THE UNIVERSITY OF WARWICK

Energy Deposition in NuFact Target Front End

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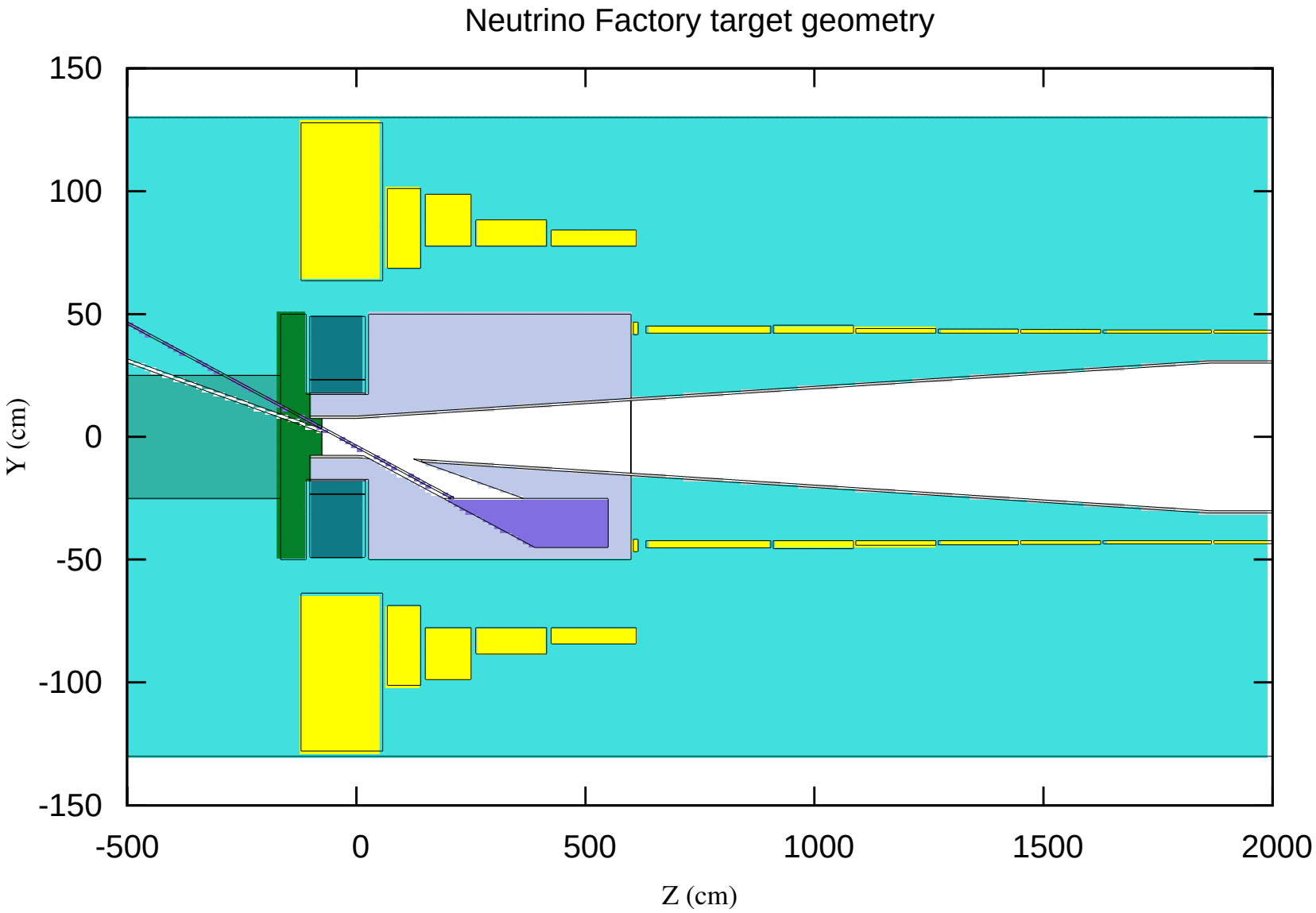
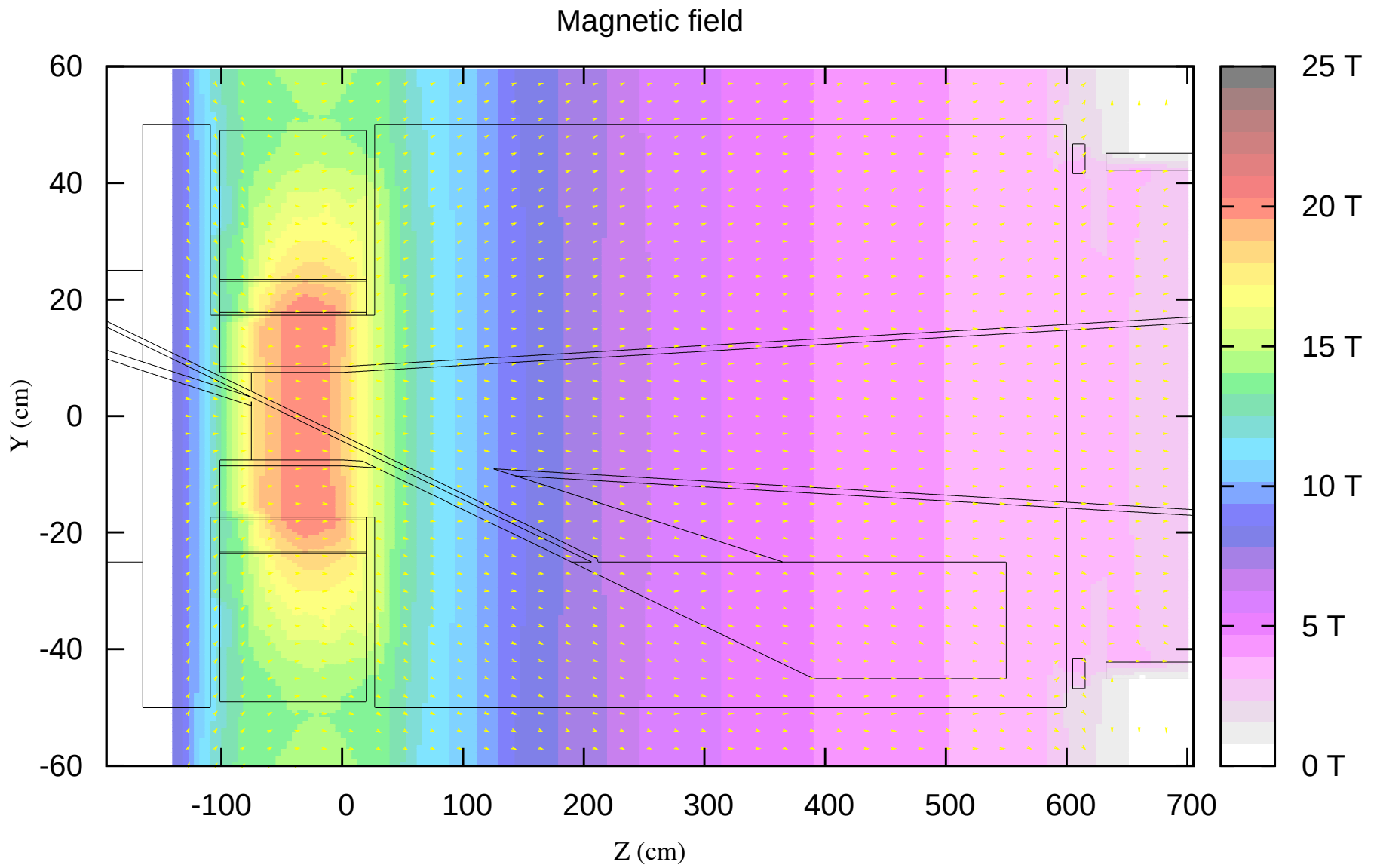
Introduction

- Using Fluka to estimate energy deposition for NuFact Hg jet target
- Study II geometry and magnetic field map
- Hg jet: $r = 0.5\,\text{cm}$, tilt θ=100 mr
- Parabolic proton beam $r_{\text{beam}} = 0.15\,\text{cm}$, tilt θ=67 mr; KE= 10 GeV
- Looking at energy per unit mass and deposited power in different regions
  - Proton rate $= 2.5 \times 10^{15}$ s^{-1} for 4 MW (10 GeV)
  - Multiply energies by proton rate to get deposited power in different regions
  - Divide by material density ρ to get energy per unit mass (J/kg)

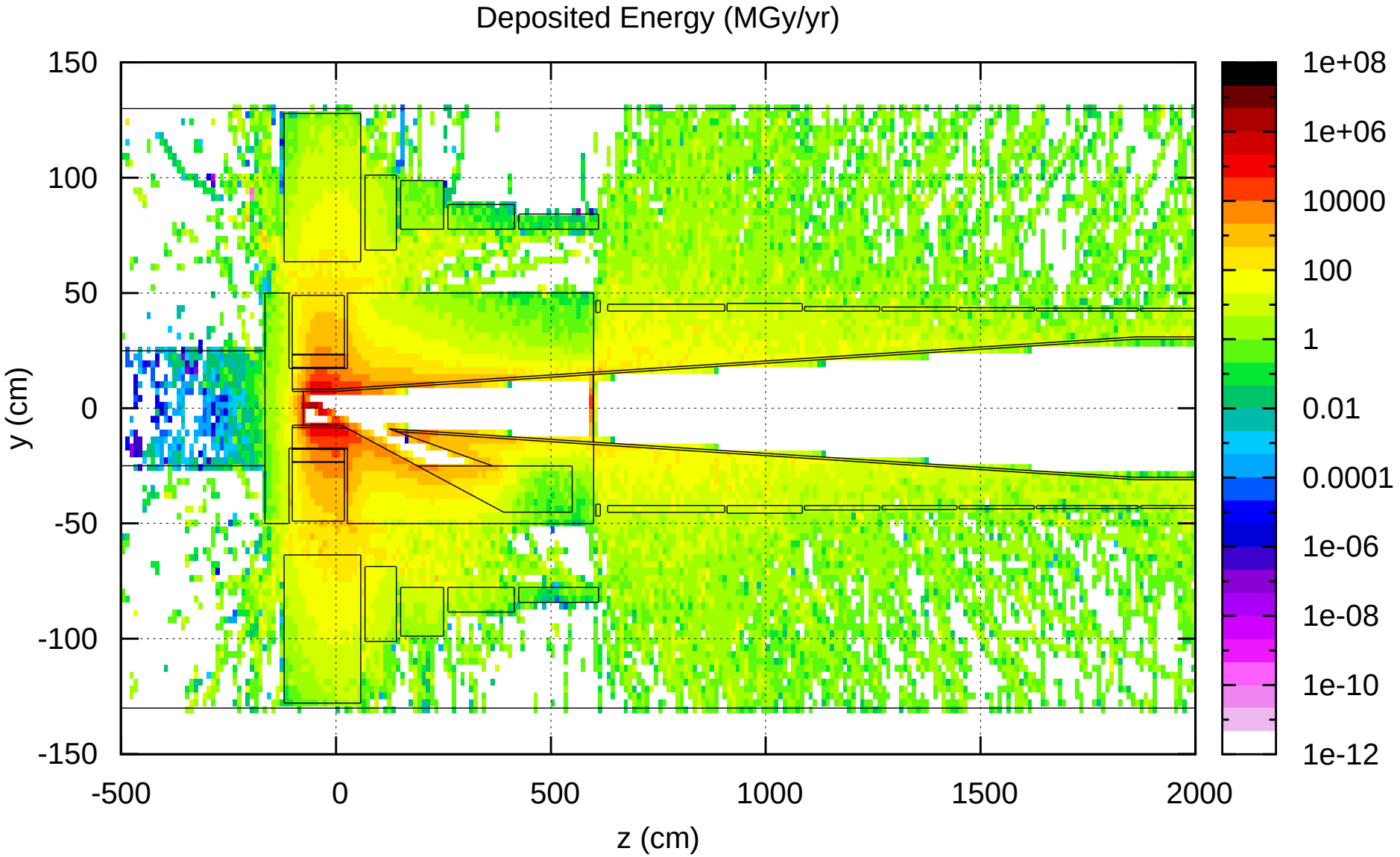
Fluka Geometry (Study II)



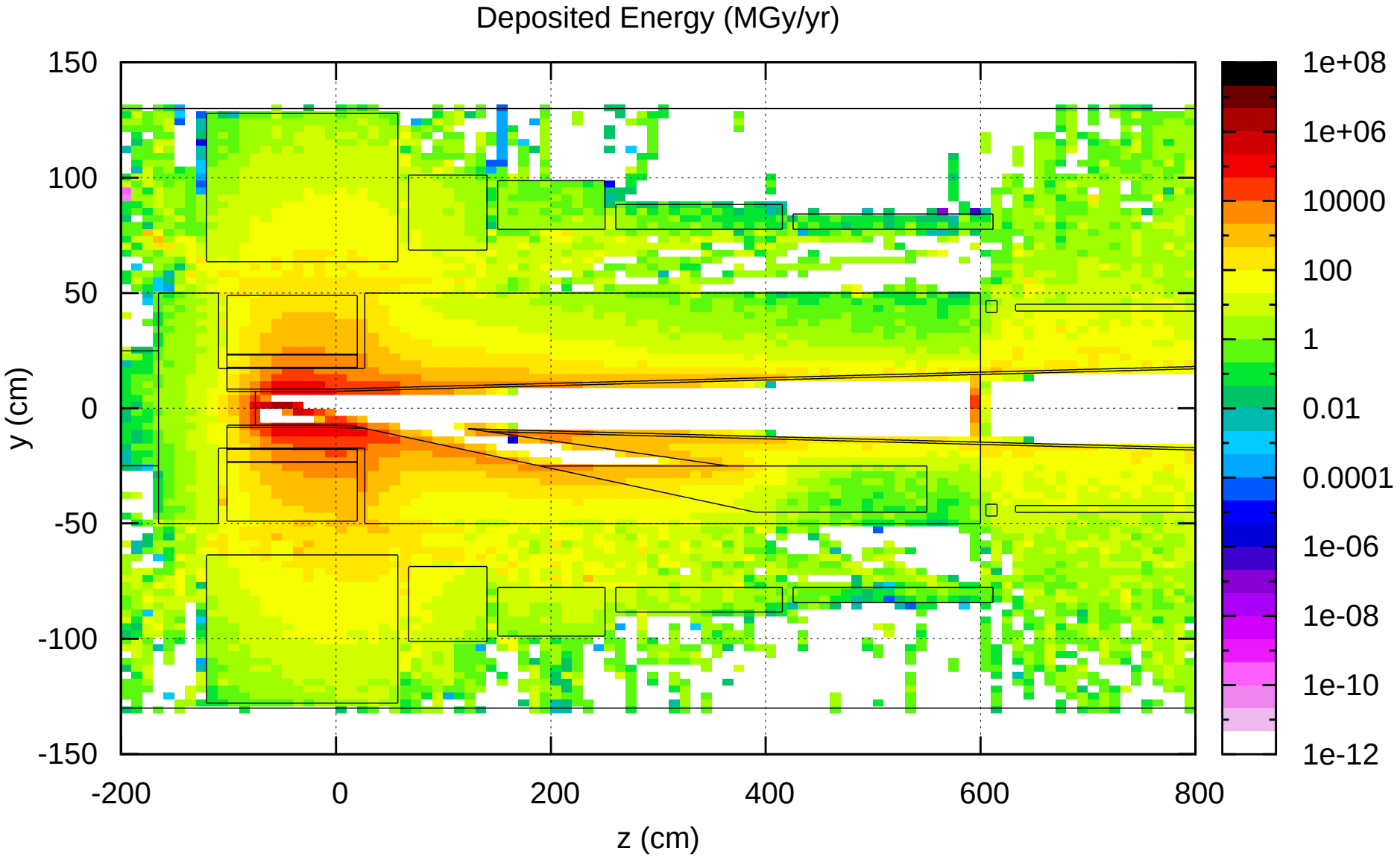
$\underline{\boldsymbol{B}}$ Field (Study II)



Energy deposition



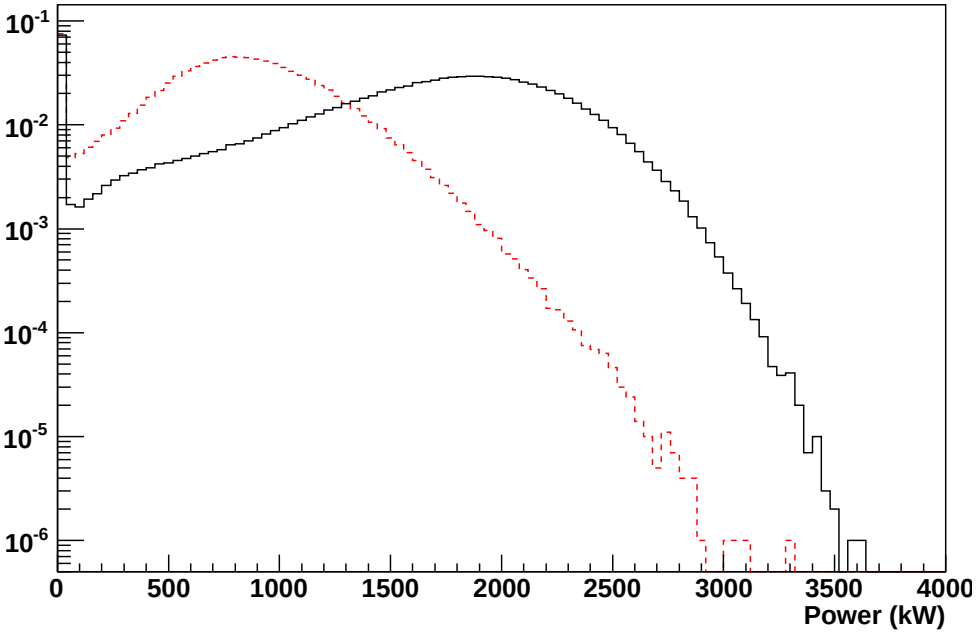
Energy deposition



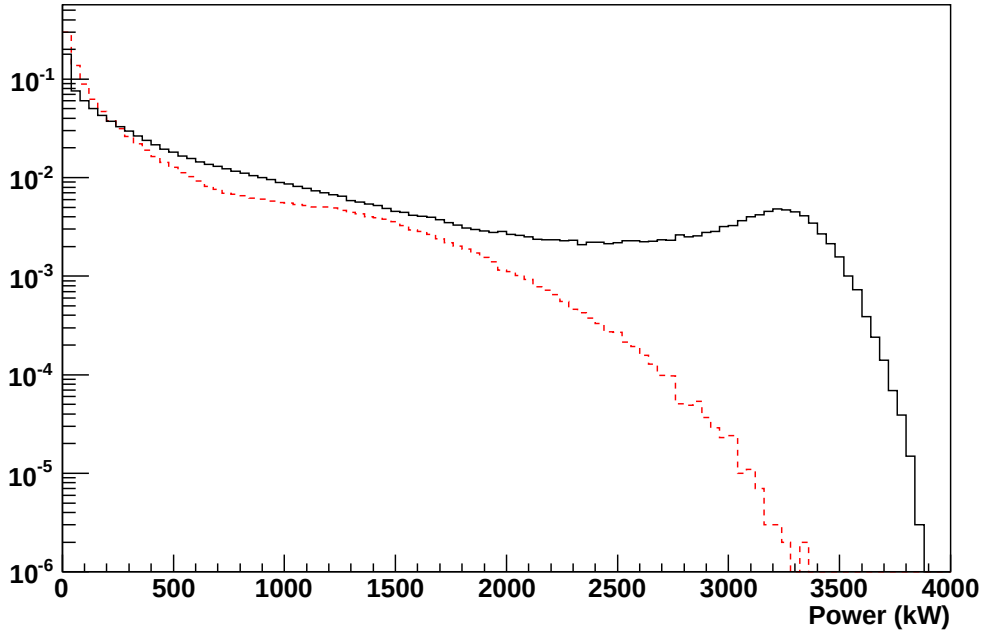
Power deposition in Shielding

Plots showing the power distribution in the tungsten-carbide inner shielding

Black - All deposited energy, Red - Electromagnetic energy
Distributions normalised to unit (all energy) area



Inner shielding within Cu coil aperture

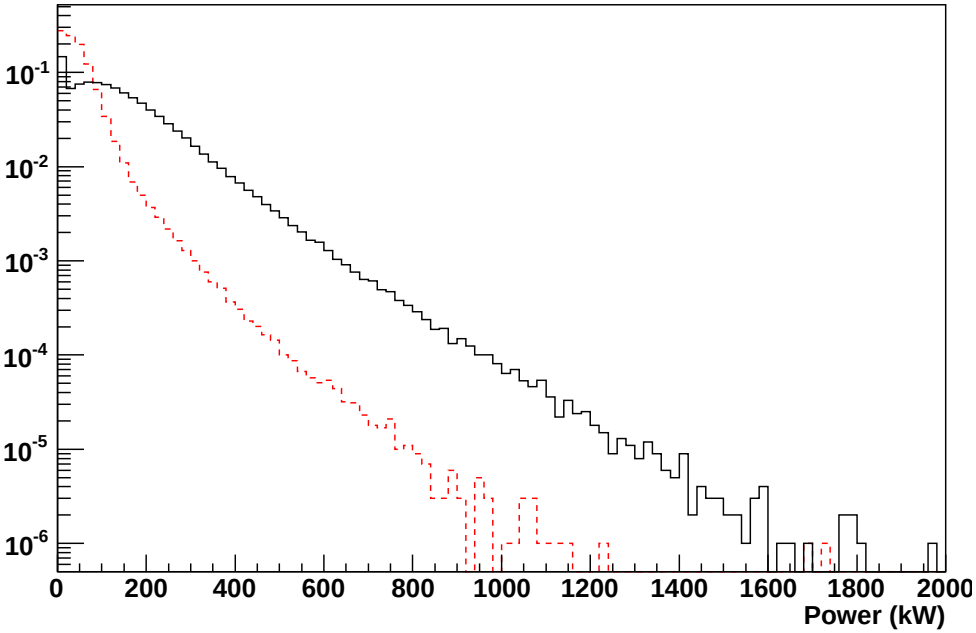


Shielding up to $z = 6\,\mathrm{m}$

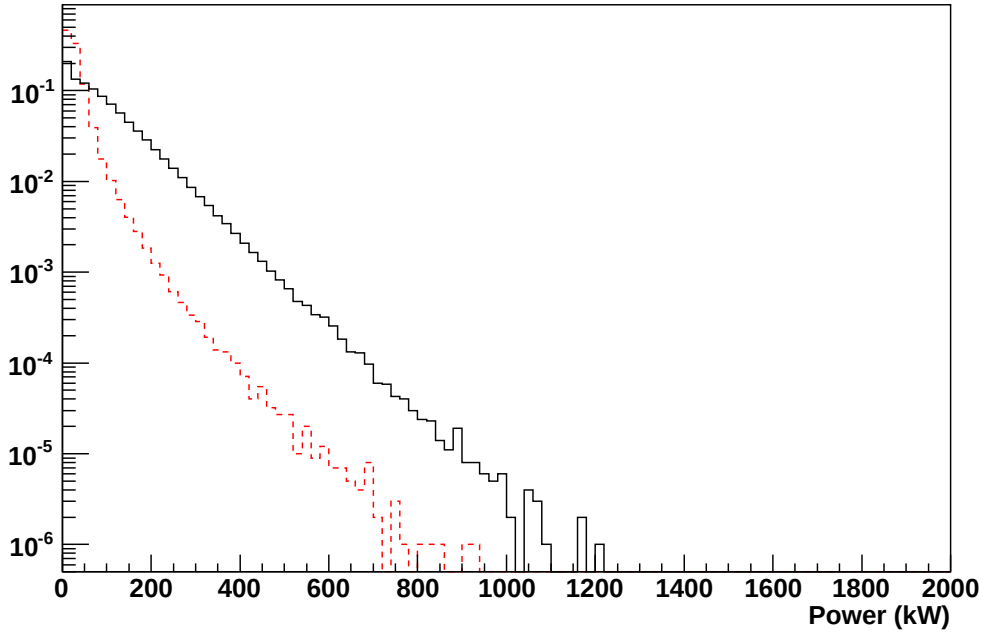
Power deposition in Cu magnets

Plots showing the power distribution in the copper resistive magnets

Black - All deposited energy, Red - Electromagnetic energy
Distributions normalised to unit (all energy) area



Inner Cu coil aperture

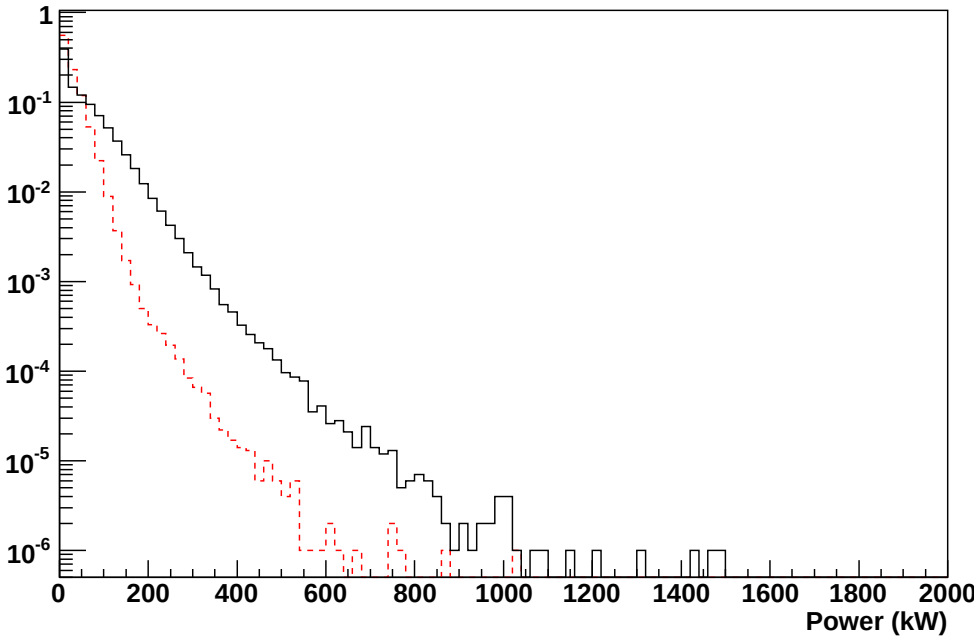


Outer Cu coil aperture

Power deposition in SC Coils 1 & 2

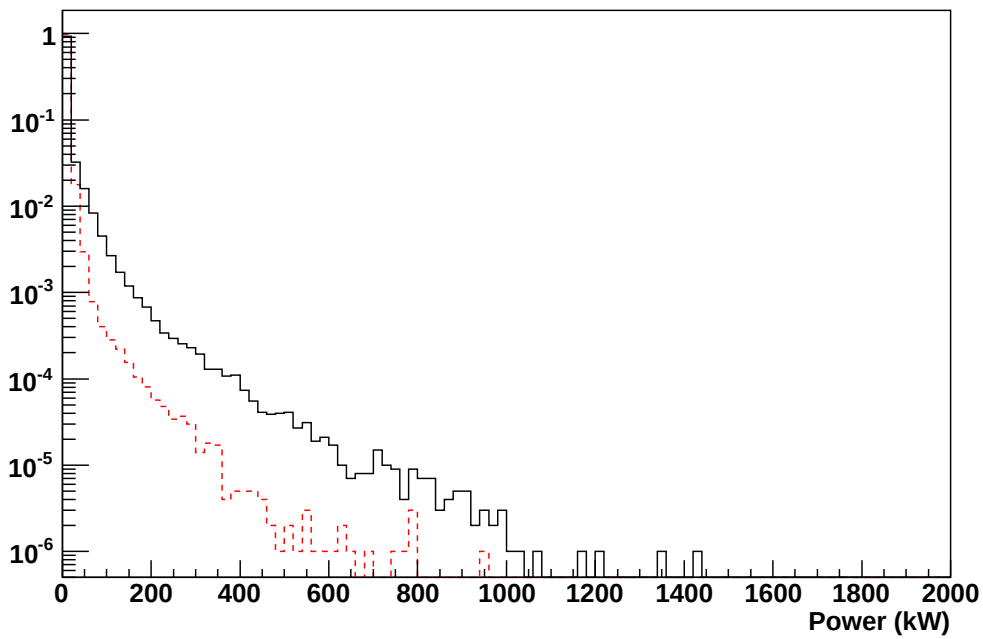
Plots showing the power distribution in the 1st 2 Superconducing Coils

Black - All deposited energy, Red - Electromagnetic energy
Distributions normalised to unit (all energy) area



SC Coil 1

10% P > 75 kW, 1% P > 200 kW



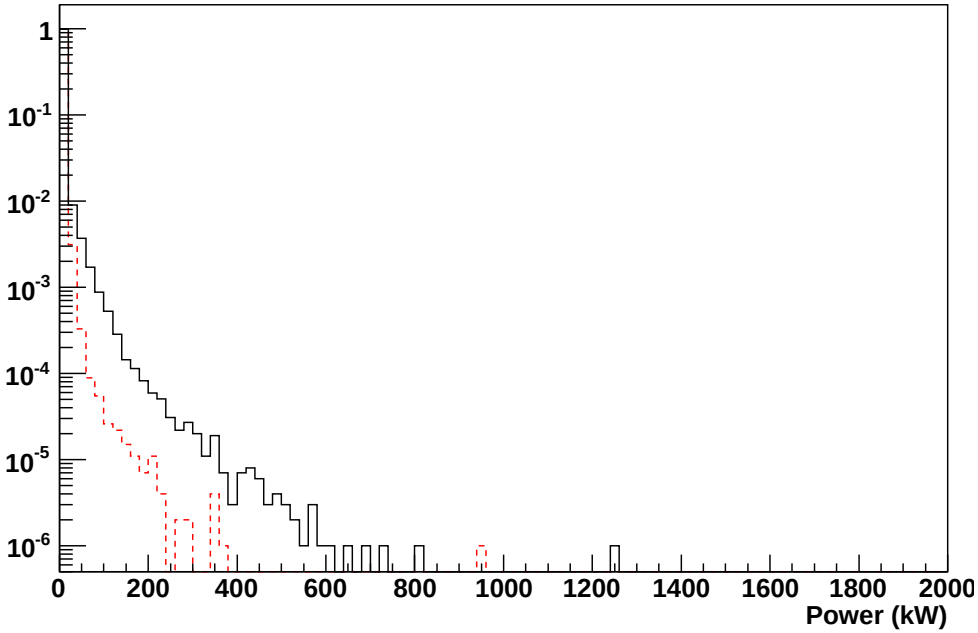
SC Coil 2

10% P > 20 kW, 1% P > 60 kW

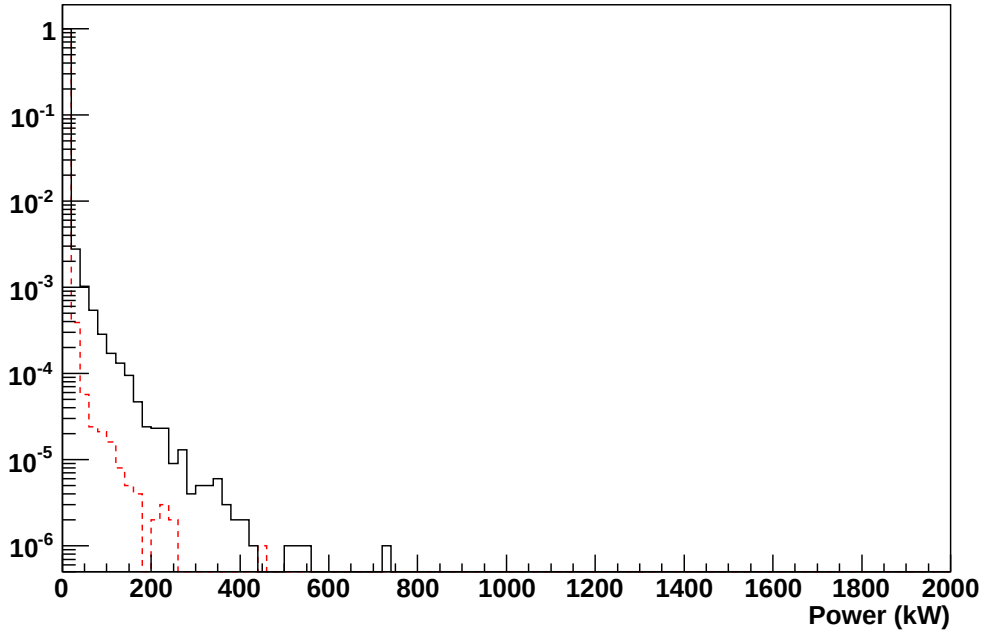
Power deposition in SC Coils 3 & 4

Plots showing the power distribution in Superconducting Coils 3 & 4

Black - All deposited energy, Red - Electromagnetic energy
Distributions normalised to unit (all energy) area



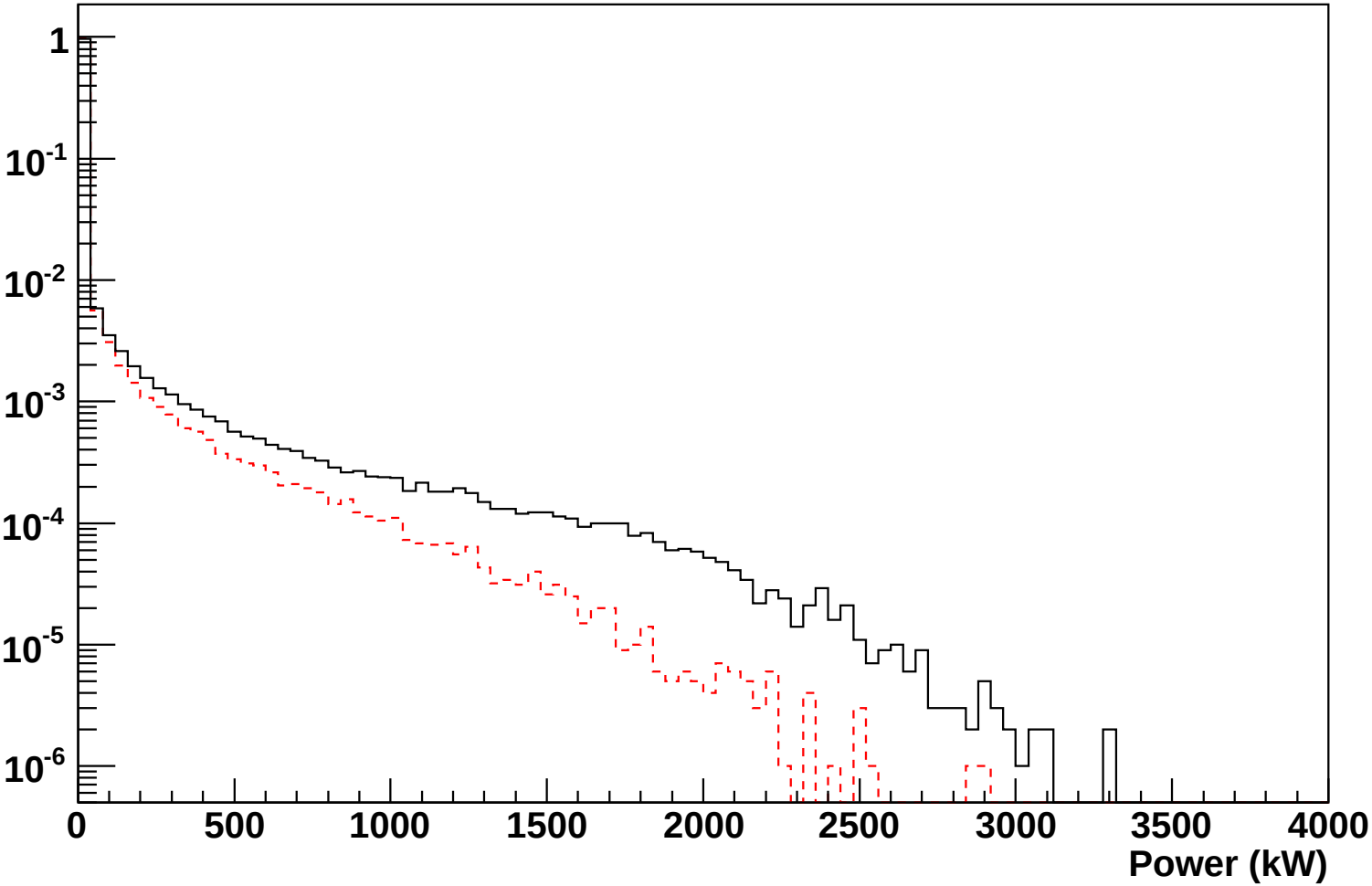
SC Coil 3



SC Coil 4

Power deposition in Mercury Pool

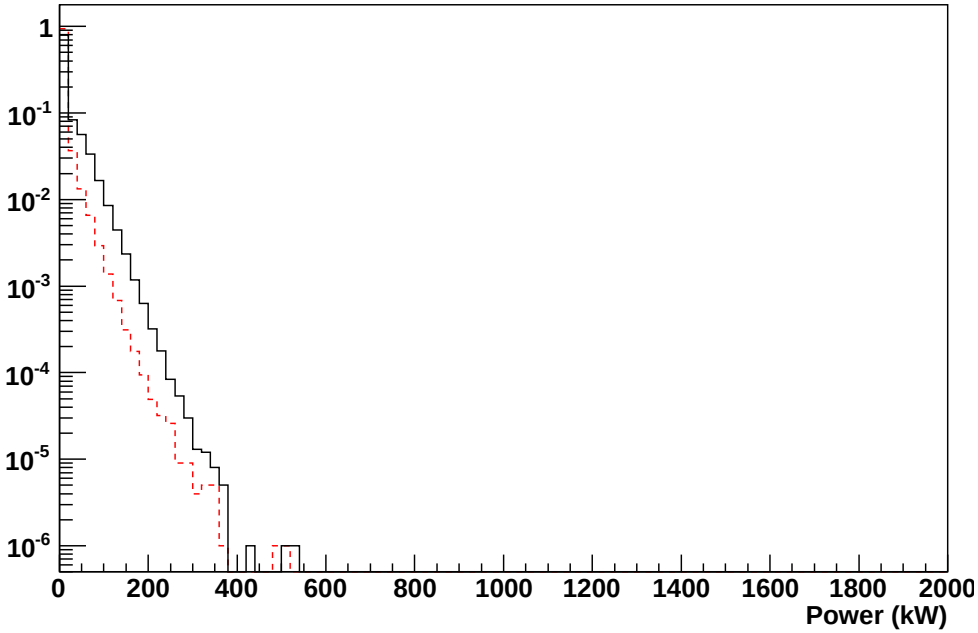
Black - All deposited energy, Red - Electromagnetic energy
Distributions normalised to unit (all energy) area



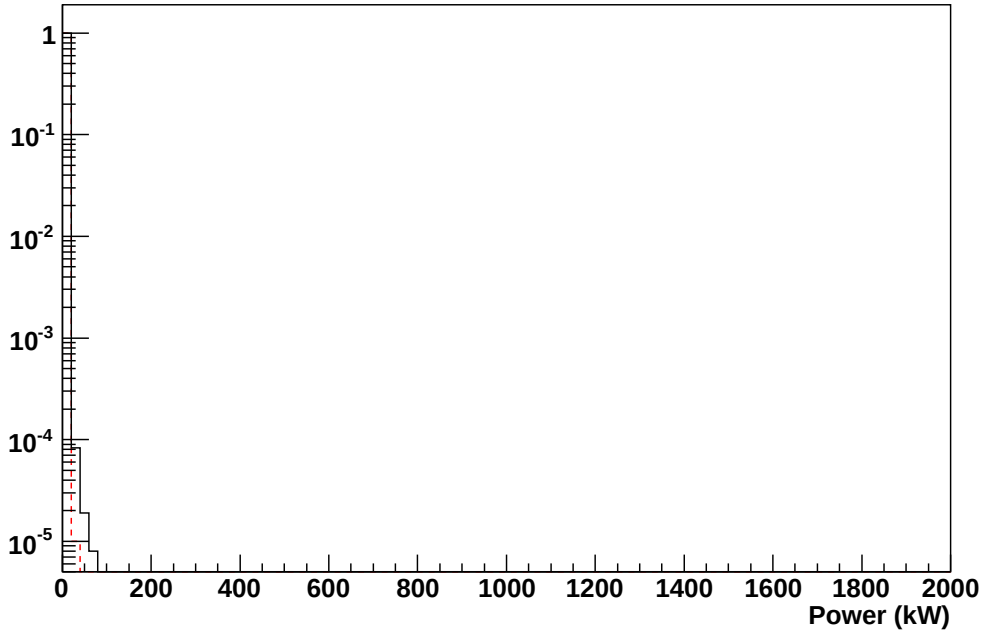
Power deposition in Magnet Yoke

Plots showing the power distribution in the iron magnet yoke

Black - All deposited energy, Red - Electromagnetic energy
Distributions normalised to unit (all energy) area



Yoke closest to Hg jet



Outermost iron plug