LUXE Full Scale MC

FLUKA Radiation Maps

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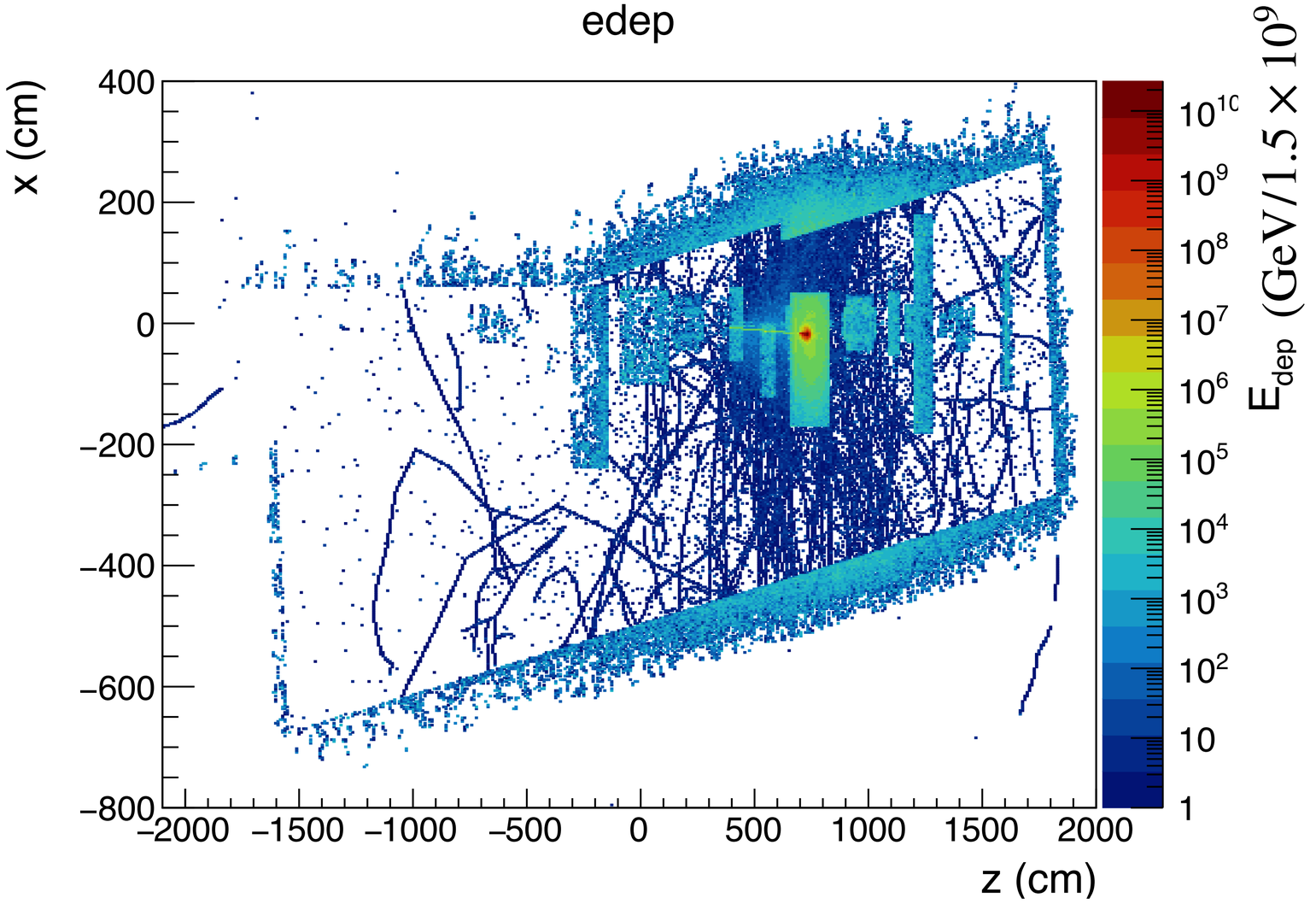
FLUKA Simulations

Current status

- FLUKA run directory set up in /nfs/dust/luxe/group/MCProduction/tmp/flukaSim
- Input file for FLUKA - lxgeomdump_fluka.inp
- Current standing:
    - 1000 jobs x 1 run x 10000 primaries (16.5 GeV electrons)
    - 513 job runs successful -> failure due to a persistent tracking bug
    - Total statistics available so far equivalent to 5.13 x 10^6
    - Run time = 1.5 hrs for simulation + 0.5 hrs for data processing
    - Can be run with BIRD default resources
- FLUKA USRBIN scoring can produce data on a 3D mesh with a maximum bin number of 400 x 400 x 400
- https://flukafiles.web.cern.ch/manual/USRBIN.html - documentation for USRBIN; scored here are: energy deposition, dose (TBI) and particle fluence
- Final file sizes for this level of statistics: bnn (FLUKA binary) files = 9 x 489 MB, dat files = 9 x 9.8MB; total final space ~4.5 GB
- Plots shown here are integrated over y - 400 x 1 x 400 (3.0 x 350.0 x 10.25 cm^3)

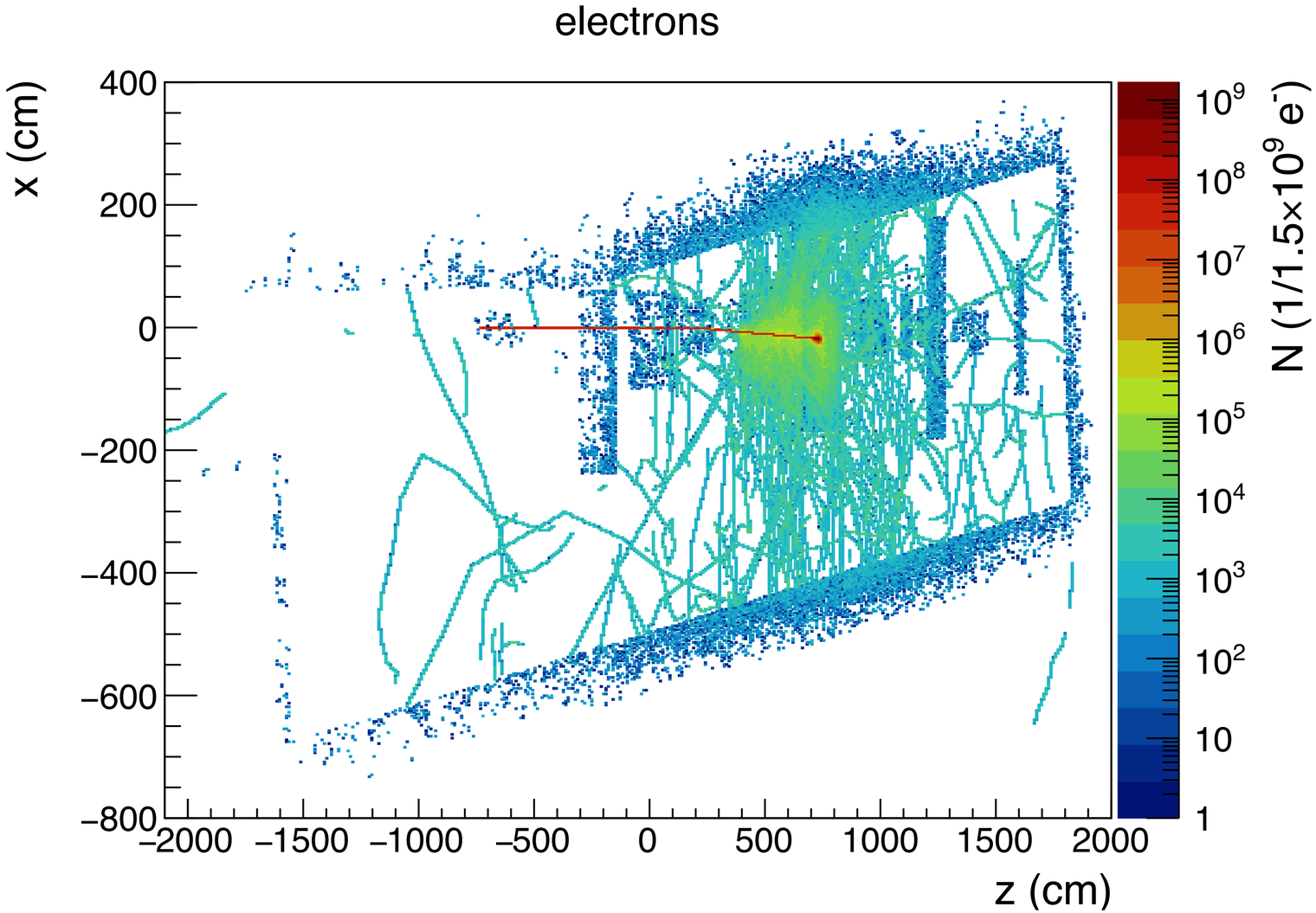
Simulation Results

Energy deposition



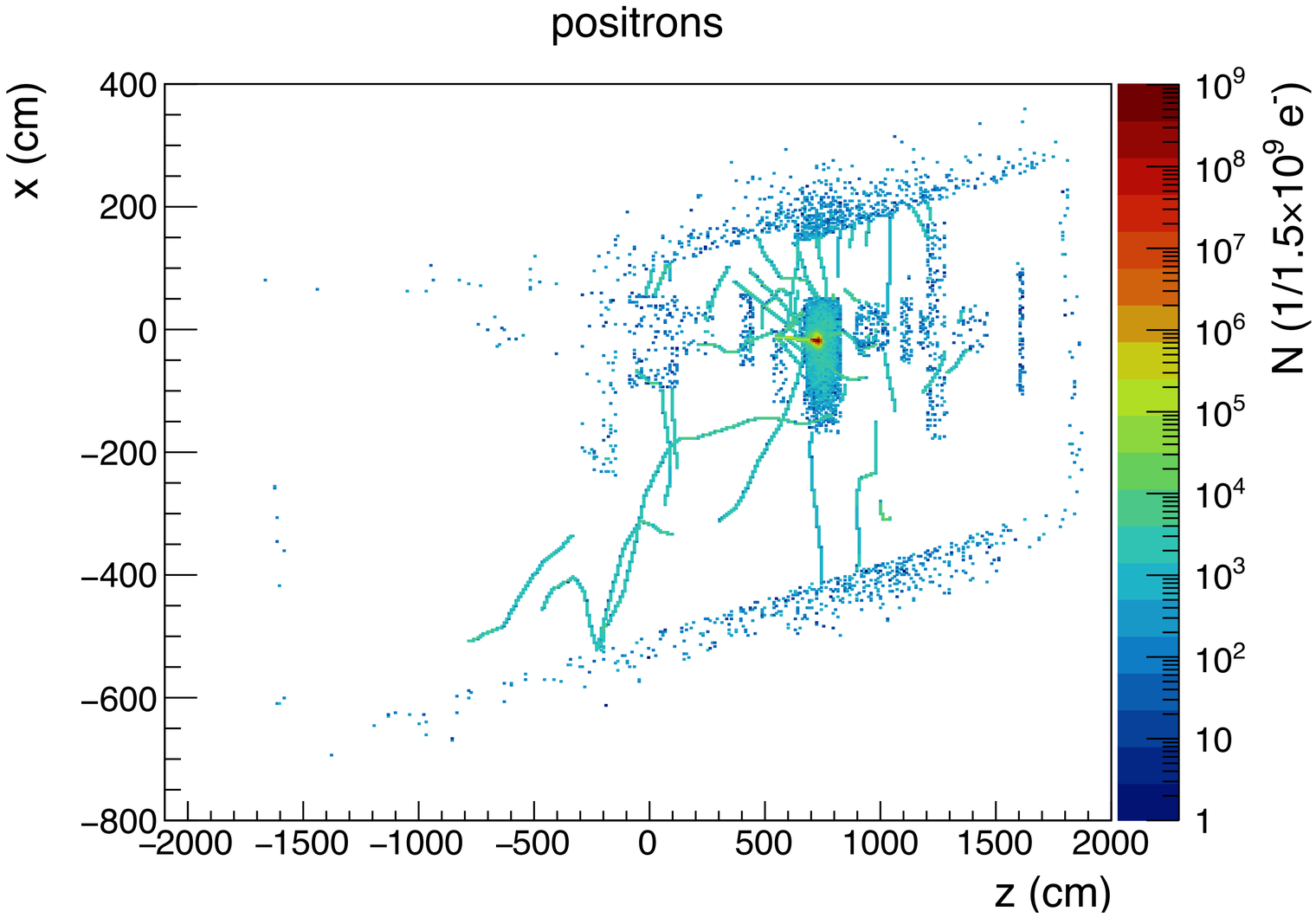
Simulation Results

Electrons



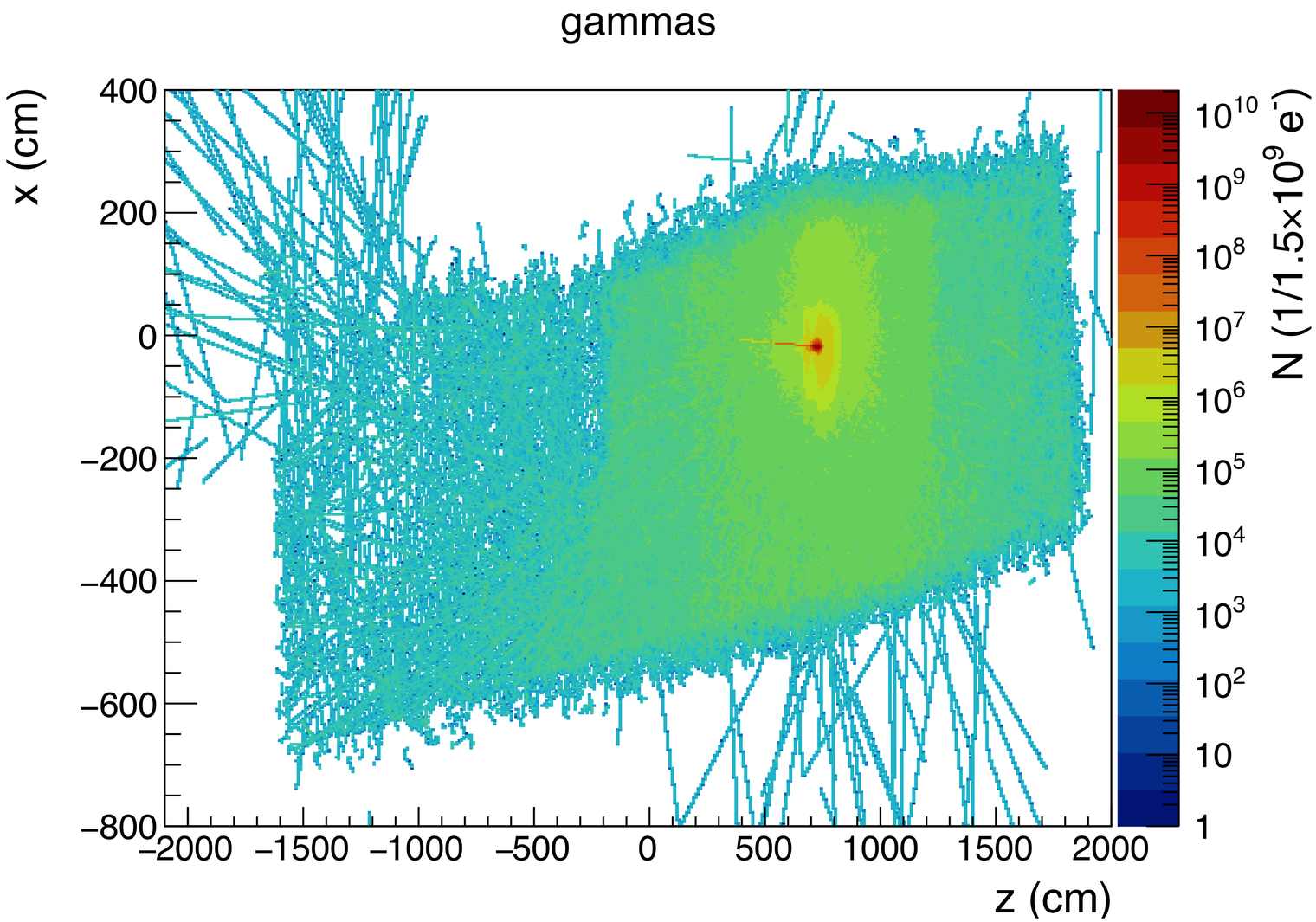
Simulation Results

Positrons



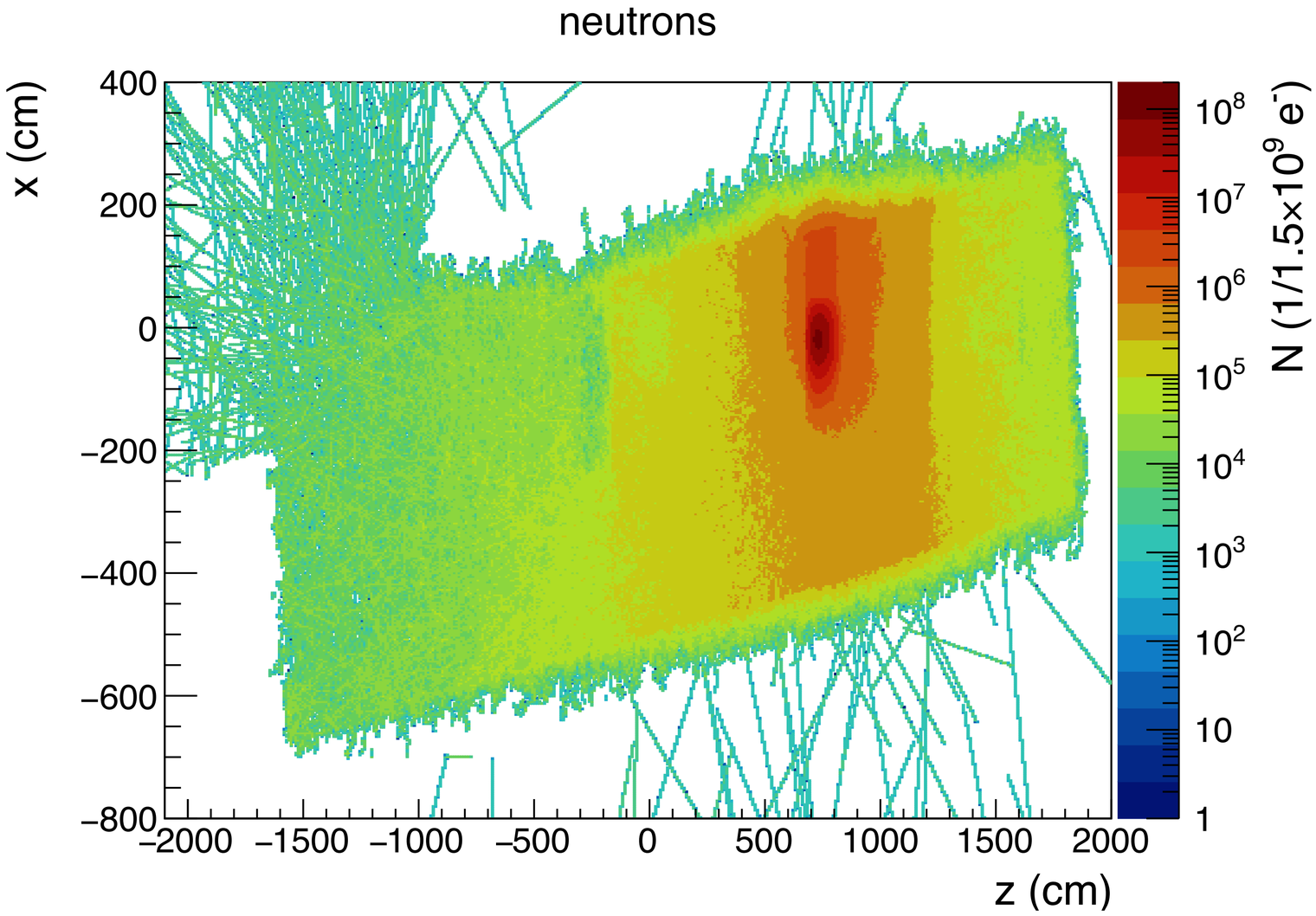
Simulation Results

Gammas



Simulation Results

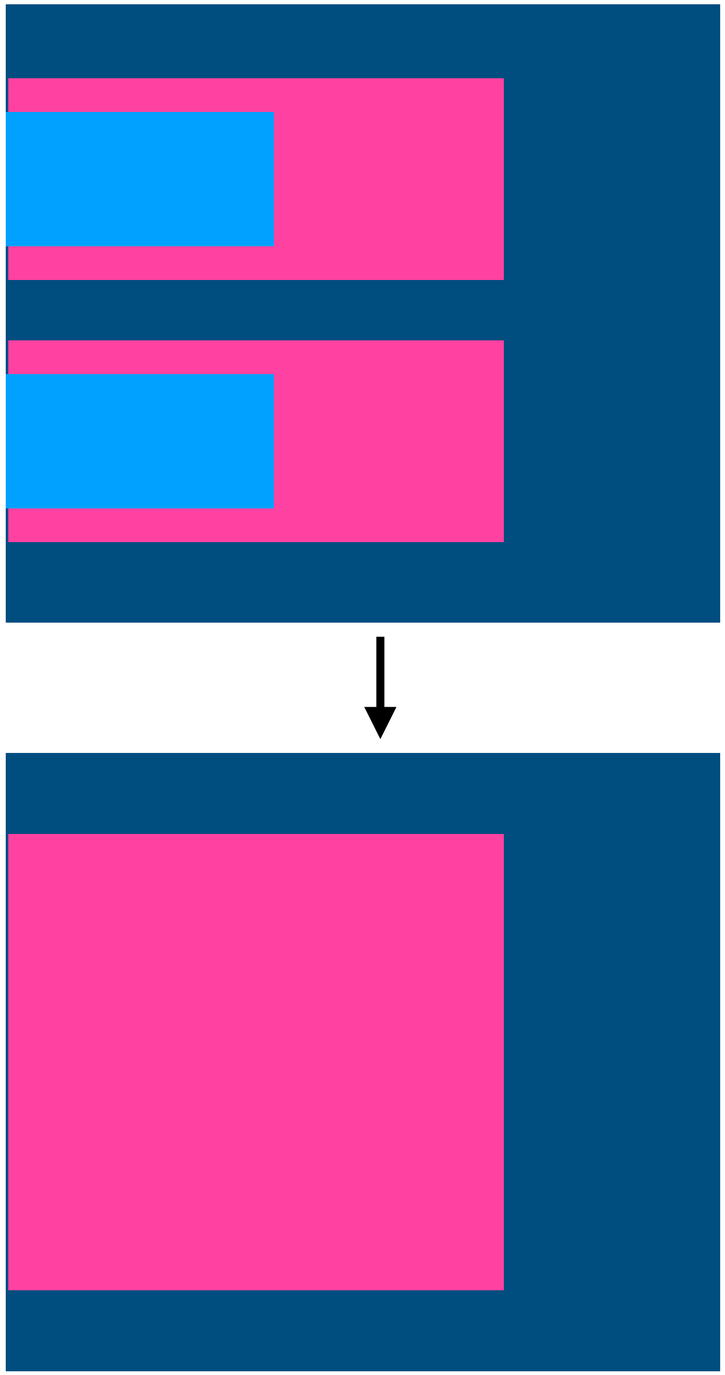
Neutrons



FLUKA Simulations

Tracking bug

- Conversion of Geant4 (GDML) geometry to FLUKA has been successful - no inherent errors in geometry
- A runtime error can occur in the electron beam dump; previously this caused all simulations to fail
- Fix - remove air inserts from beam dump
- Some tracking errors are still caused within the beam dump - one possible solution is to make the aluminium inserts one homogeneous volume



FLUKA Simulations

Next steps

- Fix tracking problem to increase number of successful jobs
- Simplify geometry description/conversion to reduce runtime cost
- Move job running to scratch space to increase data writing speed
- Fix ROOT script to save 3D distribution data to TTree
- Add USRBDX scorers to determine energy spectra of neutrons in key areas

- Work towards producing a viable simulation of 1.5e9 primaries in full!