

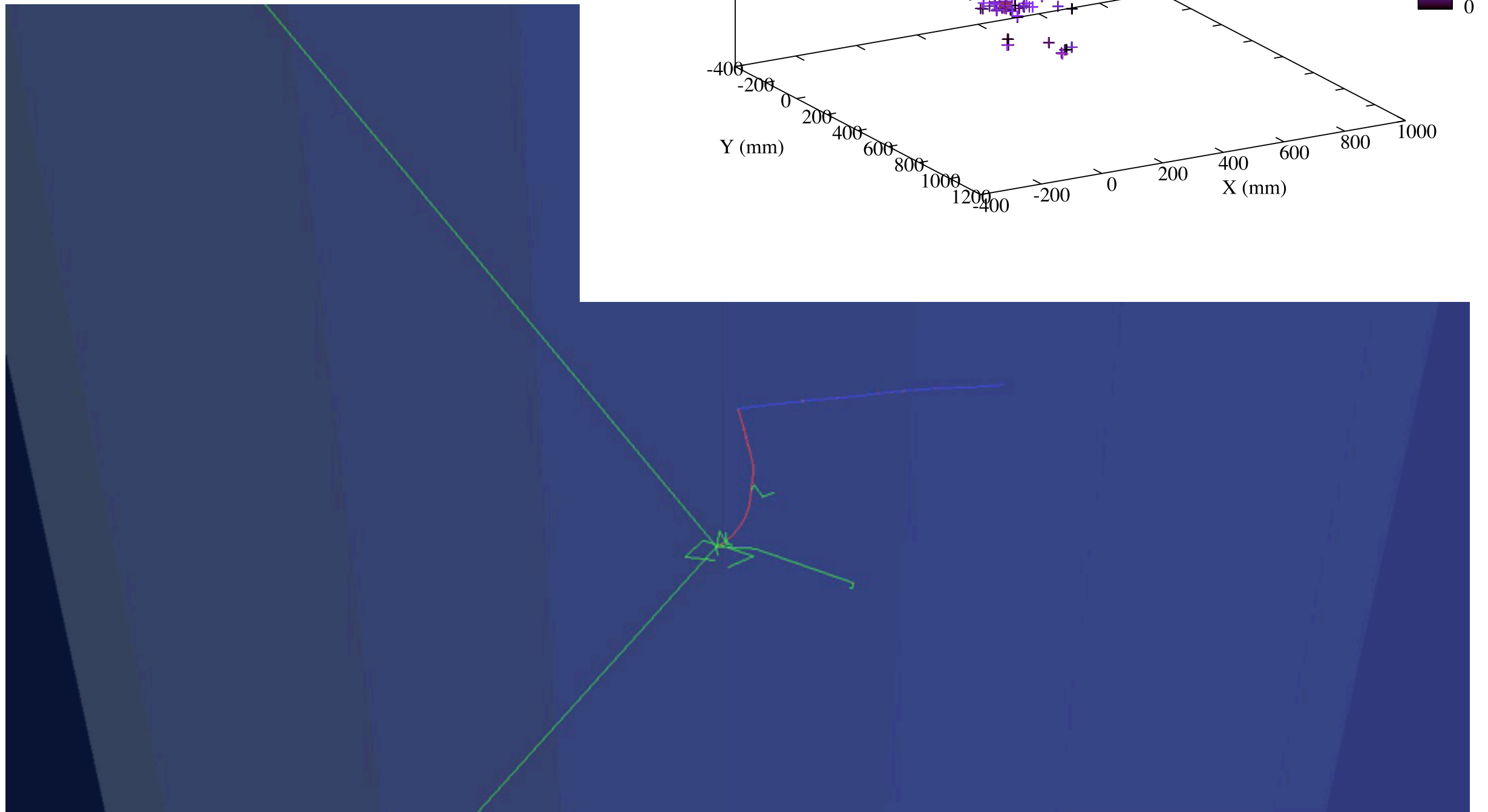
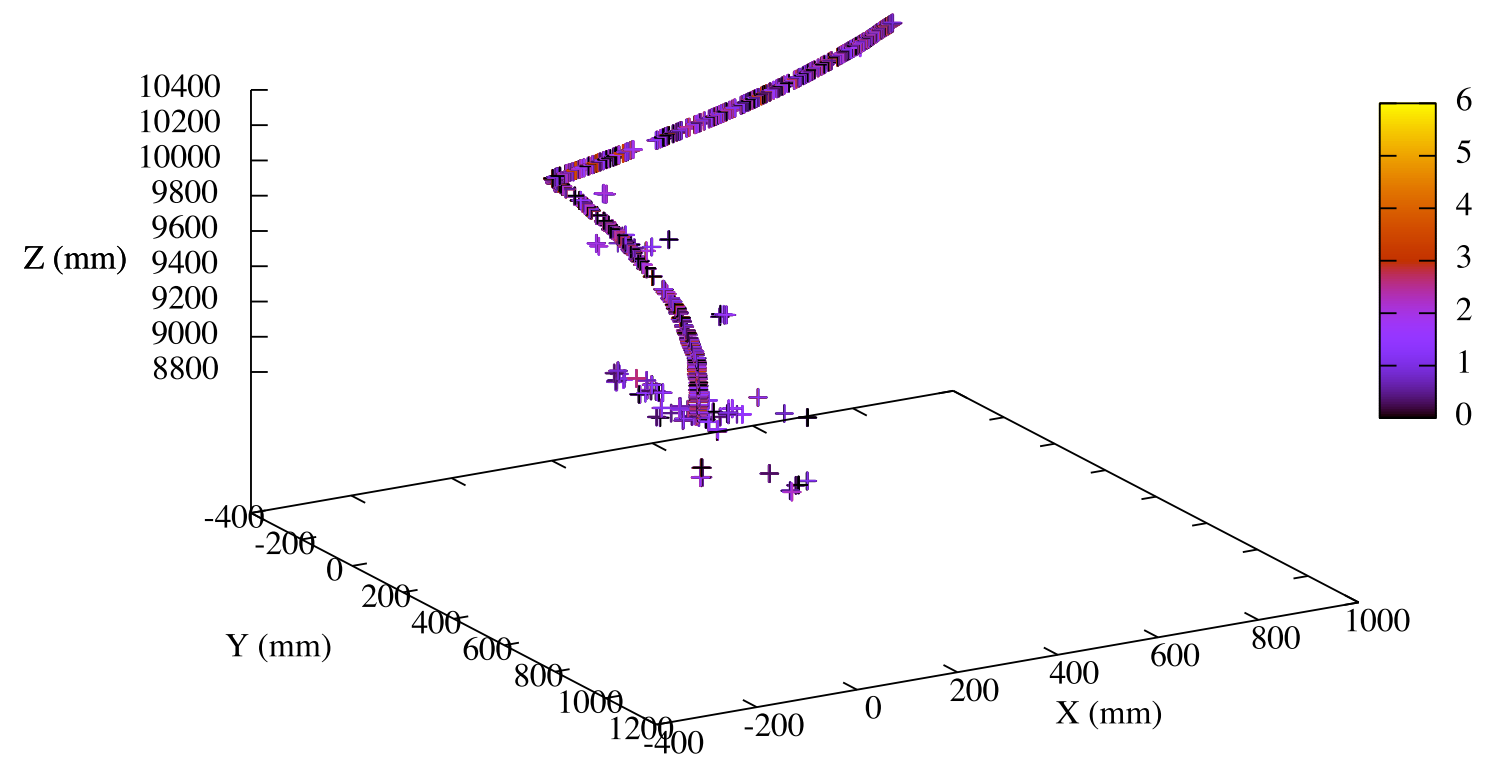
Liquid Argon TPC Simulation and Track Fitting

Matt Robinson

Simulation

- Neutrino interactions modelled by GENIE, supplied by Ben Morgan in ROOT format.
- Geant4 detector simulation follows secondary and tertiary particle through Argon.
- Energy depositions counted with 0.1 mm precision, converted into freed electrons.
- Diffusion modelled using published figures for electrons in Argon.

1 GeV ν_μ QEL-CC
Colour indicates $\log_{10}(\#Electrons)$



Detector Simulation

- 3.2 m³ of Liquid Argon in a cylinder.
- Drift speed of 2 mm/μs
- Electron lifetime of 3 ms.
- Standard Physics.

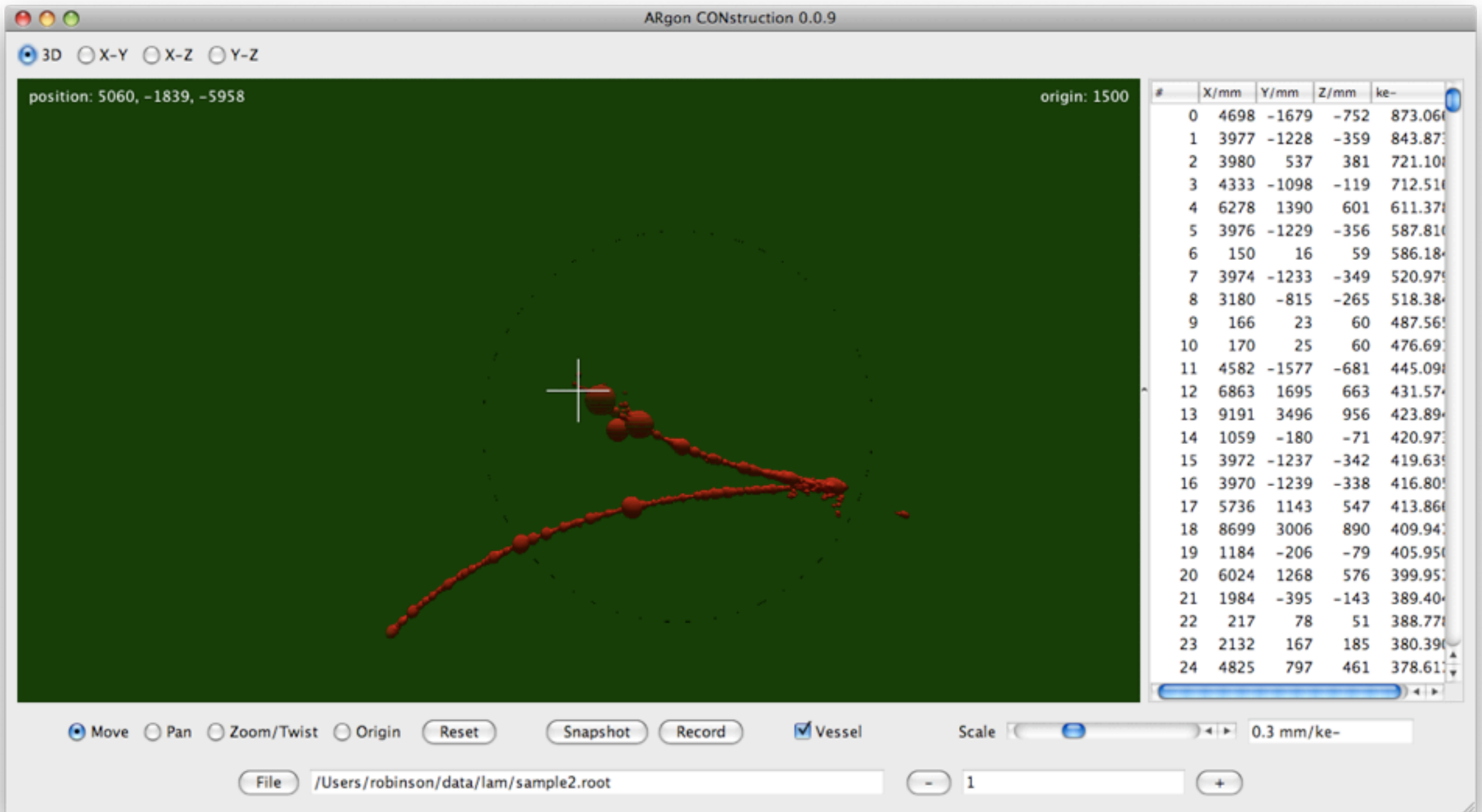
Electron release, Diffusion and Readout

- Assumed 1 electron released per 23.6 eV
- Mean delta R of electrons 45 mm/s.
- Assumed readout resolution of 3 mm.

Event Viewer

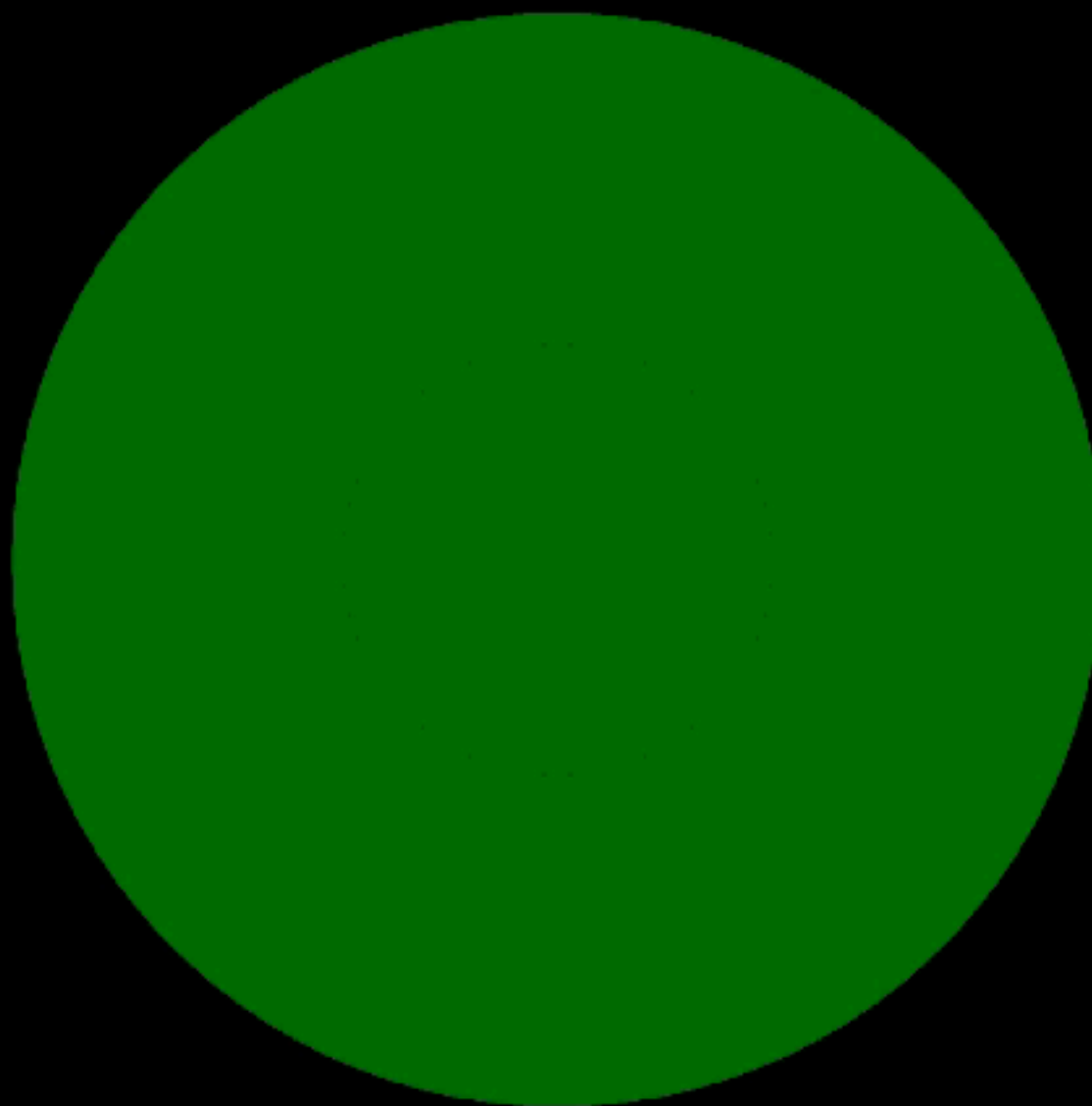
- Reads output from geant4.
- 3d OpenGL view, 3x 2d projections.
- On-the-fly track fitting.

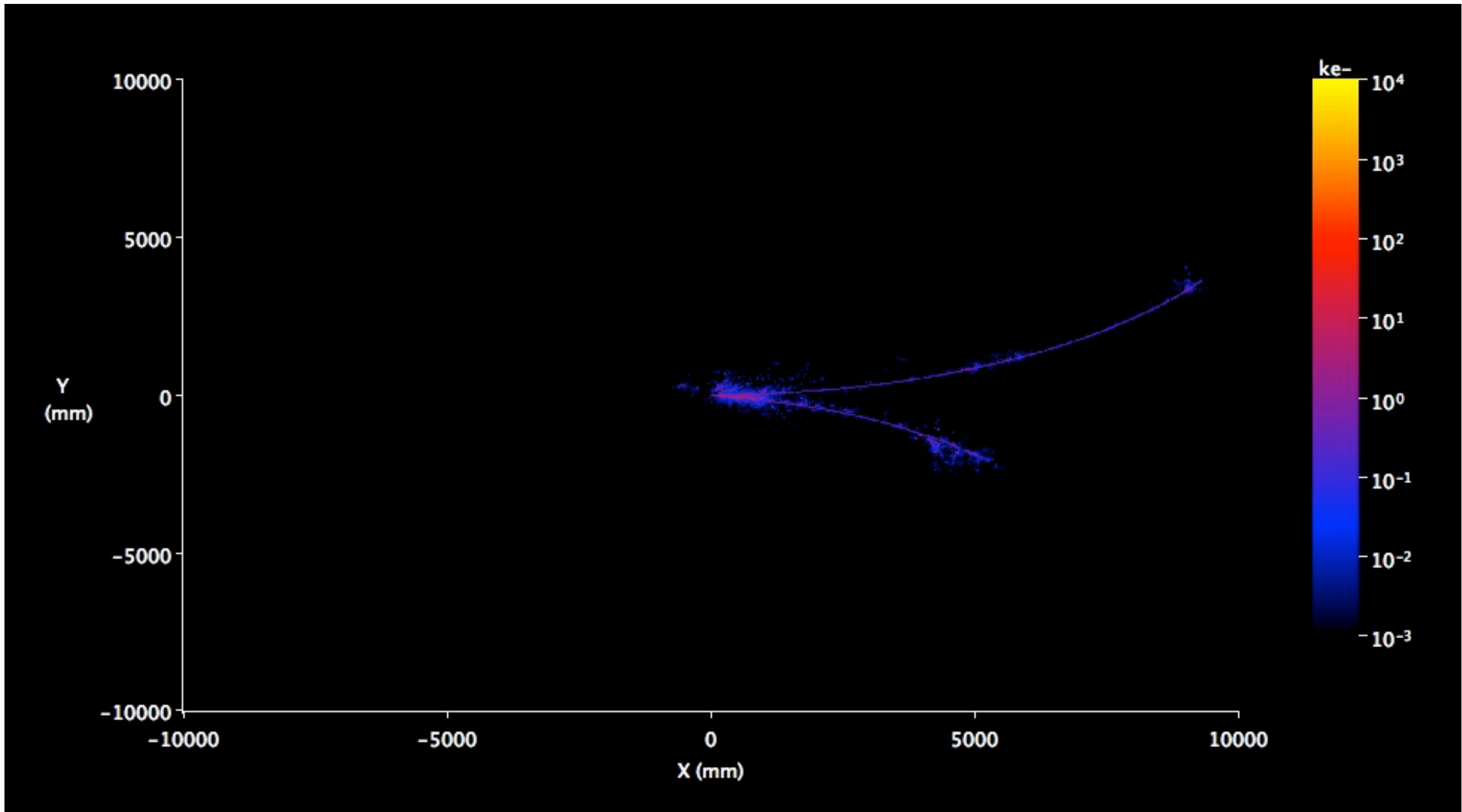
- 15 GeV numu DIS

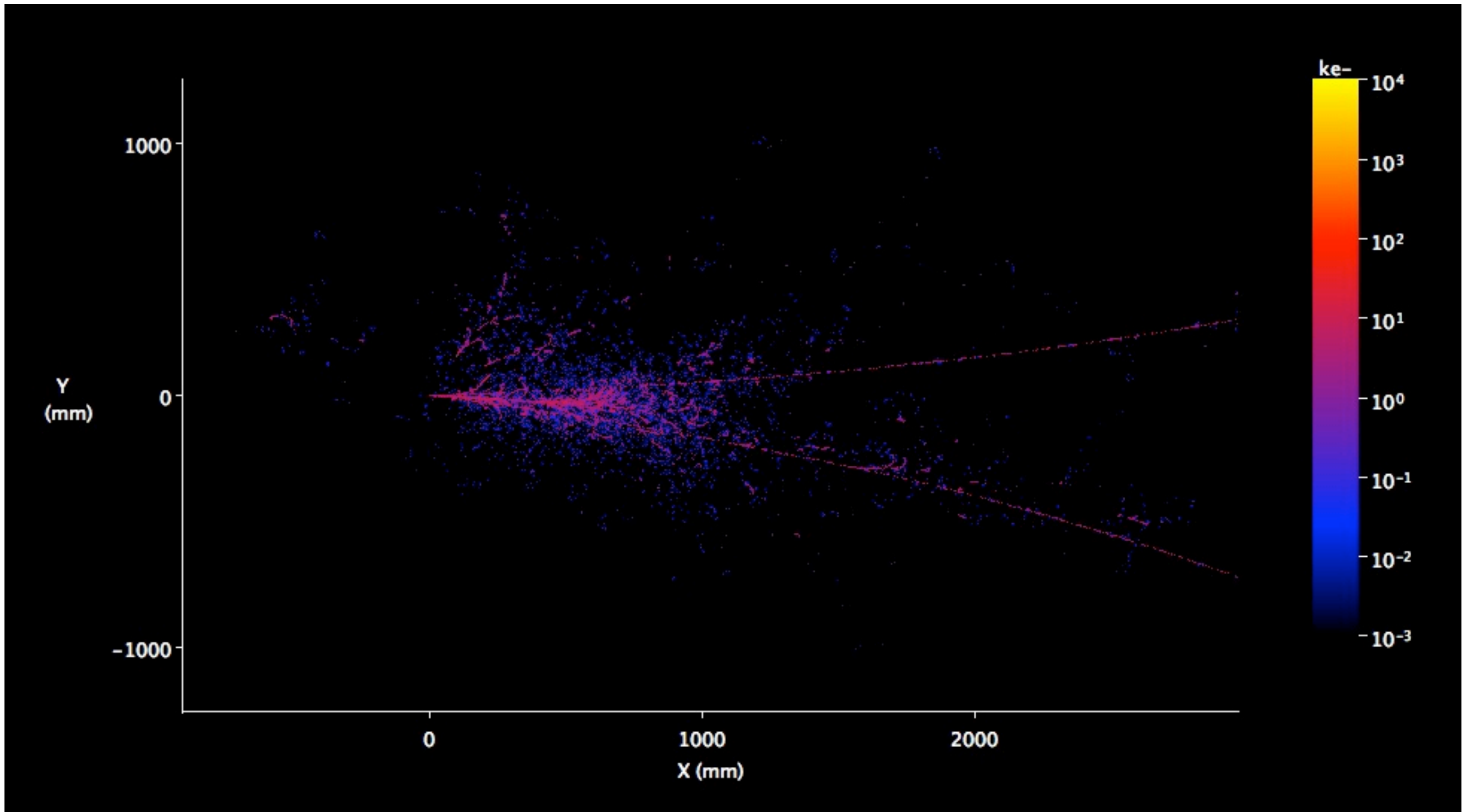


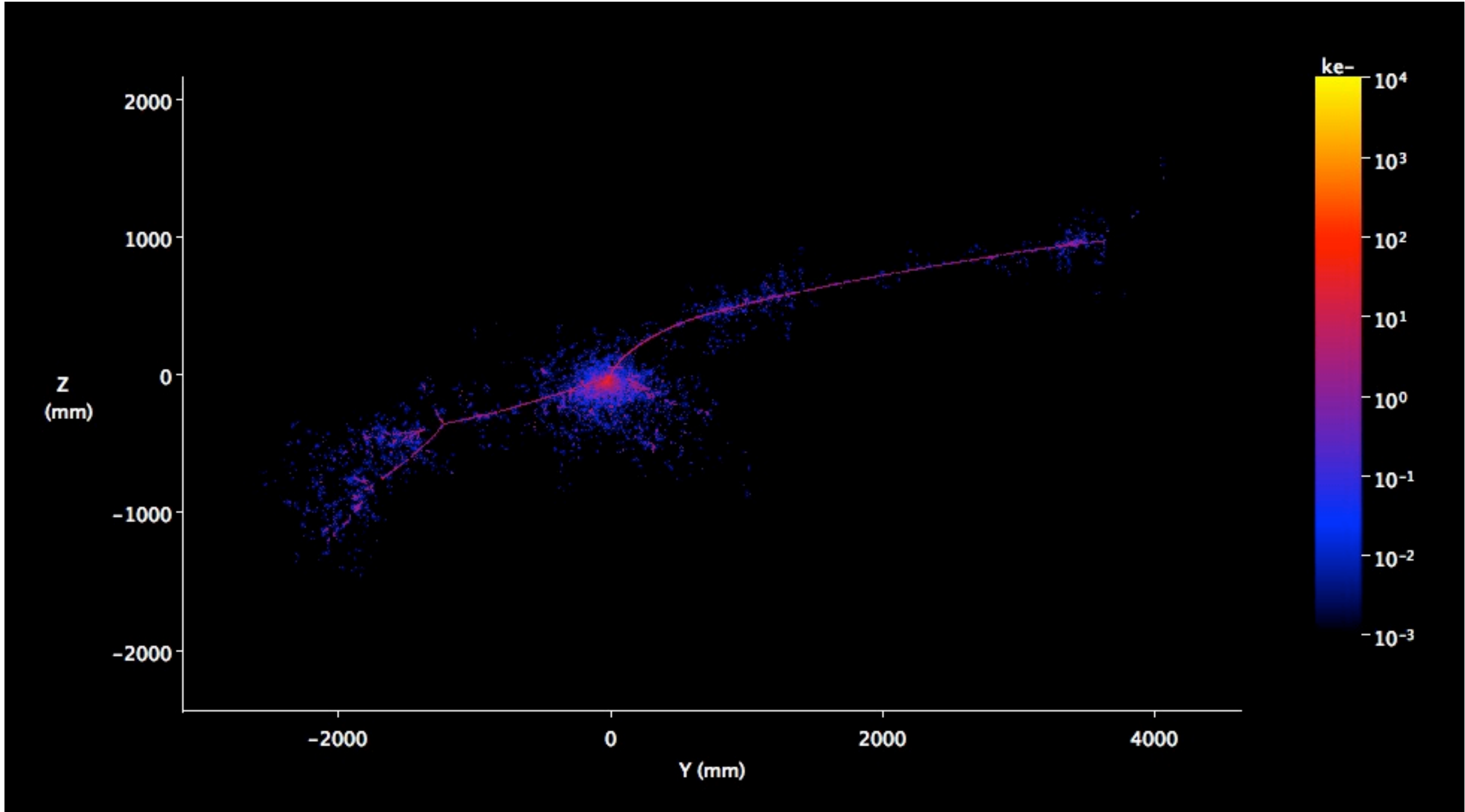
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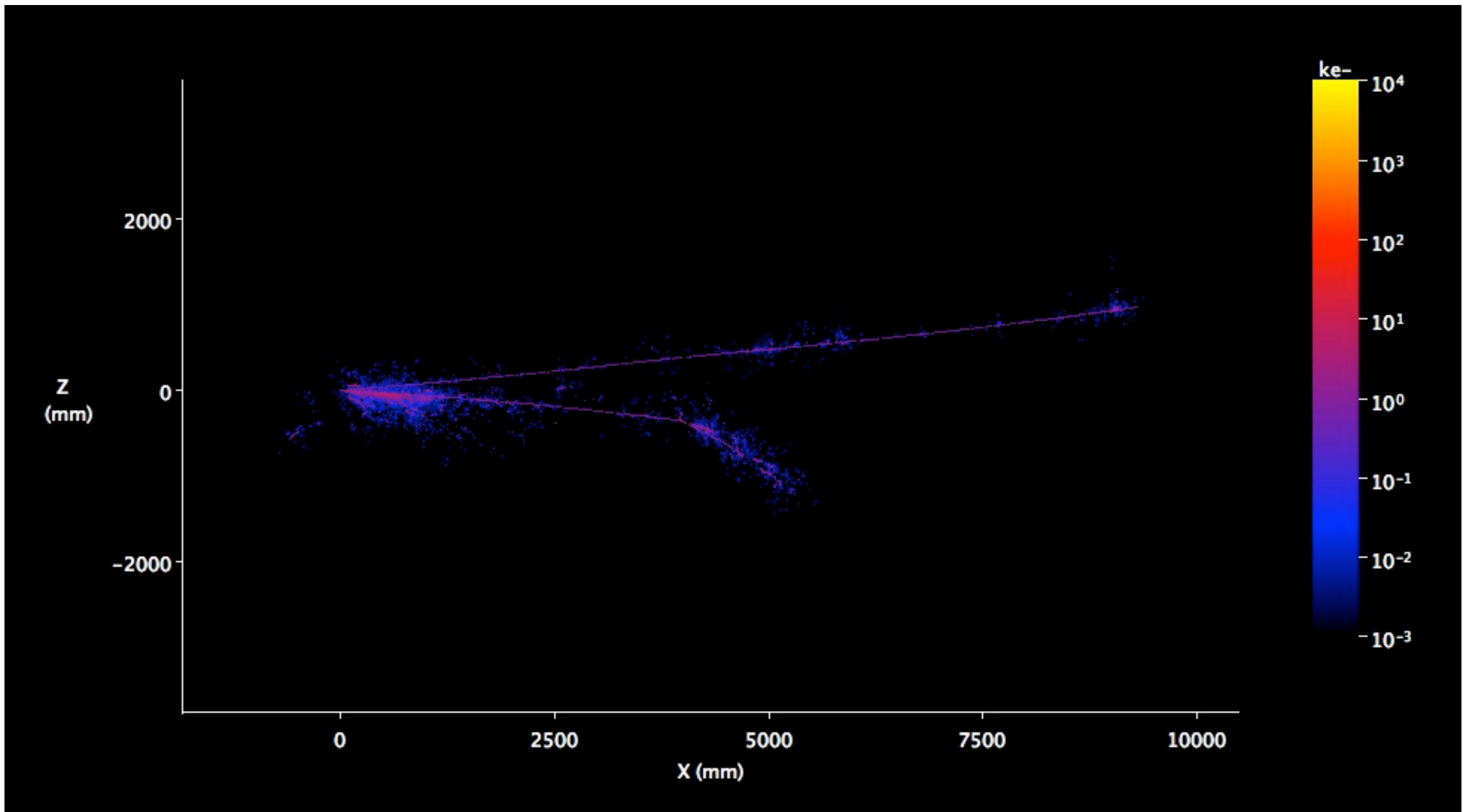
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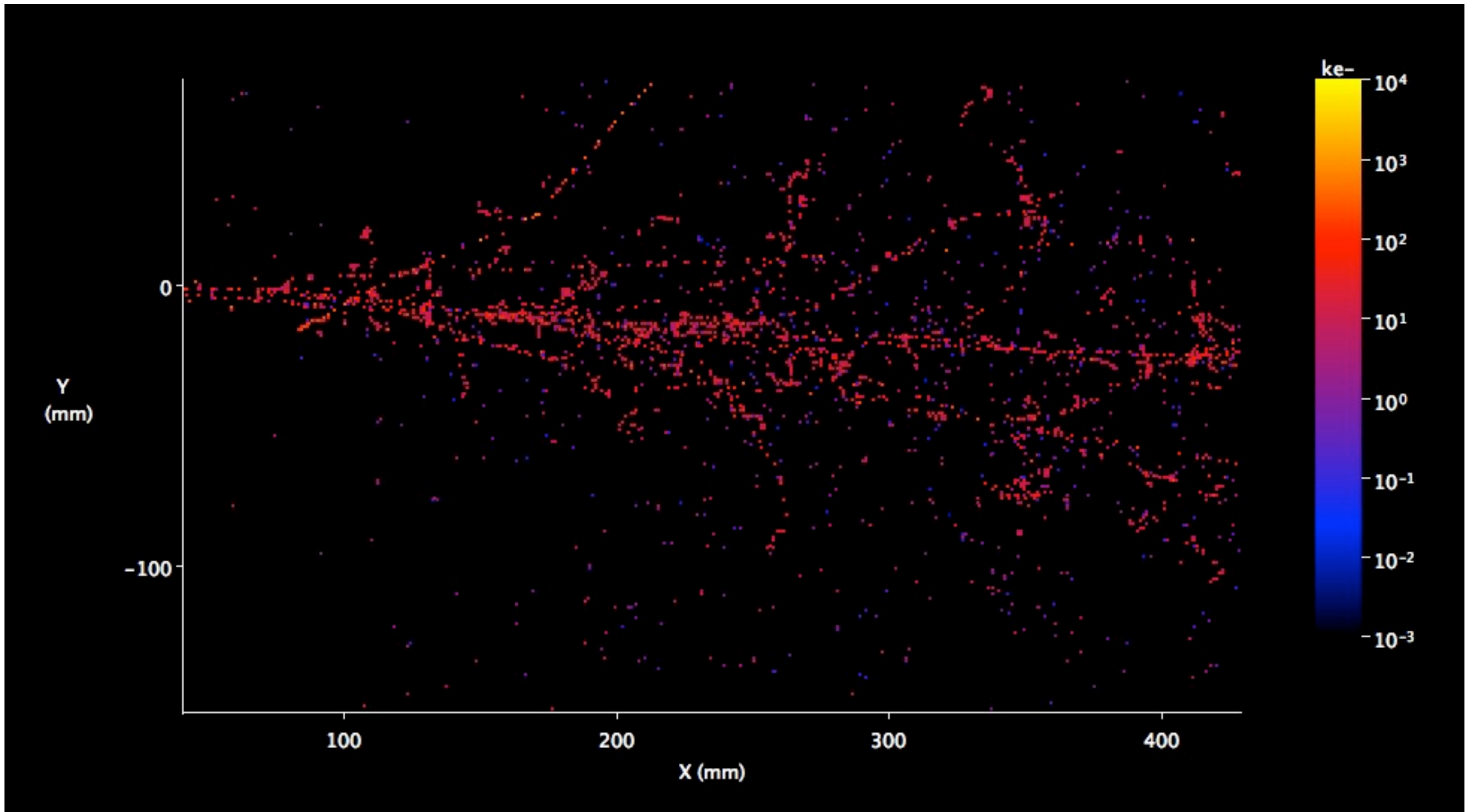


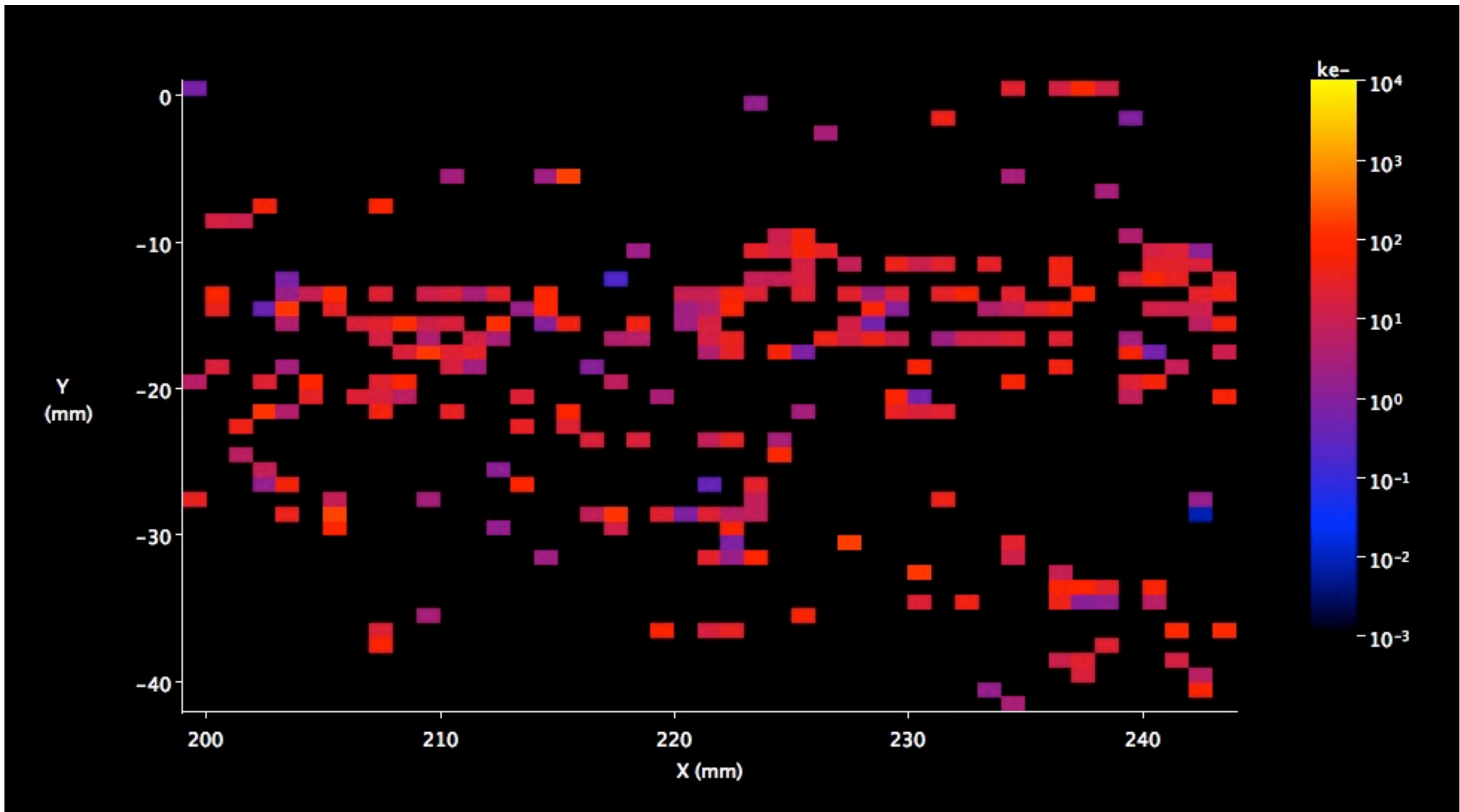






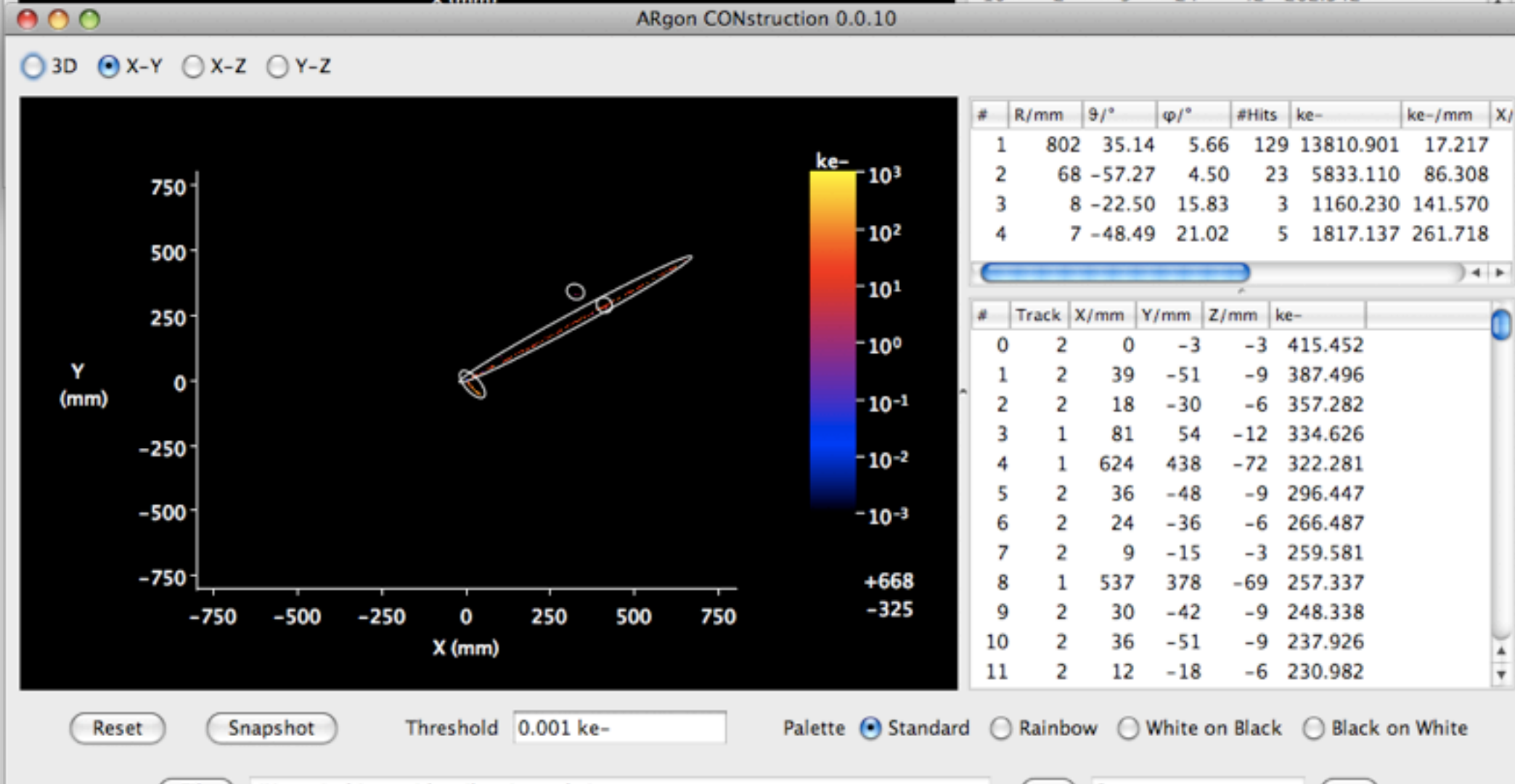
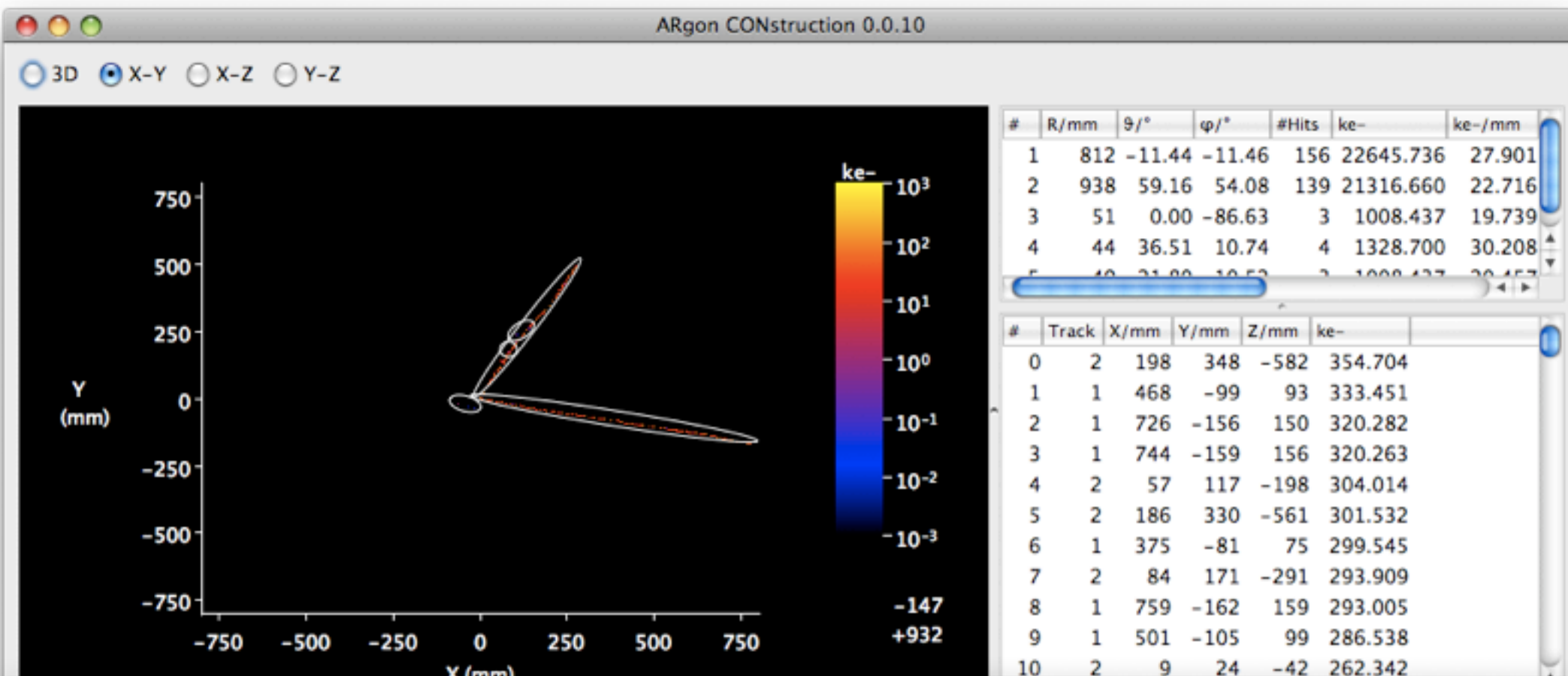


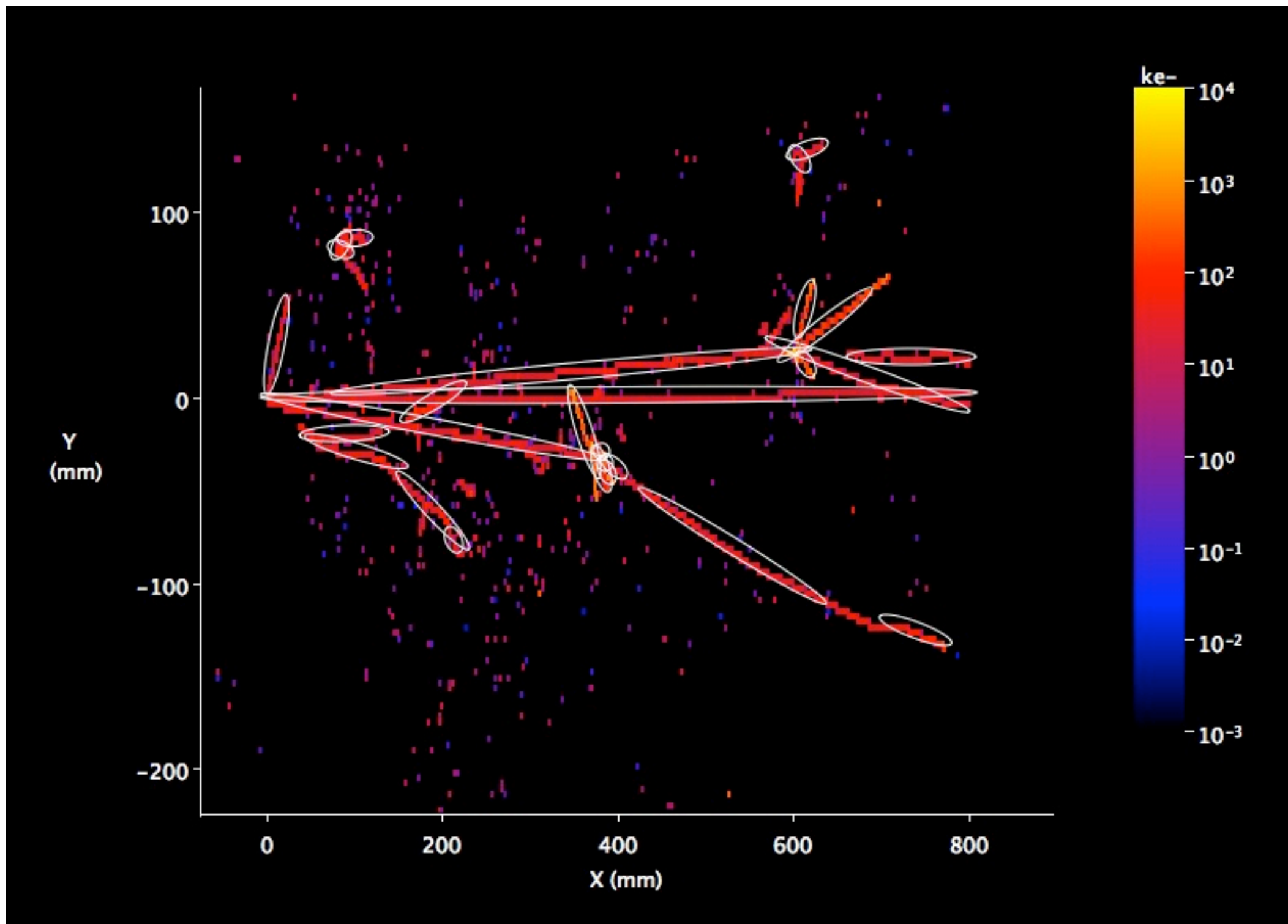




Track fitting

- Draw a cylinder along the axis connecting 2 randomly selected points to produce track candidate
- Select track candidates by total energy and uniformity.
- Combine/break track candidates based on proximity and gaps.





Not done

- Realistic readout modelling
- Optimise track fitting.
- Stability still lacking, mainly on handling root files.