titled "exampleB4a", contains a 3D scene with a grey cube and green particle tracks. A green box highlights the "Pick" button in the toolbar. A "Scene tree" panel on the left shows a hierarchy of objects, with "Trajectory: Run: 0, Event: 34" selected. A detailed "Scene tree : viewer-0 (OpenGLStoredQt)" window is open, showing the following properties:

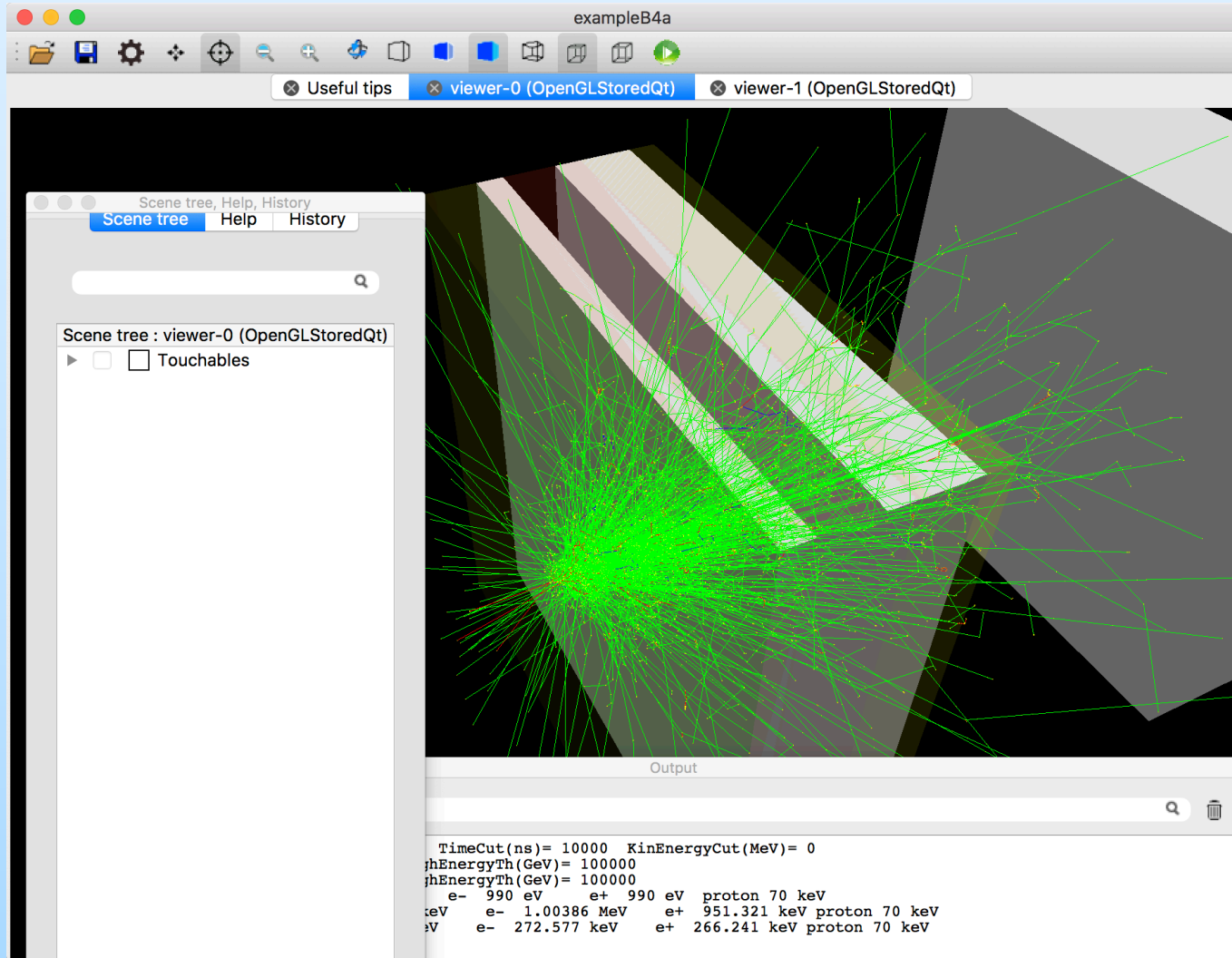
```
G4TrajectoriesModel:  
Run ID (RunID): 0  
Event ID (EventID): 34  
G4SmoothTrajectory:  
Track ID (ID): 28  
Parent ID (PID): 8  
Particle Name (PN): gamma  
Charge (Ch): 0 (e+)  
PDG Encoding (PDG): 22  
Initial kinetic energy (IKE): 1.97004 MeV (G4BestUnit)  
Initial momentum (IMom): 0.220729 1.08047 1.63245 MeV (G4BestUnit)  
Initial momentum magnitude (IMag): 1.97004 MeV (G4BestUnit)  
No. of points (NTP): 12  
G4SmoothTrajectoryPoint:  
Step Position (Pos): 0.360103 -1.62146 -1.33489 cm (G4BestUnit)  
G4SmoothTrajectoryPoint:
```

An "Output" window at the bottom right shows the following text:

```
TimeCut(ns)= 10000 KinEnergyCut(MeV)= 0  
hEnergyTh(GeV)= 100000  
hEnergyTh(GeV)= 100000  
eV - 990 eV e+ 990 eV proton 70 keV  
eV - 1.00386 MeV e+ 951.321 keV  
V e- 272.577 keV e+ 266.241 keV proton
```

Qt driver - Volume tree

Dockable widgets



References

Geant4 Visualization home page

[http://geant4-userdoc.web.cern.ch/geant4-userdoc/
UsersGuides/ForApplicationDeveloper/html/Visualization/
visualization.html](http://geant4-userdoc.web.cern.ch/geant4-userdoc/UsersGuides/ForApplicationDeveloper/html/Visualization/visualization.html)

Geant4 Qt Home Page

<http://geant4.in2p3.fr/spip.php?rubrique25&lang=en>