

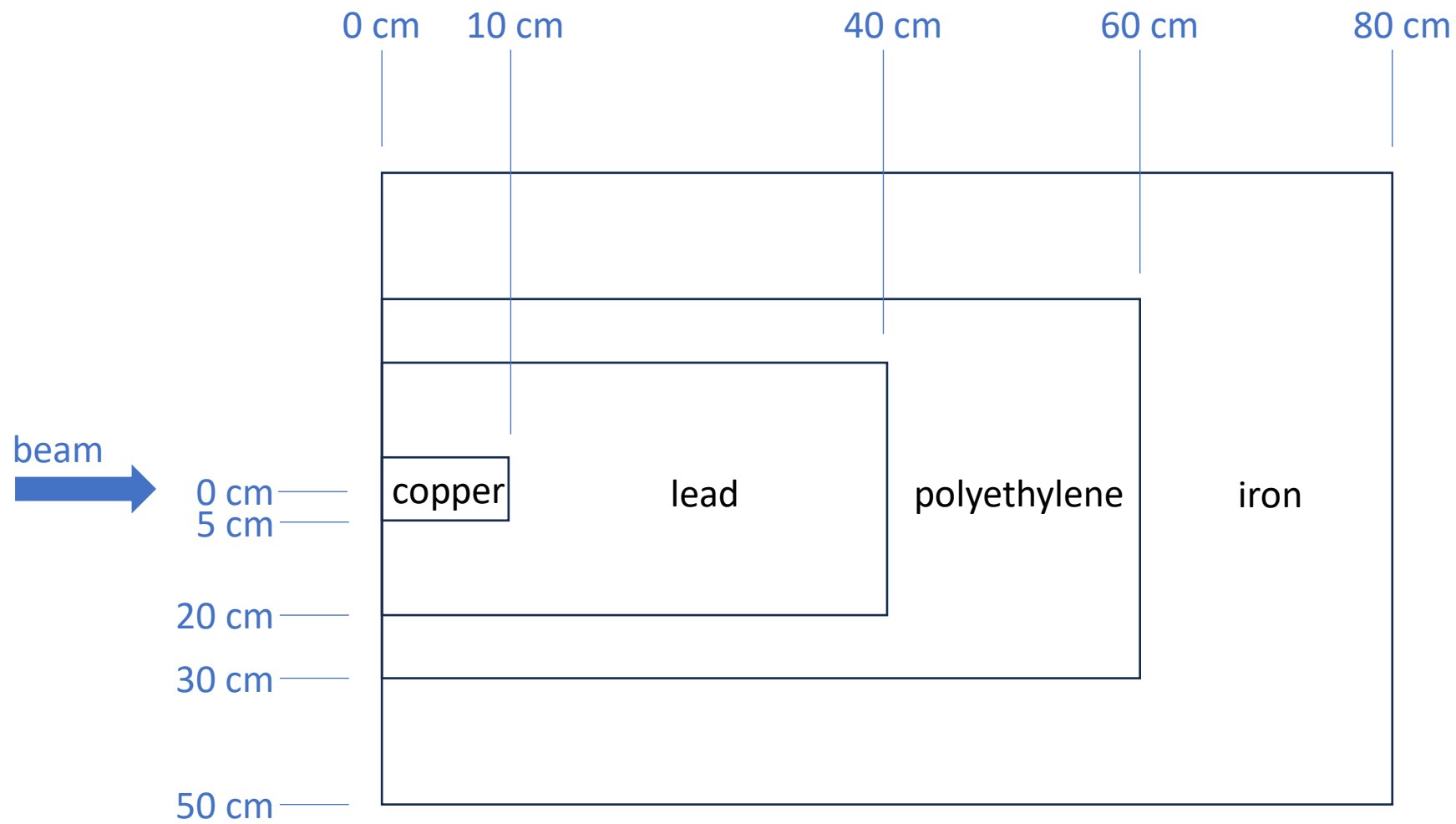
COLD beamdump design

Beam parameters: 350 MeV, 1 nC, 10 Hz → 3.5 W

Design criteria:

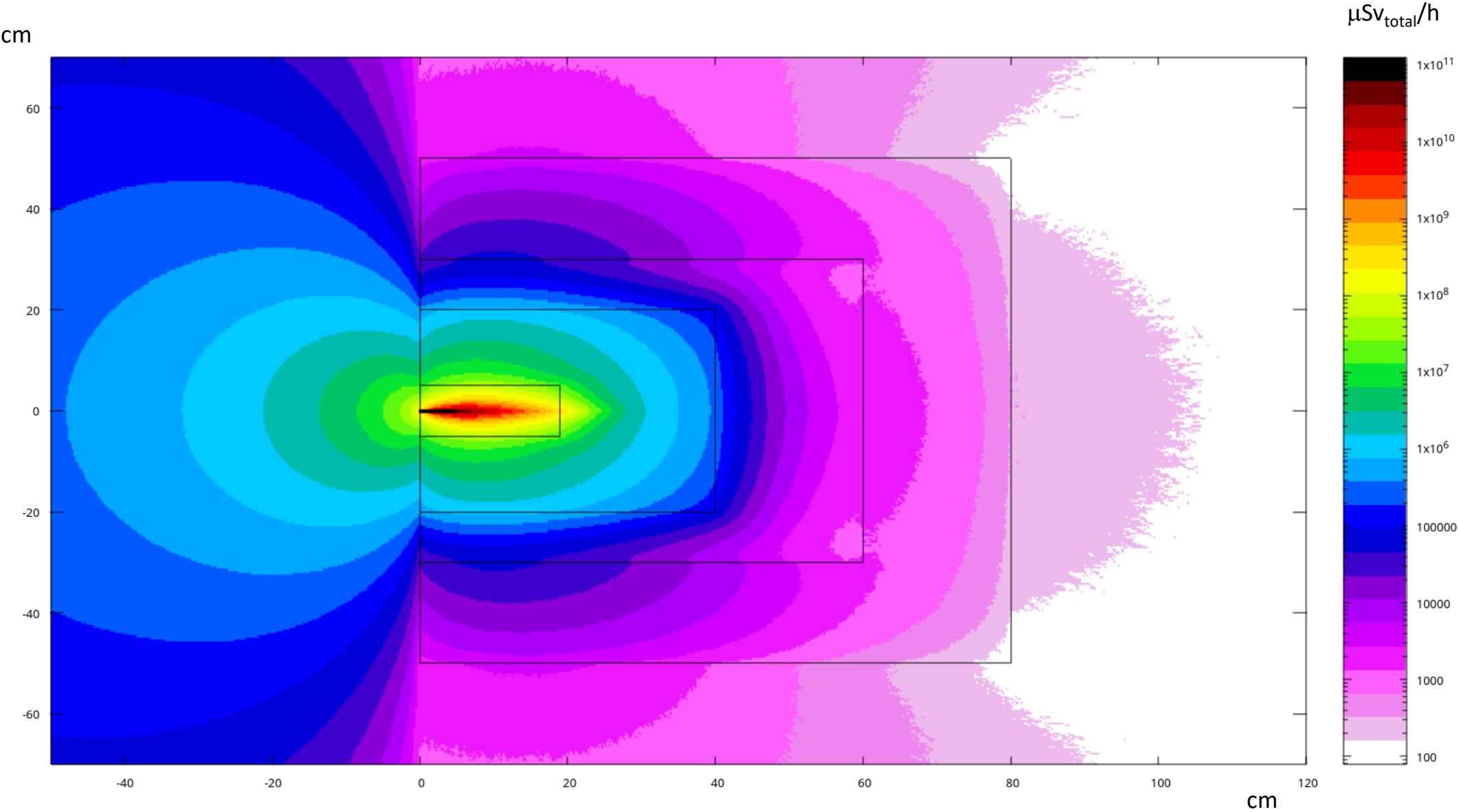
- Minimize dose rates outside beamdump (prevent damage to existing linac gun electronics)
 - Minimize residual dose rates outside beamdump (during access to linac tunnel)
 - Minimize activation outside beamdump (including groundwater*)
 - Allow measurement of electron charge hitting the beamdump
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- Instantaneous beam loss power is more than 100 times higher than beam loss power intercepted by the storage ring beam loss collimators during beam decay.

Model used for calculations presented in this report

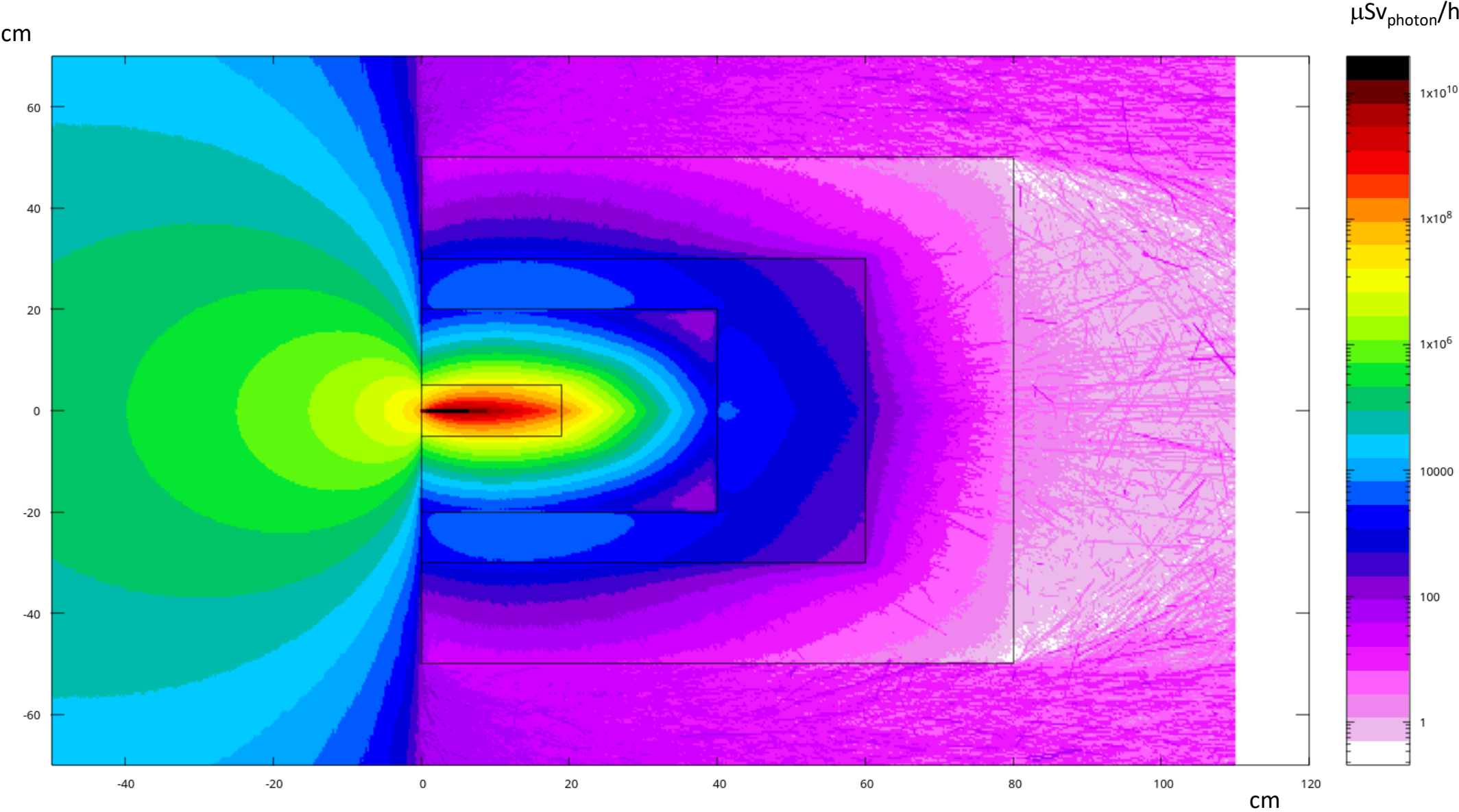


350 MeV

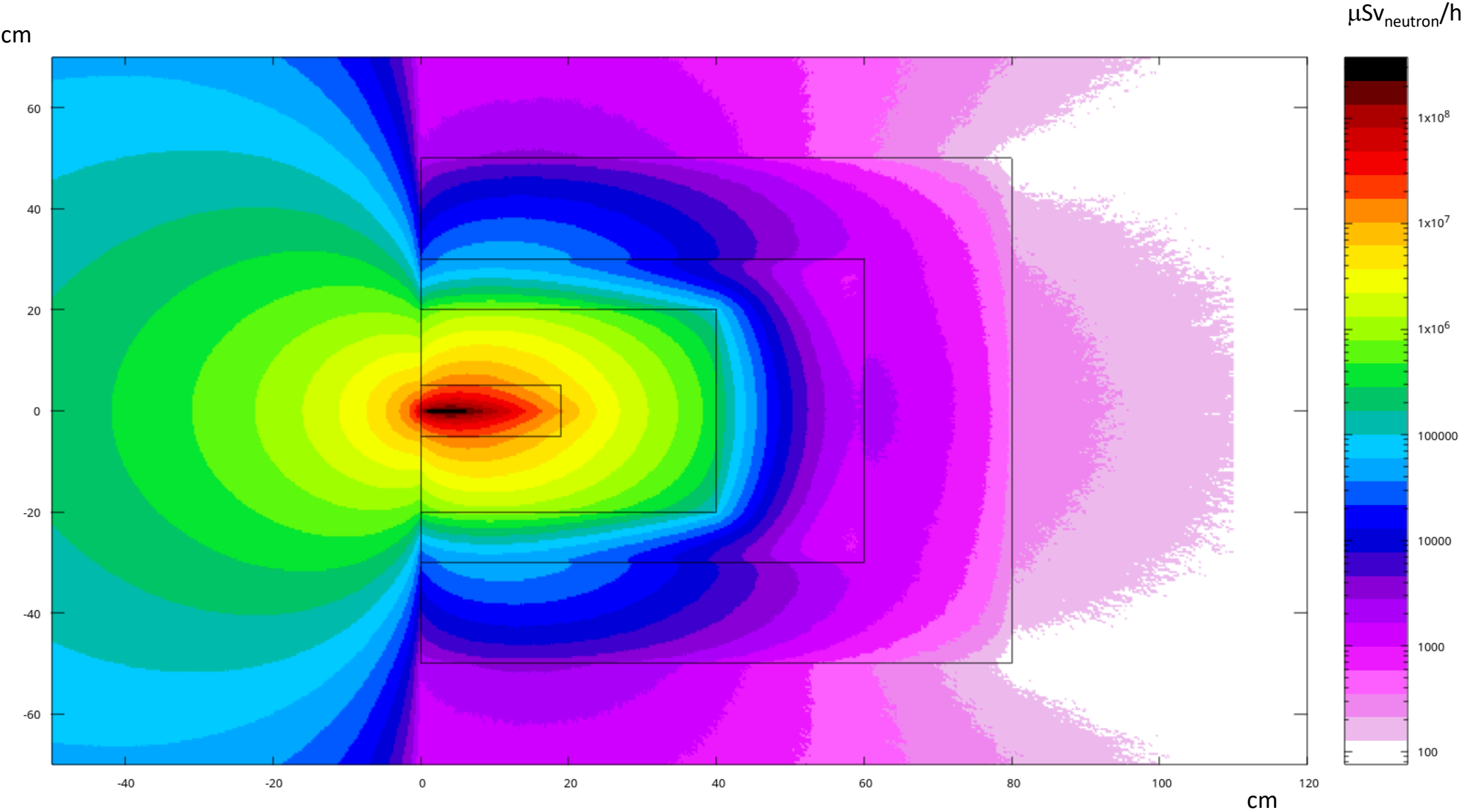
Total effective dose rate in plane through beam axis



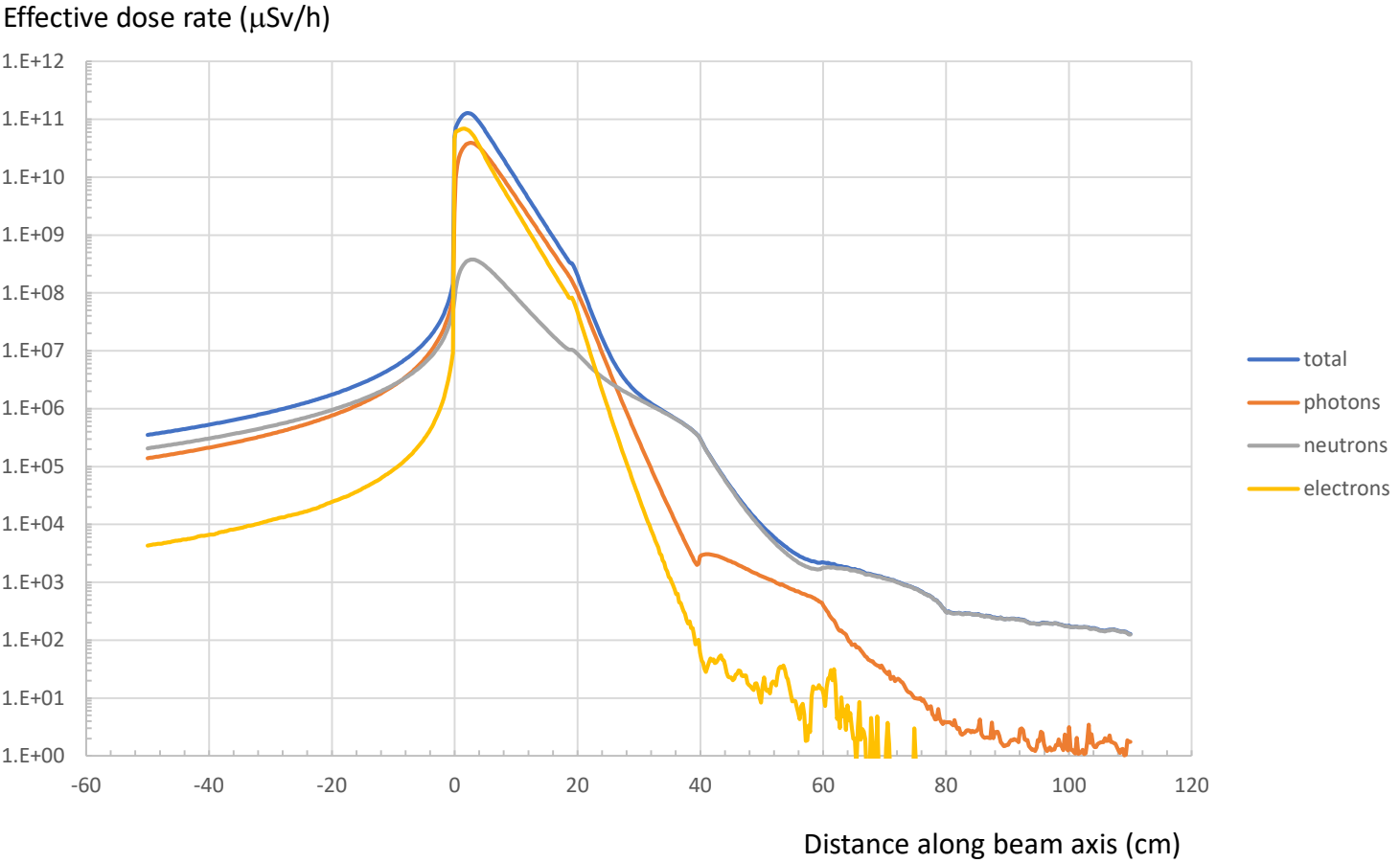
Photon effective dose rate in plane through beam axis



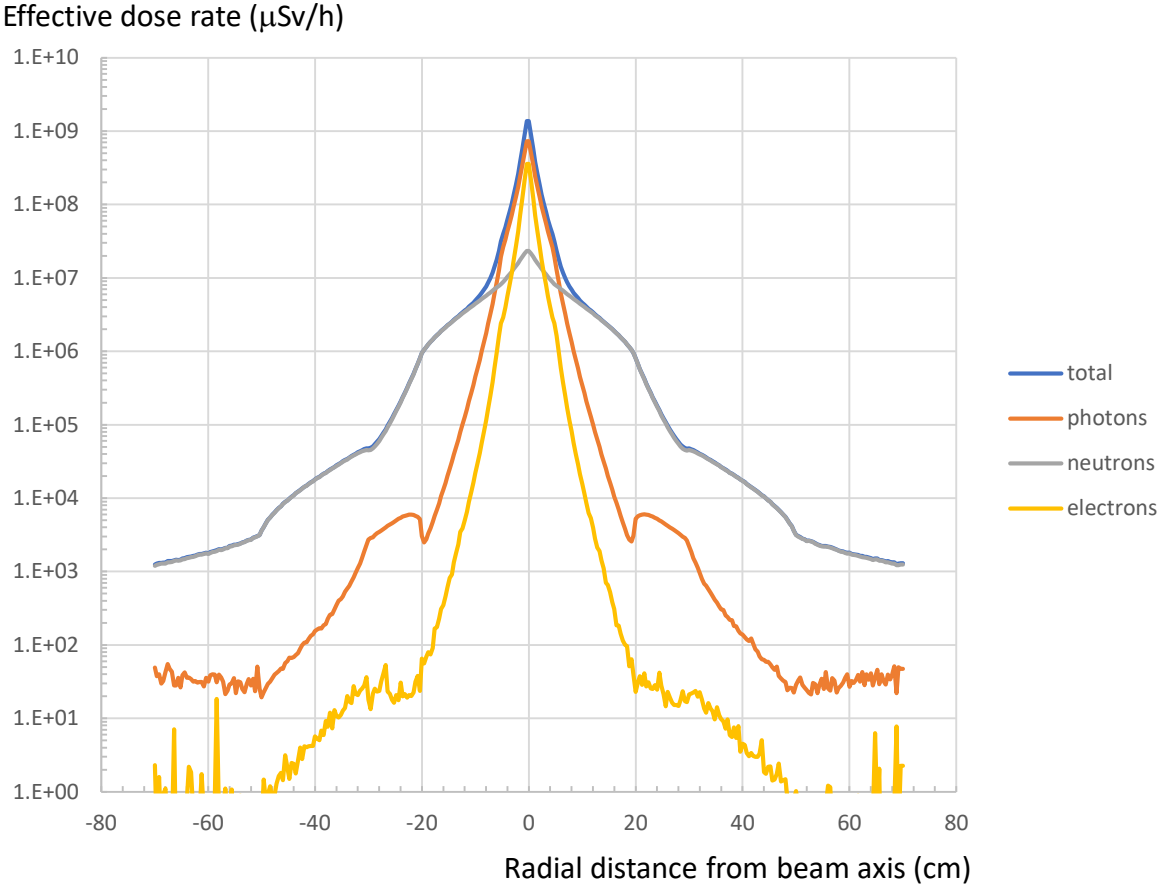
Neutron effective dose rate in plane through beam axis



On-axis dose rates

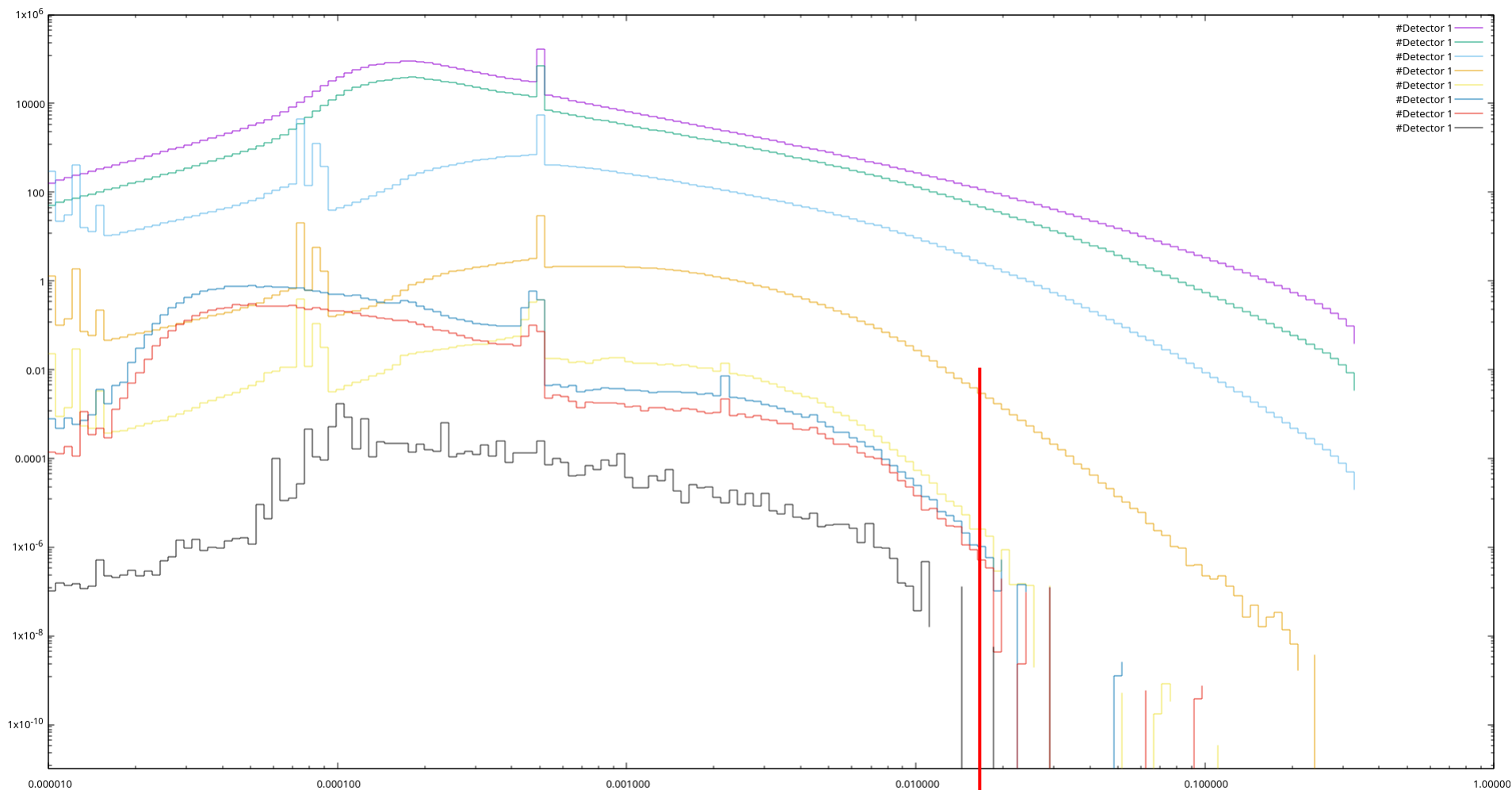


Maximum radial dose rates



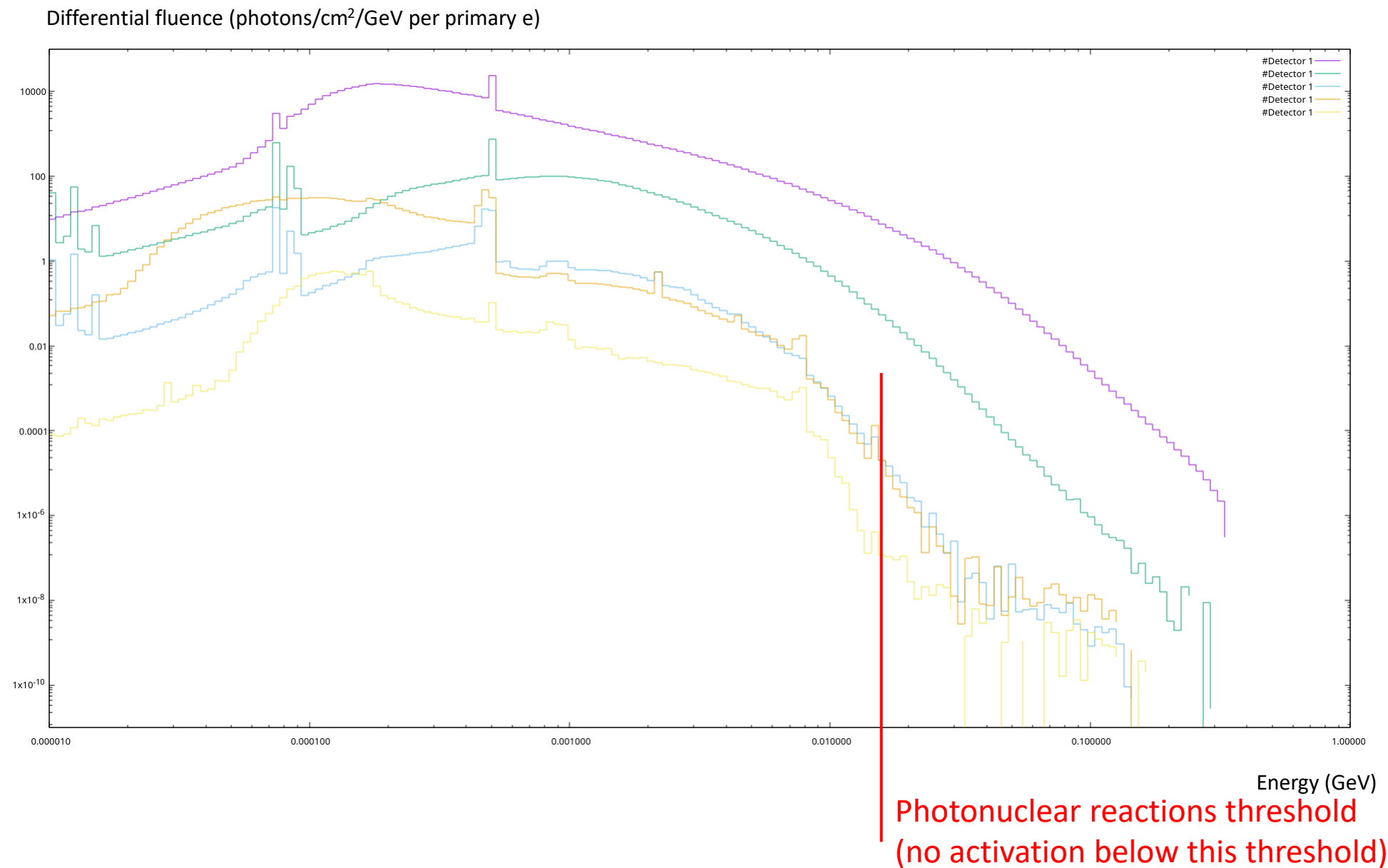
Variation of photon spectra along beam axis

Differential fluence (photons/cm²/GeV per primary e)

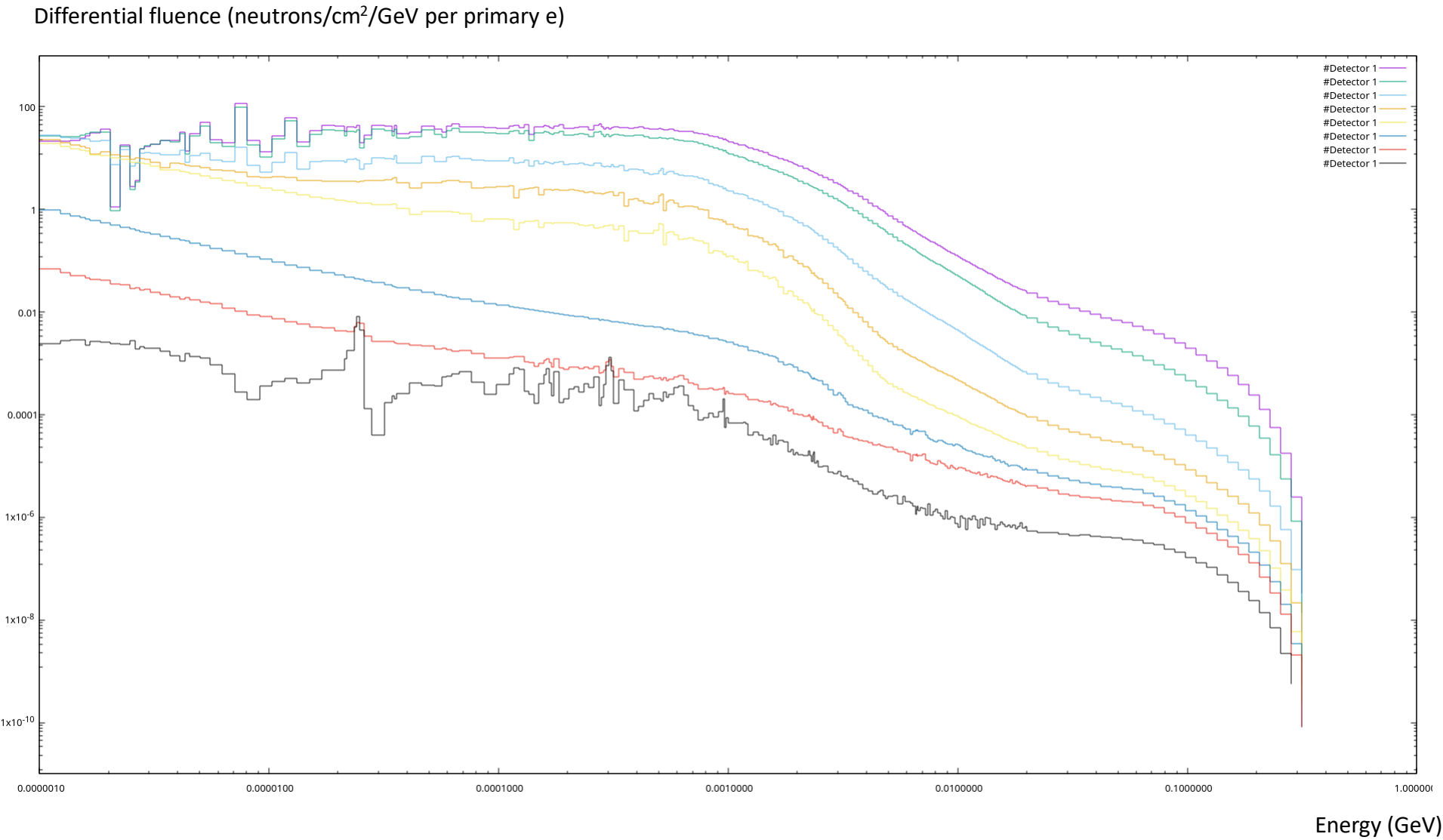


Photonuclear reactions threshold
(no activation below this threshold)

Variation of photon spectra along beam dump radius

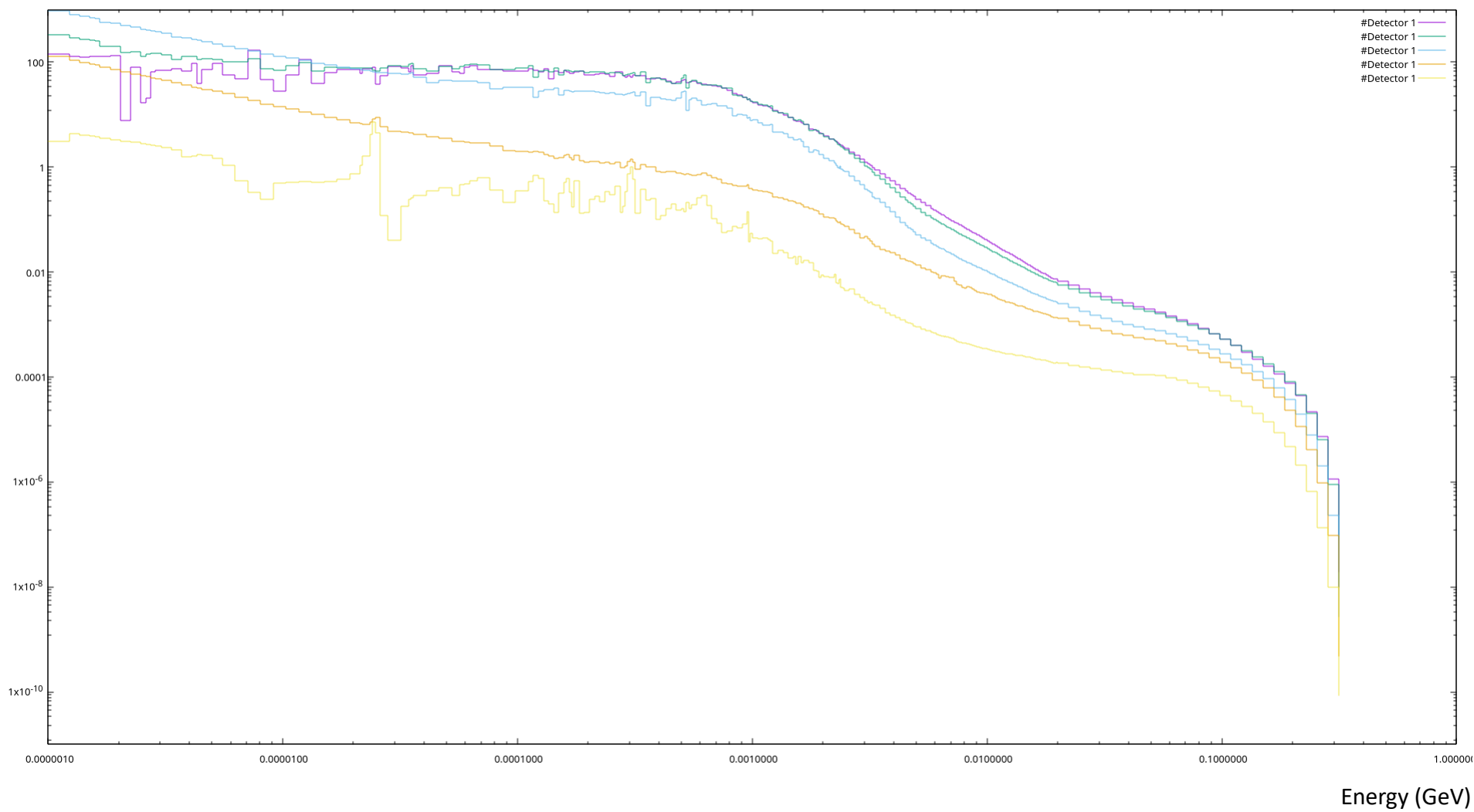


Variation of neutron spectra along beam axis

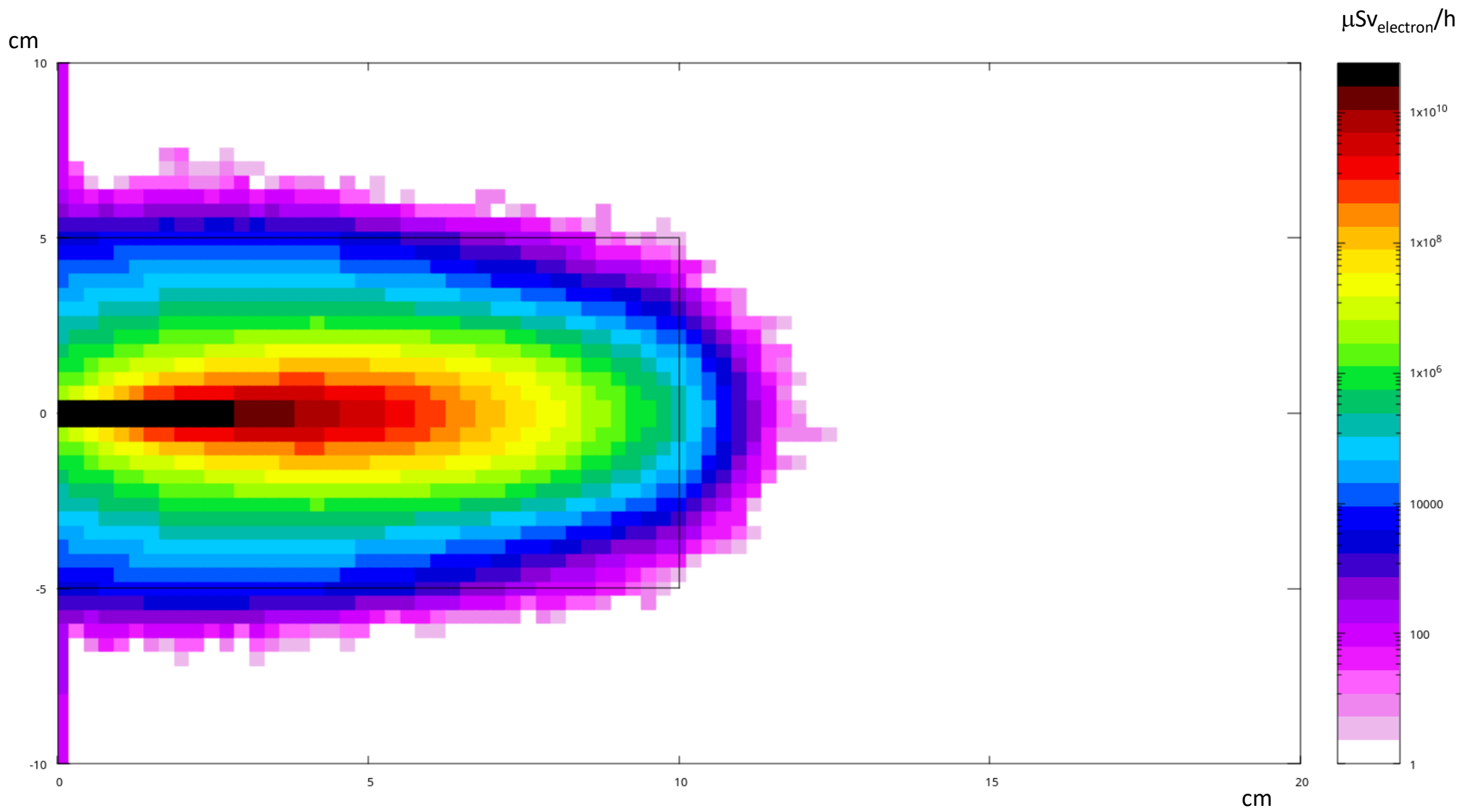


Variation of neutron spectra along beam dump radius

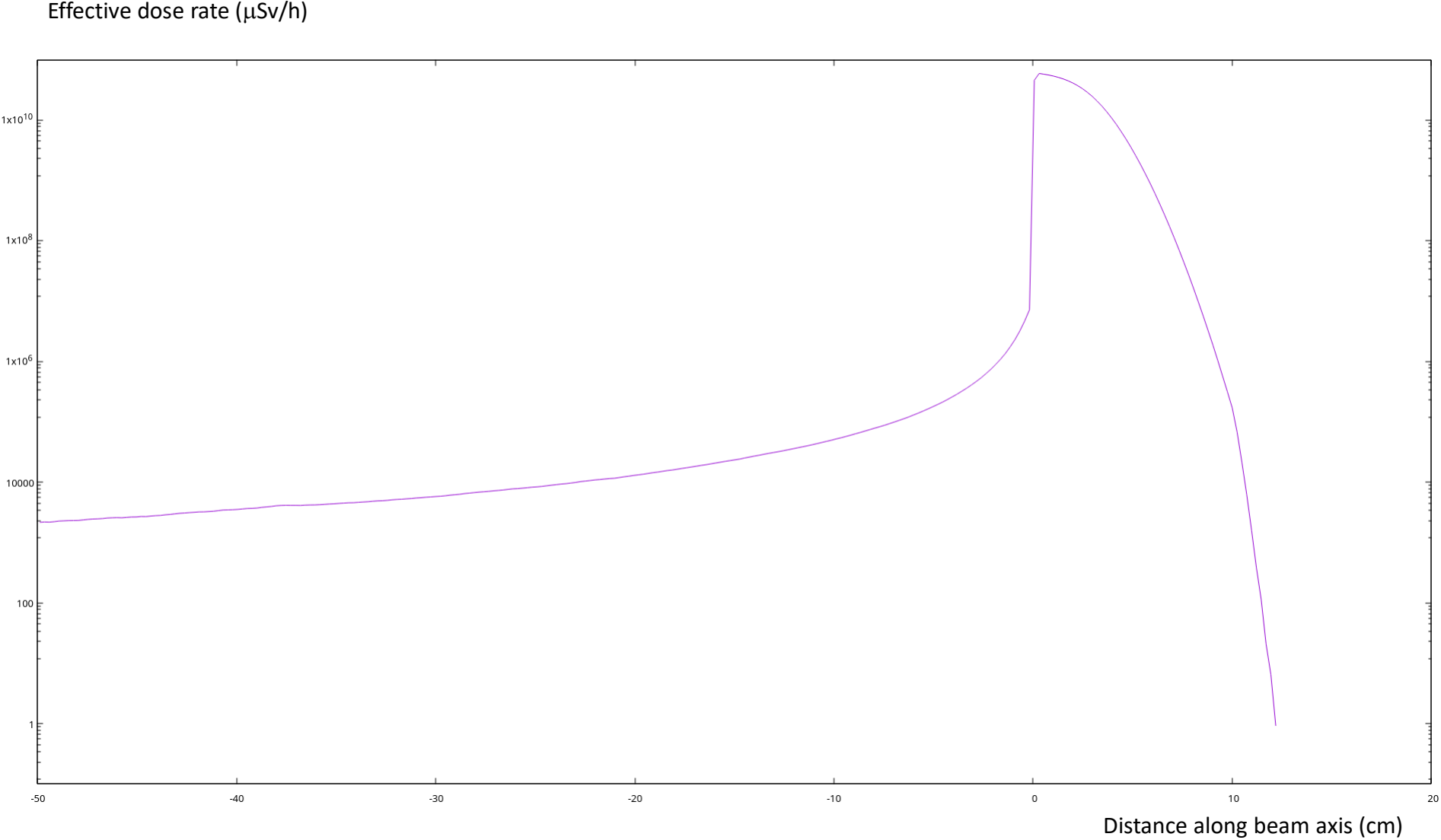
Differential fluence (neutrons/cm²/GeV per primary e)



Primary electrons (350 MeV)

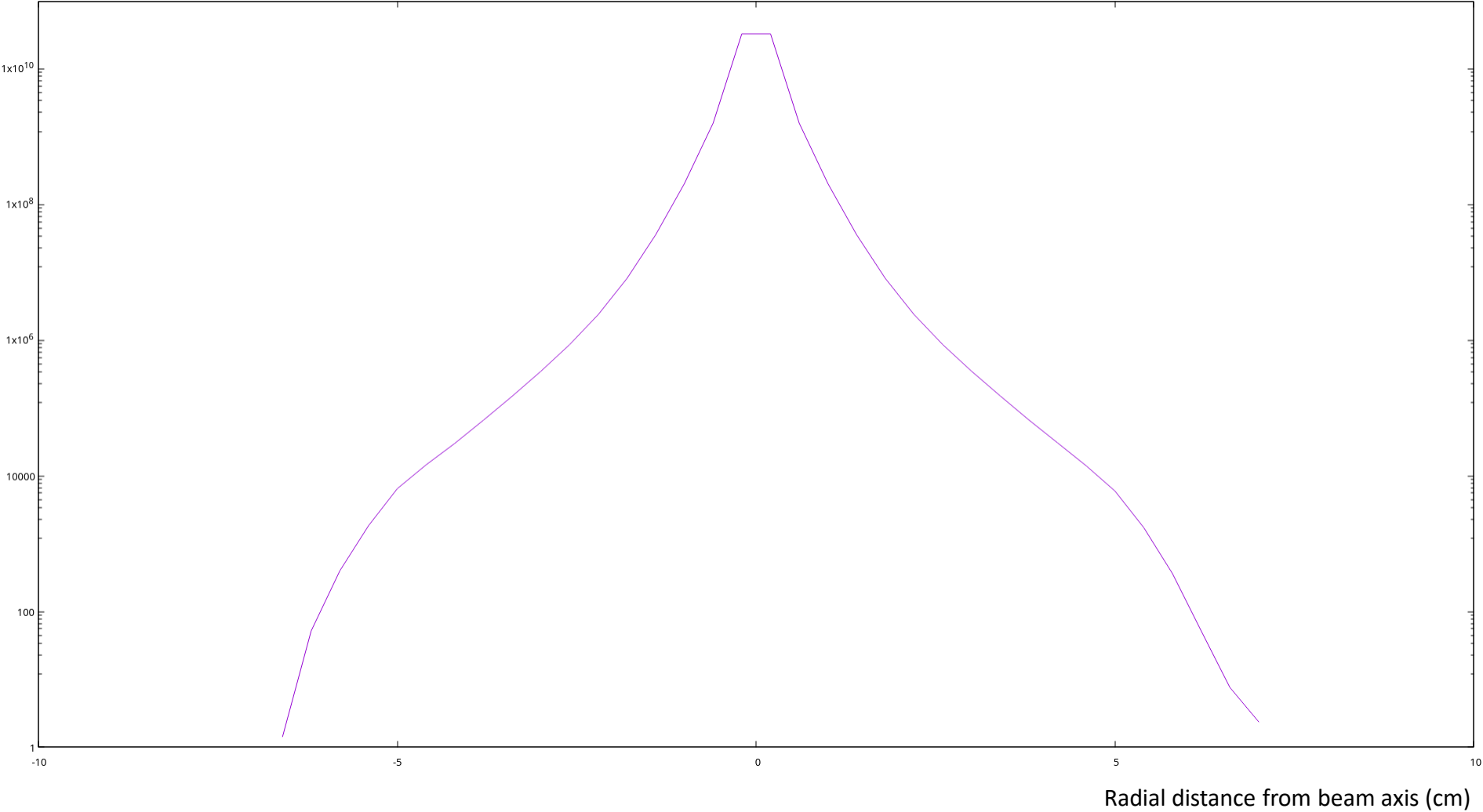


On-axis primary electron dose rate



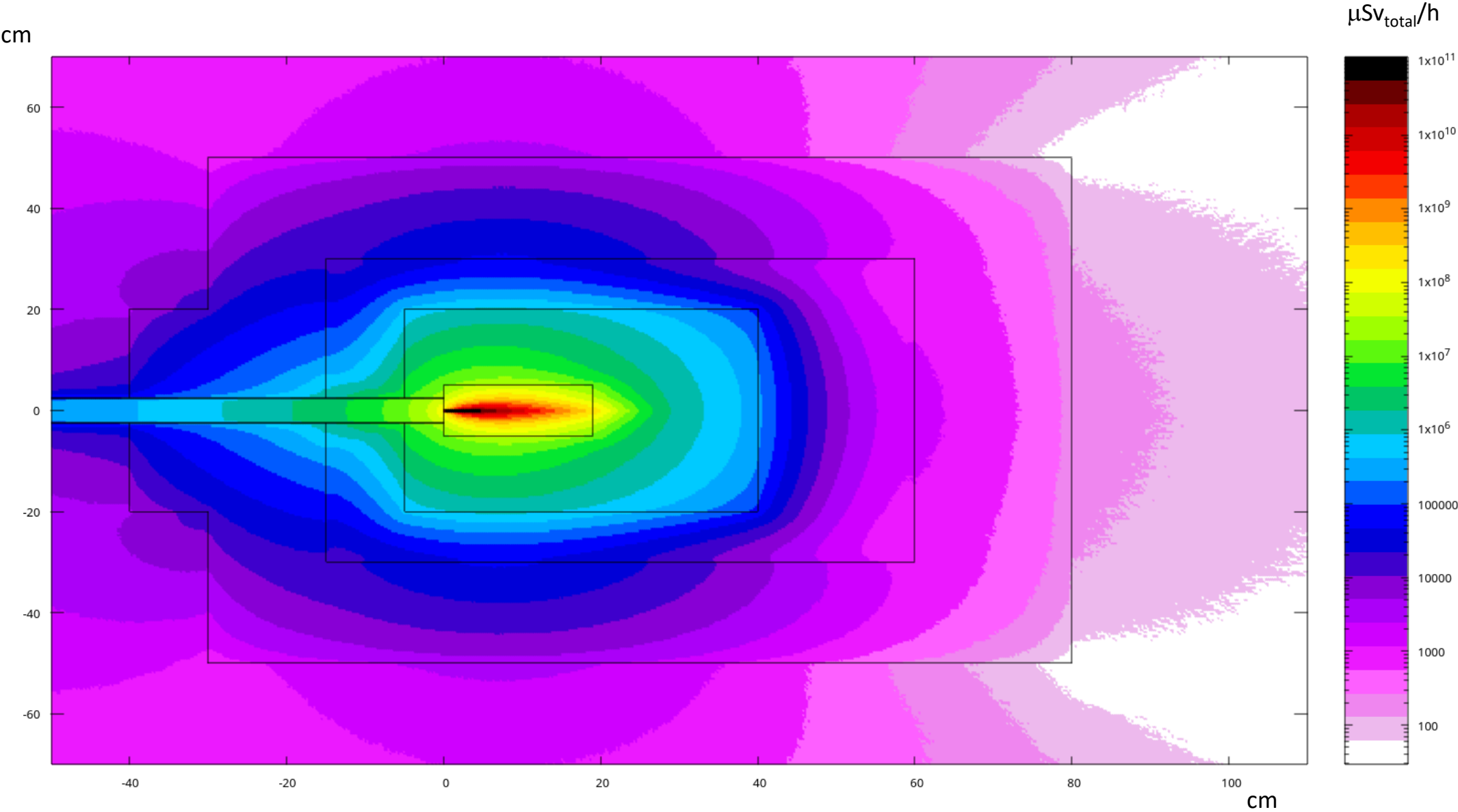
Radial primary electron dose rate

Effective dose rate ($\mu\text{Sv/h}$)

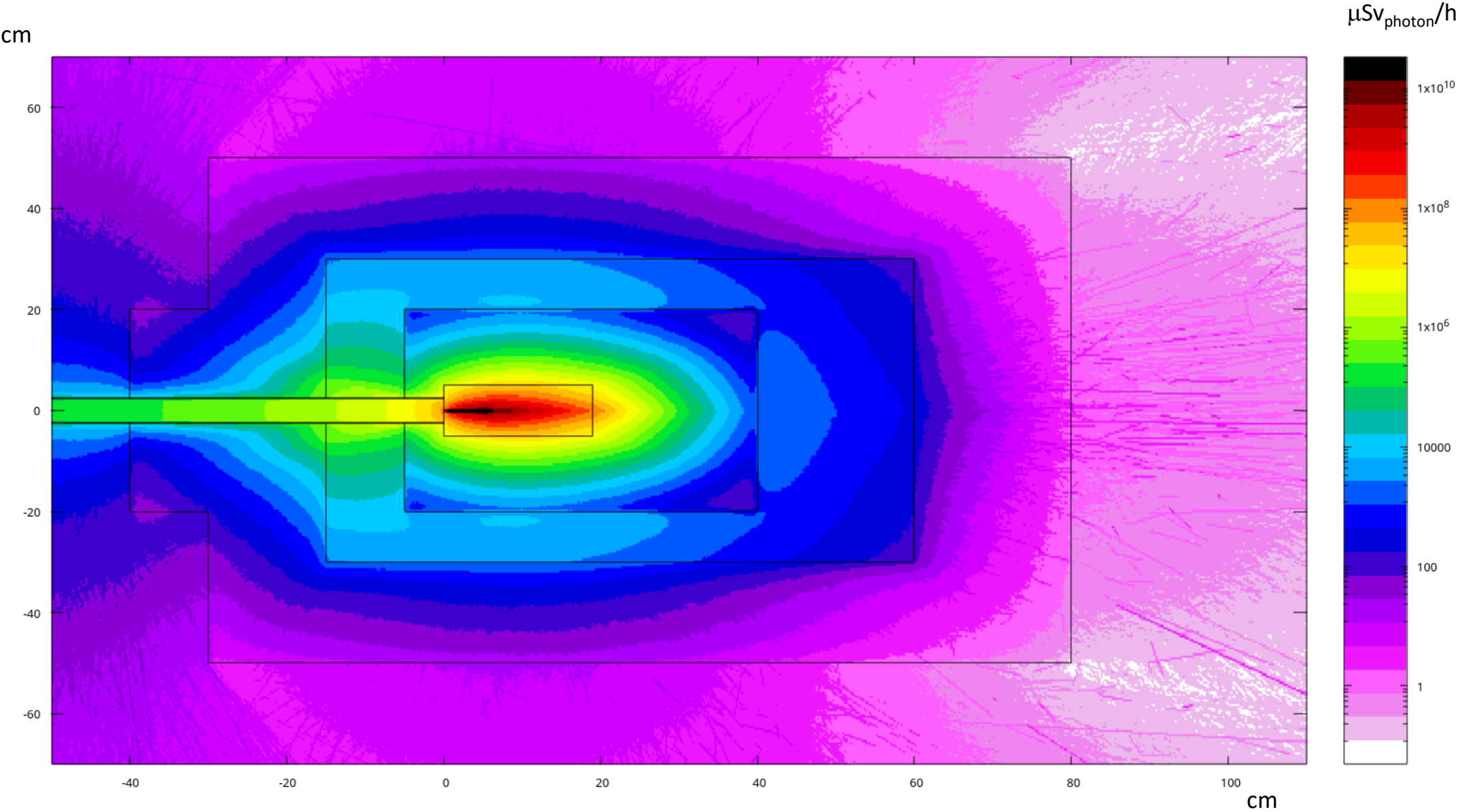


300 MeV

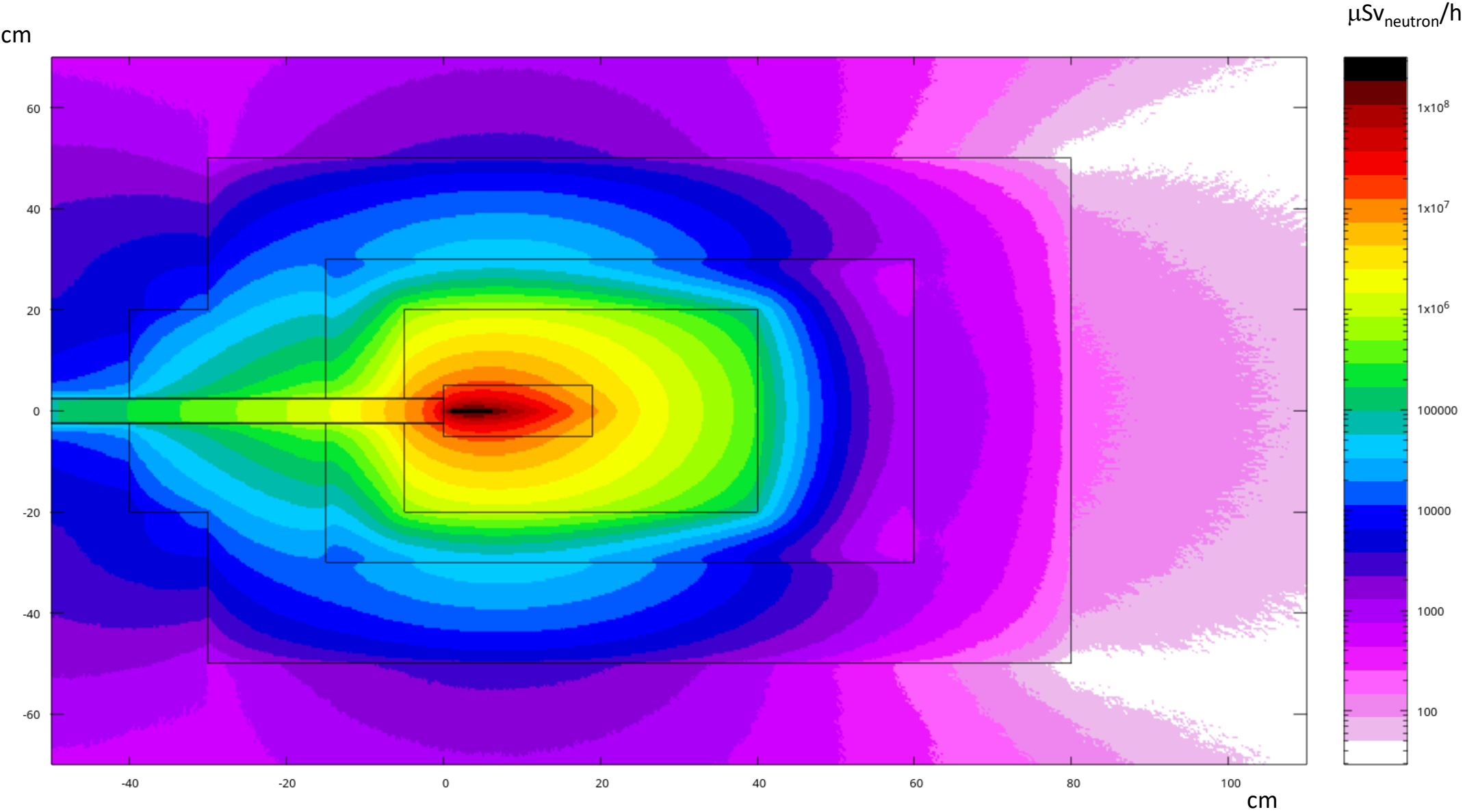
Total effective dose rate in plane through beam axis



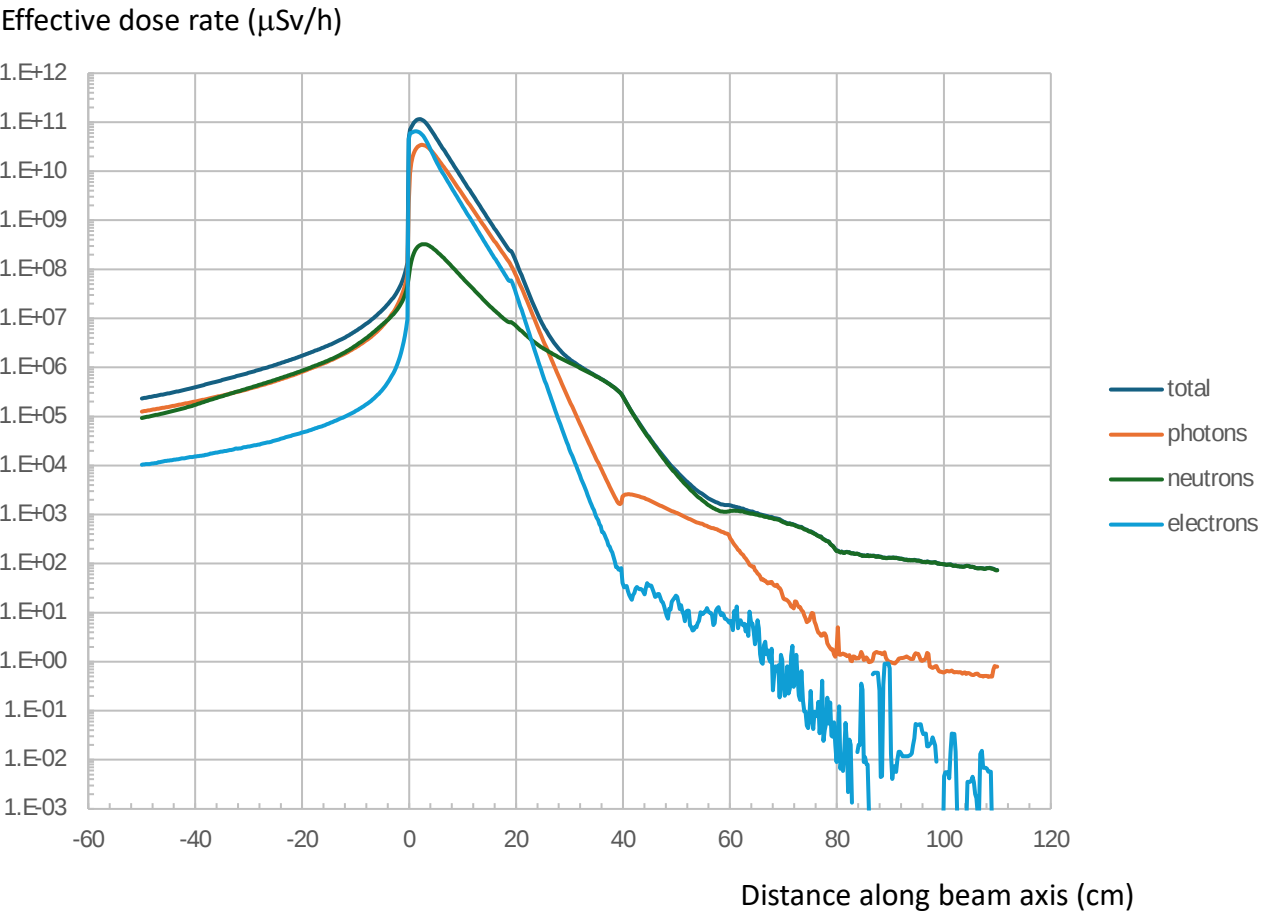
Photon effective dose rate in plane through beam axis



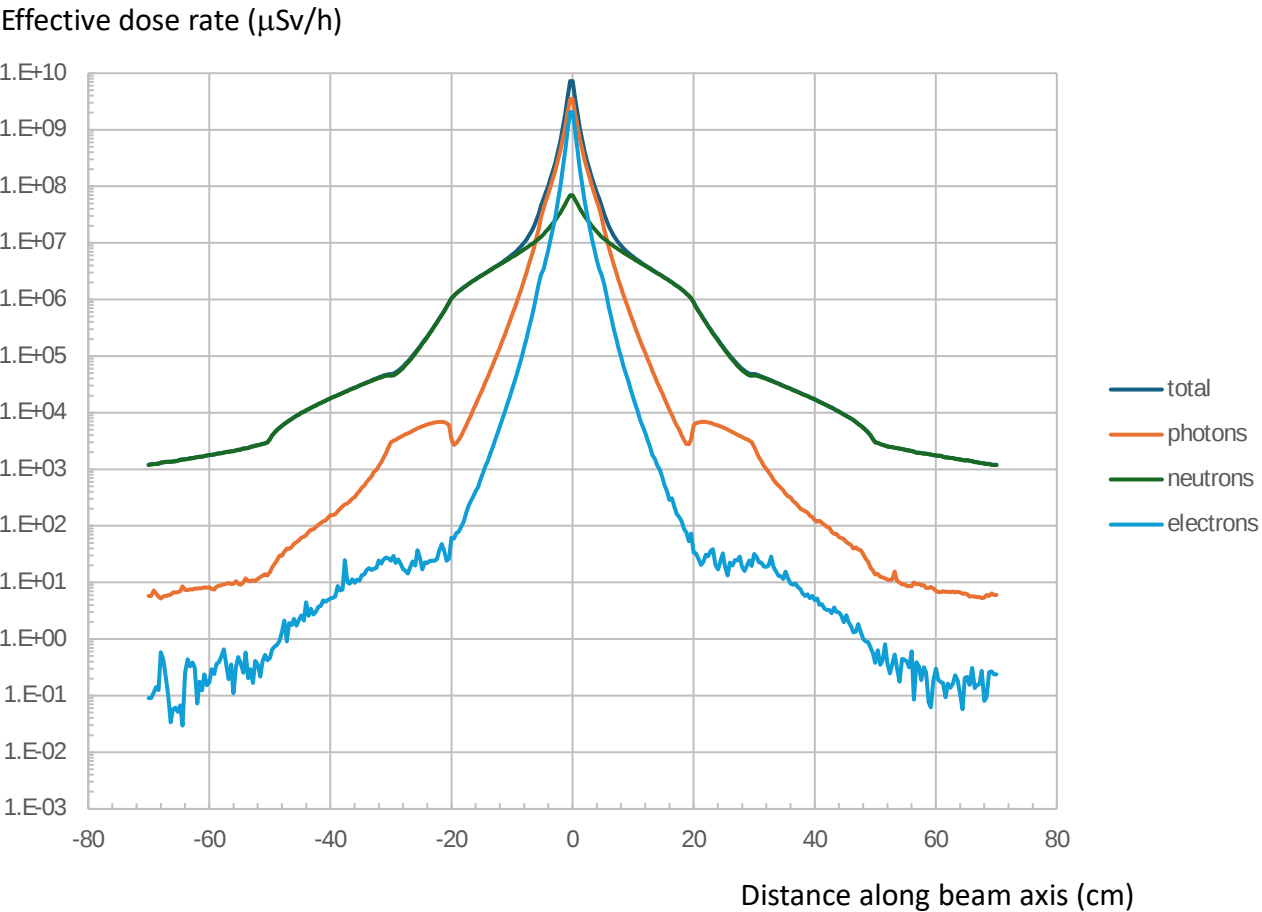
Neutron effective dose rate in plane through beam axis



On-axis dose rates

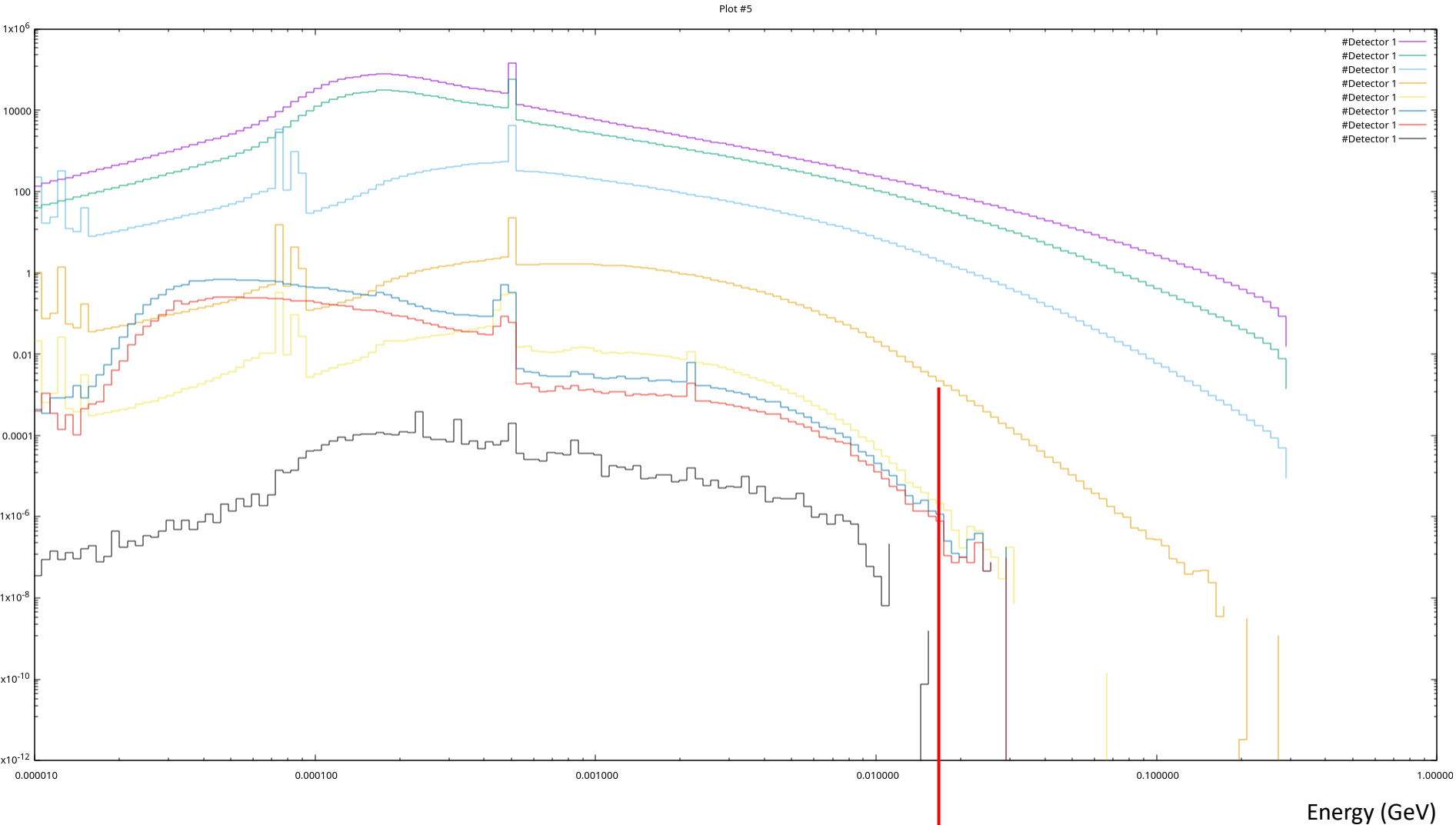


Maximum radial dose rates



Variation of photon spectra along beam axis

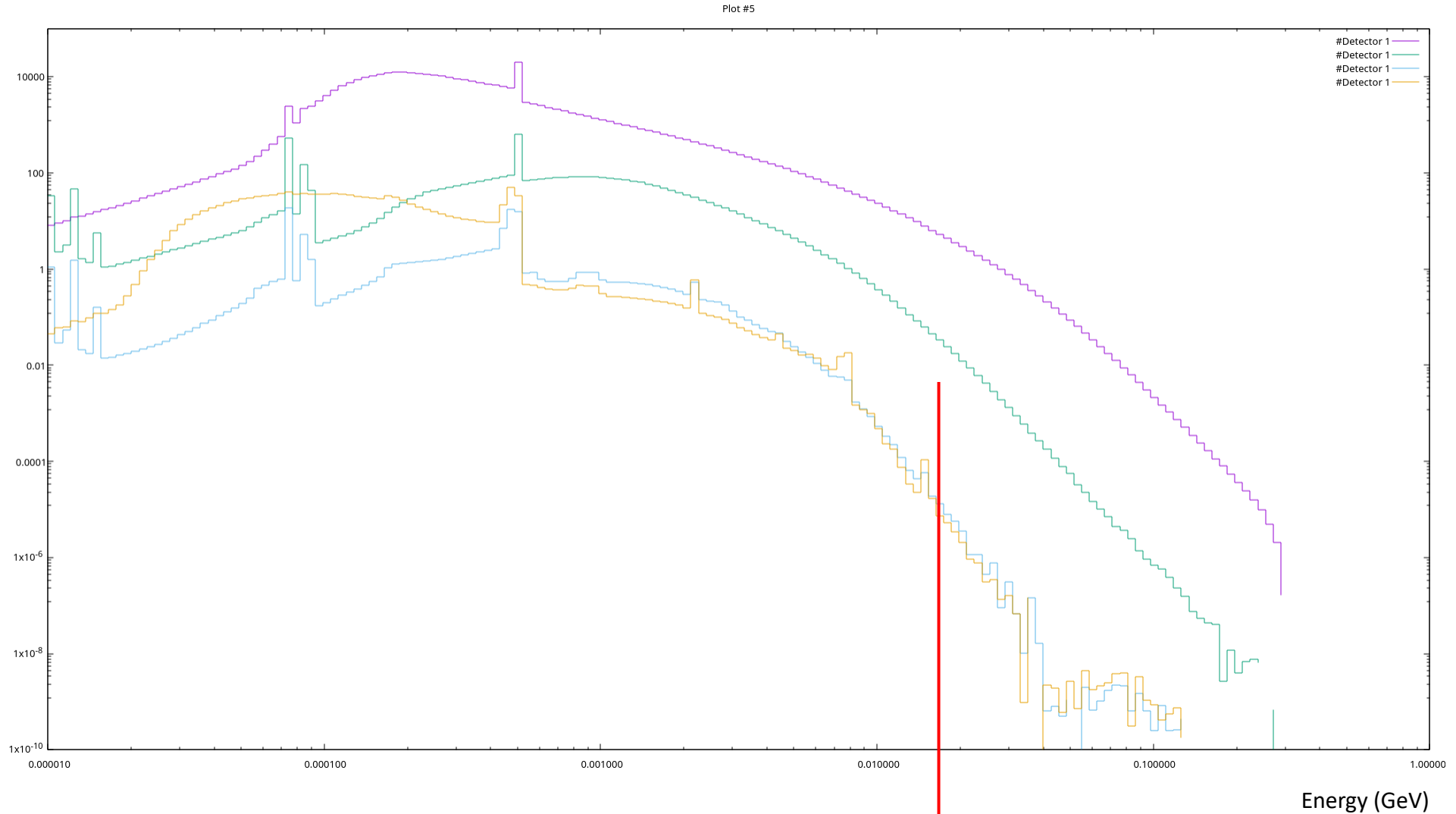
Differential fluence (photons/cm²/GeV per primary e)



Photonuclear reactions threshold
(no activation below this threshold)

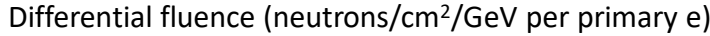
Variation of photon spectra along beam dump radius

Differential fluence (photons/cm²/GeV per primary e)

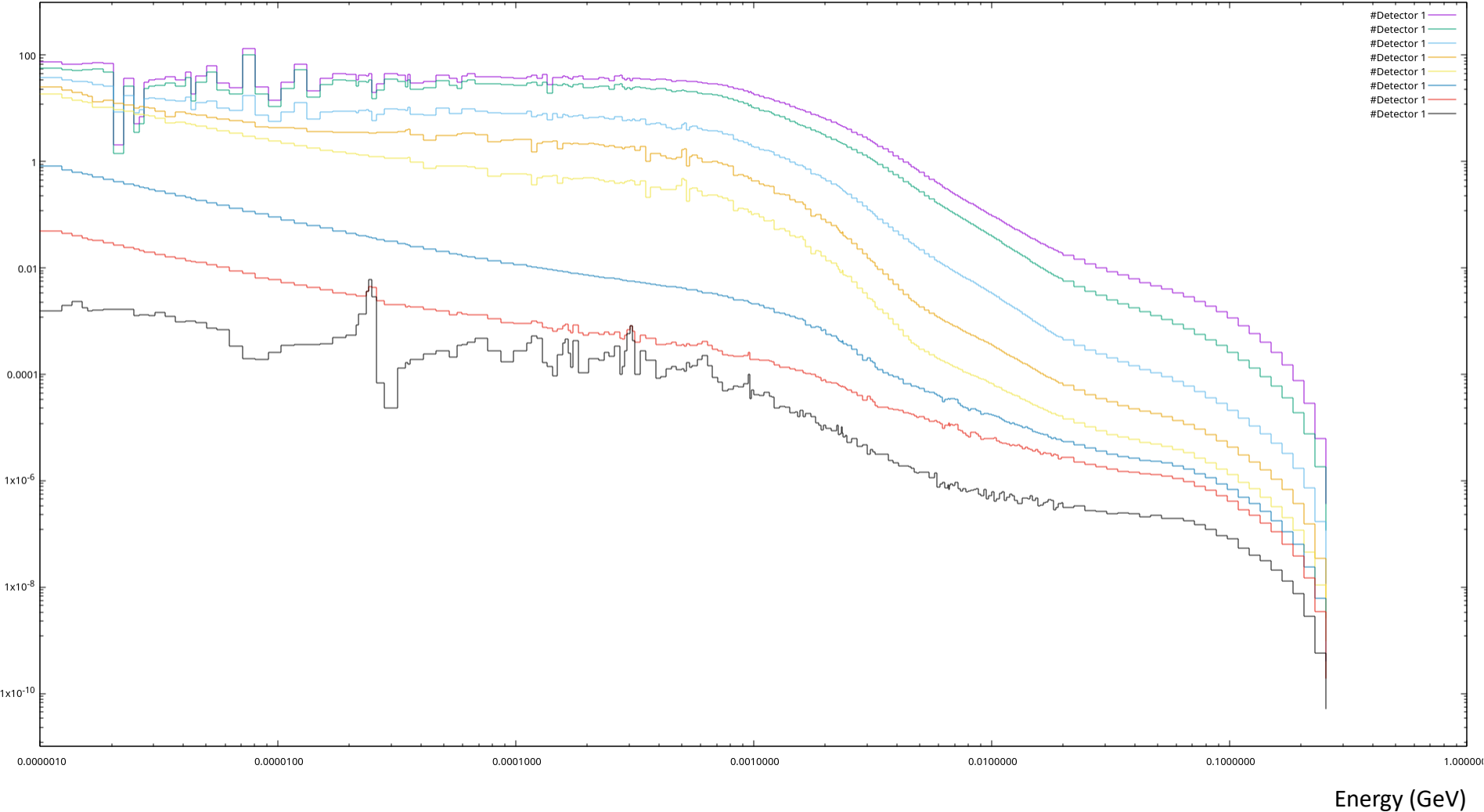


Photonuclear reactions threshold
(no activation below this threshold)

Variation of neutron spectra along beam axis

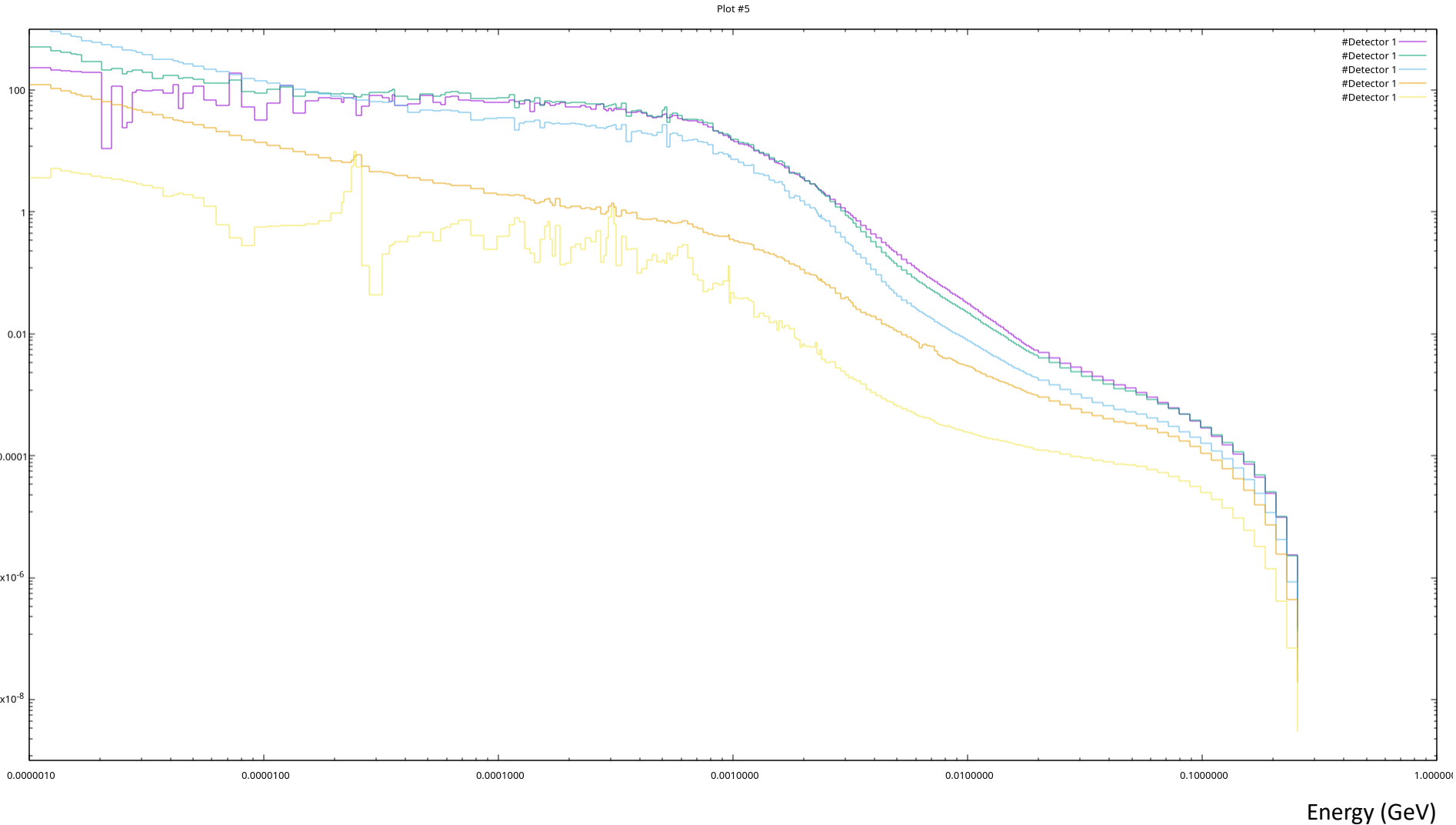


Plot #5



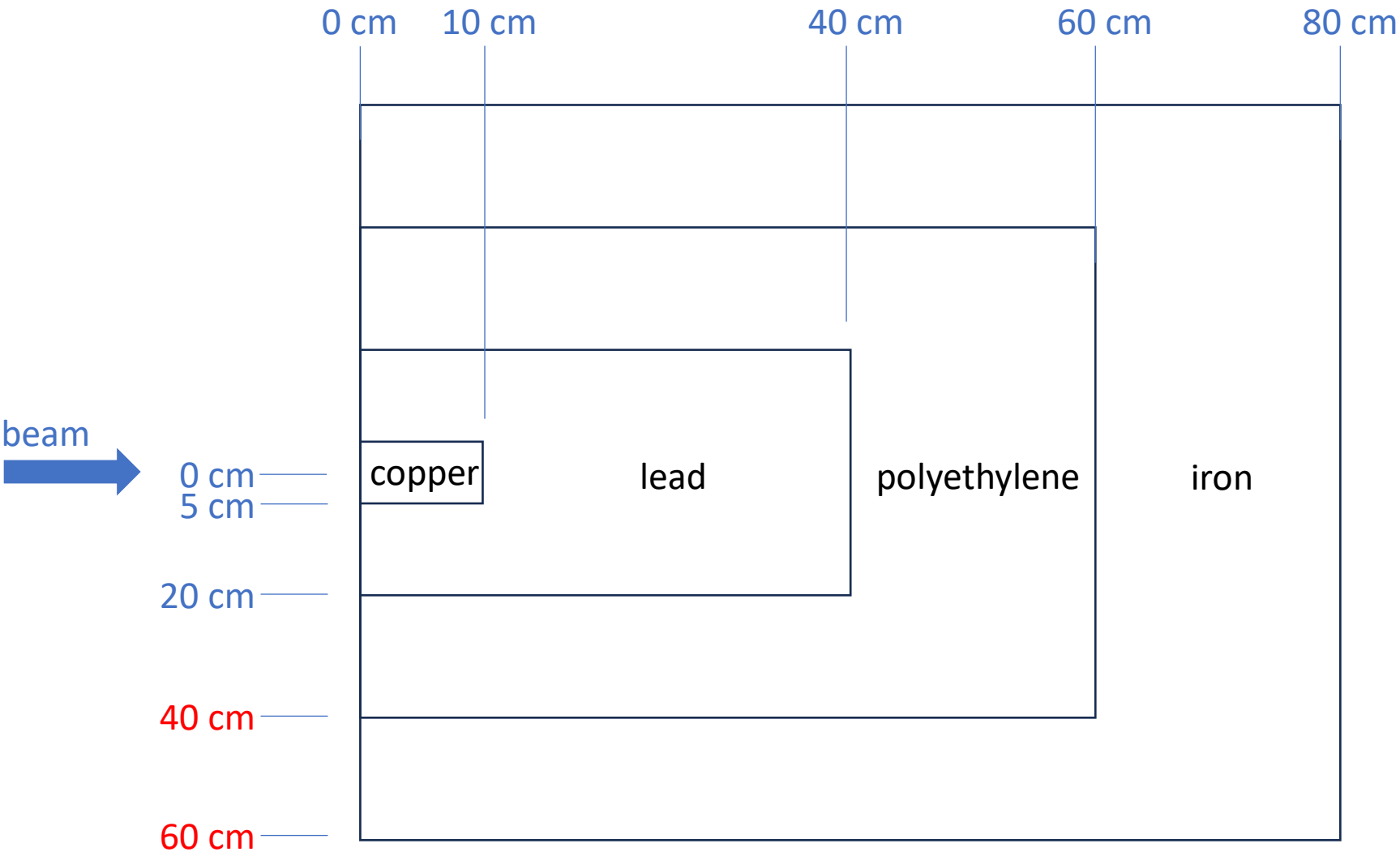
Variation of neutron spectra along beam dump radius

Differential fluence (neutrons/cm²/GeV per primary e)



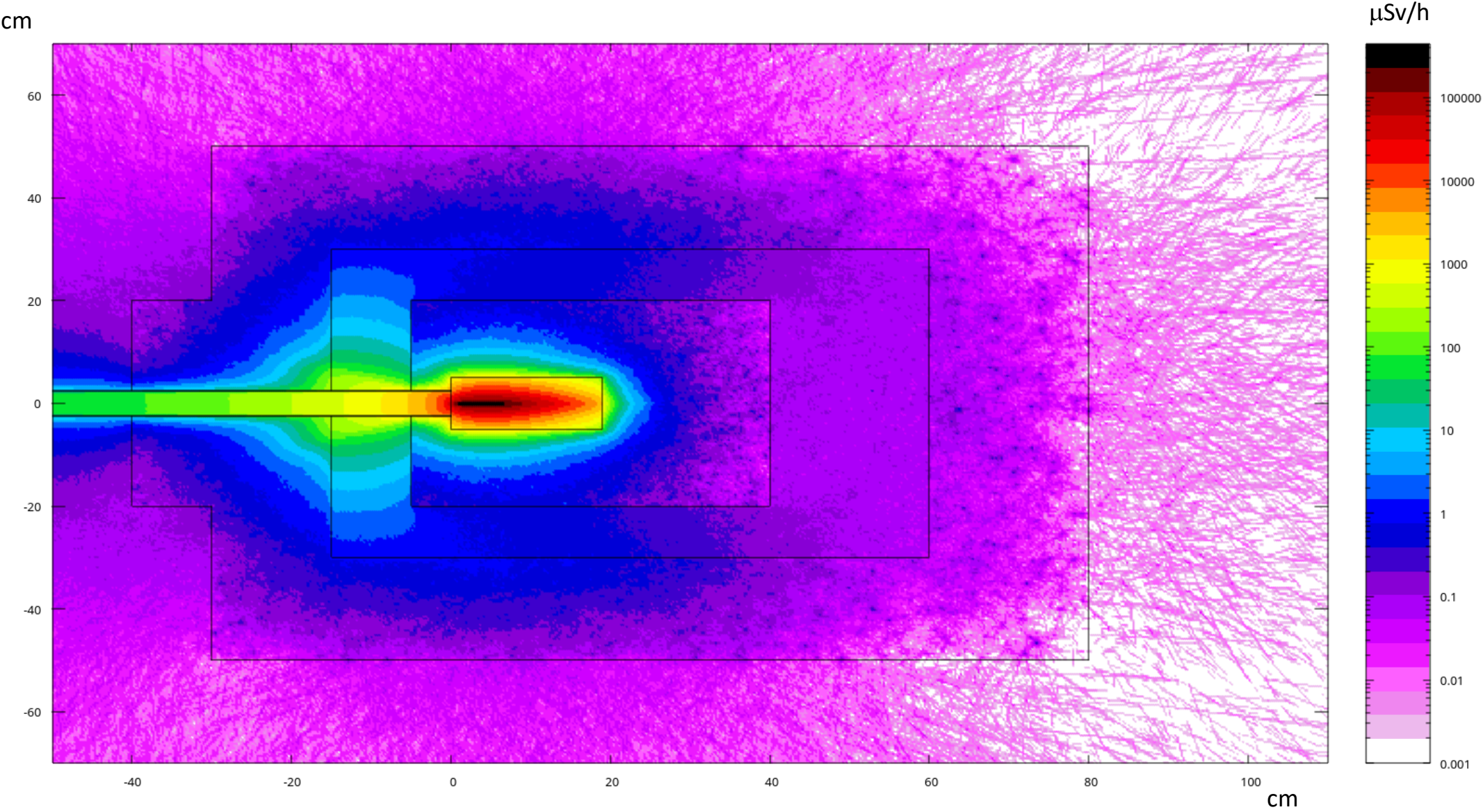
Proposed minimum dimensions for beam dump (upstream shielding not included)

→ Minimum cylinder around possible points of impact of beam

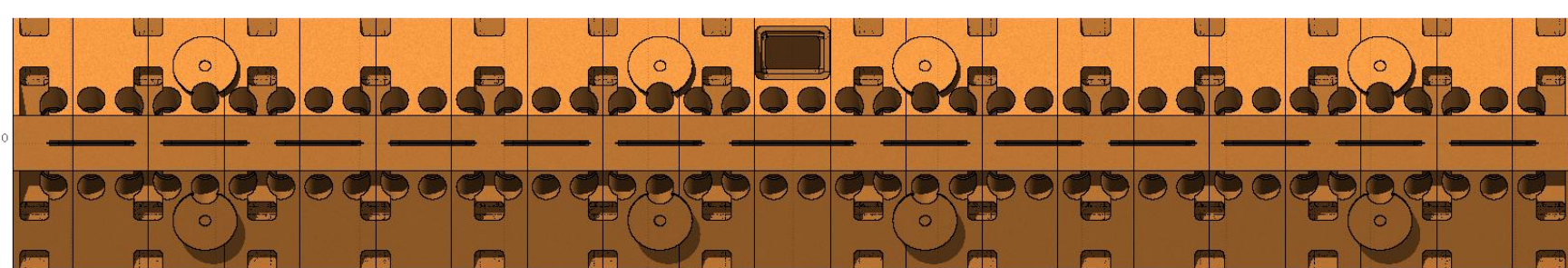


Residual dose rates around beamdump

Residual dose rates in plane through beam axis – 5 years operation, 2000 h/year at 3.5 W, cooling time = 1 min.



FLUKA model QCM



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