Event displays

d0ve

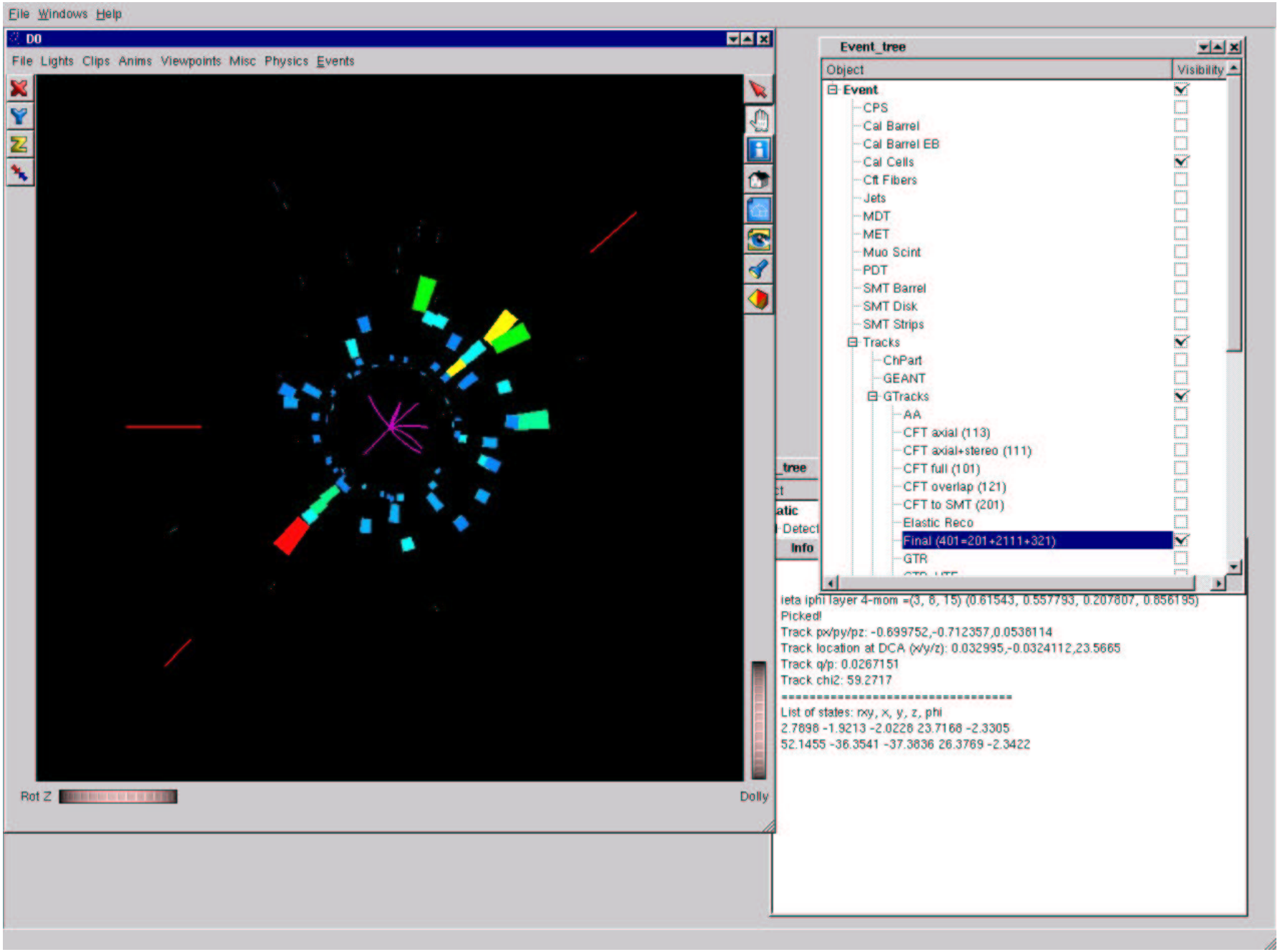
- Familiar, runs in the CR
- 3D, XY, RZ, cal lego
- Lightweight
- Flexibility in customization
- Does not provide object selection and inspection

d0scan_qt

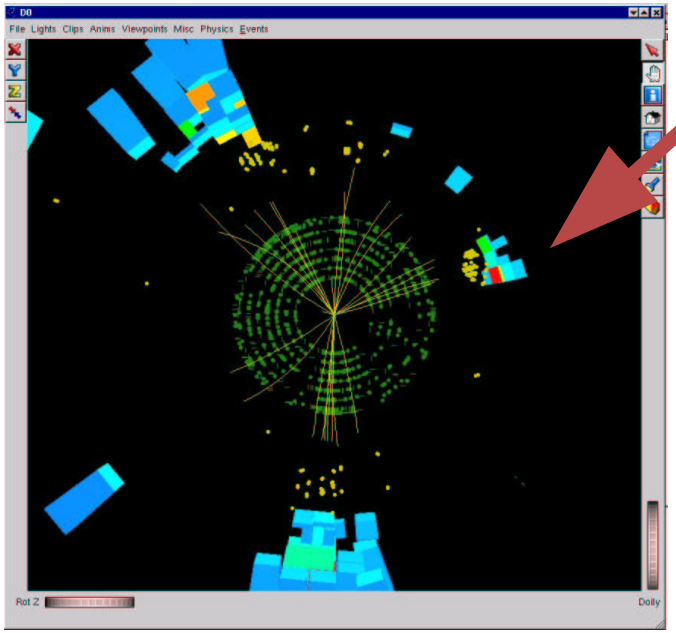
- New, different interface
- 3D, (eta,phi), physics lego; XY & RZ not yet, cal lego needs work
- Demanding in display bandwith
- Object selection and printout, currently limited processing but will evolve

d0scan_qt tutorial

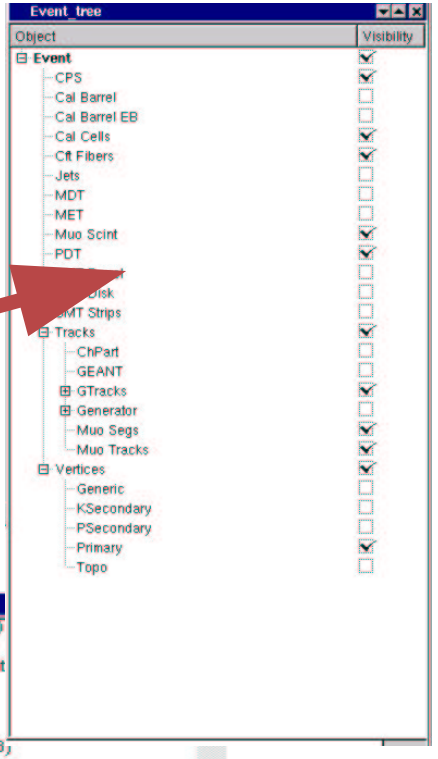
- The user interface
  - The various windows
  - The viewer
    - Translations, rotations and other manipulations
    - Printing
    - Special features
- Performances tips
- The views
  - The views currently available, how to use them in realistic situations
  - Known problems and to do list


File Windows Help
D0
File Lights Clips Anims Viewpoints Misc Physics Events
Rot Z
Dolly
Event_tree
Object
Visibility
Event
CPS
Cal Barrel
Cal Barrel EB
Cal Cells
Cft Fibers
Jets
MDT
MET
Muo Scint
PDT
SMT Barrel
SMT Disk
SMT Strips
Tracks
ChPart
GEANT
GTracks
AA
CFT axial (113)
CFT axial+stereo (111)
CFT full (101)
CFT overlap (121)
CFT to SMT (201)
Elastic Reco
Final (401=201+2111+321)
GTR
Info
ieta iphi layer 4-mom =(3, 8, 15) (0.61543, 0.557793, 0.207607, 0.656195)
Picked!
Track px/py/pz: -0.699752,-0.712357,0.0538114
Track location at DCA (x/y/z): 0.032995,-0.0324112,23.5665
Track q/p: 0.0267151
Track chi2: 59.2717
List of states: rxy, x, y, z, phi
2.7898 -1.9213 -2.0228 23.7168 -2.3305
52.1455 -36.3541 -37.3836 26.3769 -2.3422

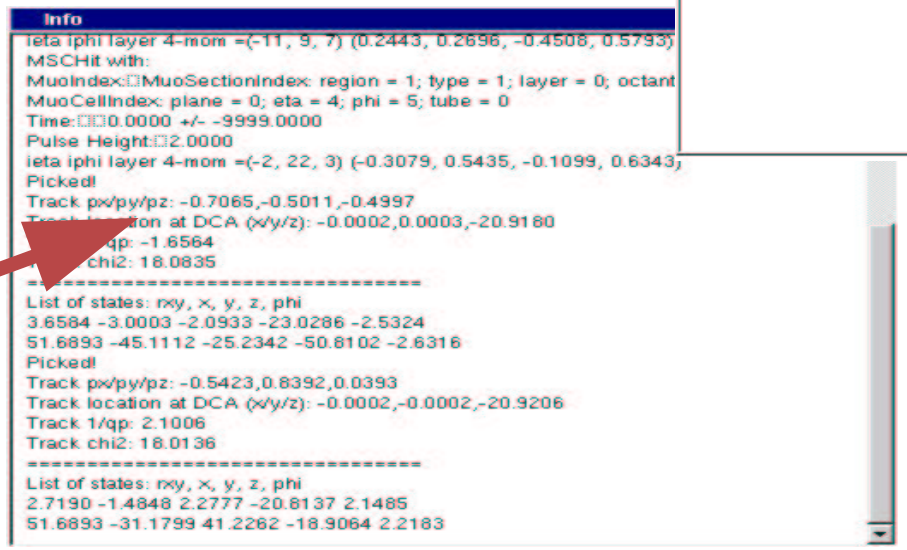
The various windows



The viewer
(representation)
one per view



The controller
(controls what is displayed)
there could be several per view

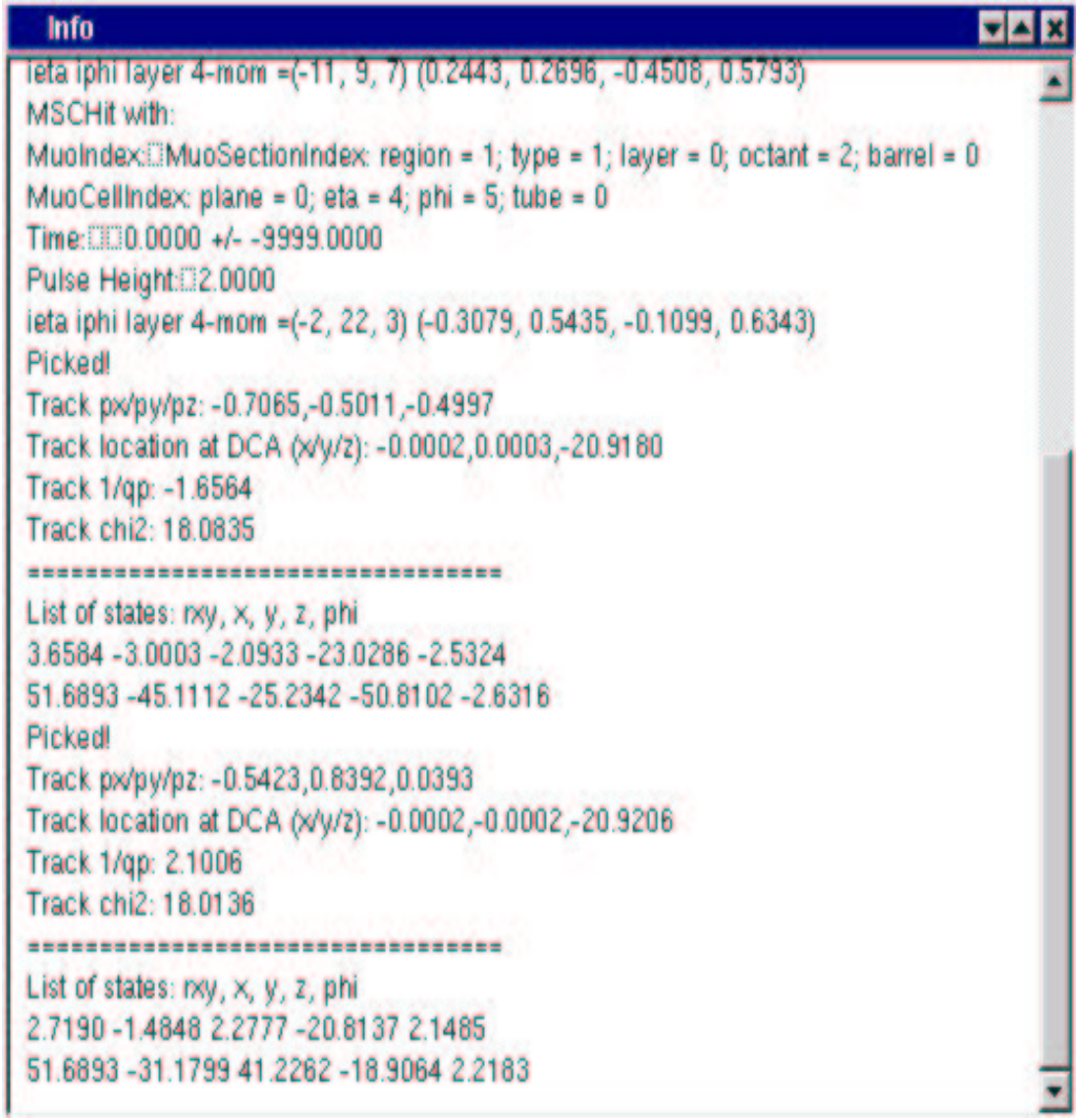


The info window
one for the session

The info window

When an object is selected some informations are printed in this window.

We use the << operator for the object or the print() method. Can be customized.

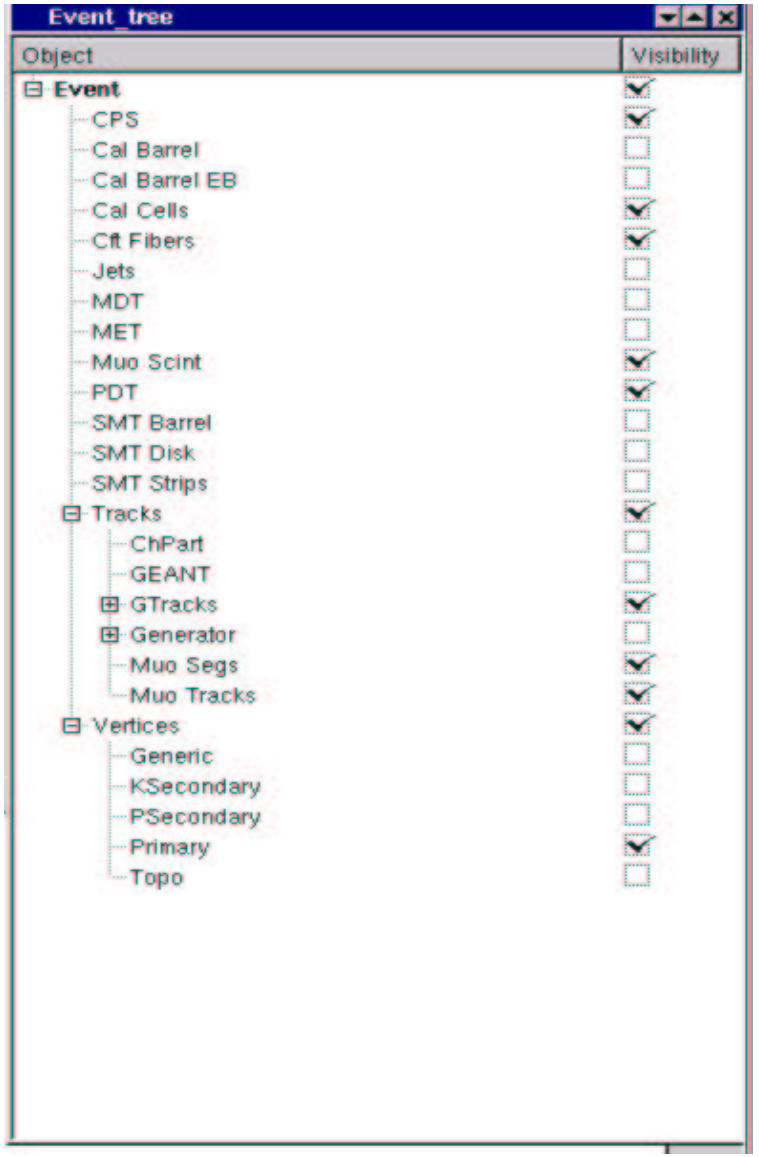


The controller window

It controls the visibility of the elements (data or geometry).

It has a tree structure, and the leaves are the objects that can be represented. The whole tree has to be selected for a leaf object to be represented.

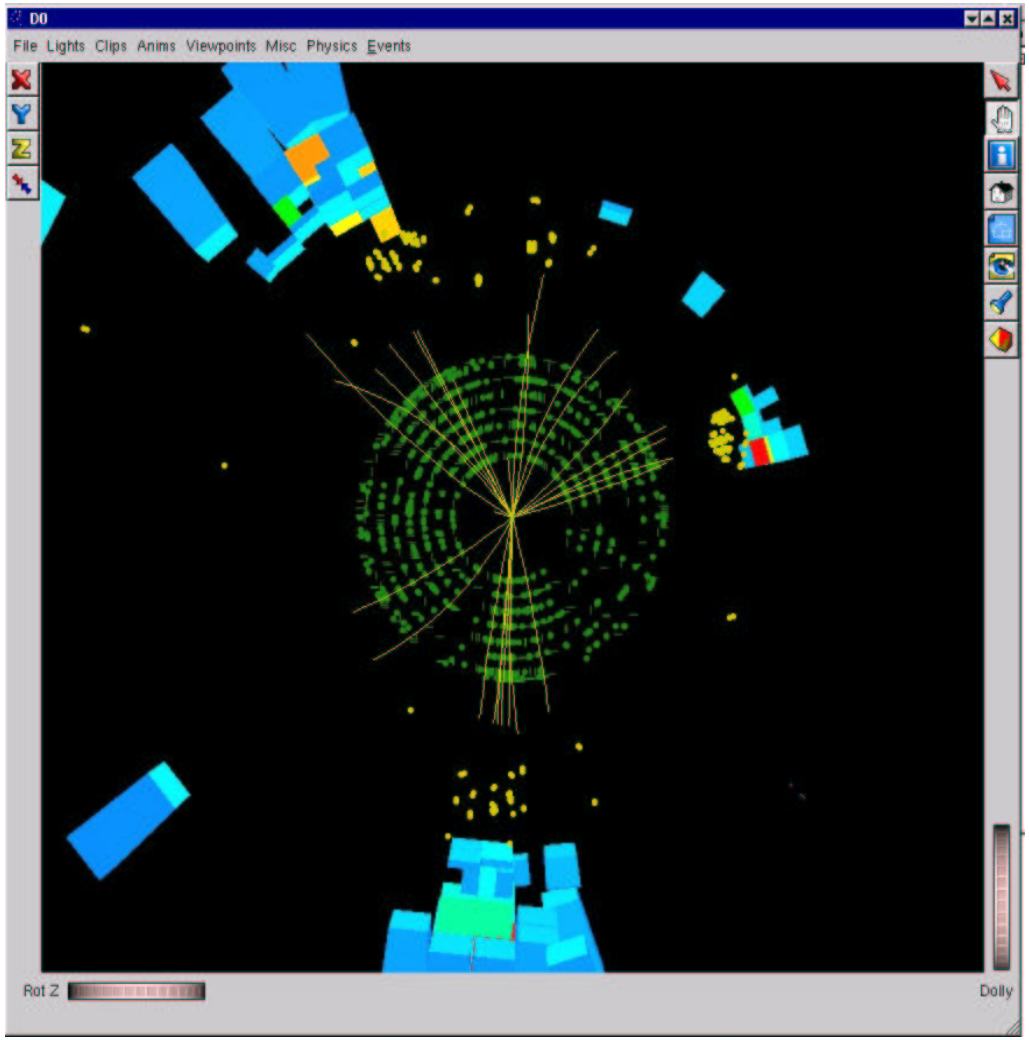
There could be a problem for the first event where the controller does not get the focus, you may have to click for the objects to be shown.

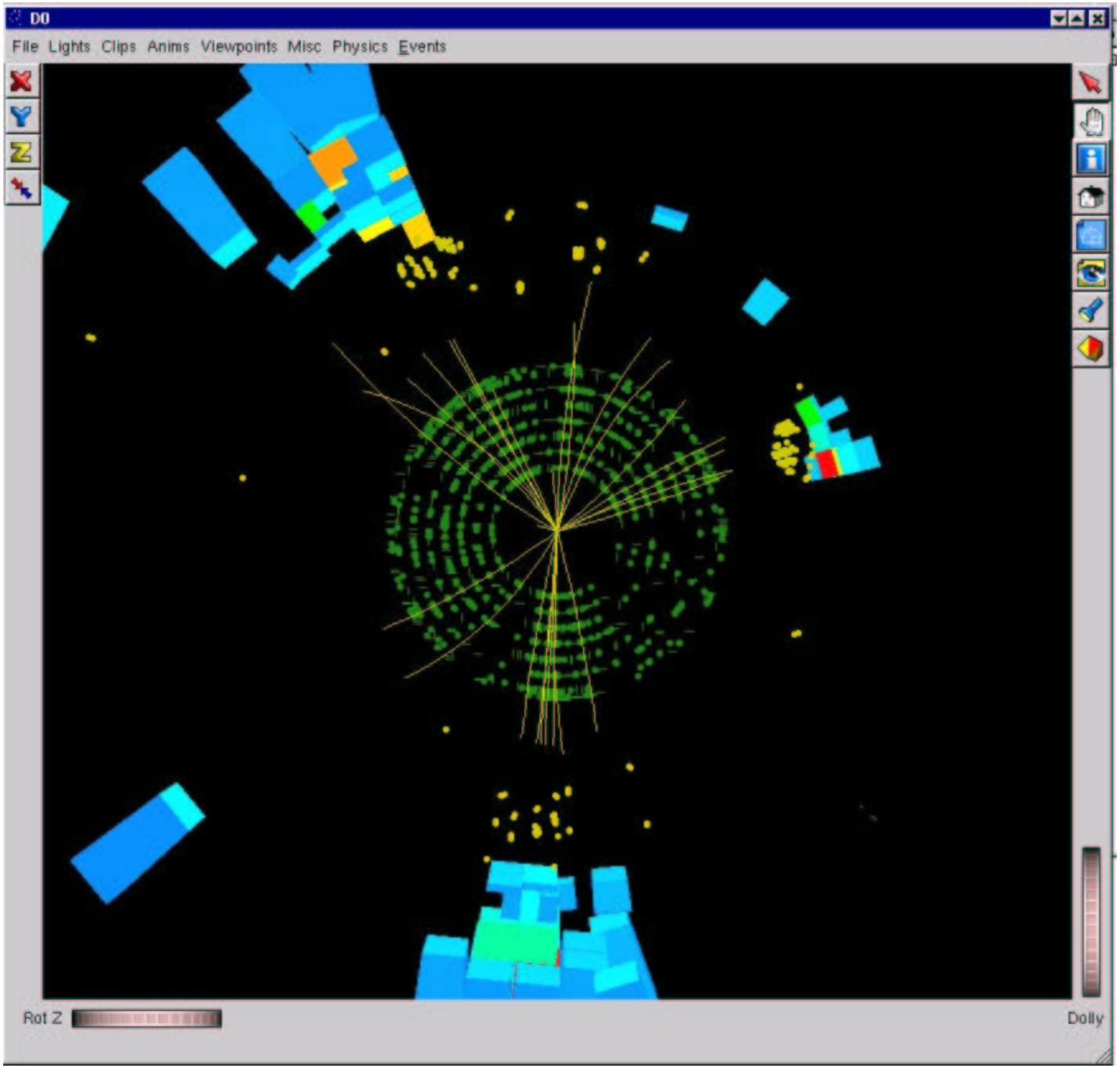


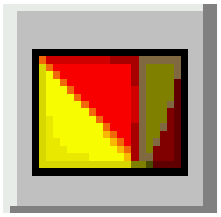
The viewer

The geometry and data are represented by volumes, surfaces and curves that forms a scene. The viewer is used to explore the scene using a camera that you can control.

This is the most complex part of the GUI, I will go through the most important buttons and menus.

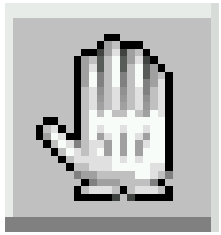



D0
File Lights Clips Anims Viewpoints Misc Physics Events
Rot Z
Dolly

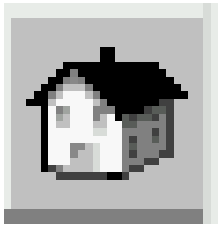


This button toggles between perspective and orthographic (parallel) projections. For d0scan_qt, the perspective projection (default) is the best and I will suppose that this is what you will use.

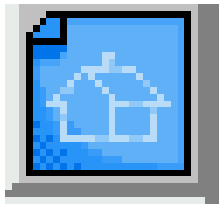
When this button is clicked, the mouse movements (when clicking) are linked to the camera movements:
left mouse button = rotations,
middle button = translations.
You can use the 'Dolly' wheel to get closer or farther away from the scene (zooming).



For the 2D views in d0scan_qt, we use a special 2D viewer in which you cannot rotate the camera. The wheels control the translations in X and Y and the zooming.

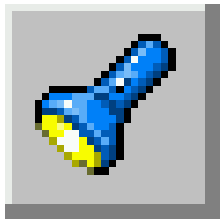


If you get lost in rotations and/or translations and/or zooming, clicking on this button will bring the camera back to the default position.

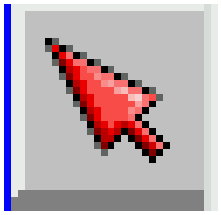


Sets the current position as the new default position that you can get back to with the 'home' button. If you want to store several favorite positions, you can use the 'Viewpoints' menu.

Move camera away (zoom out) so as to see all objects in the scene.



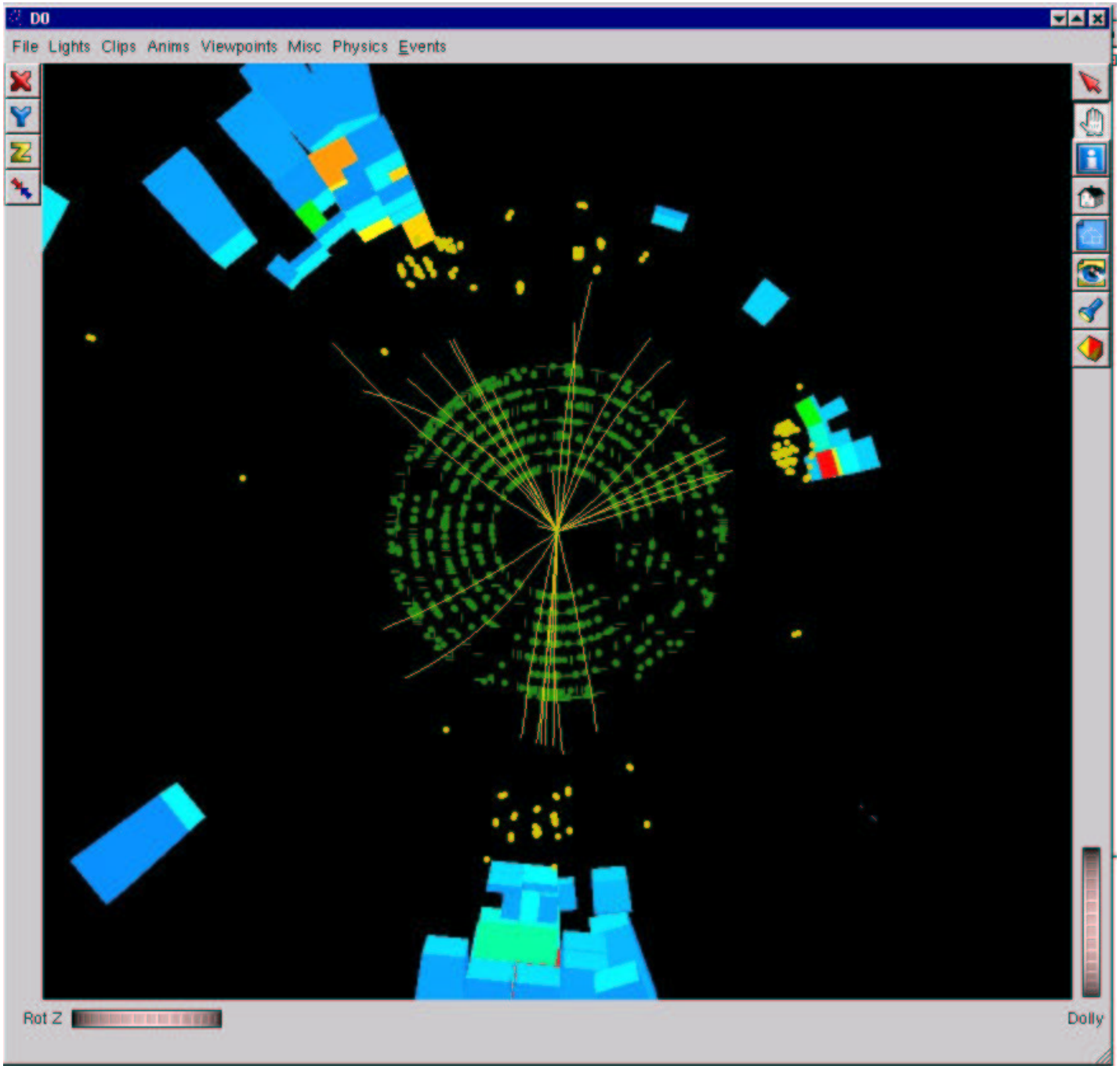
Click on an object after clicking on this button.
The camera will be moved so as to put the selected object in the center and zoom in.



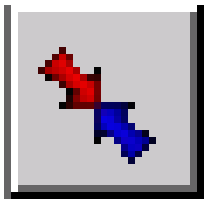
When clicked, the mouse acts as a selection pointer.
When an object is clicked, it is highlighted and some information is printed in the 'info window'

Opens a web page explaining the various buttons.

Check for browser windows already opened.
May not work on all systems.


D0
File Lights Clips Anims Viewpoints Misc Physics Events
Rot Z
Dolly

Align the camera along the selected axis



Do a parity operation x → -x

The viewer menus

- Events: Read next event, or read event by event with rotations along all axes
- File:
  - Print as: allows to save the display as tiff, jpeg or postscript
  - Clone scene: Opens another viewer with the same scene, e.g. to look at it from a different point of view.
  - Save as: Saves the whole scene in an ASCII OpenInventor file that can be edited (e.g. To change colors, line width, etc). The new oiv file can be viewed using the Open menu.

- Viewpoints: Any number of camera settings (position and orientation) can be saved (use new) and restored by this menu. In some views (e.g. 3D view), there are predefined viewpoints.
- Clips: You can cut away part of the scene via a plane, this menus allows to define several clip settings.
- Physics: on the 3D view, you can select the Z position at which the CFT stereo fibers are shown. In cvs, we also have sliders to select threshold on calorimeter tower/cell energies. Will be expanded to cover other settings.

Performance tips

- d0scan_qt can be demanding in CPU and display, for example for camera movements with a busy scene graph
  - The best is to use the local console whenever possible, even on a moderately powerful machine, because the display uses a lot of bandwidth
    - Will investigate RTE to distribute d0scan_qt to sites that don't have any release, or when the latest version is to be used.
  - If you display via X windows, try a direct X connection instead of tunneling via ssh (e.g. redefine your DISPLAY). Depending on the network, it can improve performance (e.g. it does on LAN). Alternatively, you can try to connect via ssh using compression.

- You can change the settings for drawing to improve response: the Draw styles menu can be accessed by right clicking in the drawing area. The Still draw style sets the options for rendering when the camera is still while the Animating draw style sets the rendering options when the camera moves.
  - To improve the response when you move the camera, you can set the animating draw style to wireframe.
- The performance will also depend a lot on the machine used to display: check the settings of the graphics card and especially the drivers. If OpenGL is supported, that will improve a lot the performances. This part is often neglected on Linux.

The Standard 3D view

- CPS: Cps clusters
- Cal Barrel: draw CC towers (1^{st} cell)
- Cal Barrel EB: draw energy as lego as well
- CalCells: cells, energy color coded
- CFT fibers: slider to choose the Z position and ADC thresholds
- Jets: first JetChunk in event (simple cone?)
- MET: MET not METNE
- MDT: crashes on Linux...
- MuoScint and PDT
- SMT barrel and disk (SMTGlbXCollectChunk), strips (SmtDataChunk)
- Tracks:
  - GEANT: MCTrackChunk
  - Gen: MCKineChunk (charged and stable)
  - All GtrackChunks and ChP

The Standard 3D view

- MuoSeg: MuoSegmentChunk
- MuoTrack: MuoTrackChunk
- New in CVS:
  - User thresholds for CAL towers and cells
- To do list:
  - CFT clusters
  - Track extrapolations
- Known bugs:
  - Display does not refresh on first event
  - MDT cause crash on Linux in OpenInventor (need to test new OIV)
- Purpose:
  - Debug geometry, data or algorithm when the position and correlation in space is important
  - Tracking, tracks & CAL, tracks and muon tracks
  - 'abstract' 3D view of an event (jets, MET...)

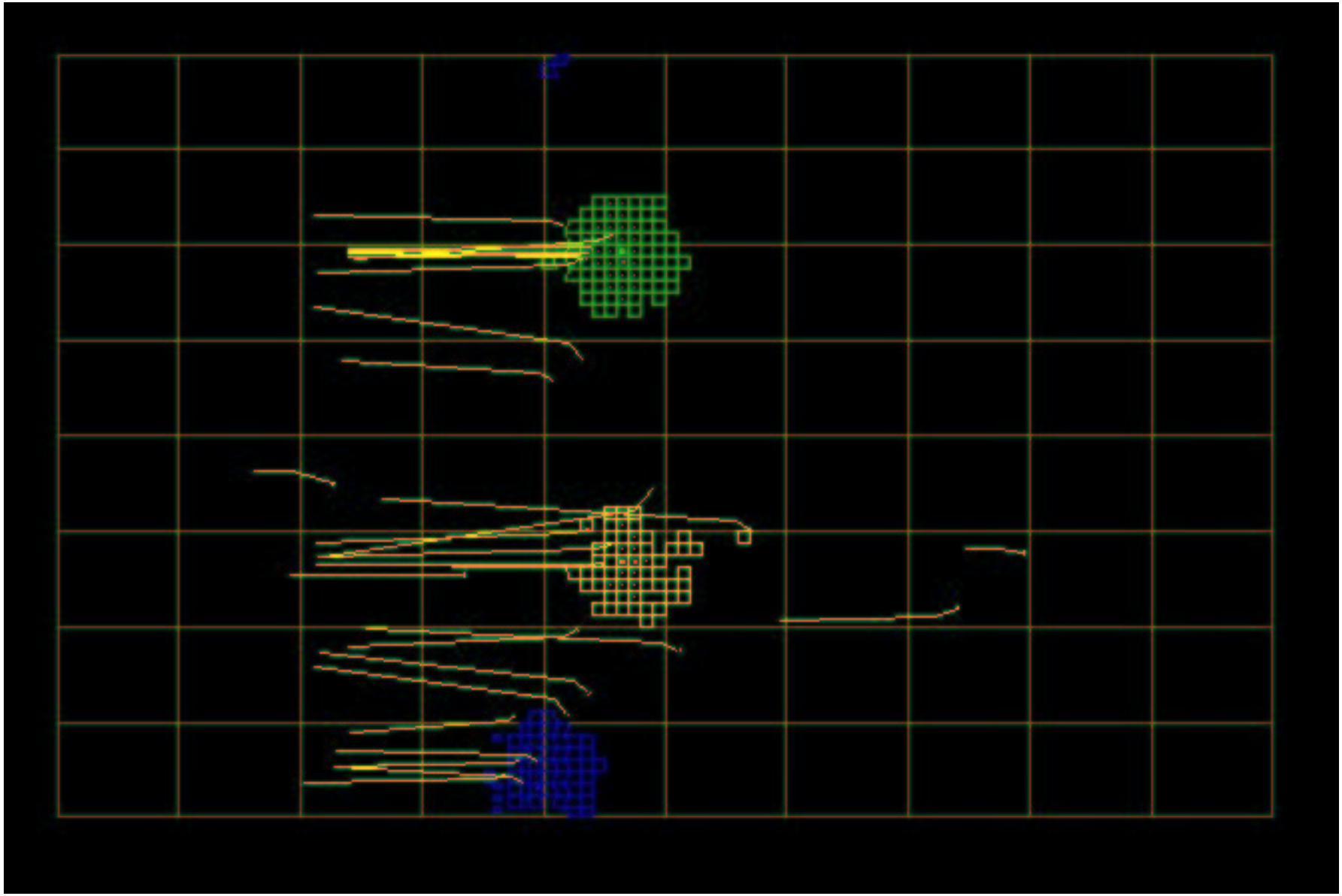
The '2D' view

- This view is still being developed, it will have XY and RZ views similar to those of d0ve

The '2D (eta,phi)' view

- A flat (detector eta, phi) view, with emphasis on the calorimeter
- CAL towers, cells (layer per layer)
- Jets, EM clusters, cellNN clusters (layer per layer), EMpart & SEMpart cells
- Tracks with extrapolations to EM1 (look weird in this view)
- Muons
- MC particles

- To do list:
  - Cal Trigger Towers
  - L2 Cal jets
  - Alternative CAL representations
  - Eflow particles
- Purpose:
  - Mostly calorimeter related, data and algorithm debugging
  - CellNN
  - Track associations

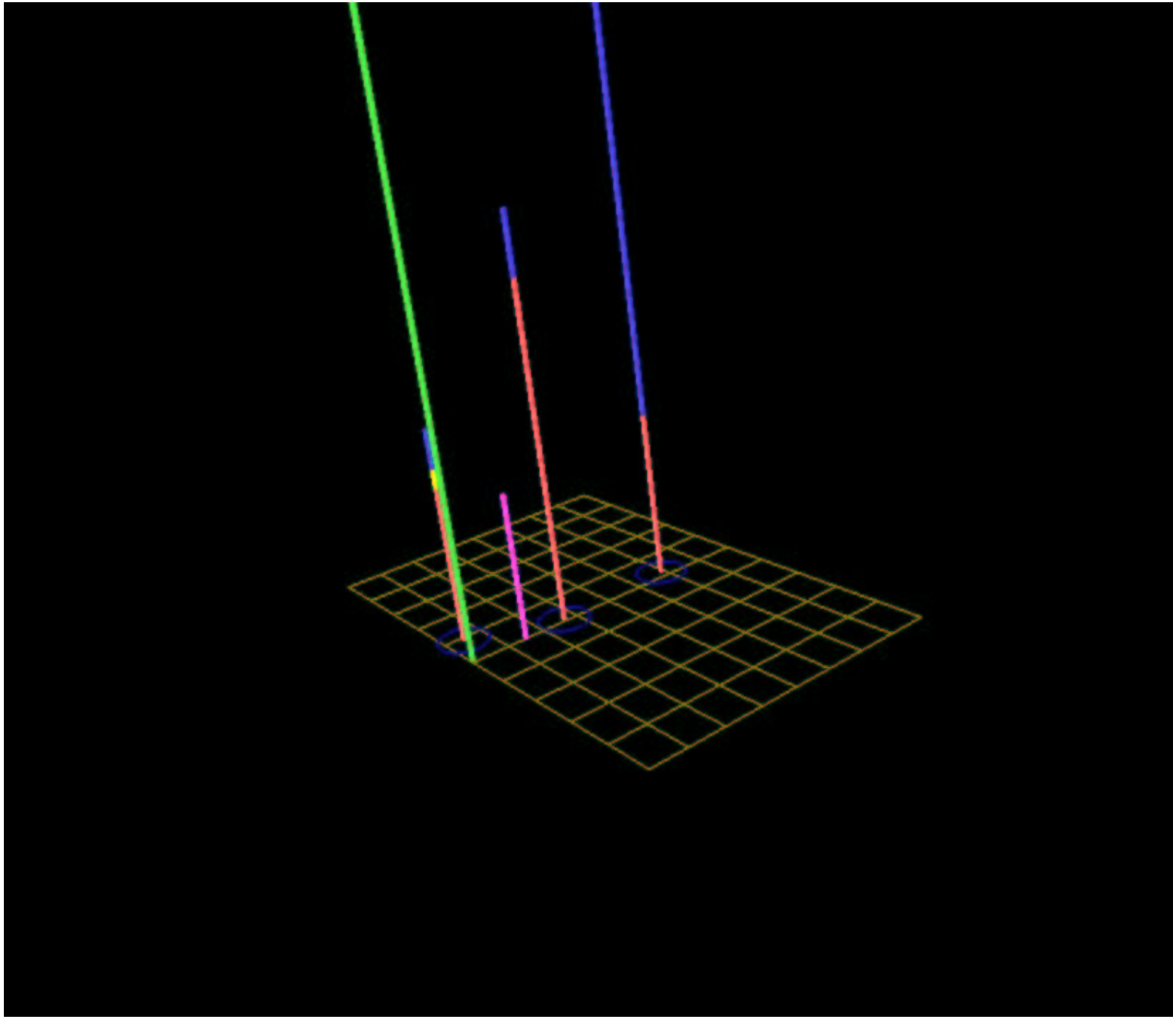


The 'Calorimeter Lego' view

- Needs some work to allow picking, change color code to 'standard' color code (EM/ICR/HAD)

The 'Physics Lego' view

- Represents the objects of the events as lego with height proportional to pT
- MC: electrons, muons, taus, invisible, jets
  - Cylinder, red toping
- Reco: electrons, muons, MET, jets (electrons not removed from jets)
  - Square section
  - No quality cuts applied
- L3: electrons, muons, taus, MET, jets (first tool found)
  - Trapezoid, yellow toping
  - Tool results, not filter
- To do:
  - reco taus
  - Easy selection of algorithm or L3 tool
  - User defined quality cuts
  - Font problems on Linux
  - Scaling in Z



Conclusions

- D0scan has made a lot of progress recently, although there still a long way to go to implement all the desired functionalities.
- Give it a try and let us know if you find problems or if there are functionalities that you would need. We intend to make a display useful to YOU.
- Thanks to the people that have provided feedback and found bugs.
- Best release currently: t02.35.00 / p13.00.00 where the corrected several bugs.