

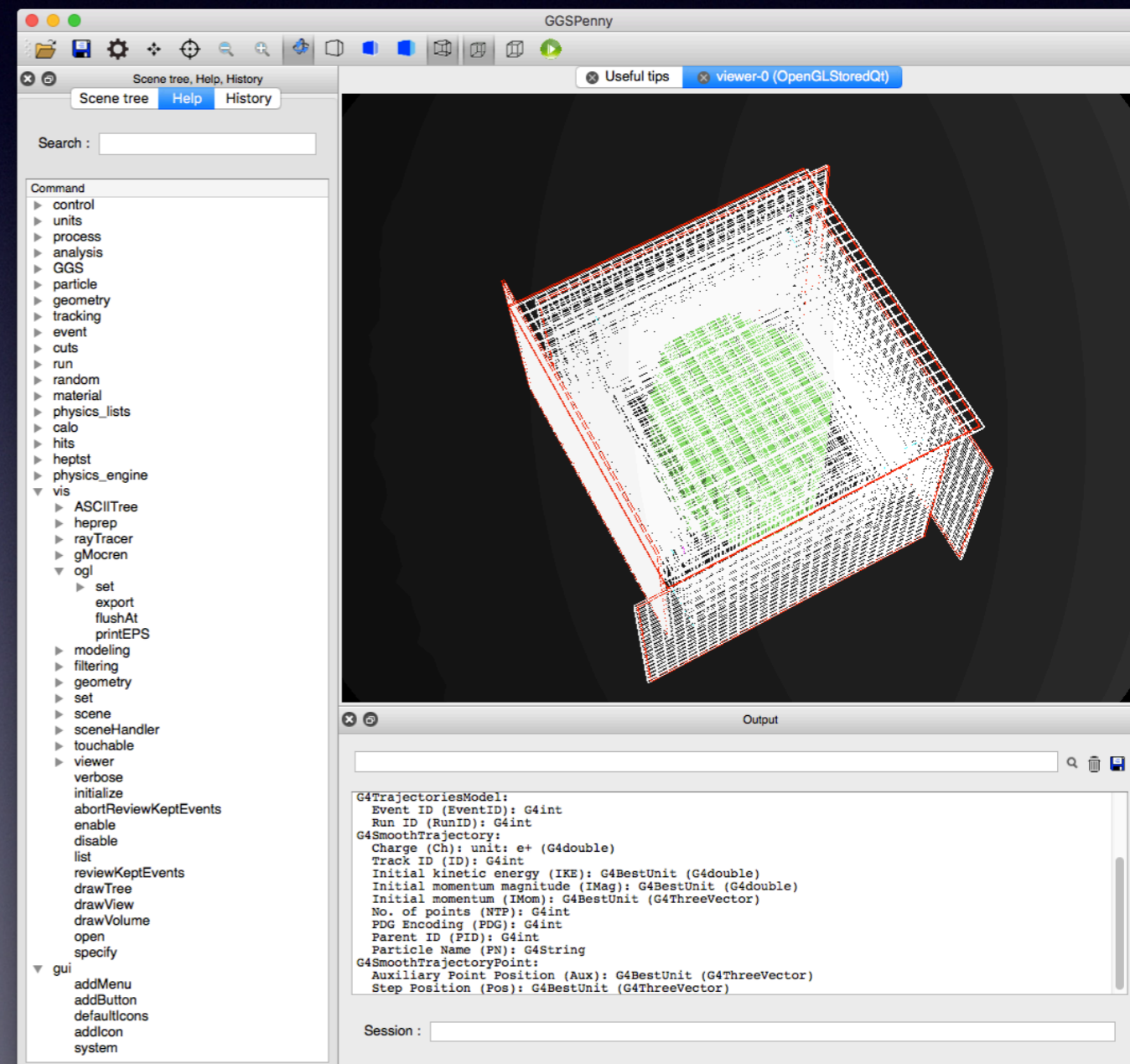
HERDward

A prototype for a HERD event display

V. Formato - I.N.F.N. Sezione di Perugia
XX/10/2017 - CERN - 5th HERD Workshop

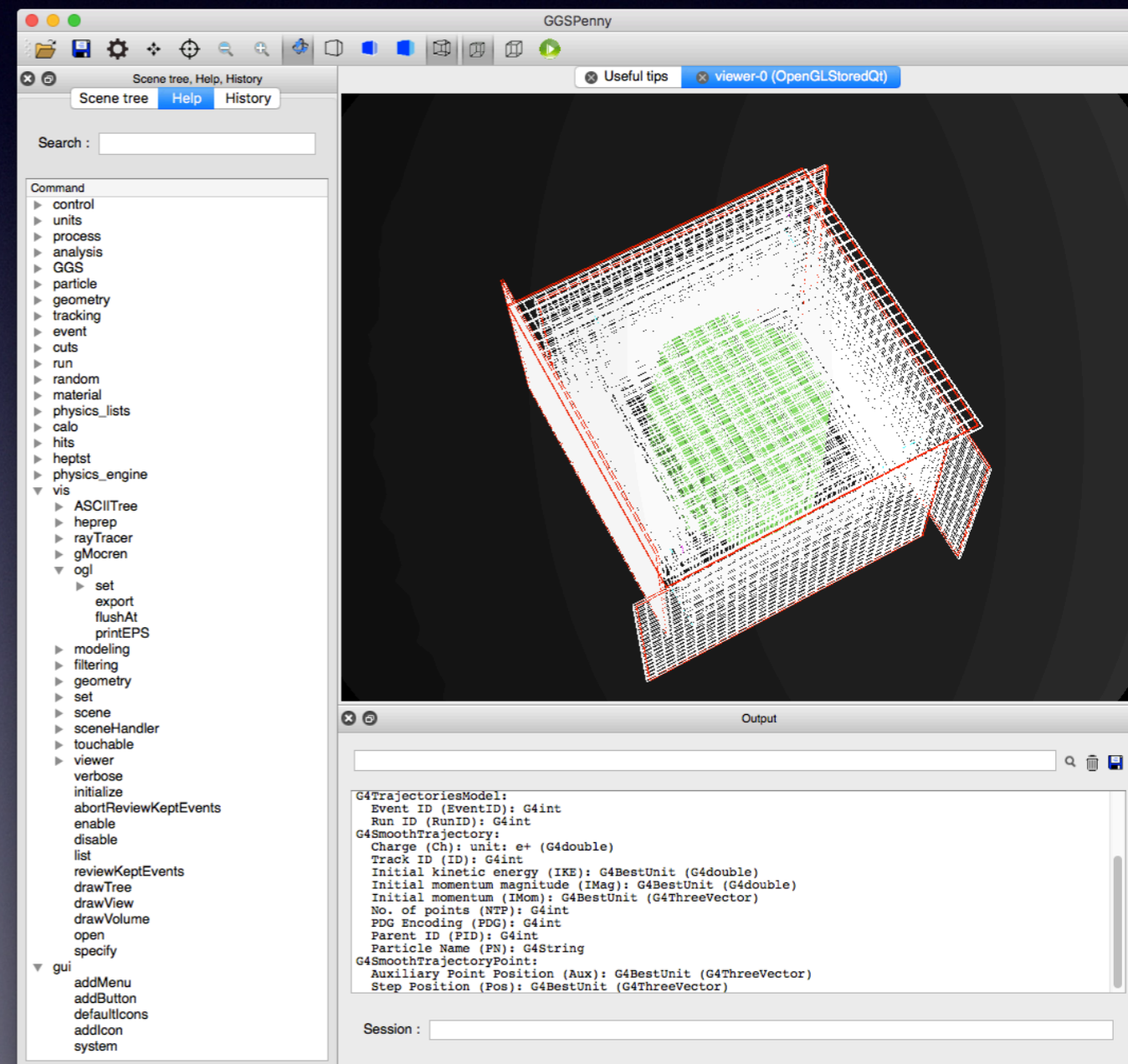
What we have so far....

- Working simulation code
- Two geometry models
- Everything based on the GGS framework (see N. Mori's talk)
- Detector geometry in “proprietary” format (*dll plugin*)
- Some basic visualisation options, based on G4 interface

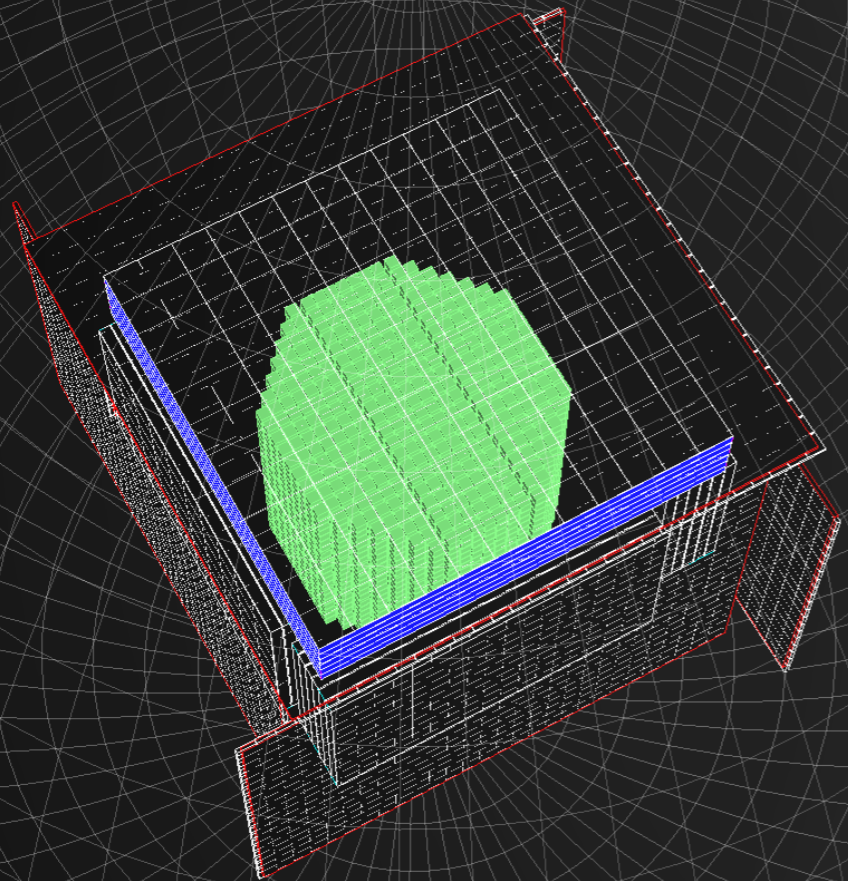


Pros and cons

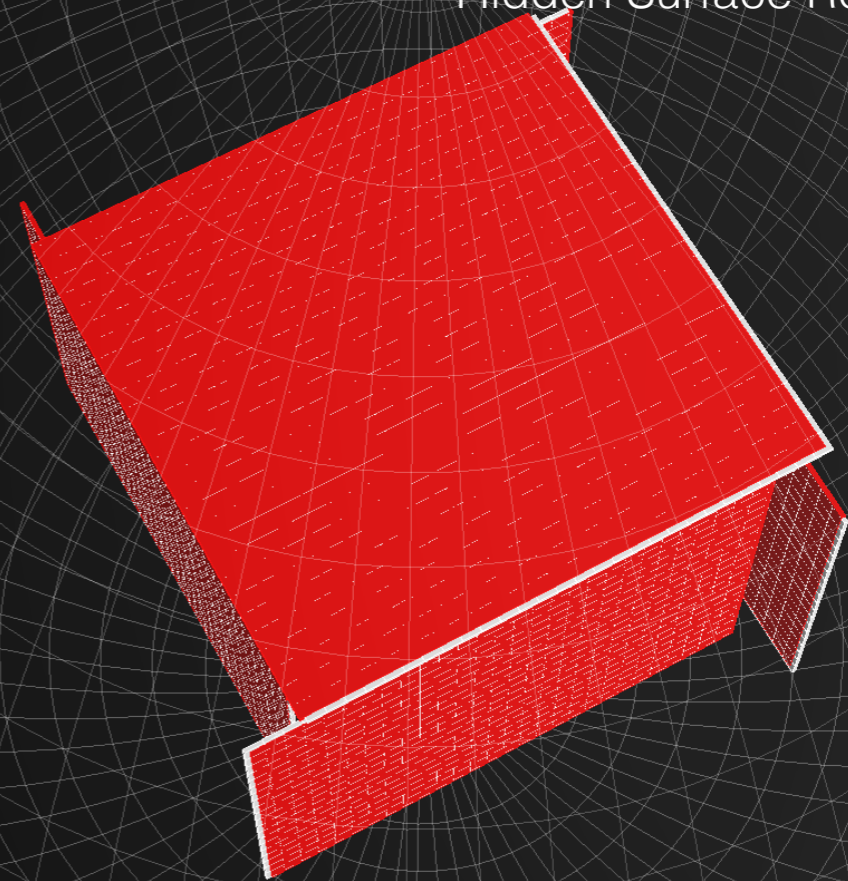
- Useful for quick inspection of the geometry (spotting positioning bugs and so on...)
- You can just run one event and see what happens (although... see next slides)
- You get the full display of simulated particles, but no display of energy deposition in sensitive volumes
- Visualisation can get a bit cluttered.
- 4 visualisation options, some of them quite heavy on the system.



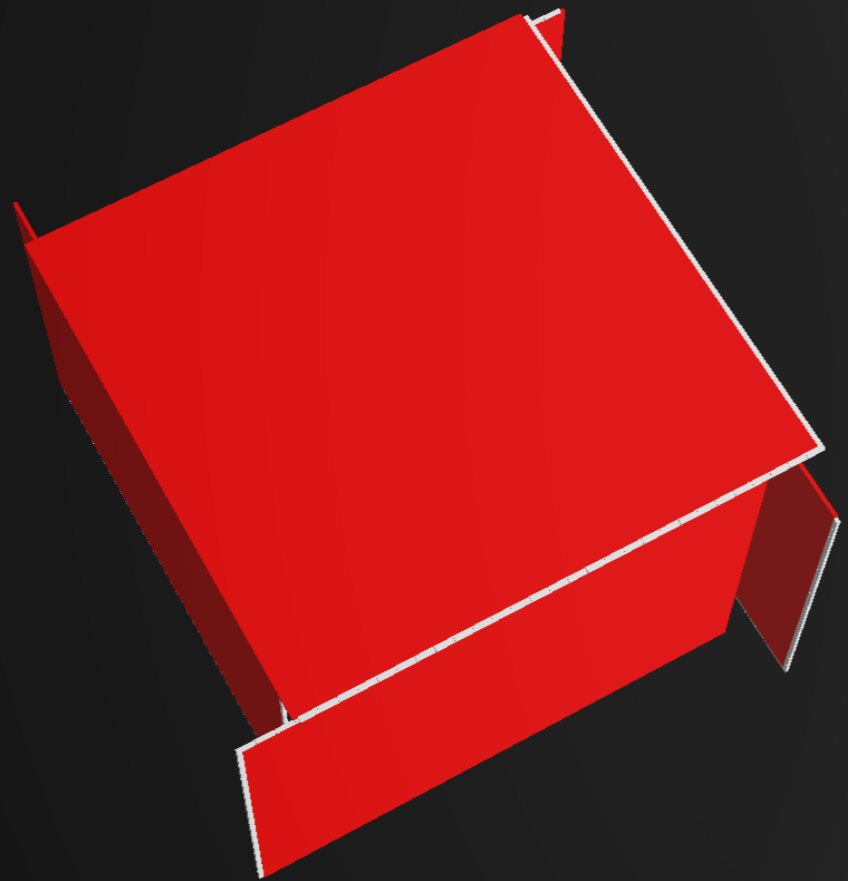
Hidden Line Removal



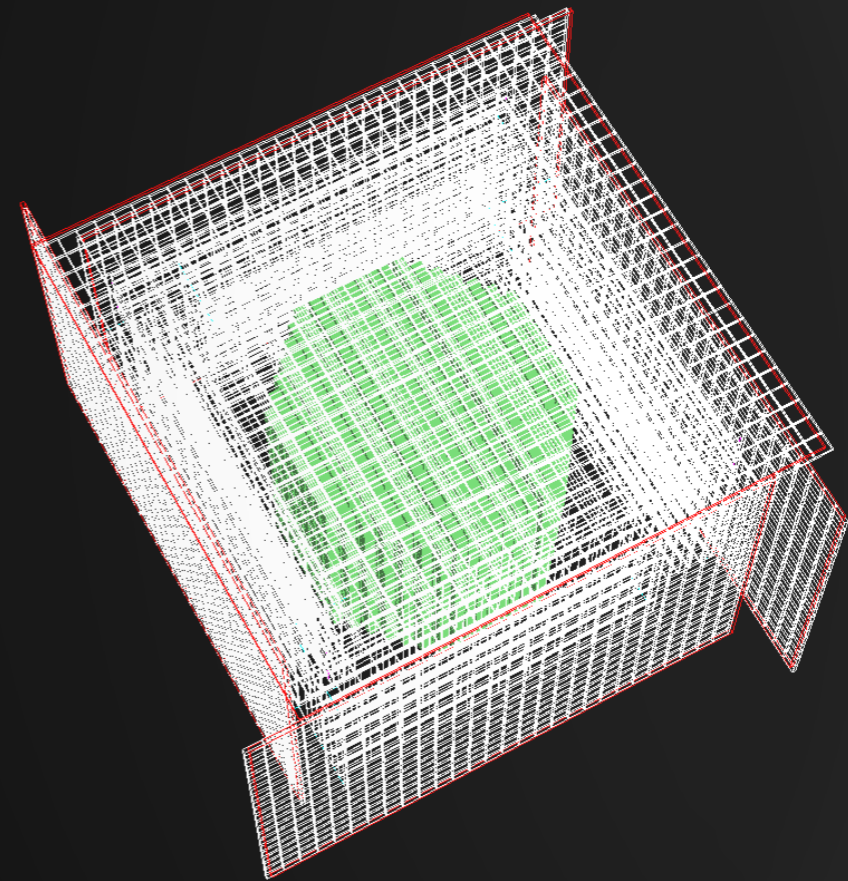
Hidden Line and Hidden Surface Removal



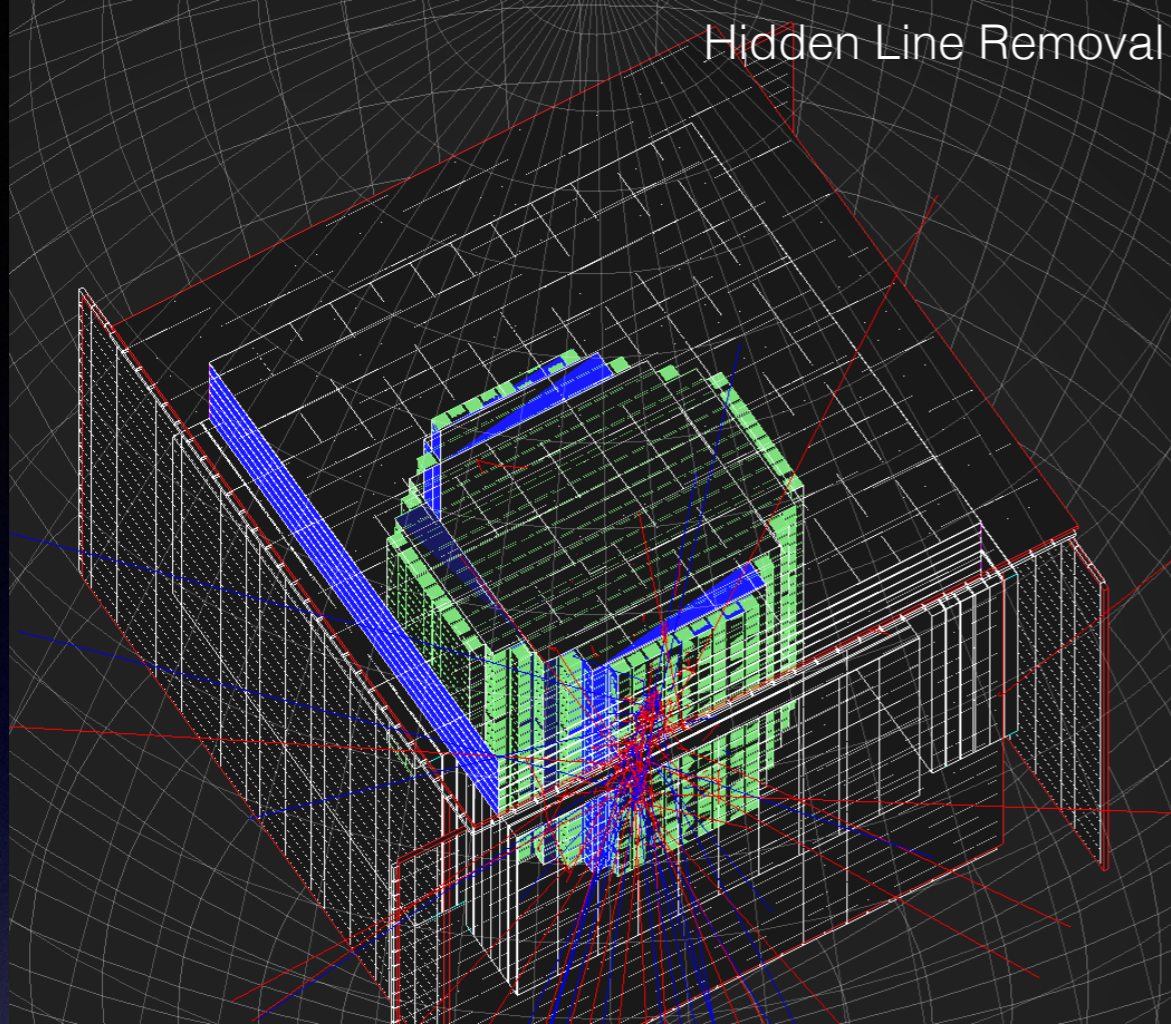
Surfaces



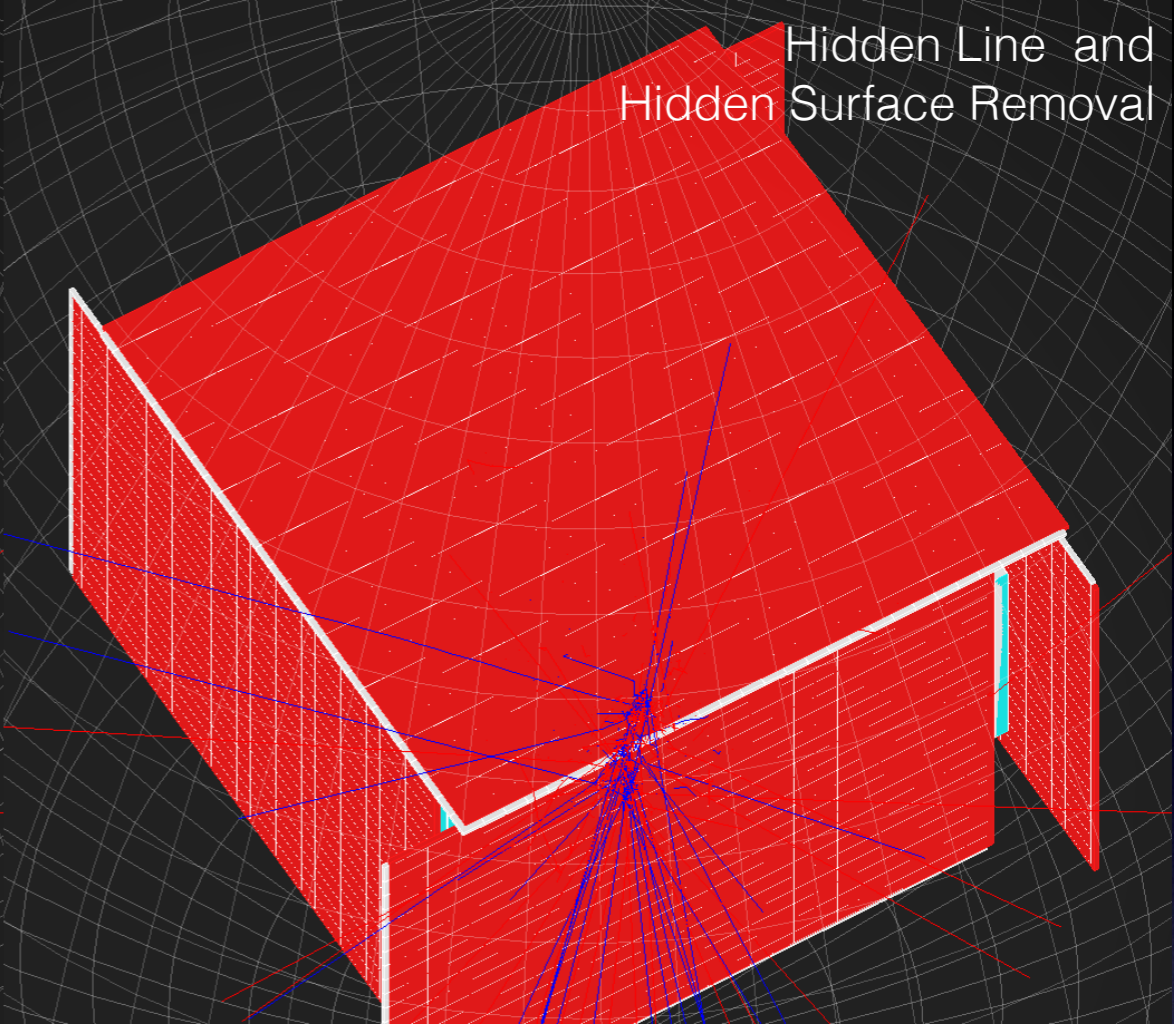
Wireframe



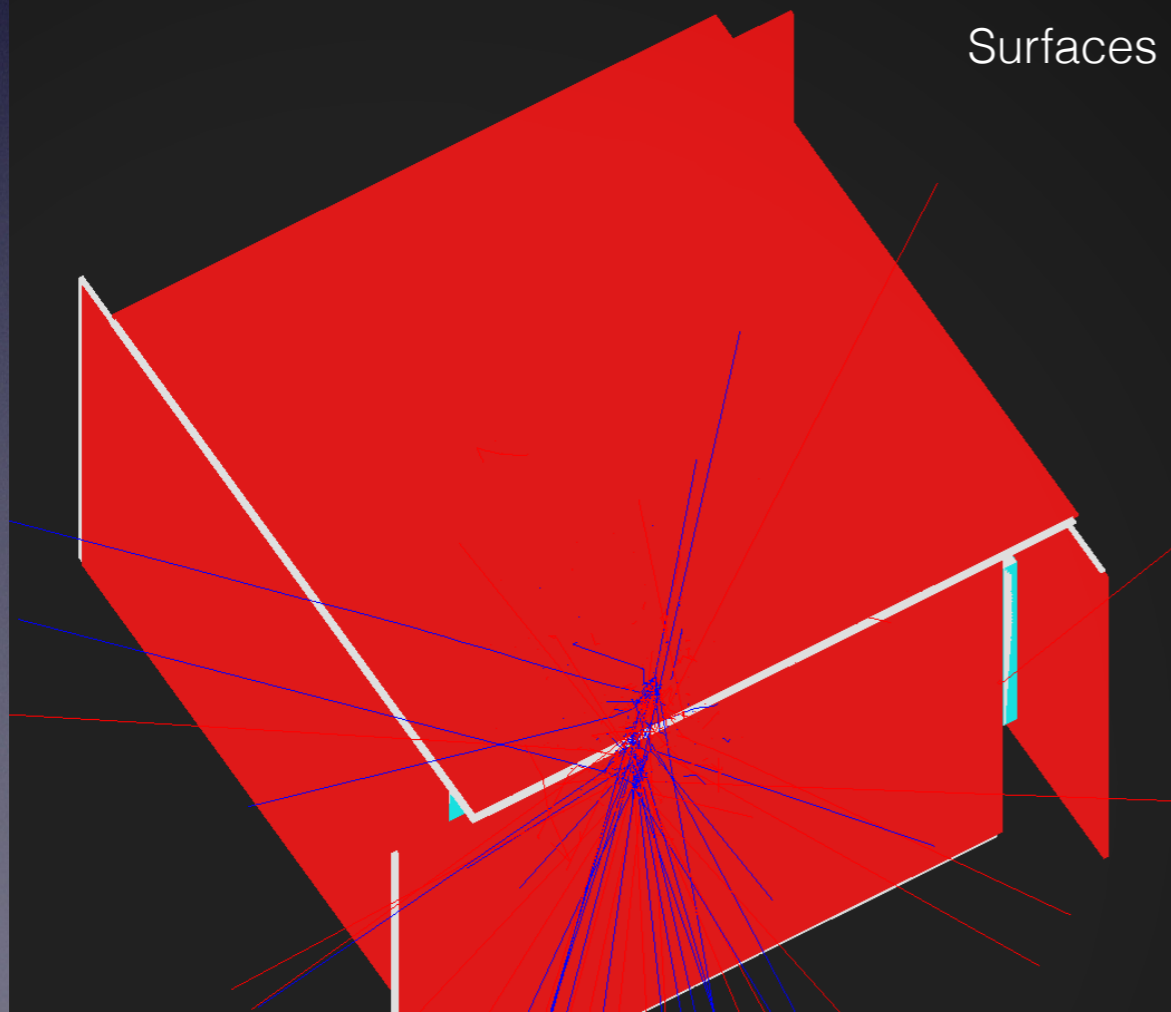
Hidden Line Removal



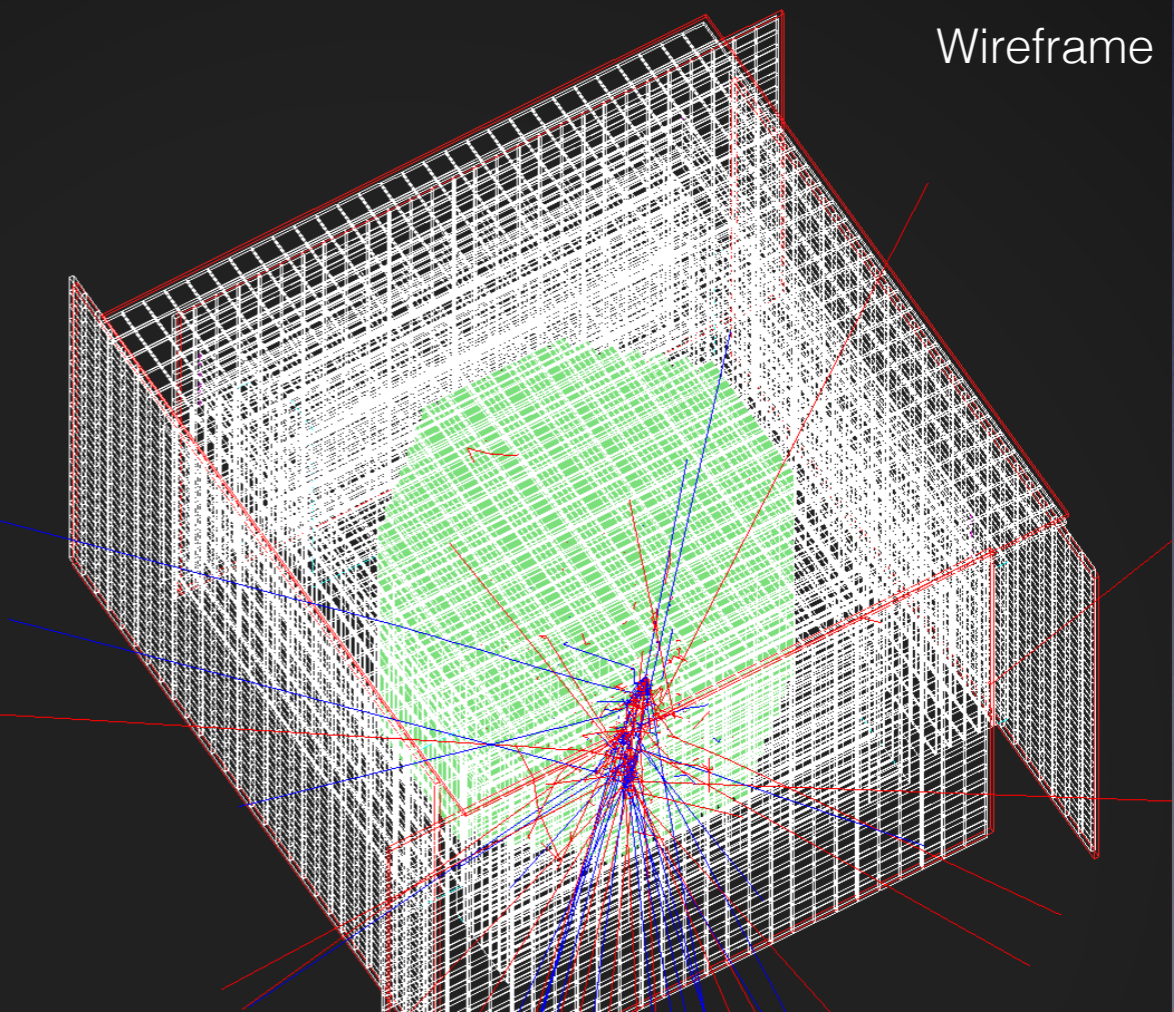
Hidden Line and Hidden Surface Removal



Surfaces



Wireframe



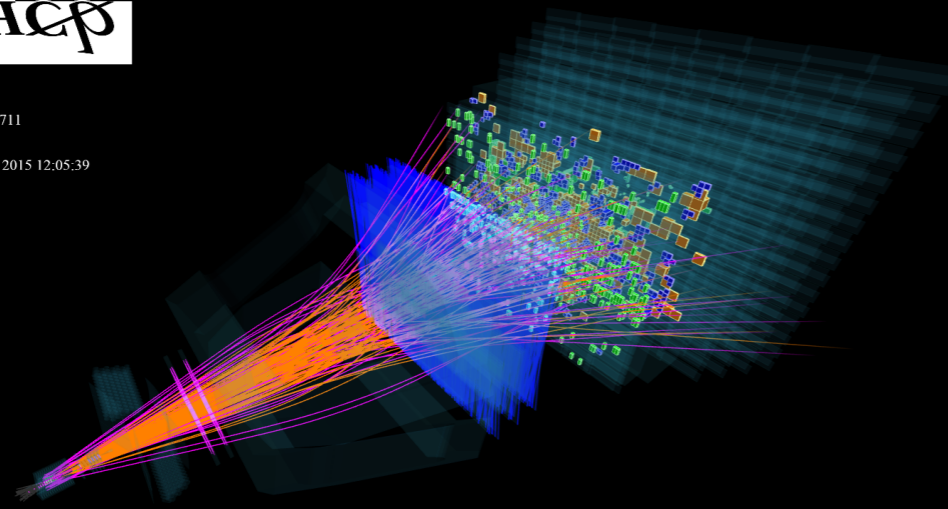
EVE

- Built into ROOT
- Optimised OpenGL support
- Capable of handling both 2D/3D visualisation
- Explicitly designed for HEP experiments

EVE

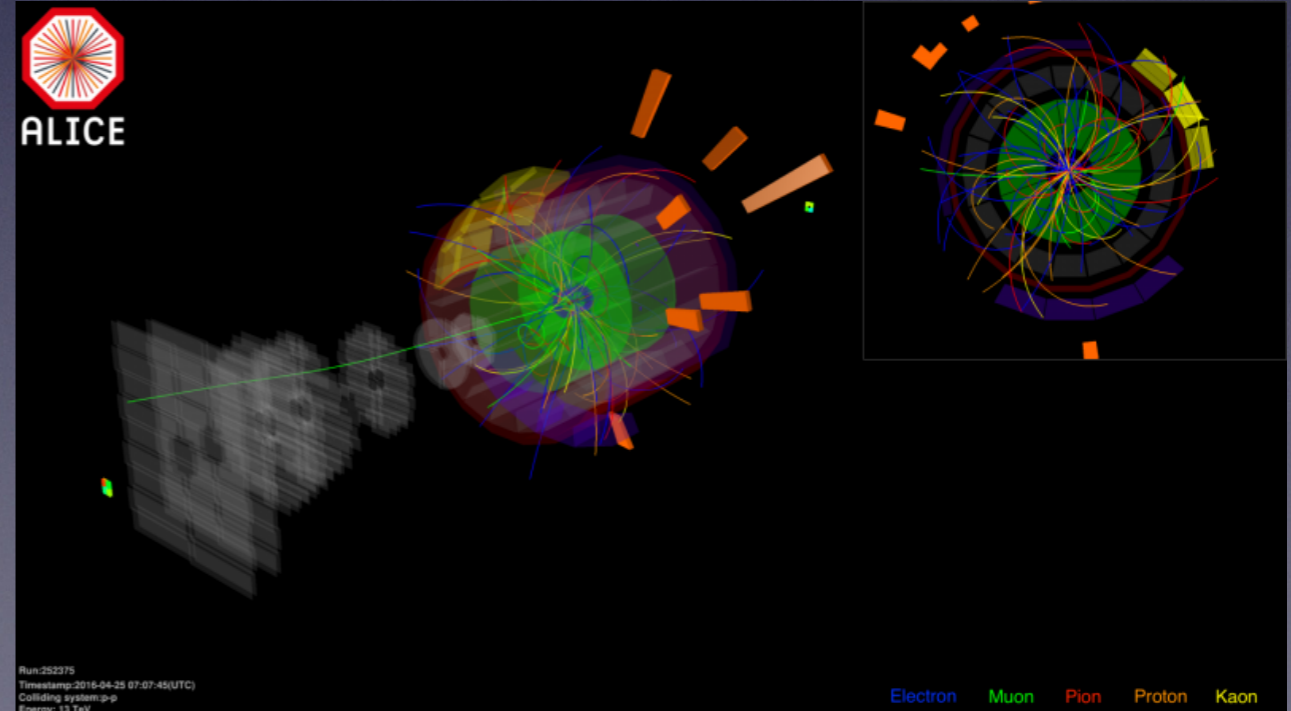
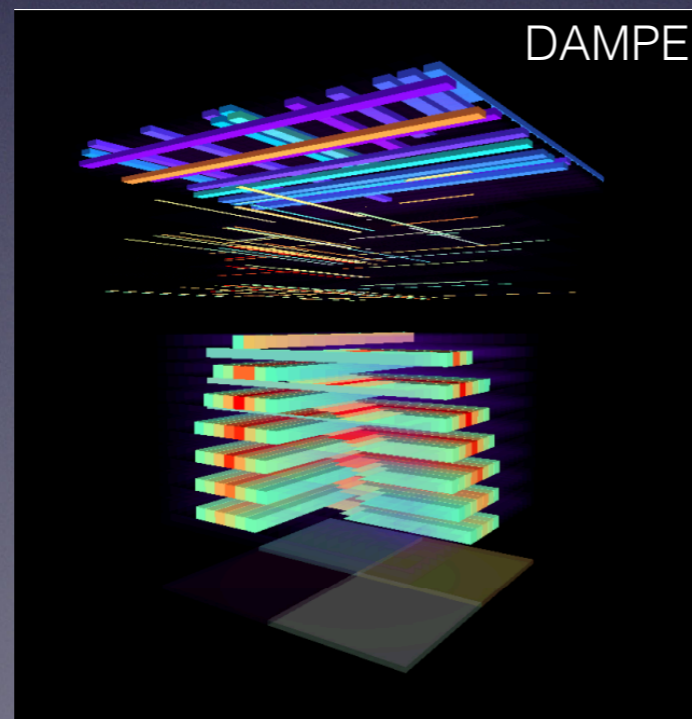
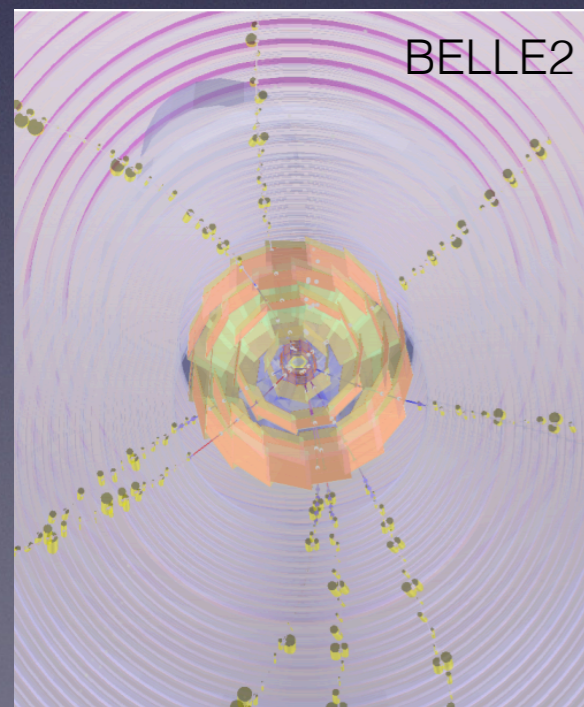
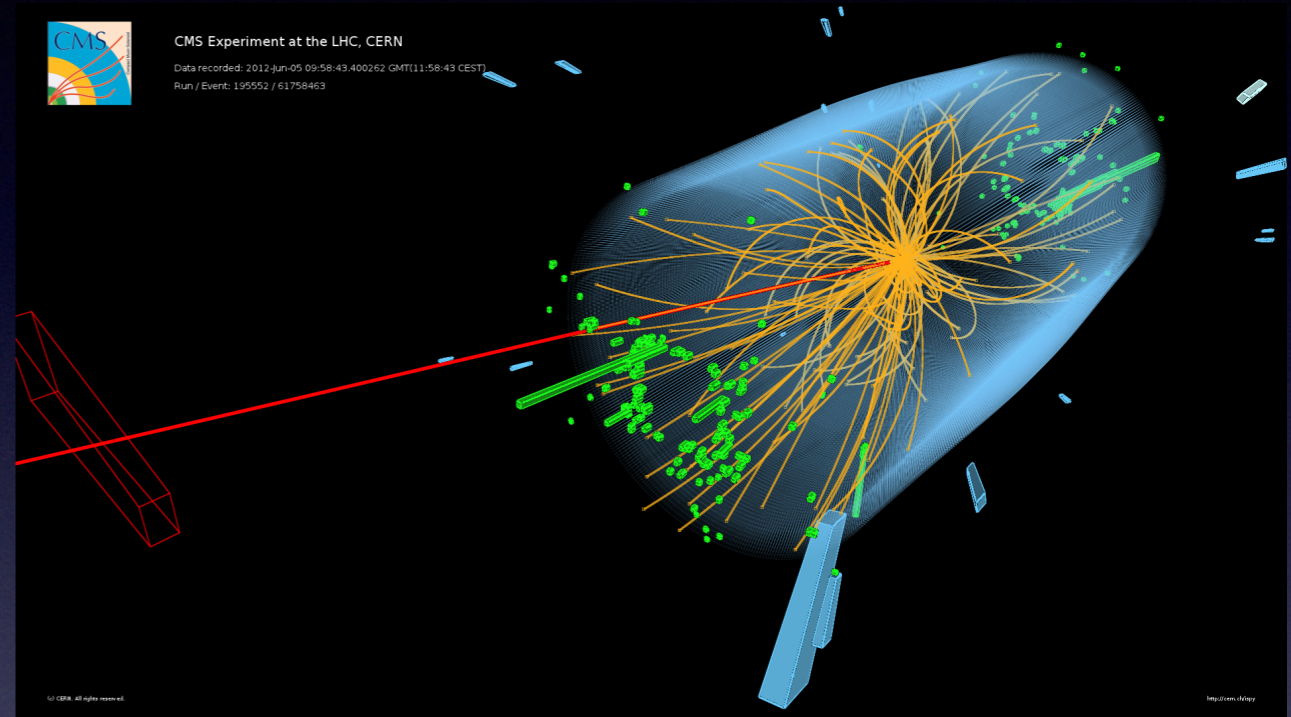
LHCb
LHCb

Event 58049711
Run 153460
Wed, 03 Jun 2015 12:05:39



CMS Experiment at the LHC, CERN

Data recorded: 2012 Jun 05 09:58:43.400262 GMT(11:58:43 CEST)
Run / Event: 195552 / 61758463

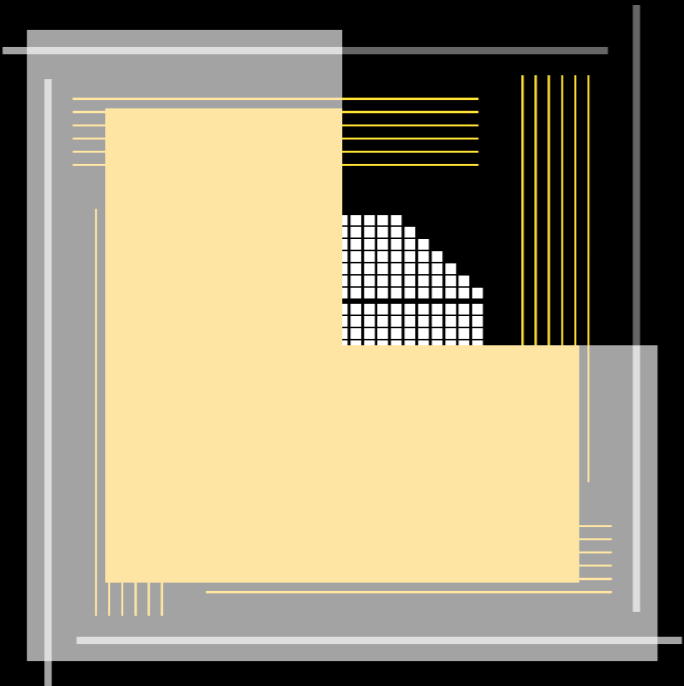


HERDward

HERD
Wants
A
Realistic
Display

- Built with EVE
- Detector geometry in ROOT format (conversion already implemented in GGS converter)
- Displays energy deposition in HERD sensitive volumes - Close to what an actual event display will look like.

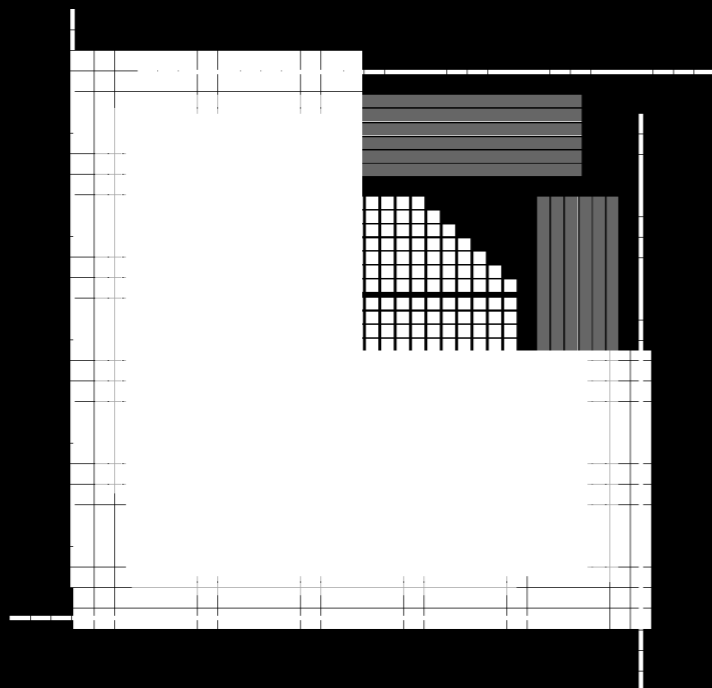
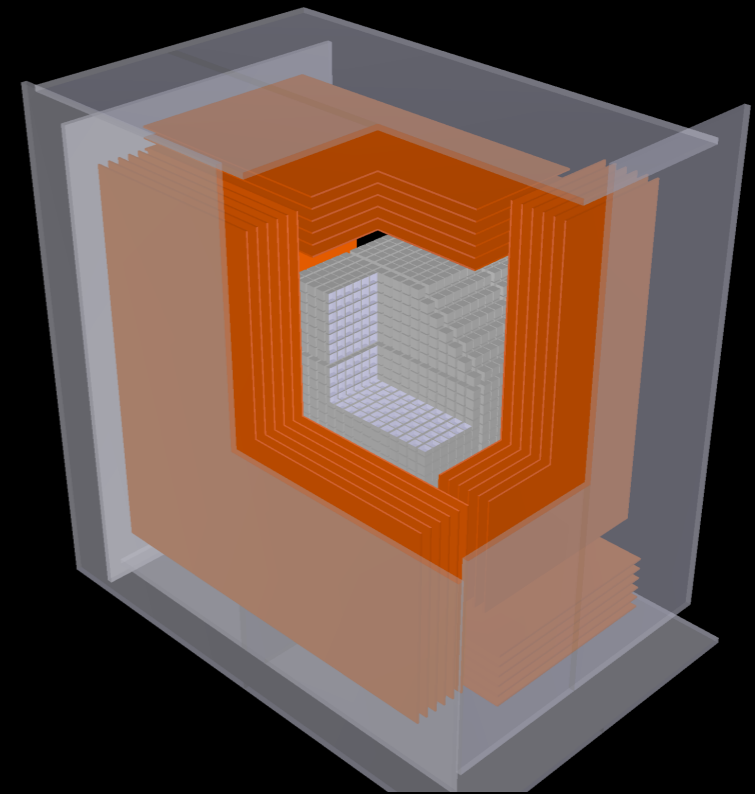
HERDward



HerdBaseline

- No Segmentation in PSD or STK
- Full Calorimeter segmentation
- PSD/STK overlaps not optimised

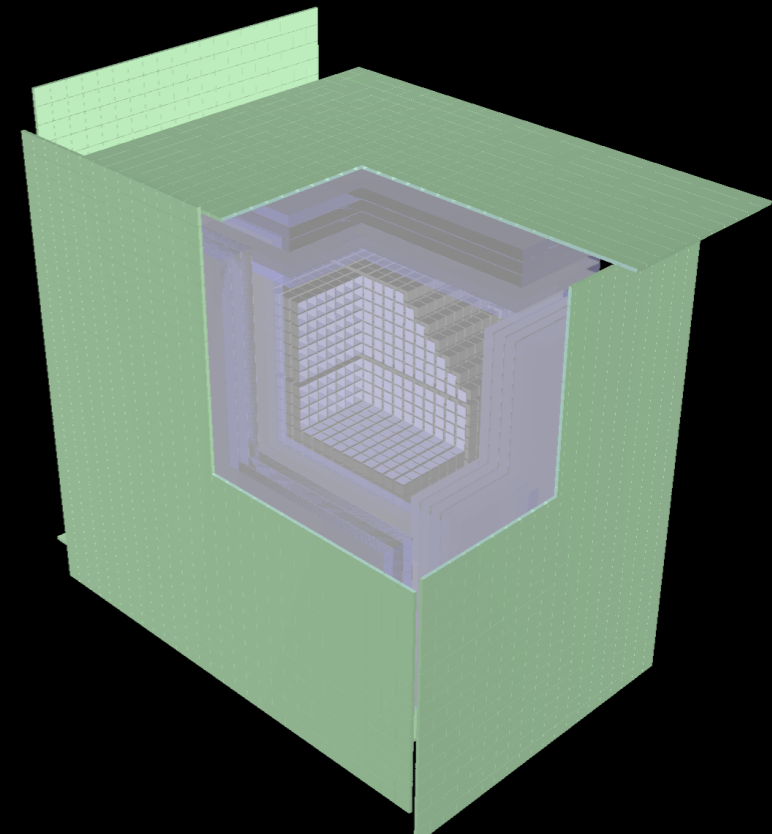
(Junjing Wang, Ming Xu, Zheng Quan)



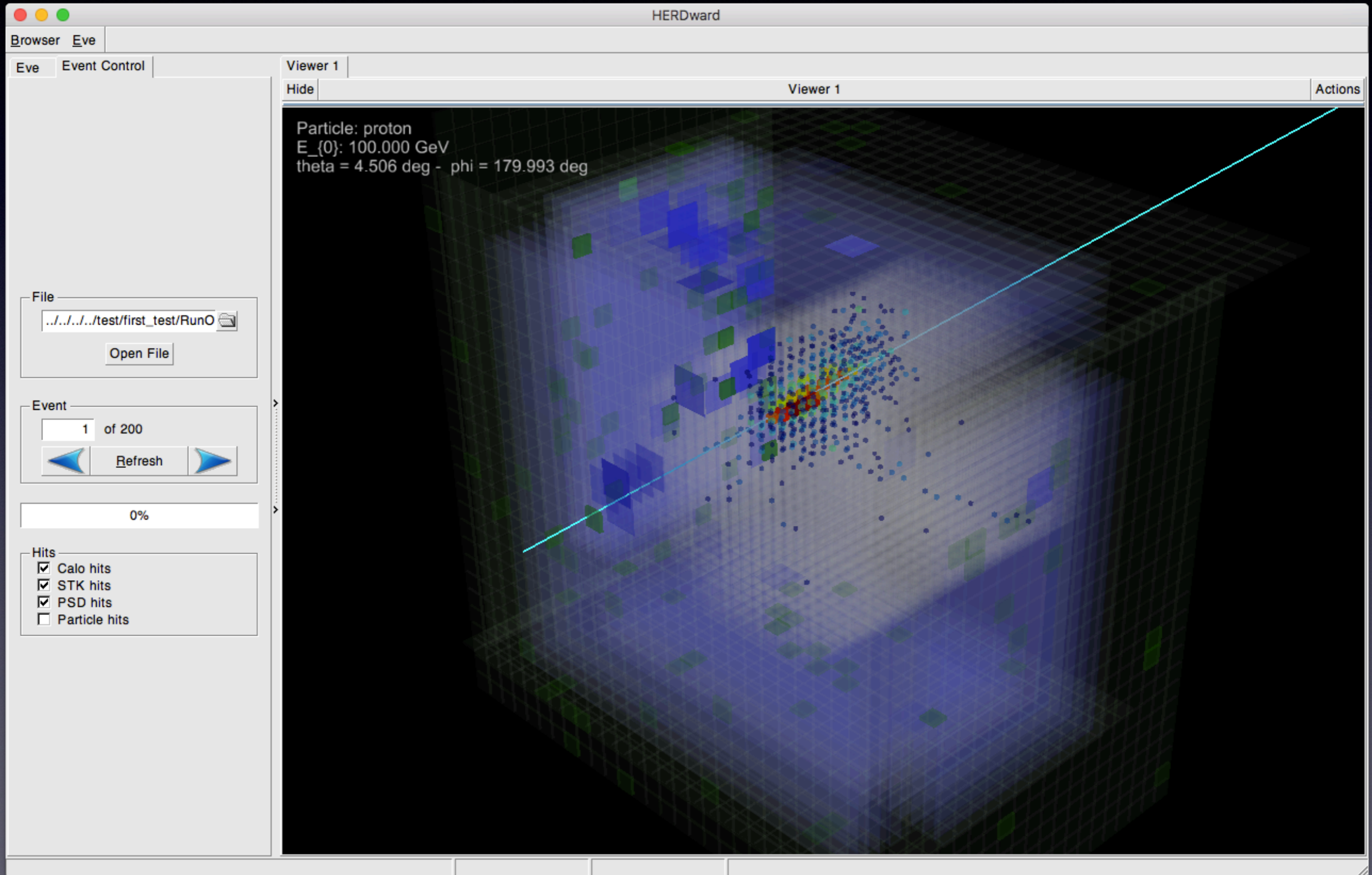
HerdCompactV0

- PSD segmented in tiles, STK in sensors
- Full Calorimeter segmentation
- PSD/STK repositioned, smaller footprint

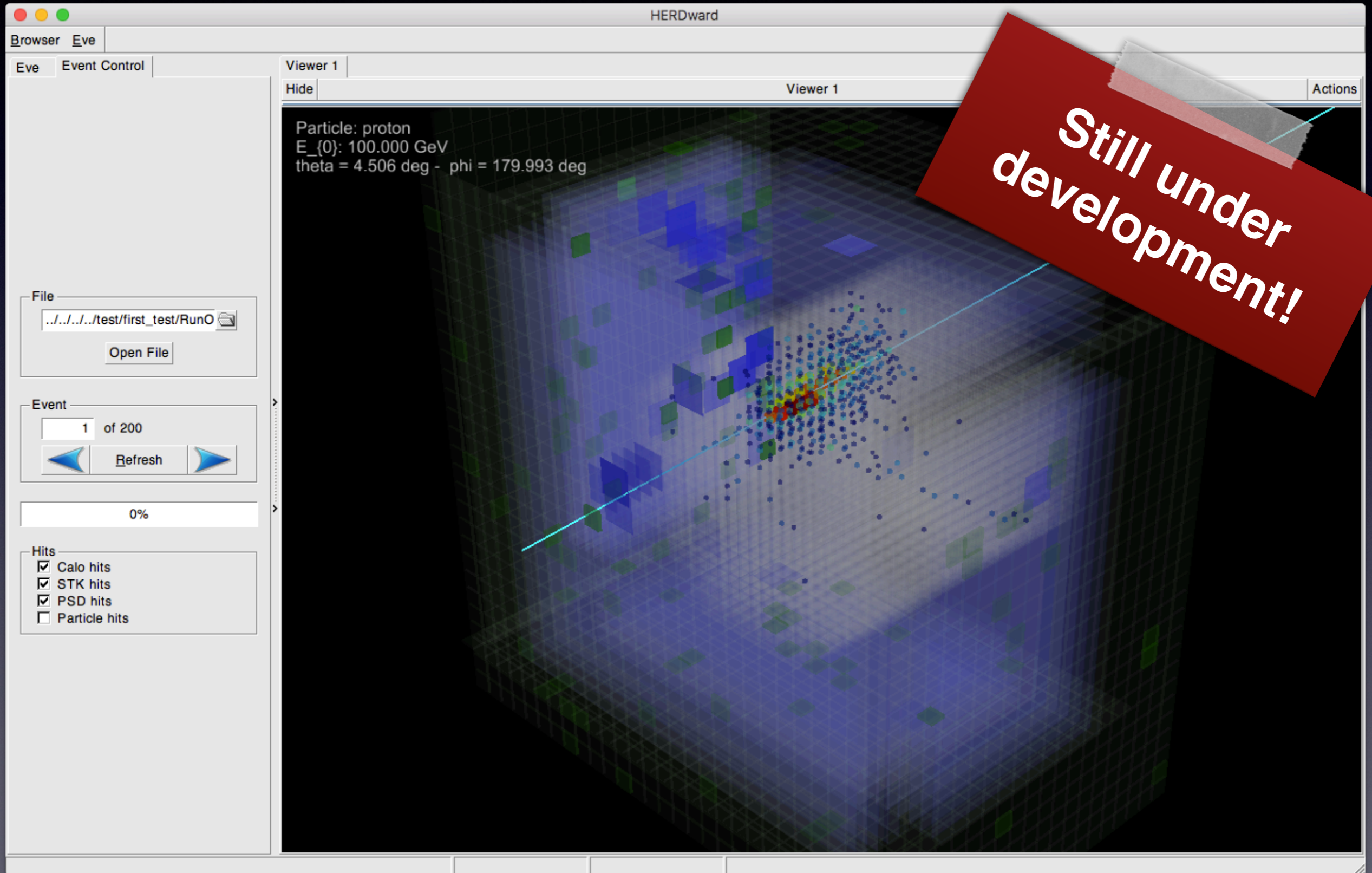
(Fabio Gargano)



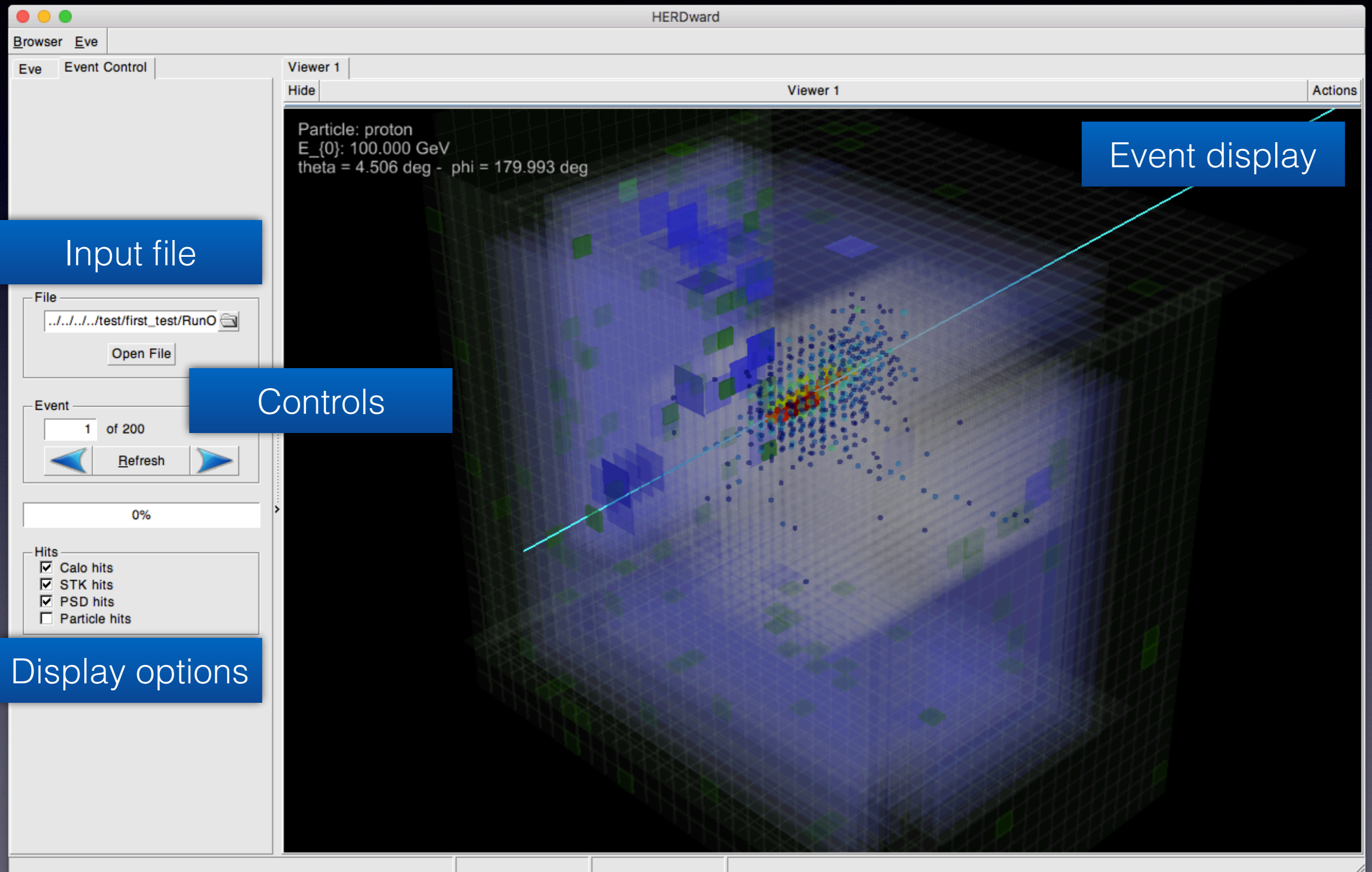
HERDward: GUI



HERDward: GUI



HERDward: GUI



HERDward: GUI

The screenshot shows the HERDward GUI with the following components:

- Browser:** Contains 'Eve' and 'Event Control' tabs.
- Viewer 1:** Contains 'Hide' and 'Viewer 1' tabs, and an 'Actions' button.
- Event Information:** Particle: proton, $E_{\{0\}}$: 100.000 GeV, theta = 4.506 deg - phi = 179.993 deg.
- File:** Path: `../../../../test/first_test/RunO`, with an 'Open File' button.
- Event:** '1 of 200' with navigation arrows and a 'Refresh' button.
- Progress:** A progress bar showing '0%'.
- Hits:** A list of checkboxes: Calo hits, STK hits, PSD hits, Particle hits.
- Event Display:** A large central area showing a calorimeter hit pattern with a cyan line indicating the particle path.

Event display

Calorimeter display:

- Each cell color and size proportional to energy released.

HERDward: GUI

The screenshot shows the HERDward GUI with a central 3D viewer. The viewer displays a particle track (a red line) passing through a series of blue, semi-transparent hexagonal sensor planes. The track starts from the bottom left and moves towards the top right. The GUI includes a 'File' section with a path field and an 'Open File' button, an 'Event' section with a '1 of 200' indicator and a 'Refresh' button, and a 'Hits' section with checkboxes for 'Calo hits', 'STK hits', 'PSD hits', and 'Particle hits'. The 'STK hits' checkbox is checked. The viewer window has a title bar 'Viewer 1' and a 'Hide' button. The main window title is 'HERDward'.

Particle: proton
E_{0}: 100.000 GeV
theta = 4.506 deg - phi = 179.993 deg

Event display

STK display:

- At the moment only sensors are displayed.
- Opacity proportional to energy deposition

As the geometry will evolve the STK segmentation level will be on a strip-by-strip level, and the display will adapt accordingly with little effort needed.

HERDward: GUI

The screenshot shows the HERDward GUI with a 3D event display. The main window displays a proton track (red line) passing through a detector grid (blue wireframe). The track is labeled with particle information: Particle: proton, $E_{\{0\}}$: 100.000 GeV, theta = 4.506 deg - phi = 179.993 deg. The track is highlighted with a red box labeled "Event display".

On the left side, there are control panels:

- File:** A text field containing the path `../../../../test/first_test/RunO` and an "Open File" button.
- Event:** A text field showing "1 of 200", a "Refresh" button, and left/right navigation arrows.
- Progress:** A progress bar showing "0%".
- Hits:** A list of checkboxes: "Calo hits" (unchecked), "STK hits" (unchecked), "PSD hits" (checked), and "Particle hits" (unchecked).

At the bottom, a red box contains the following text:

PSD display:

- Only traversed tiles are drawn
- Opacity proportional to energy deposition

HERDward: DEMO

The screenshot displays the HERDward software interface. The main window, titled "HERDward", contains a "Viewer 1" pane showing a 3D visualization of a proton particle. The particle's properties are listed as: Particle: proton, $E_{\{0\}}$: 100.000 GeV, $\theta = 4.506$ deg, and $\phi = 179.993$ deg. The visualization shows a central cluster of blue and green points, with a red line extending from the center. The text "Live Demo (fingers crossed)" is overlaid on the visualization.

The interface includes a "Browser" pane on the left with a file path: `../../../../test/first_test/RunO` and an "Open File" button. Below this is an "Event" section with a dropdown set to "1 of 200" and a "Refresh" button. At the bottom left is a "Hits" section with checkboxes for "Calo hits", "STK hits", "PSD hits", and "Particle hits".