MC simulation of cosmic muons for Geant4

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Update of the simulation

- update of CMake configuration (to be compatible with the recent ROOT versions)

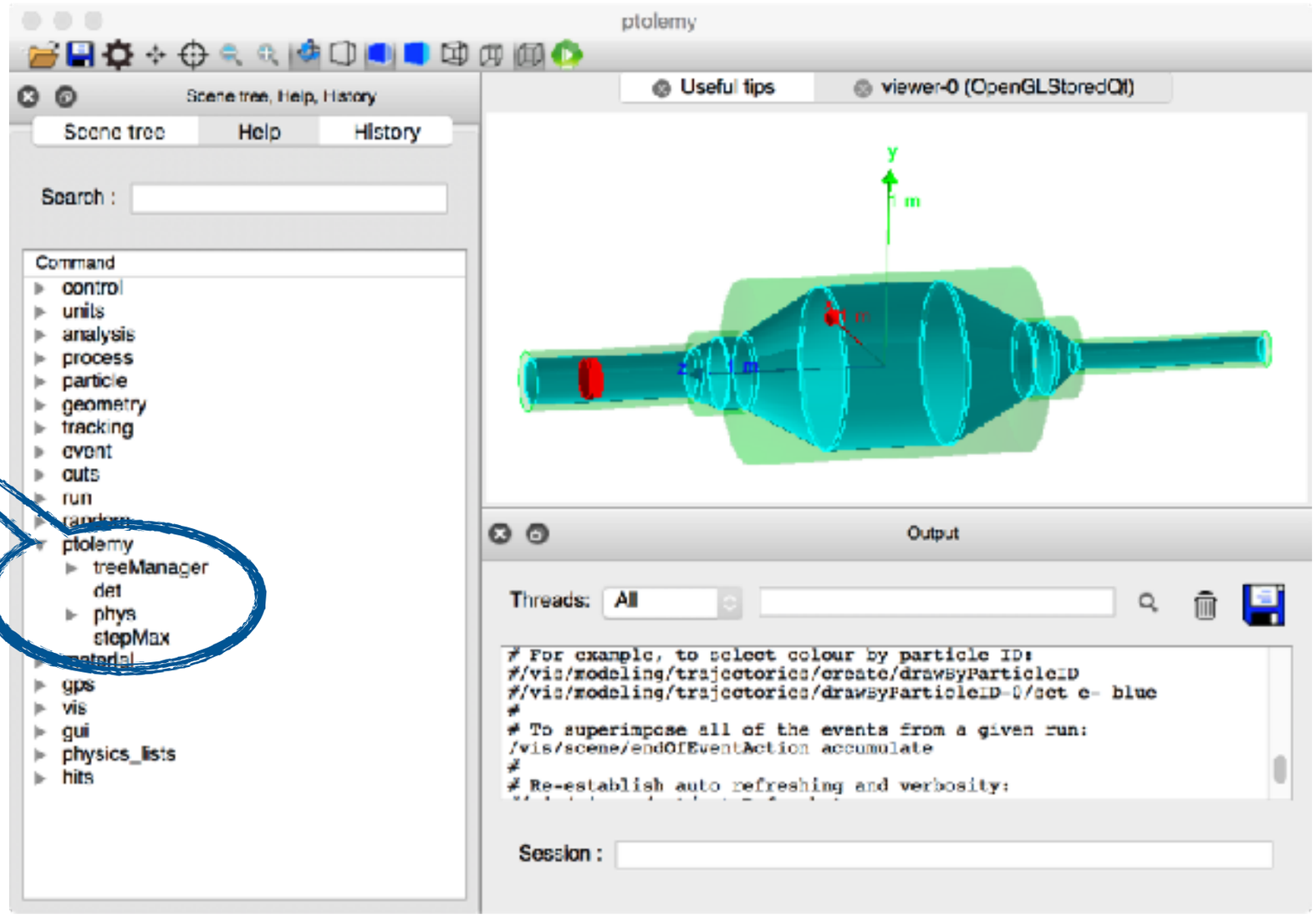
- possibility to change more parameters via macro
  - PhysicsList
  - StepMax

- GeometryMessenger added but to be finalised (for the field and other options)

- Git repository: https://gitlab.com/carlomt/PTOLEMY

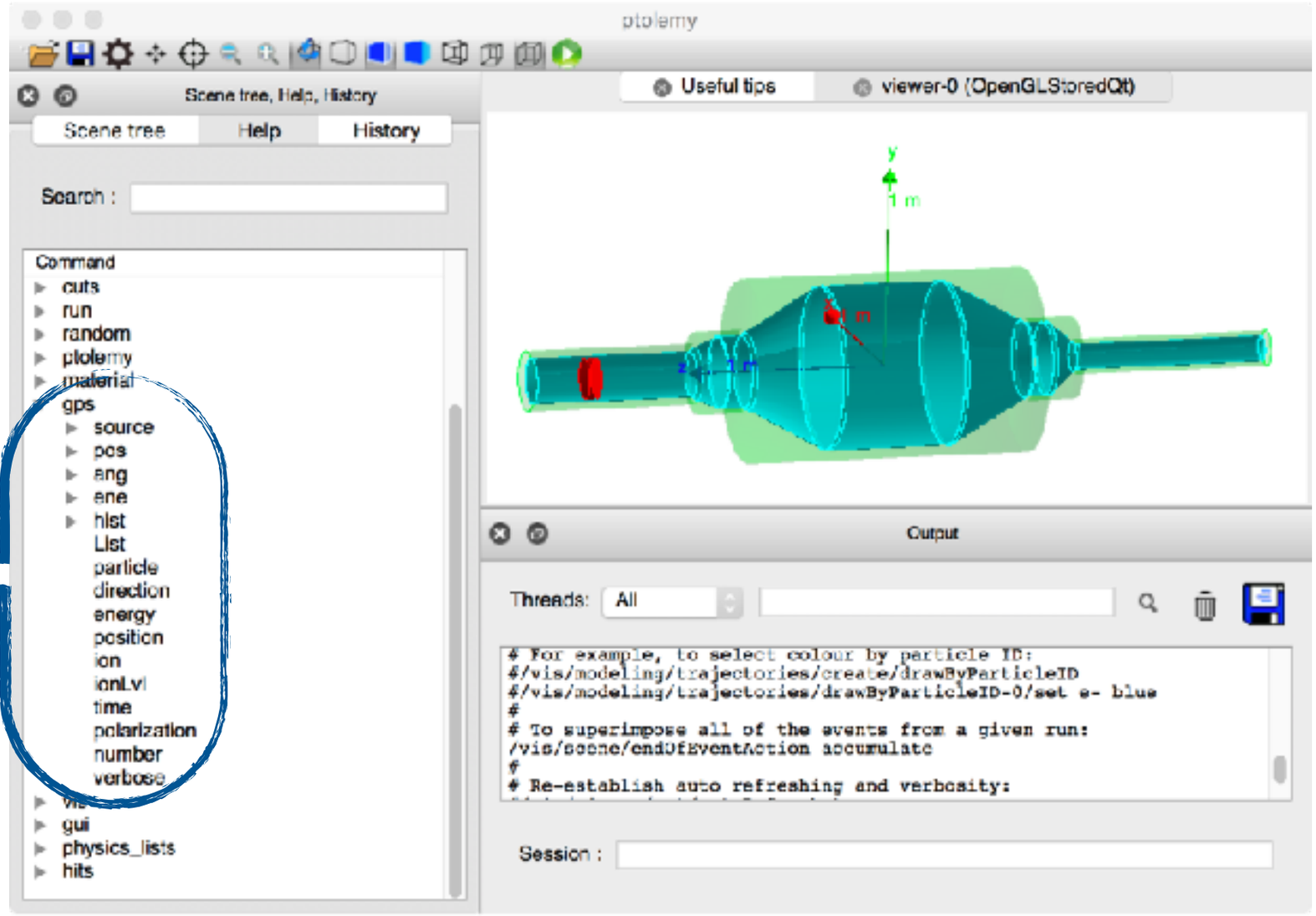
Update of the simulation

- All the options in a Macro directory “ptolemy”
- Field map from relative path



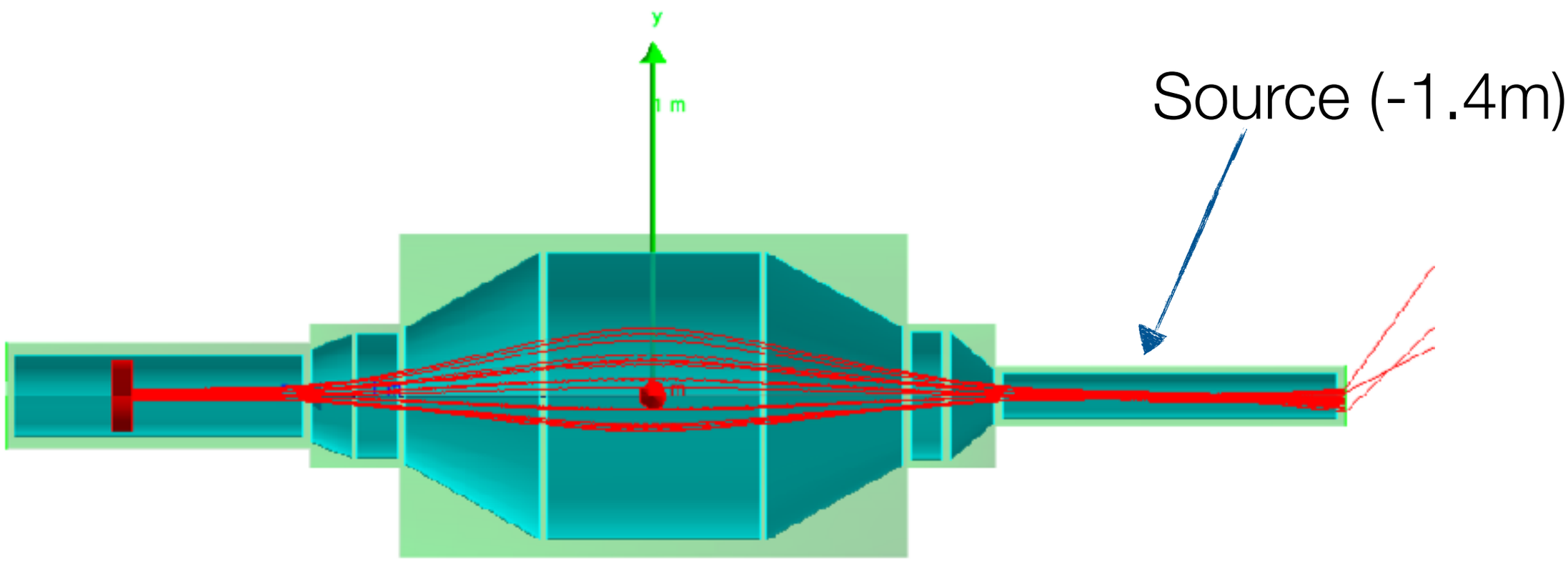
Update of the simulation

- Primaries created with General Particle Source
- All the properties via macro
- Can sample from histograms

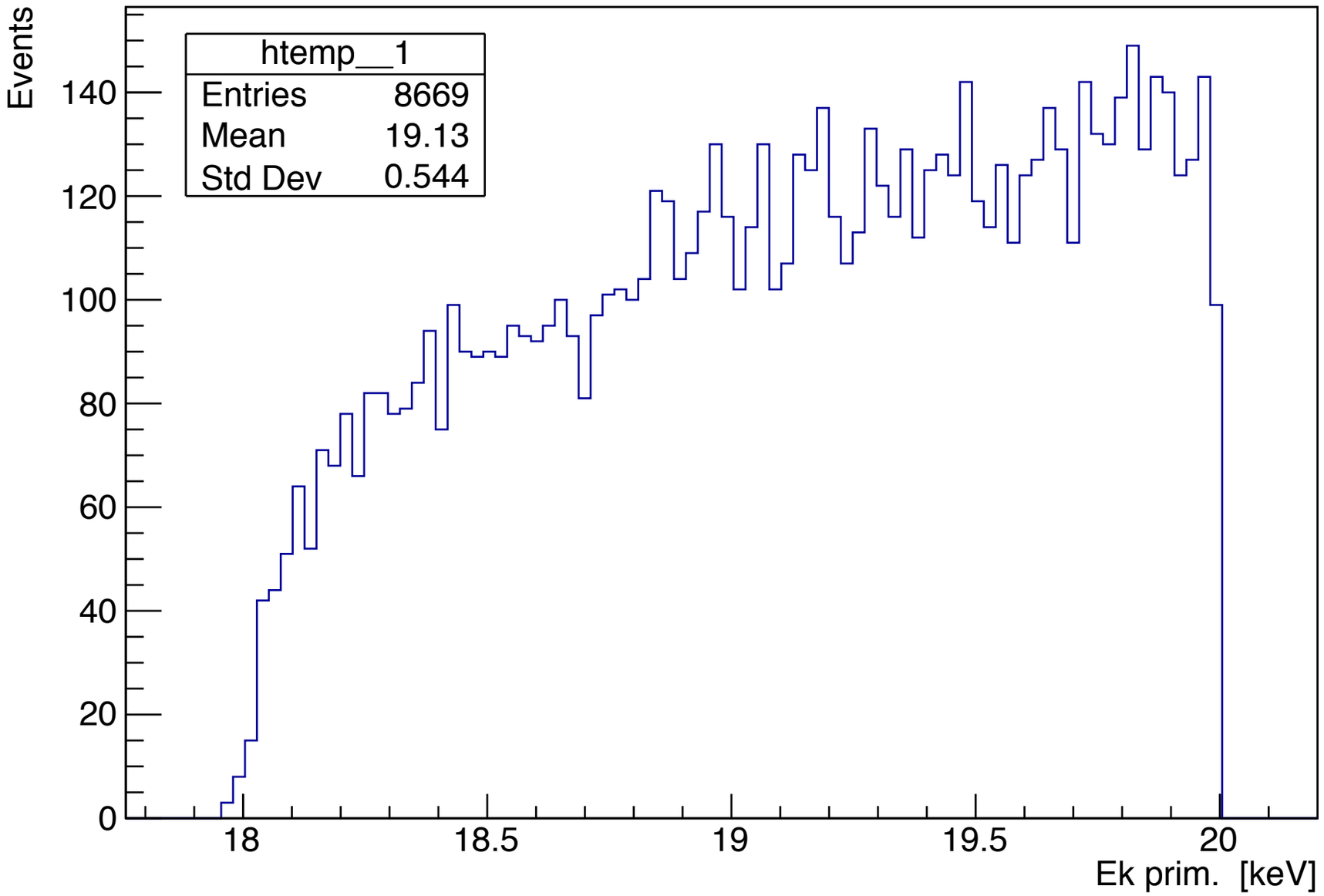


Uniform electrons

- Magnetic field: fieldmap/ptolemy_field.txt
- e-, Ek uniform 0.1-20 keV, isotropic, cylinder r:16mm h:10nm



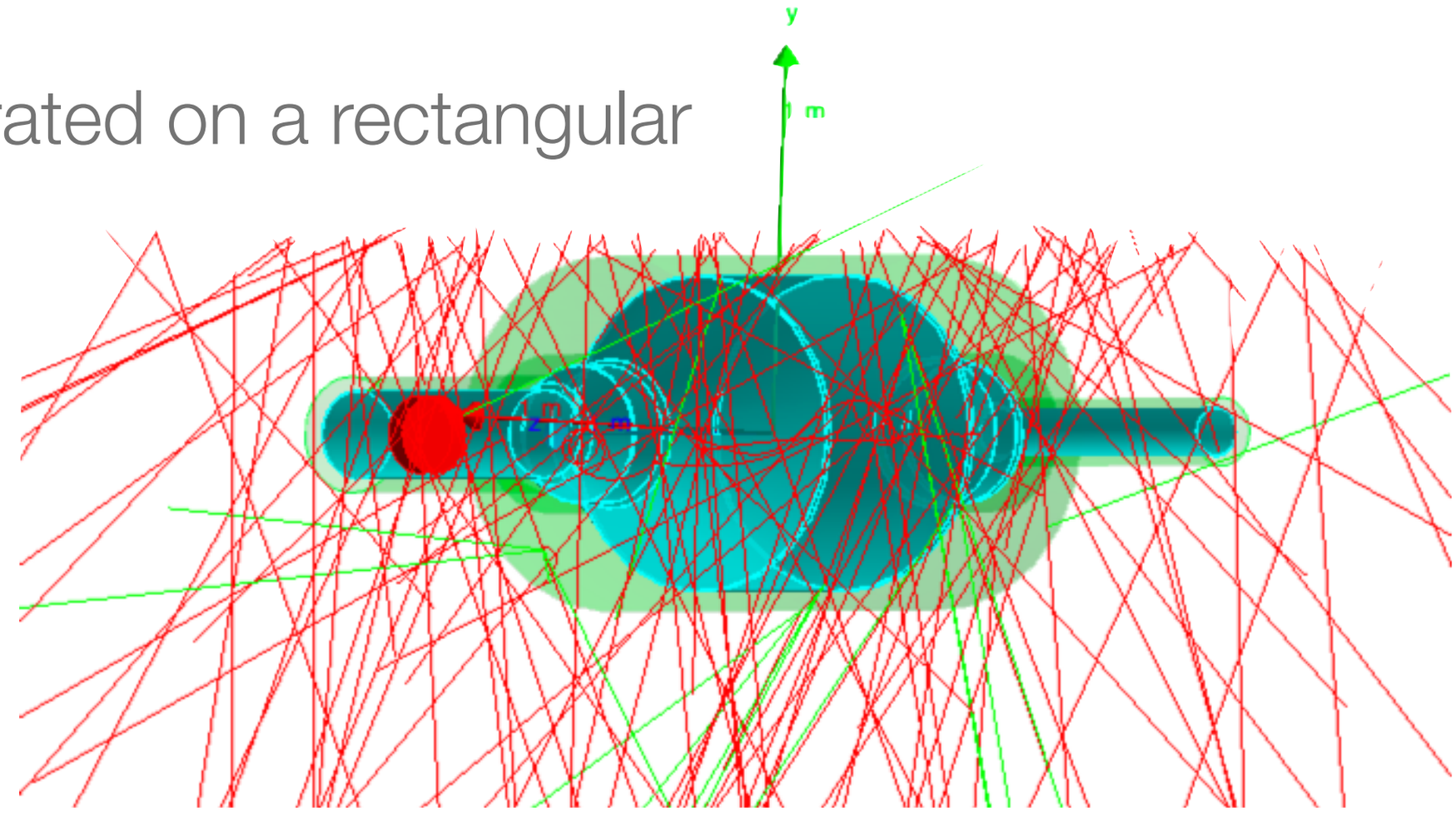
Uniform electrons



Kinetic energy of primaries that generated an energy deposition in the calorimeter

Cosmic muon simulation

- PhysicsList: QGSP_BERT_HP_LIV
- Threshold on secondaries production: 250 eV
- Muons generated on a rectangular surface 120x440cm



ptolemy

Scene tree, Help, History

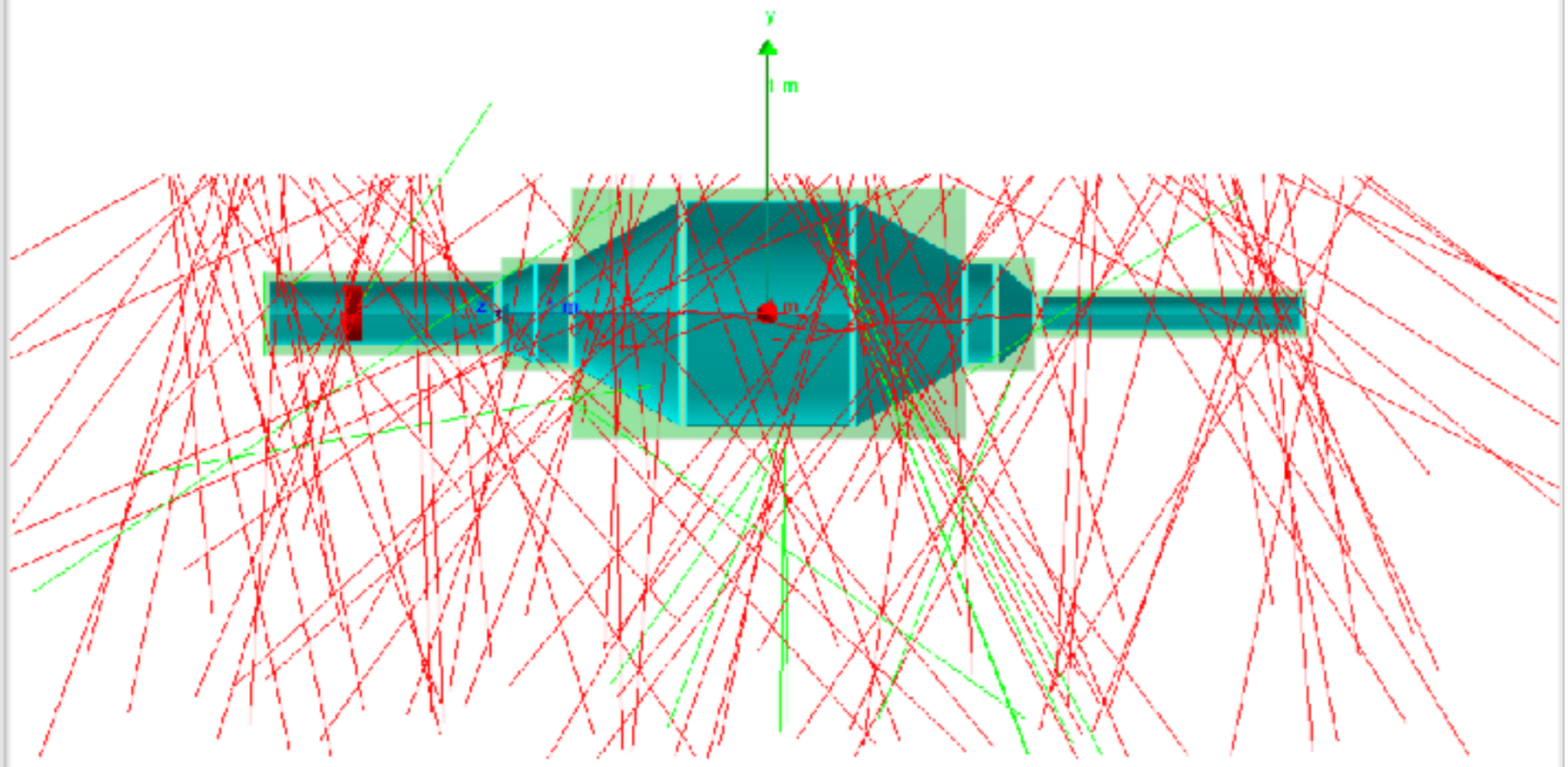
Scene tree | Help | History

Search :

Command

- control
- units
- analysis
- process
- particle
- geometry
- tracking
- event
- cuts
- run
- random
- ptolemy
- material
- gps
- vis
- gui
- physics_lists
- hits

Useful tips | viewer-0 (OpenGLStoredQt)



Output

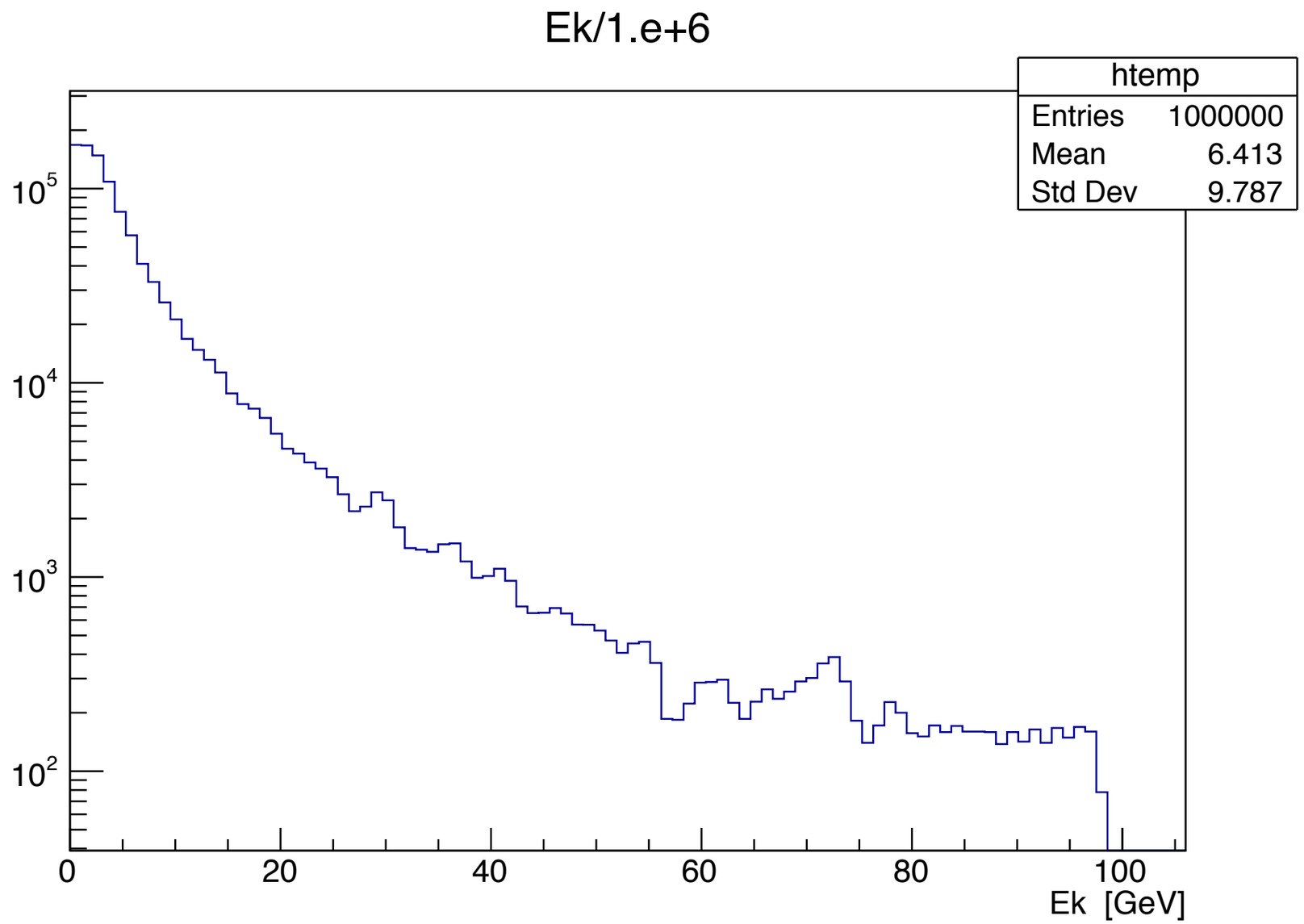
Threads: All

```
Energy thresholds :  gamma  112.394 keV    e-  2.27691 MeV    e+  2.13225 MeV proton 100 keV
Region(s) which use this couple :
DefaultRegionForTheWorld
------------------------------------------------------------------
/vis/scene/notifyHandlers scene-0
### Run 0 starts.
--> Event 0 starts.
Run terminated.
Run Summary
Number of events processed : 100
User=0.01s Real=0.02s Sys=0s
... trying to write Root file : ptolemy-out - done
WARNING: 100 events have been kept for refreshing and/or reviewing.
"/vis/reviewKeptEvents" to review them one by one.
  "/vis/enable", then "/vis/viewer/flush" or "/vis/viewer/rebuild" to see them accumulated.
Starting UI session...
```

Session :

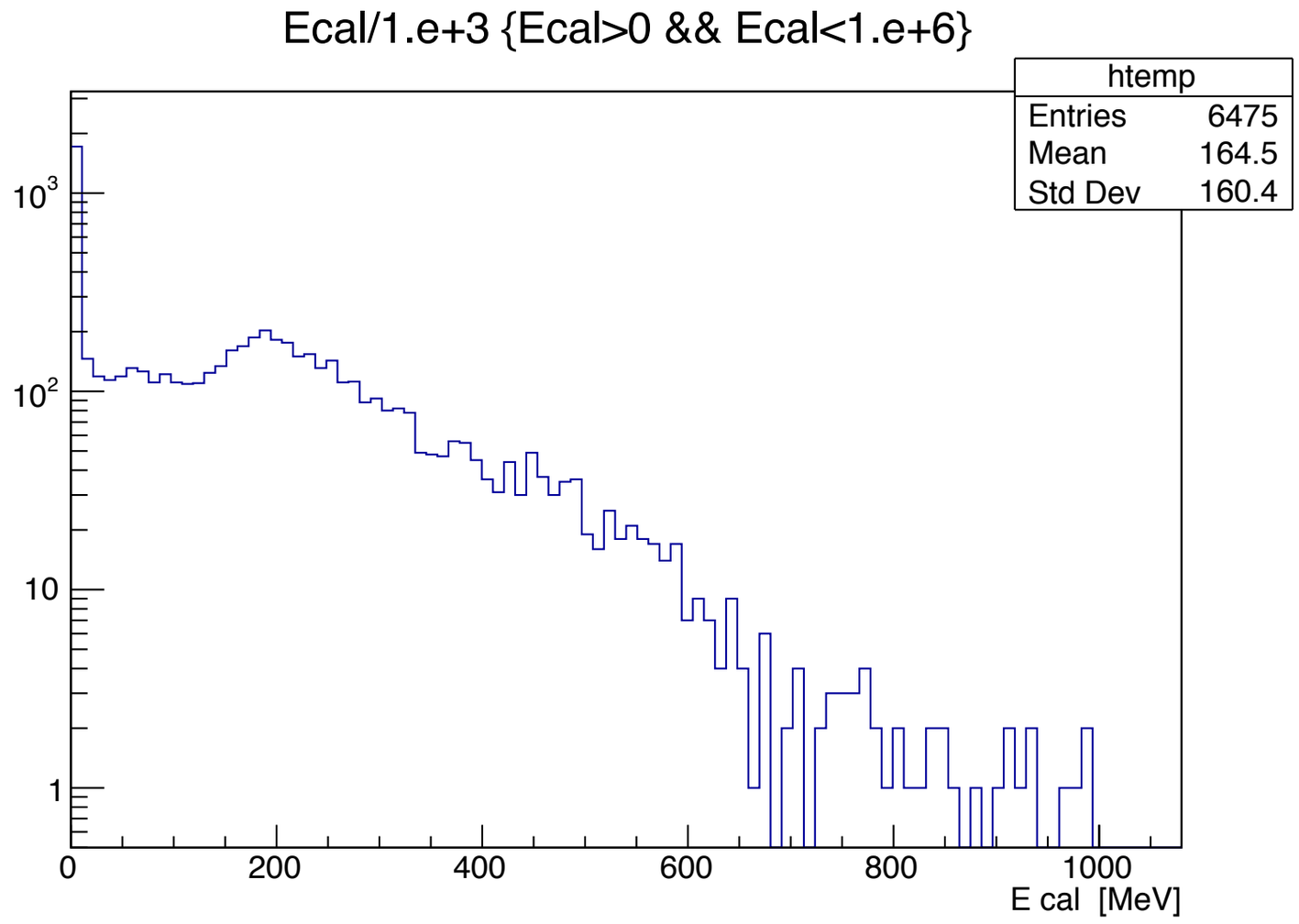
Cosmic muon simulation

- Energy sampling a spectrum
- Const < 2 GeV
- 1’000’000 events



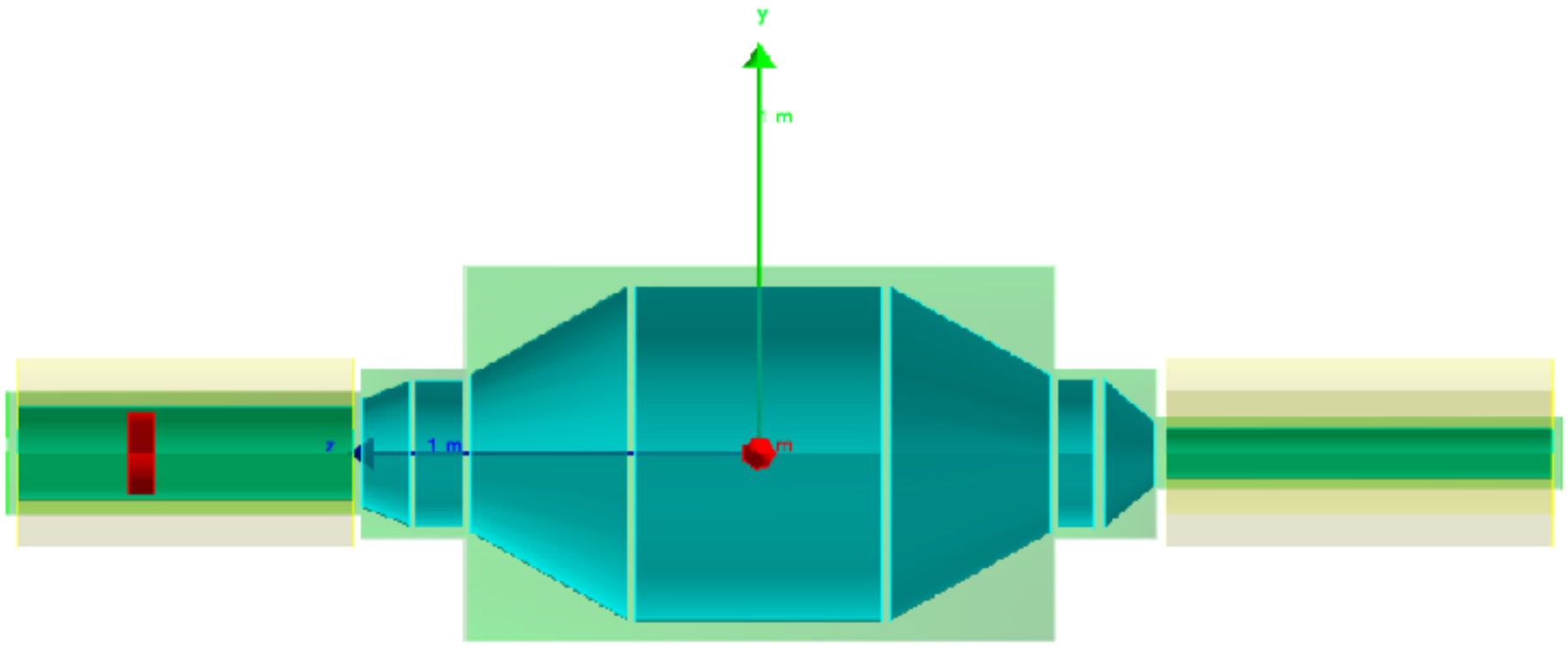
Cosmic muon simulation

- 6.5 e-3 events per primary generate a signal in the calorimeter
- assuming 1 cosmic muon per cm^2 per min
- area of 52’800cm^2
- **5.7 Hz**



Magnets

- Approximated implementation
- Cylinders in steel (in radius:15cm out radius:23cm)
- Same length of first and last electrodes



With the magnets

- 1% of the events produces an energy deposition in the calorimeter
- assuming 1 cosmic muon per cm^2 per min
- area of 52’800cm^2
- **9.3 Hz**