Forward Spectrometer and FLUKA Simulation Update 29/09/20

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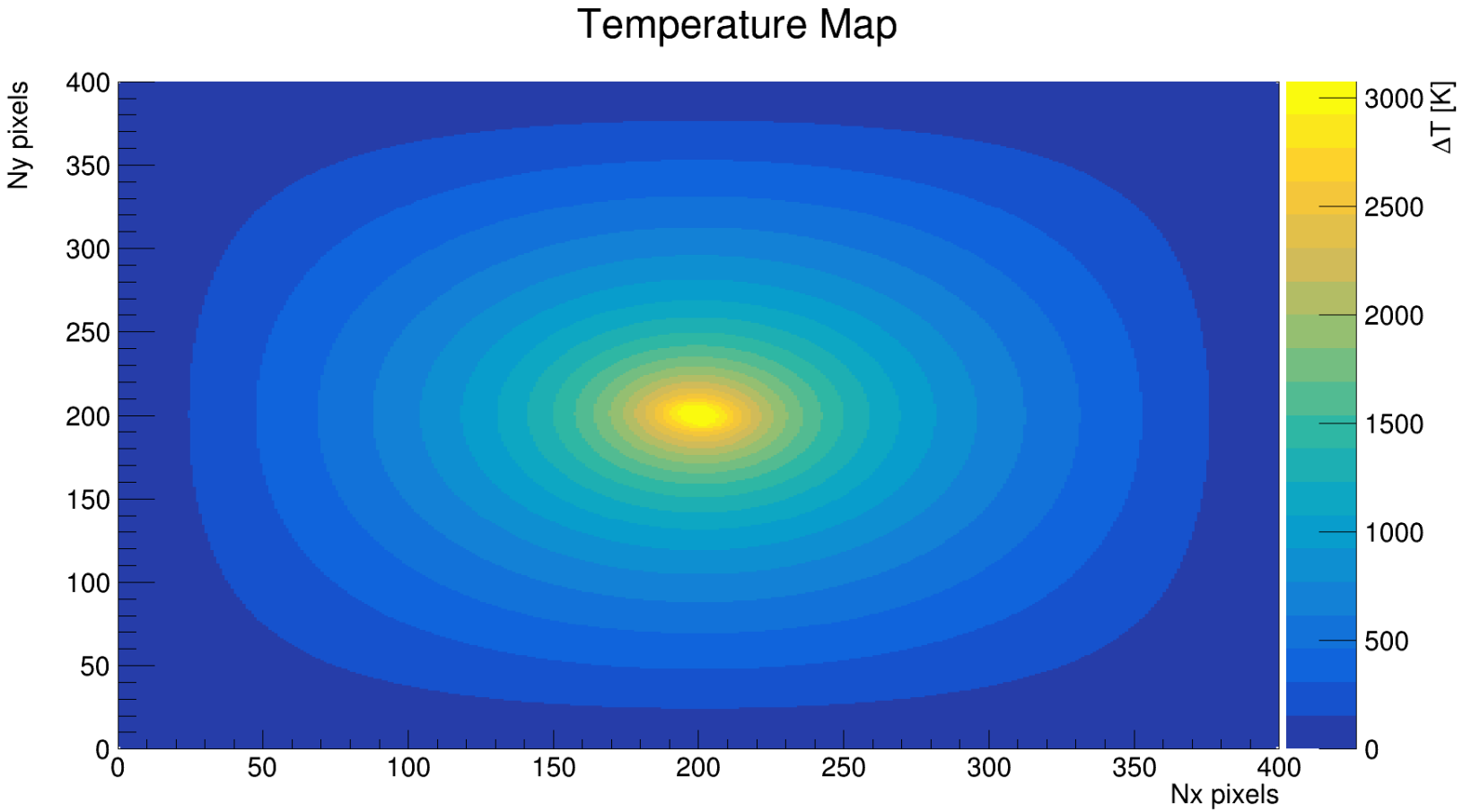
Forward Spectrometer Profiler

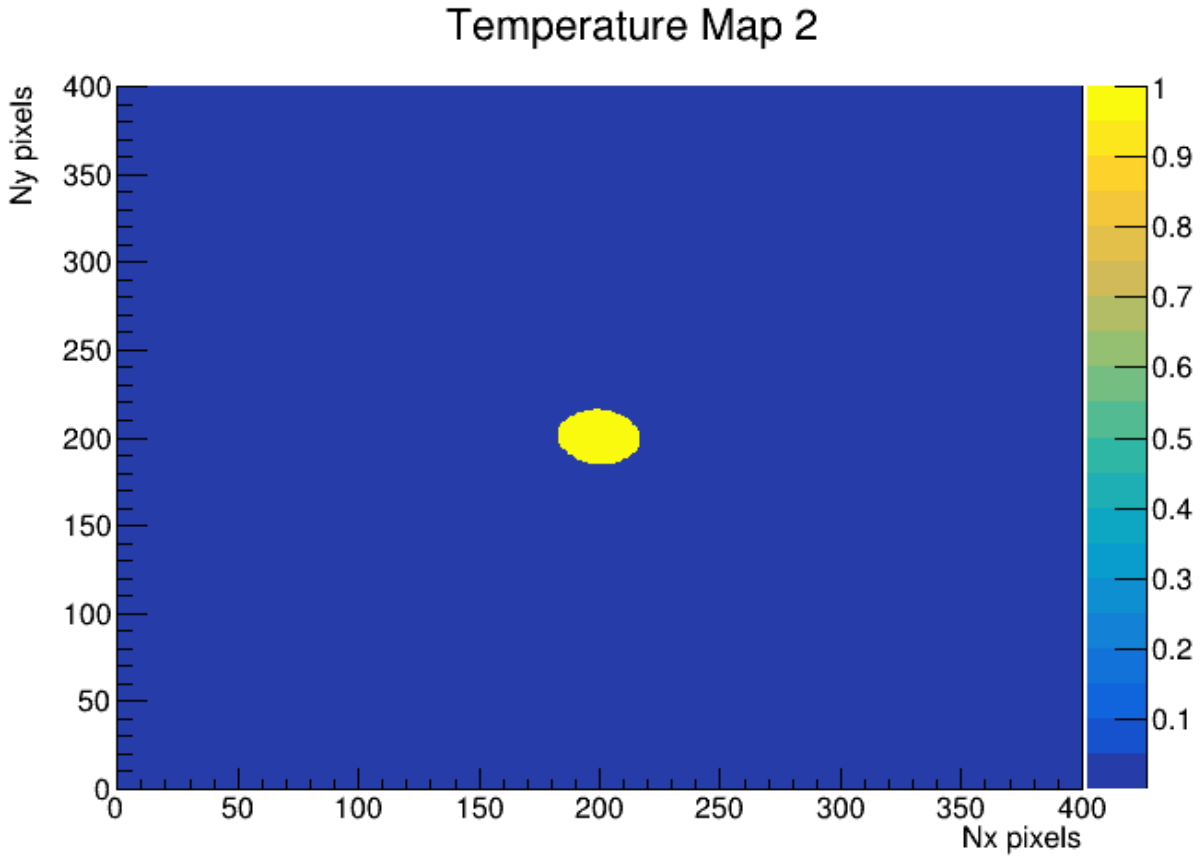
- Thermal conductivity of Gd2O2S at 293K is

  k = 9.6 +/- 1.4W/m/K
- Thermal change of light output quoted as 6 GU/K?
- Simulated the heat dissipation in the profiler as a 2D sheet (transverse dimension much greater than thickness) and used the heat equation – energy deposition from FLUKA acts as source
- Time to first point of melting – 5489 s (~1.5 hrs)

Profiler – Temperature after 2 hours



Profiler – Melted region after 2 hours



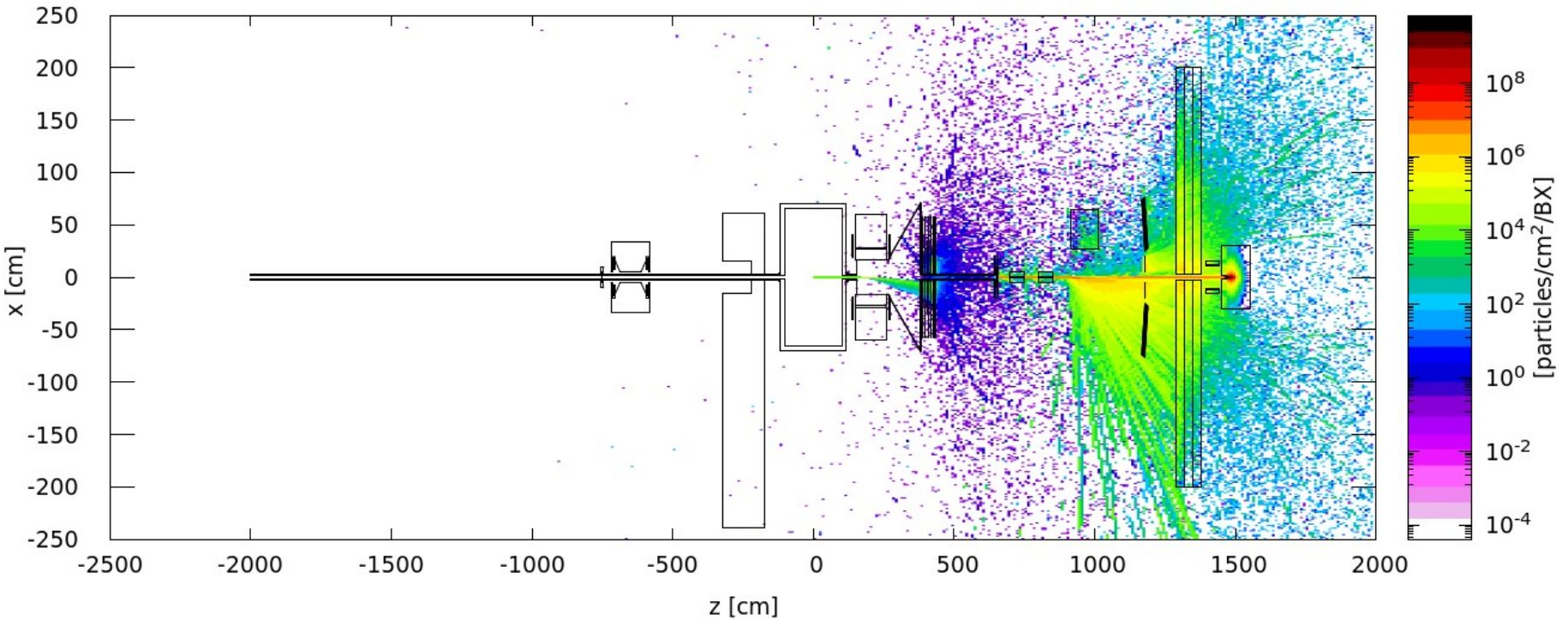
Profiler

- After 2 hours, region with temperatures greater than melting point (2343 K) has a diameter ~40 pixels
- In FLUKA, 400 x 400 pixels simulated for an area 2 x 2 cm^2 → 50 x 50 um pixel size
- Hence, ‘hotspot’ region is ~ 2 x 2 mm^2 in size (1% of profiler cross-sectional area)

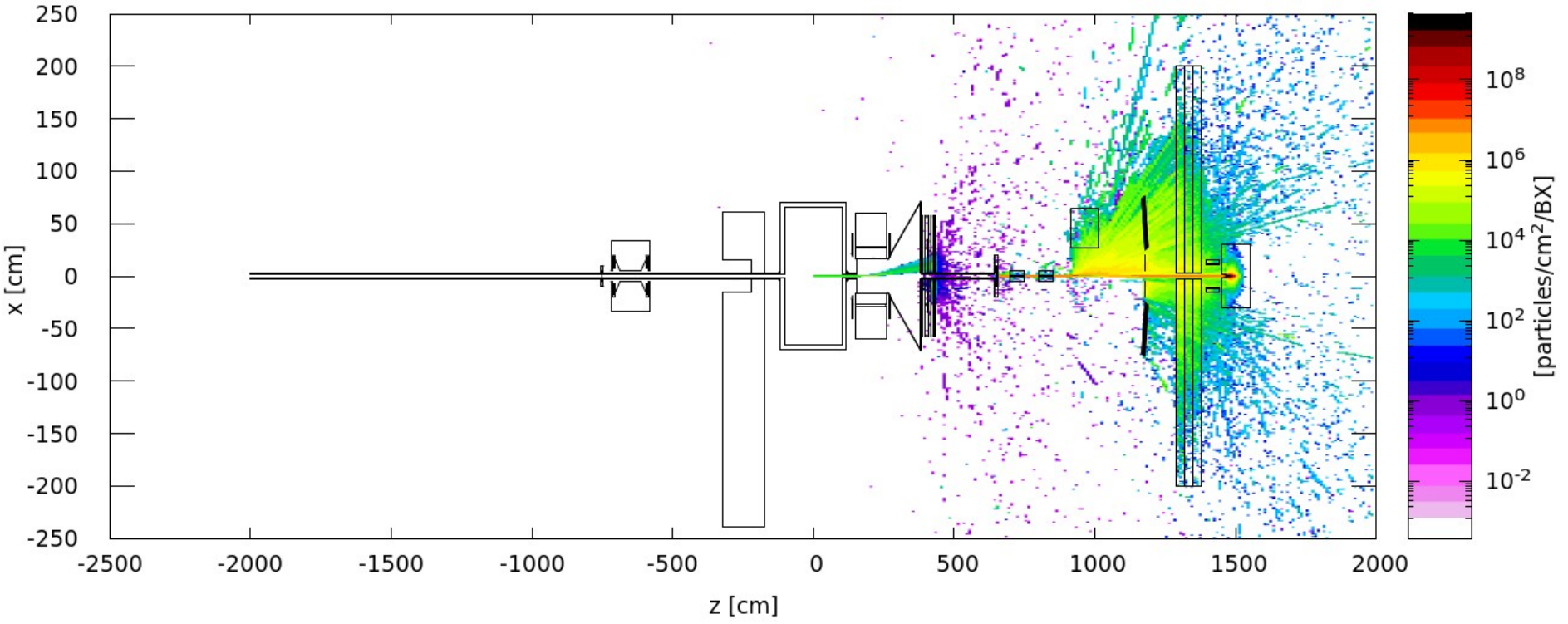
FLUKA full scale simulations

- Gamma/laser mode simulated with 10*7 primaries; no special black holes or emf-cuts implemented
- Results still need to be compared to GEANT4 results, but look promising – there is a difference in how FLUKA and GEANT4 score particle deposition

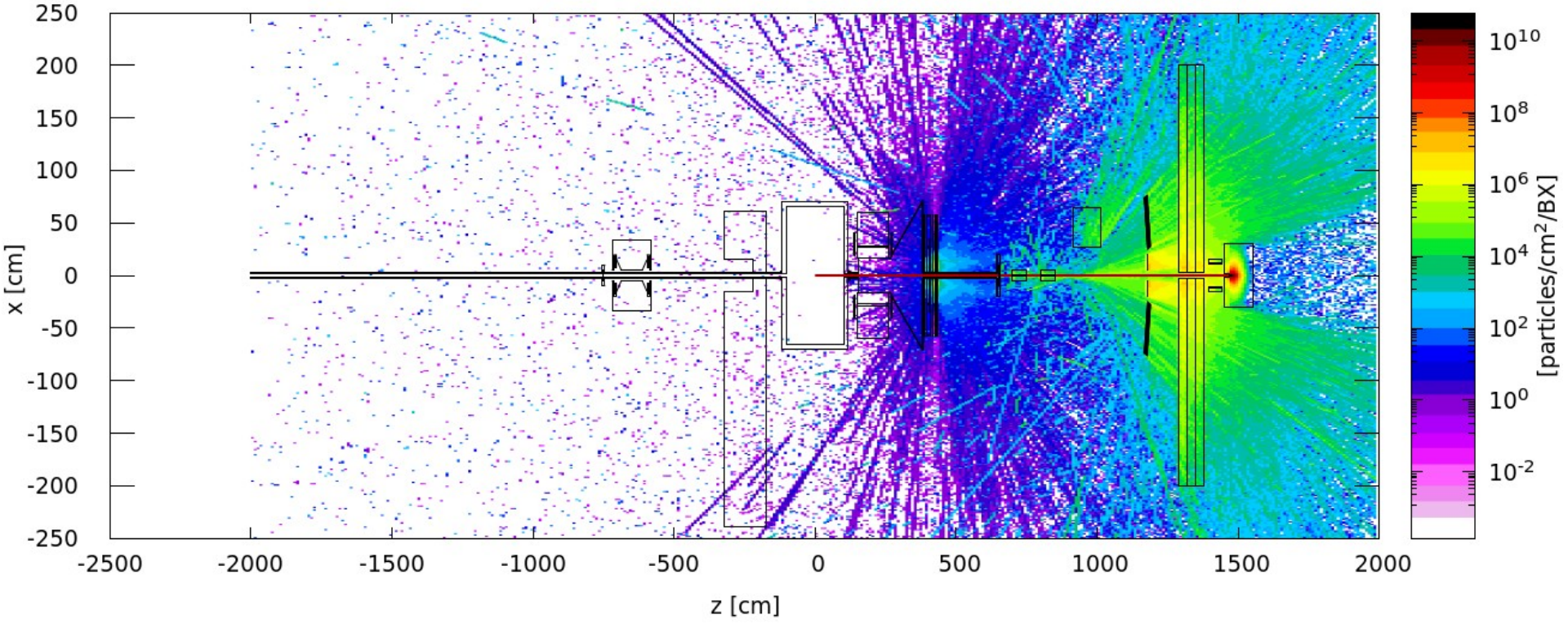
Electron Distribution



Positron Distribution



Photon Distribution



Energy Spectra