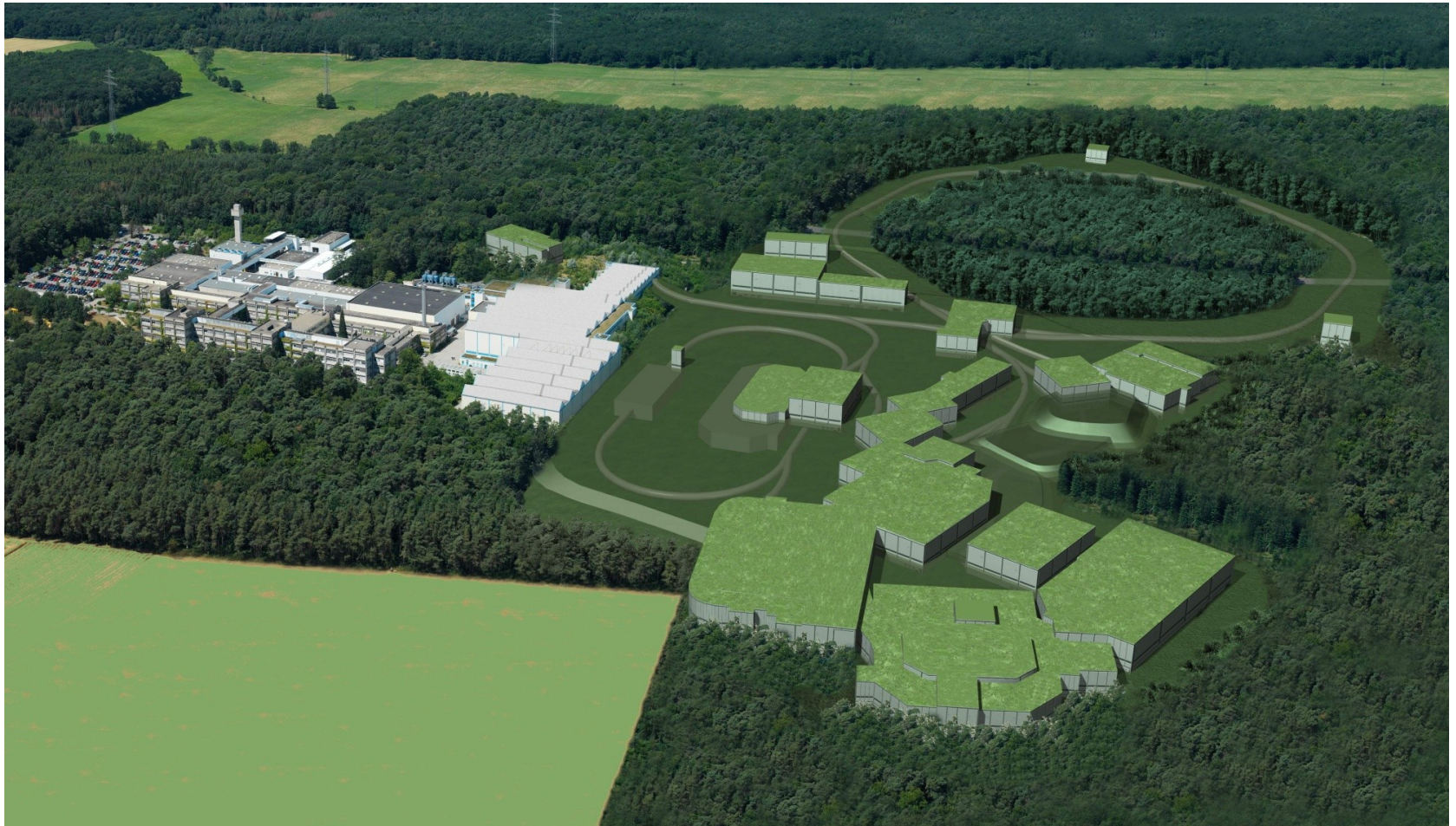
A large, complex wireframe model of a particle accelerator ring, likely the FAIR facility, is shown in a perspective view. The ring is composed of many segments and is surrounded by various support structures and piping. The model is rendered in a light gray color, giving it a technical, schematic appearance. It is positioned in the center of the slide, with the title text overlaid on it.

# FLUKA calculations for the pbar separator at FAIR

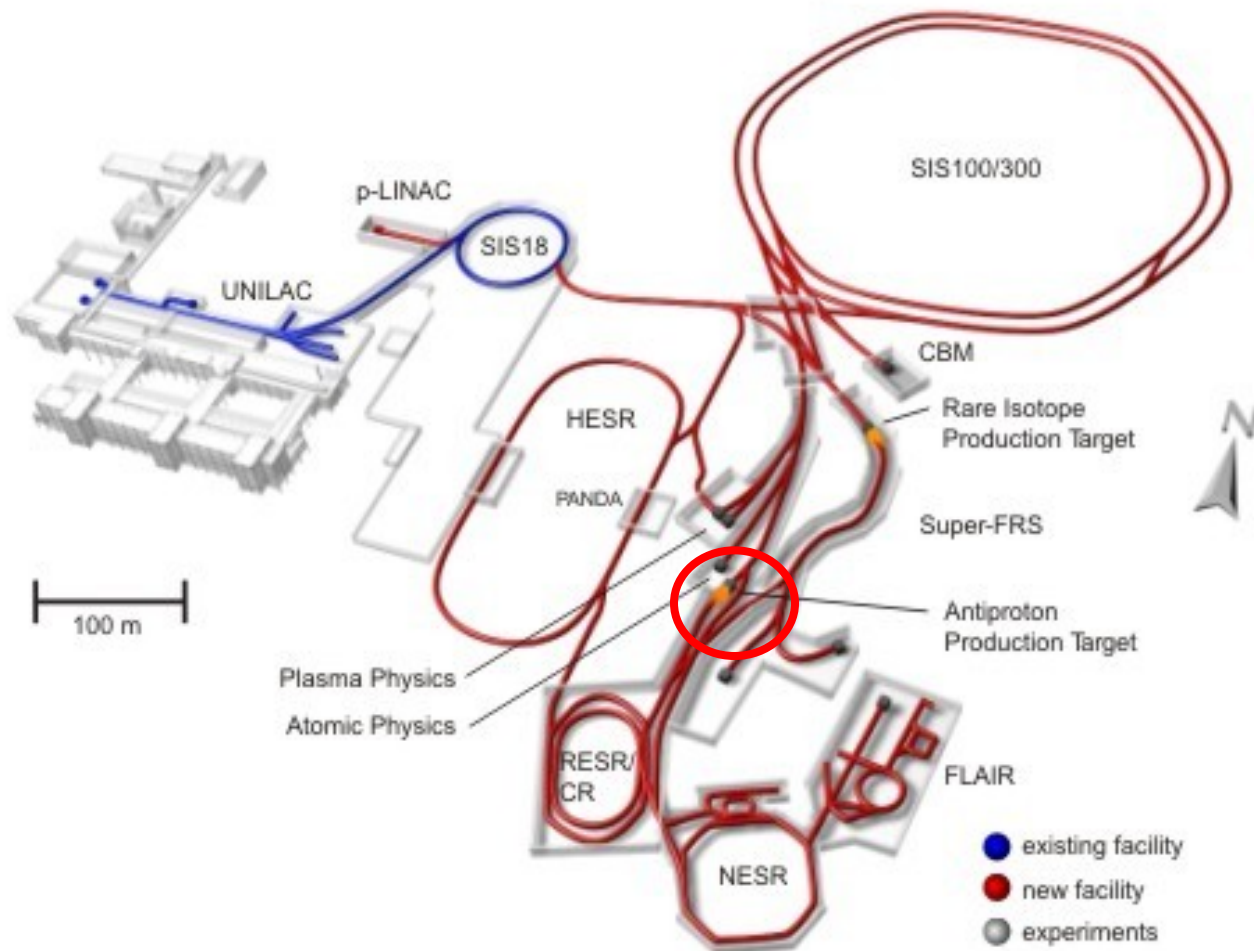
Vitaliy Gostishchev

# GSI and FAIR facility

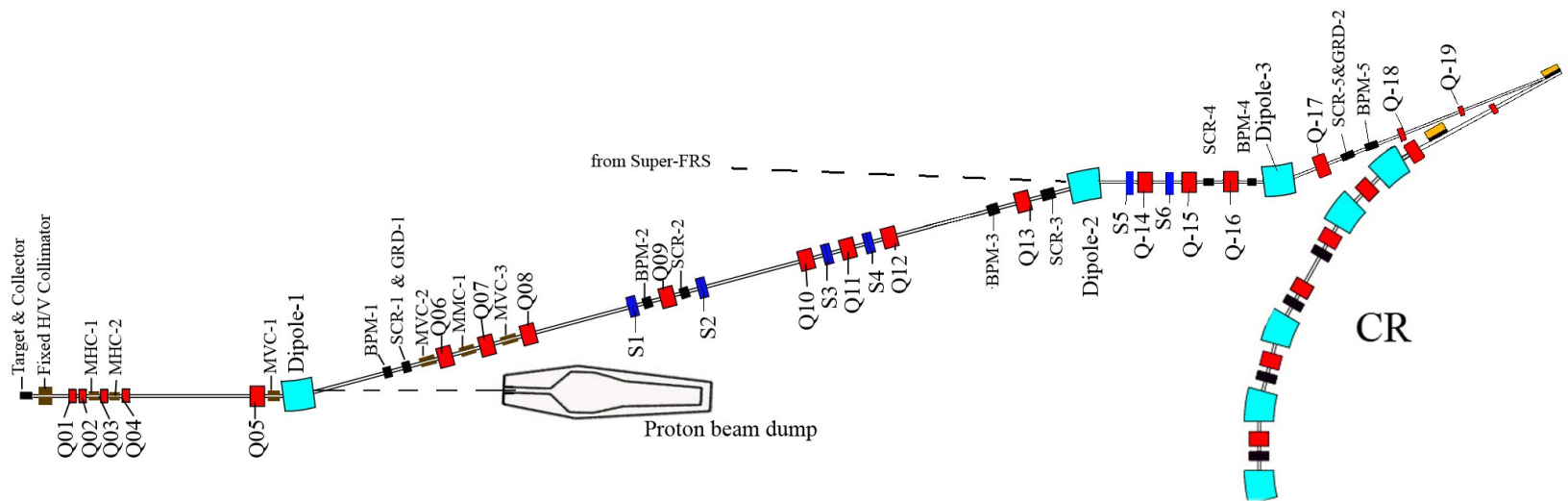




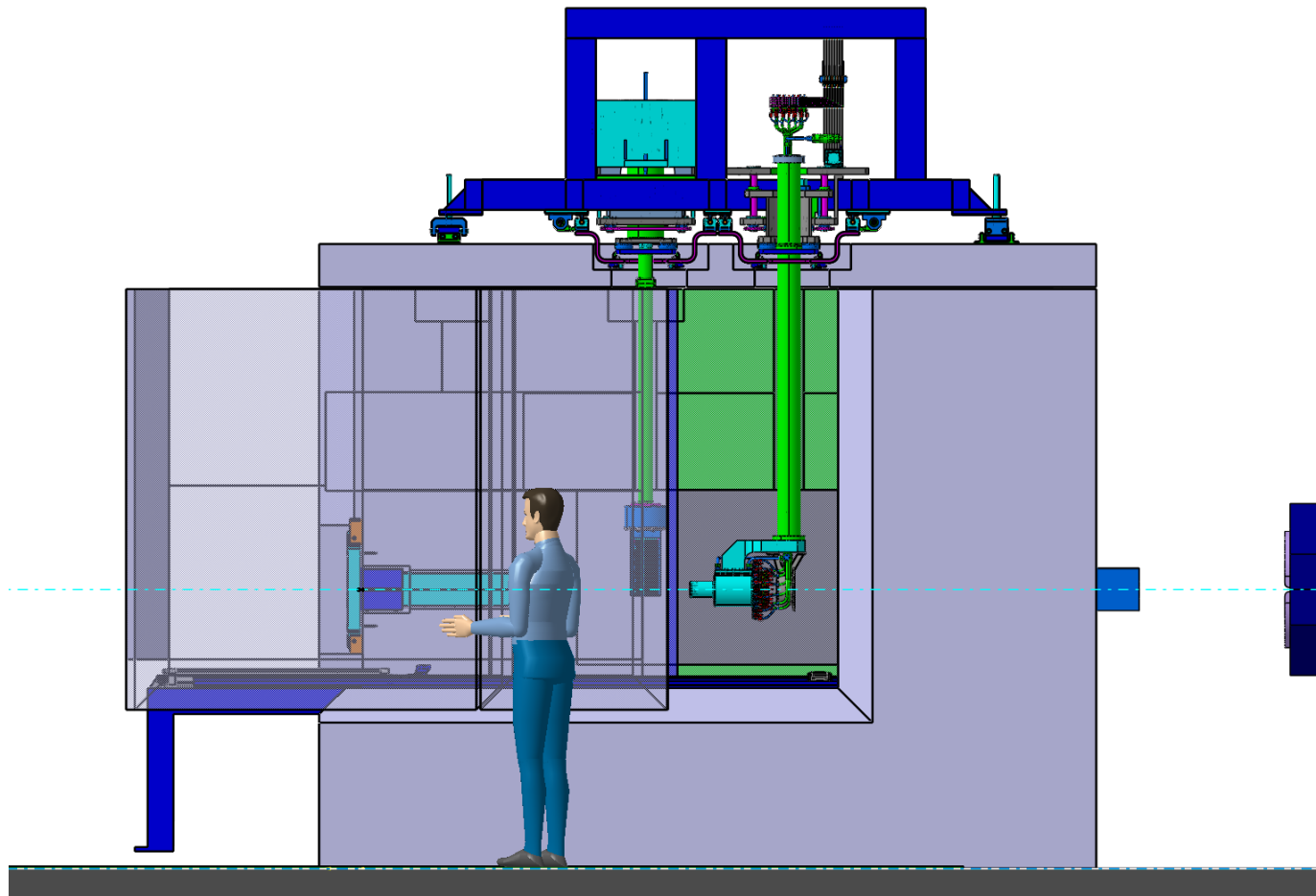
# FAIR facility



# Layout of the pbar target area

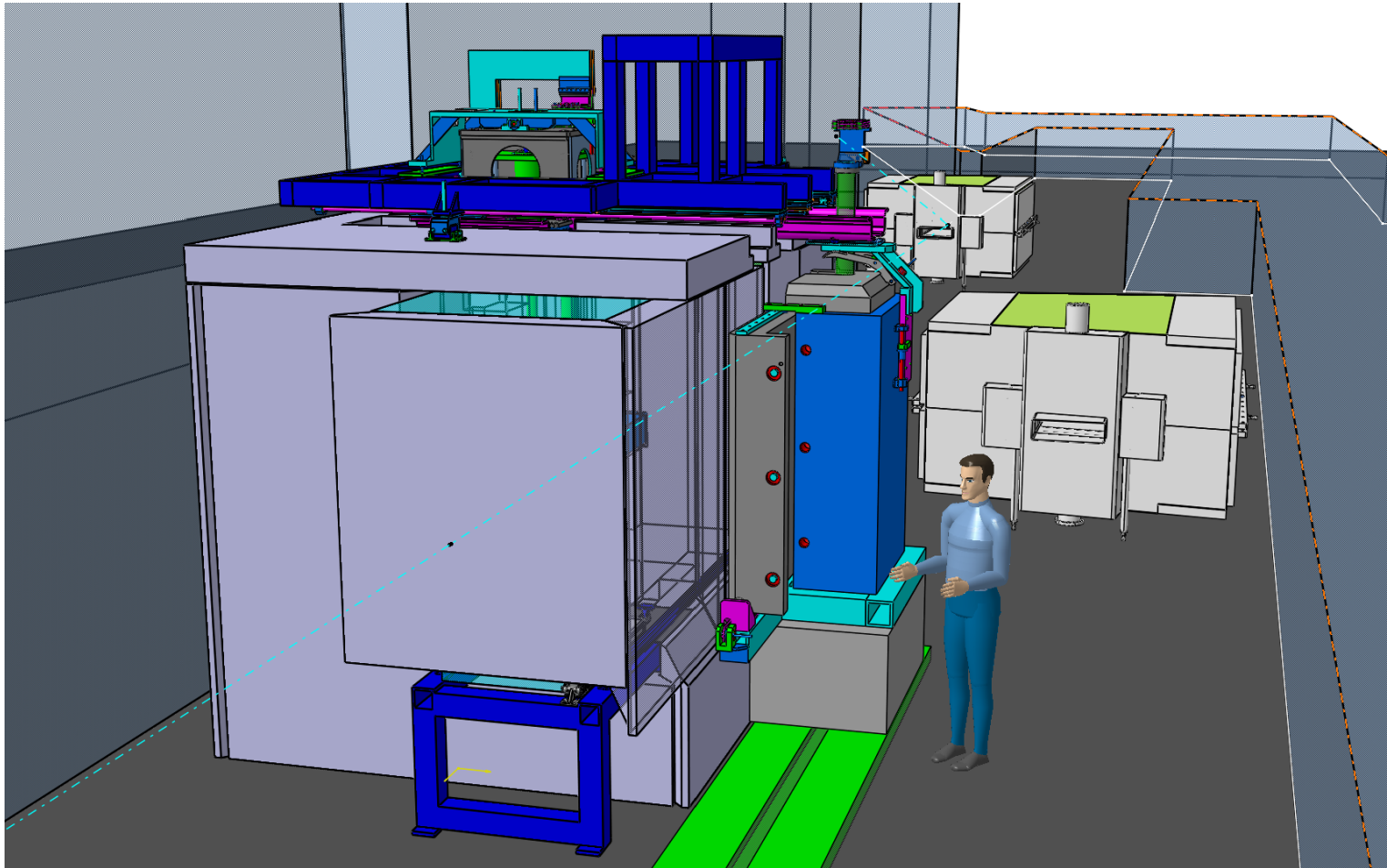


# Target Station

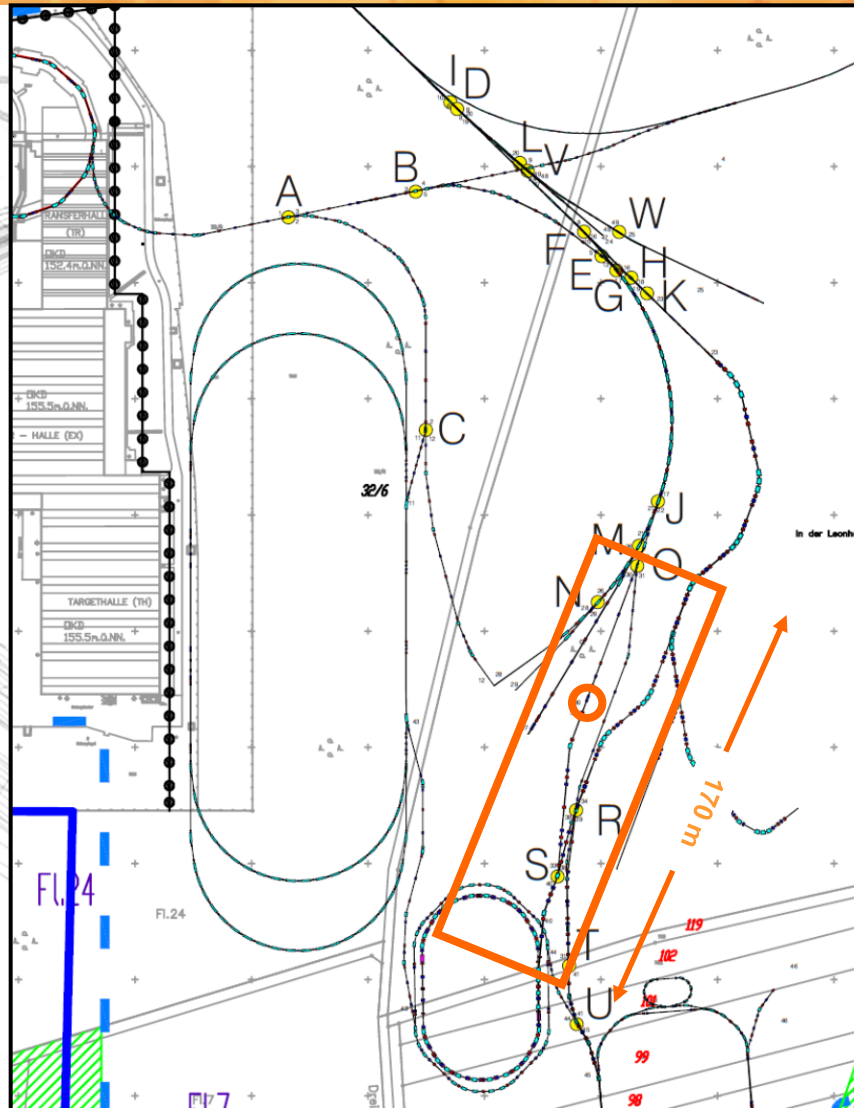




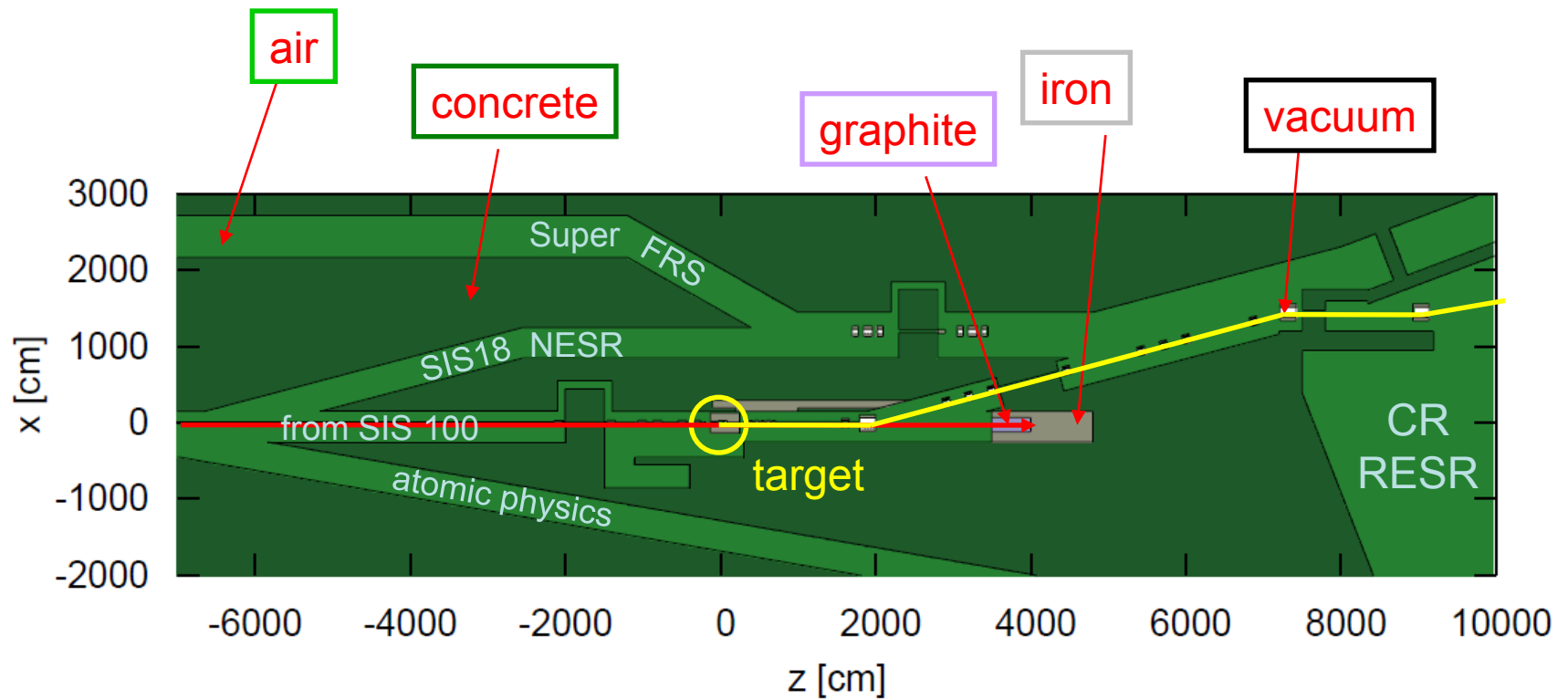
# Target Station



# Dose rates around the pbar target

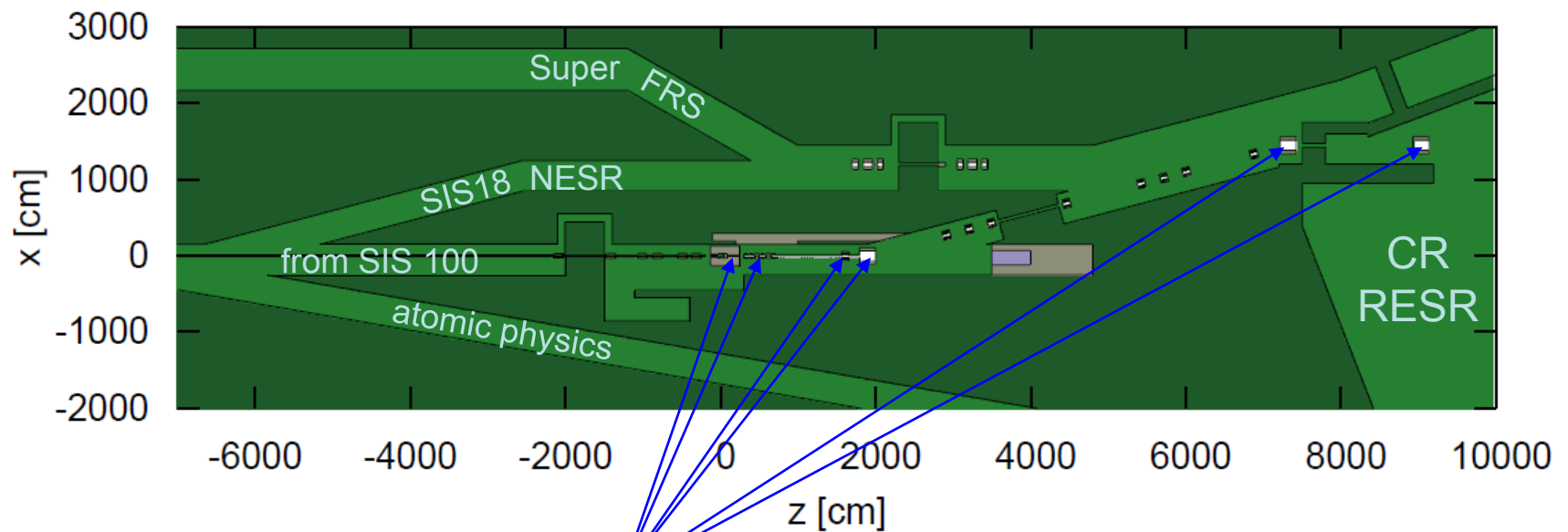


# Fluka input, top view 1



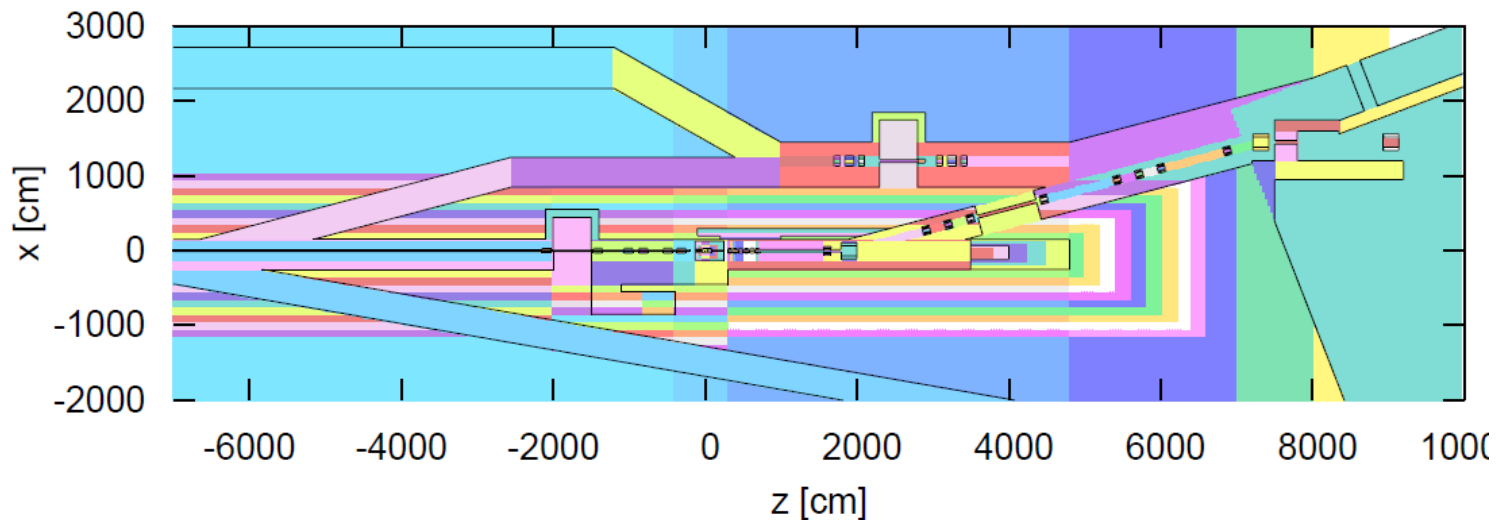
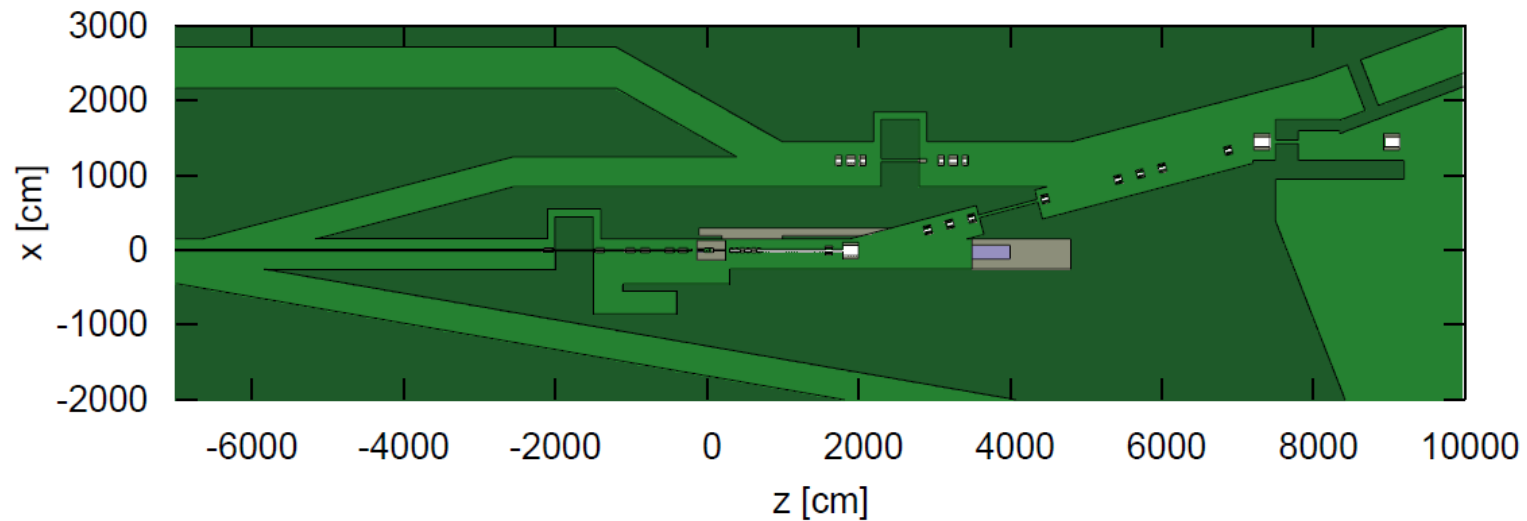


# Fluka input, top view 2

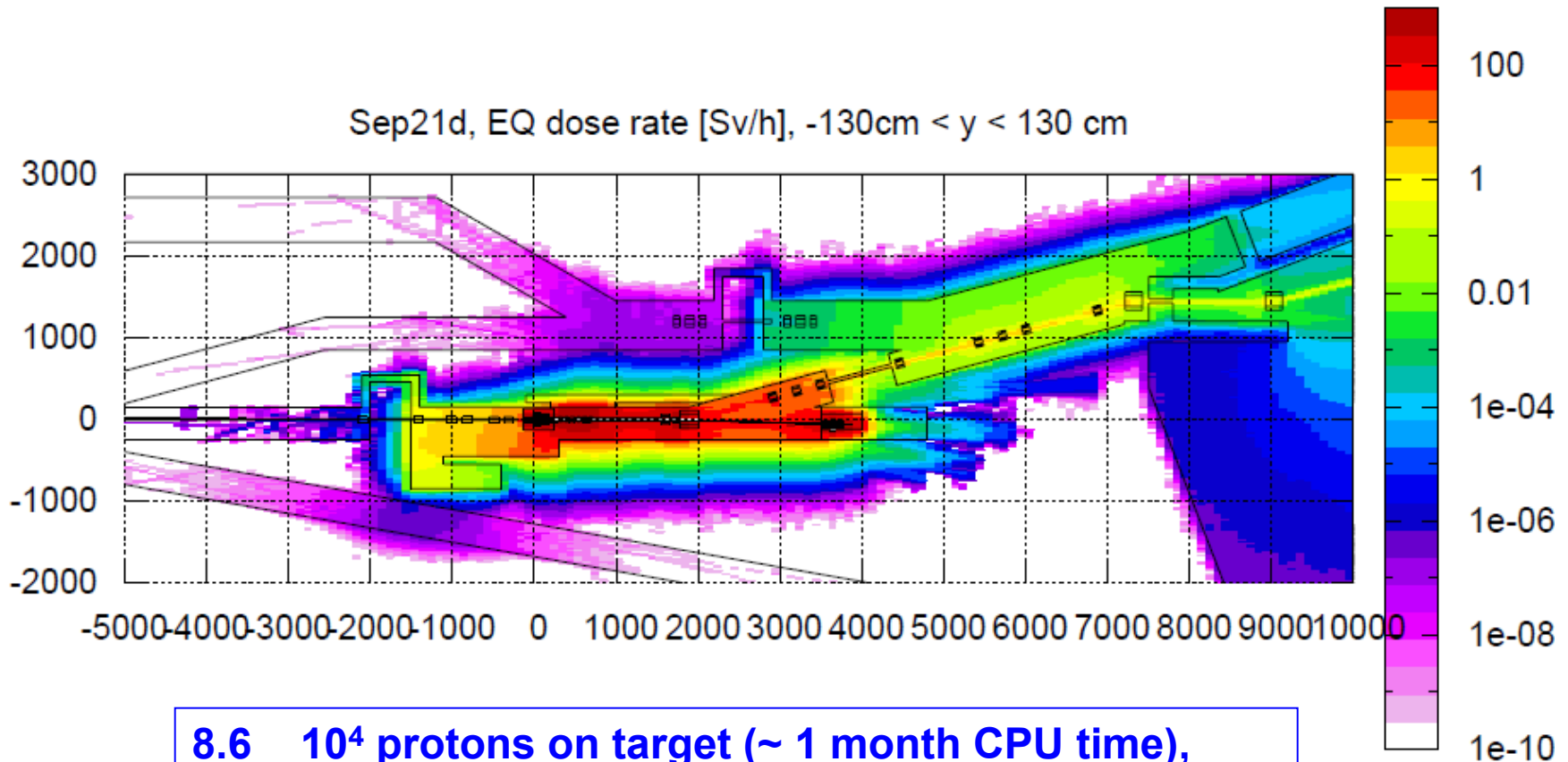


magnetic field in horn, Q1-Q5, D1-D3

# Good statistics in a reasonable CPU time: Importance Biasing



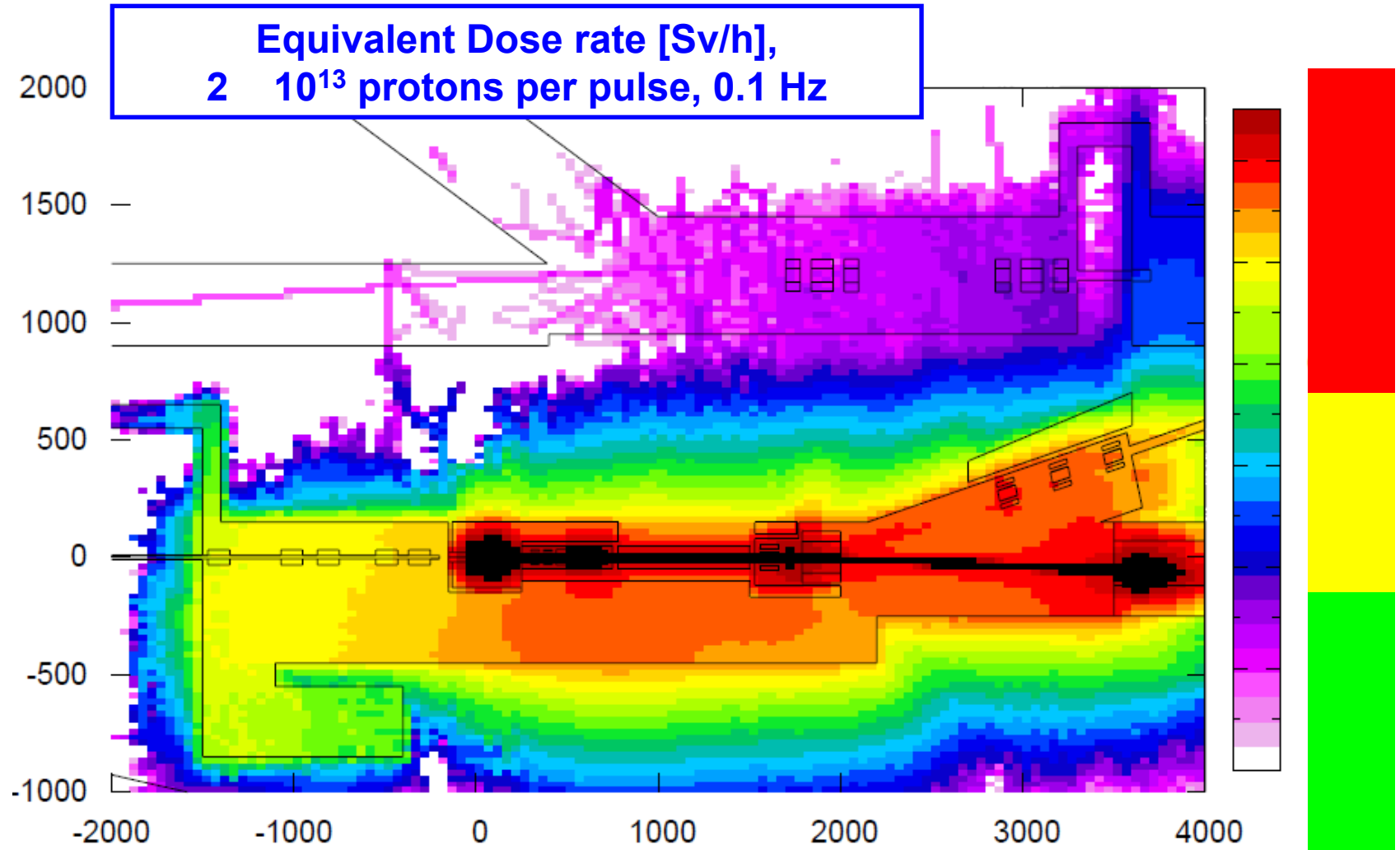
# Equivalent dose rates during operation



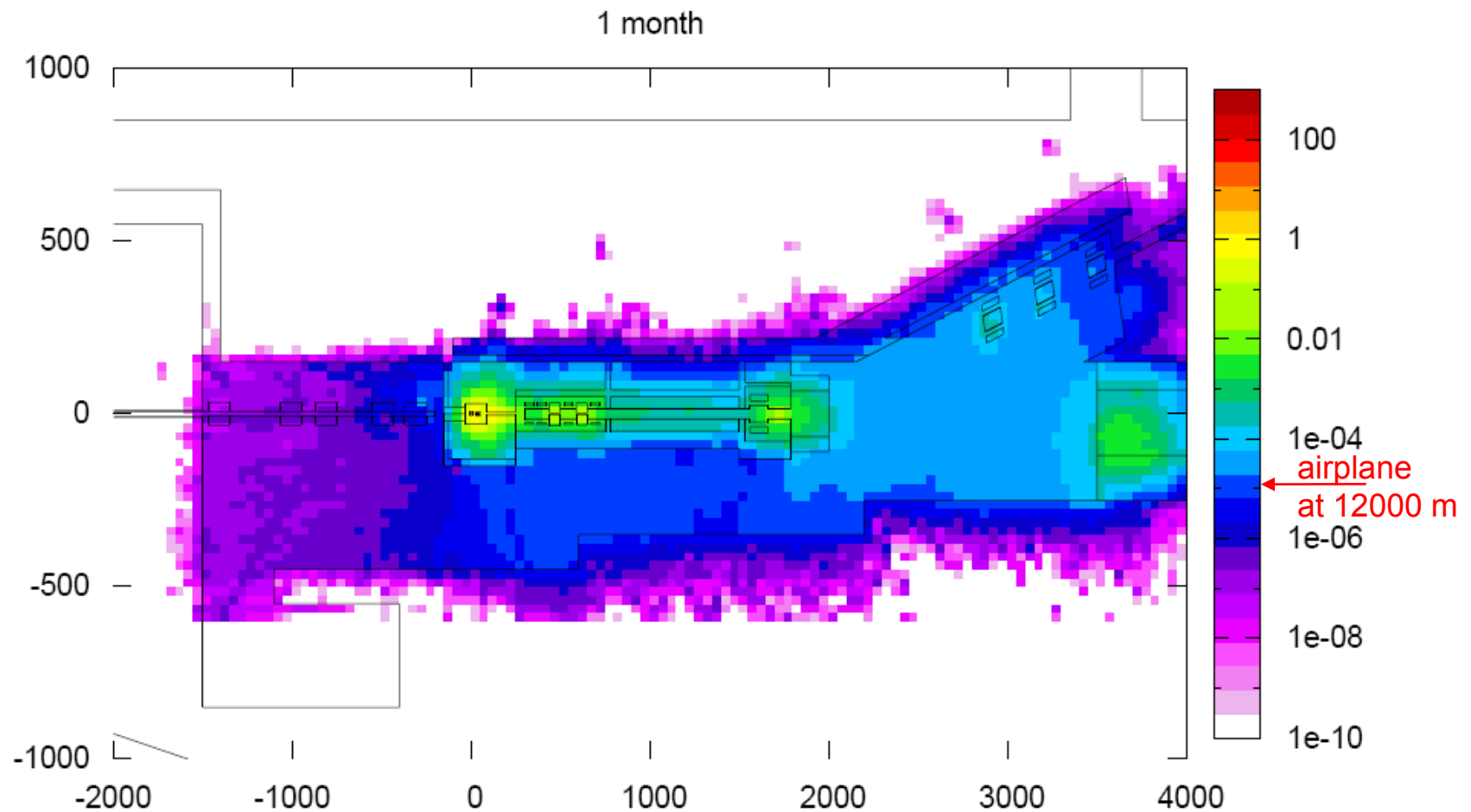
8.6  $10^4$  protons on target ( $\sim 1$  month CPU time),  
importance  $10^{-4}$  (target) –  $10^4$  (Super FRS tunnel)



# Equivalent dose rates during operation



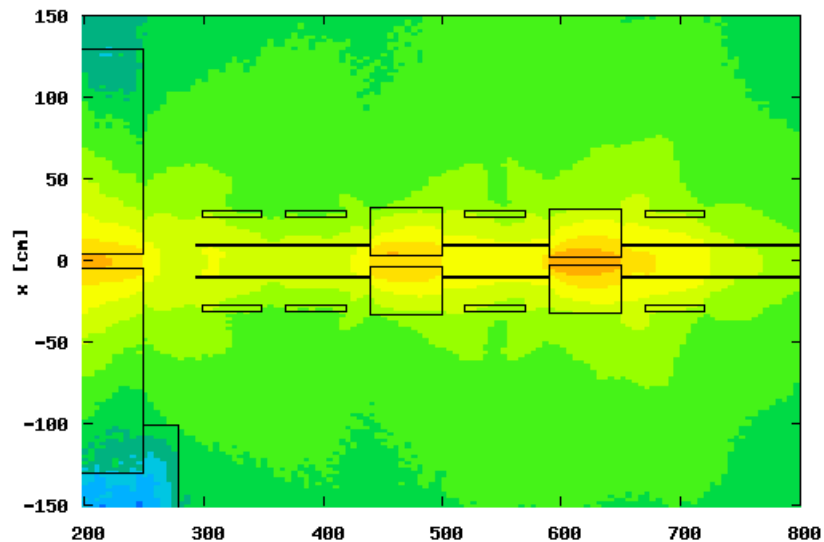
# Induced Activity after Shut-Down



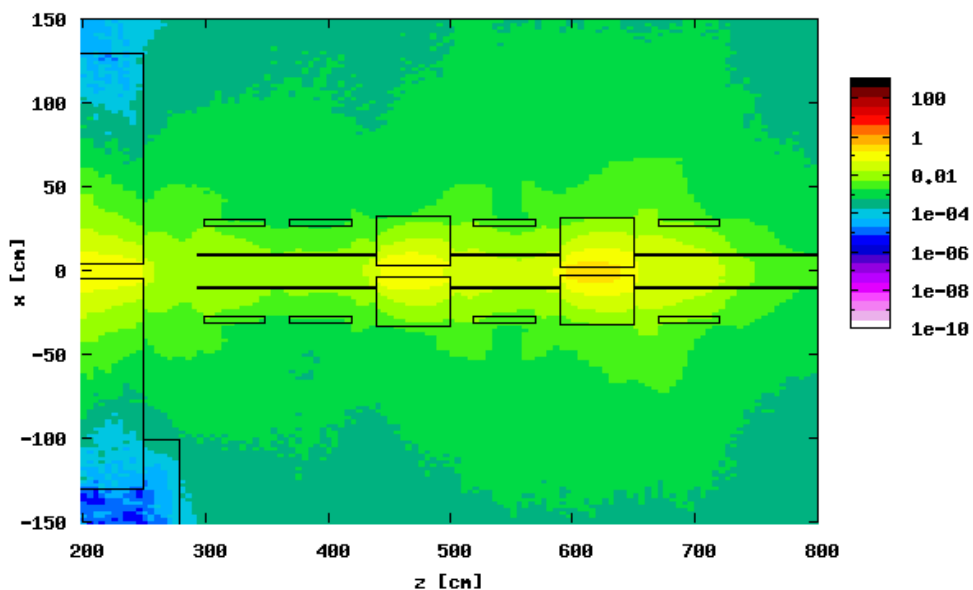
# FLUKA: Induced Activity

Cooling time

1 week



1 year

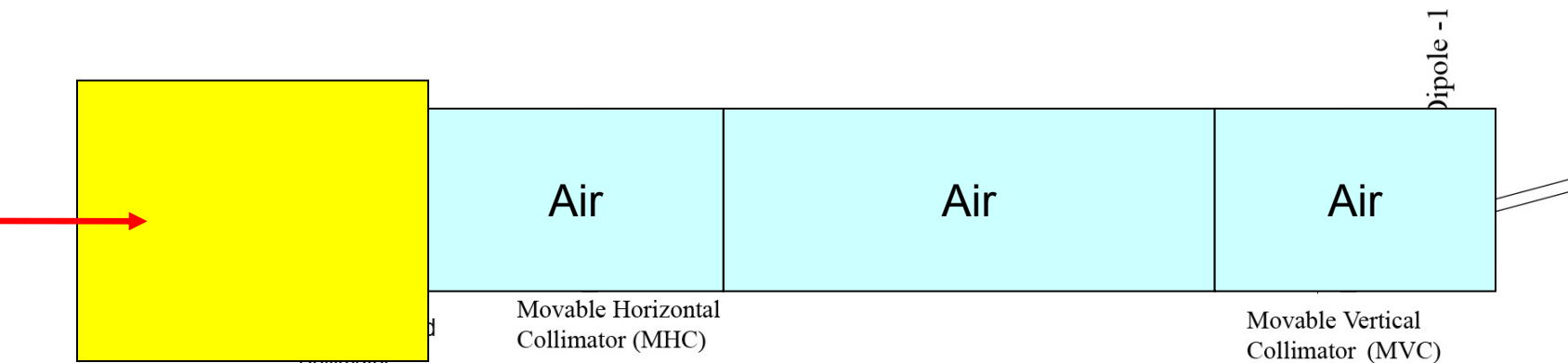




# Step by step calculations

The calculations were performed with two codes:

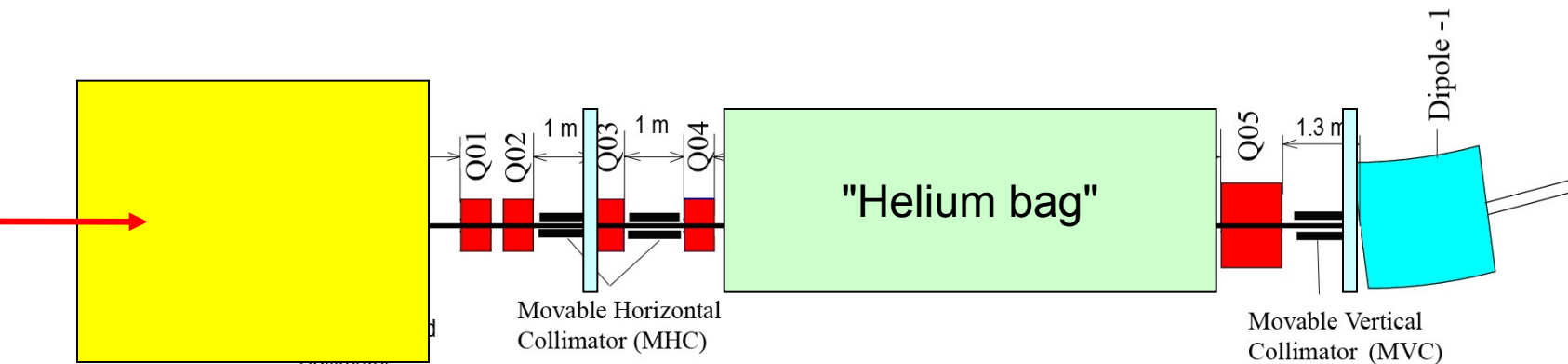
- FLUKA: interaction with matter  
particle tracking in regions without magnetic fields
- Pbartrack: particle tracking in vacuum



# Step by step calculations

The calculations were performed with two codes:

- FLUKA: interaction with matter  
particle tracking in regions without magnetic fields
- Pbartrack: particle tracking in vacuum



# Results

Particle	Helium/ Air	Losses up to septum	Statistical errors
pbar	Air	8.0 %	0.5 %
pbar	Helium		0.22 %
p	Helium		

**Annihilation: (0.9    0.3) %**

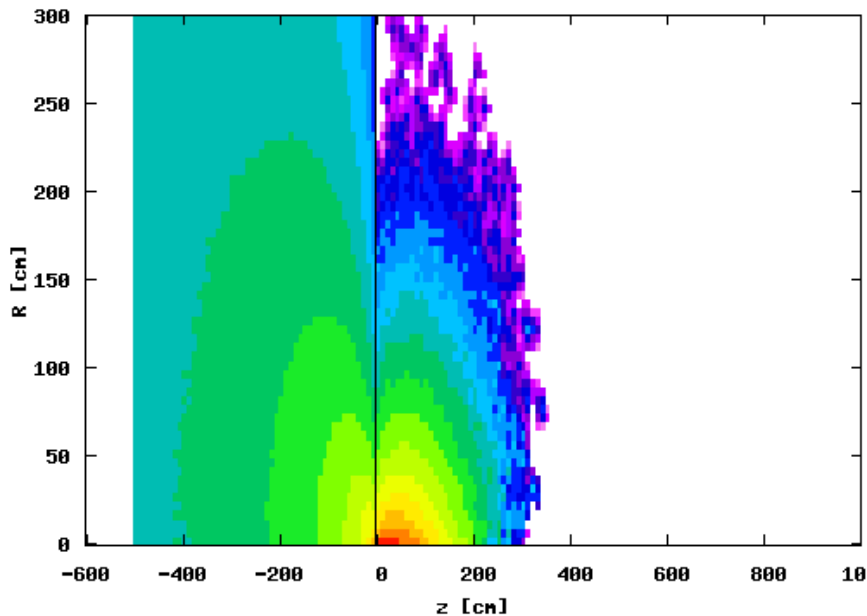


# Beam dump. Iron 1

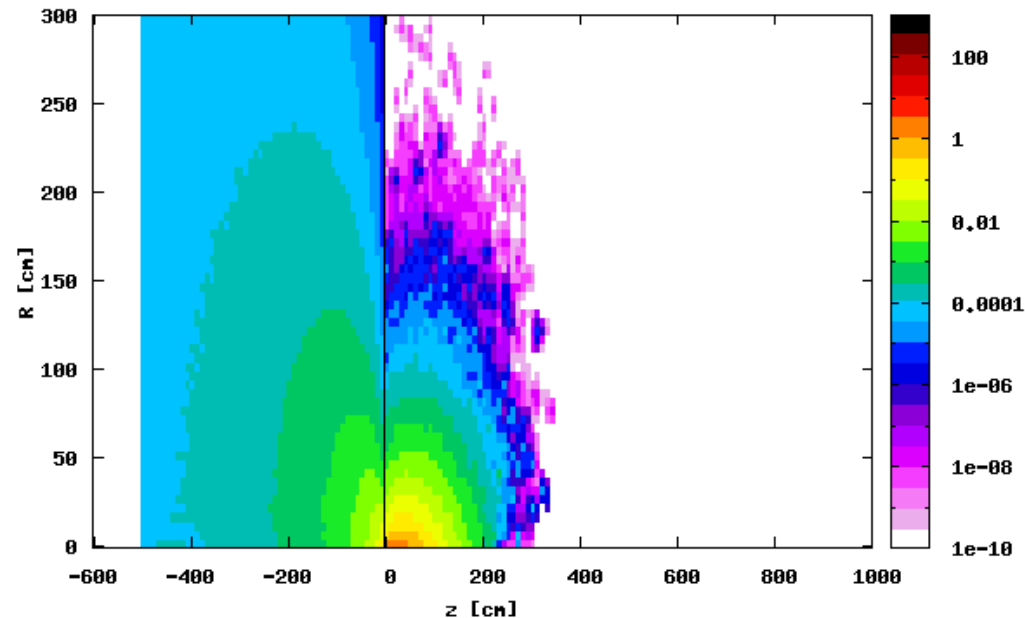
1 week

1 year

Equivalent dose rate 1 week after shutdown [Sv/h]



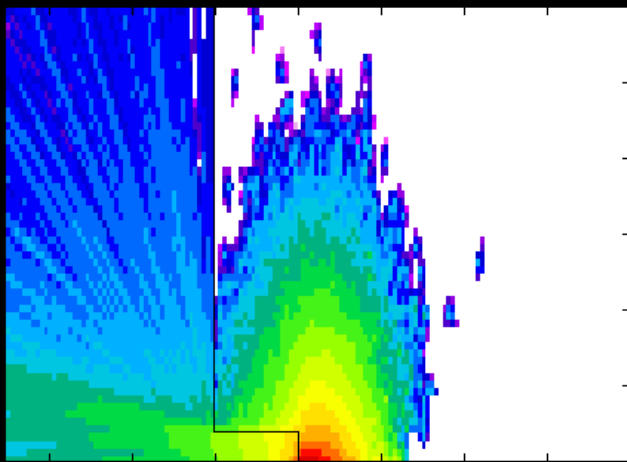
Equivalent dose rate 1 year after shutdown [Sv/h]



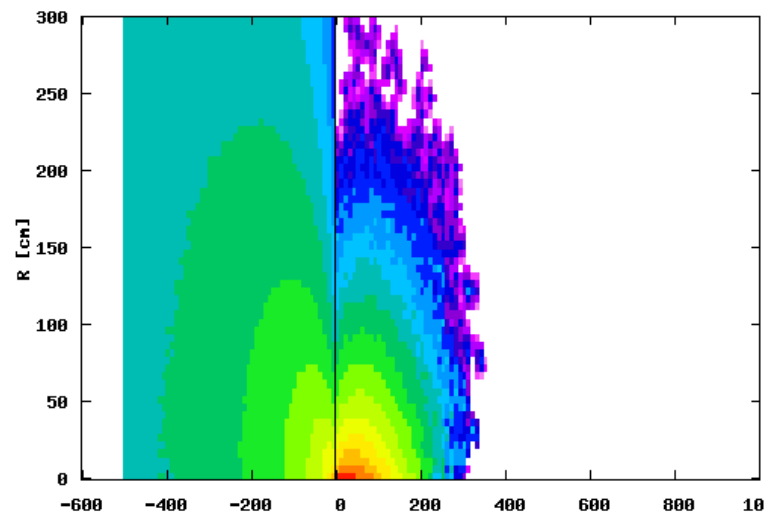
Purple means free access!  
Blue means restricted access!

# Beam Dump. Iron 2

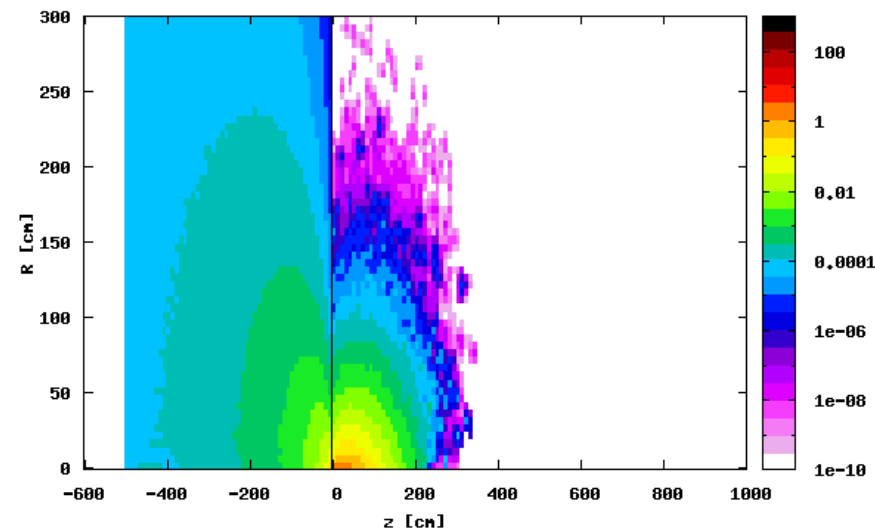
1 week



Equivalent dose rate 1 week after shutdown [Sv/h]



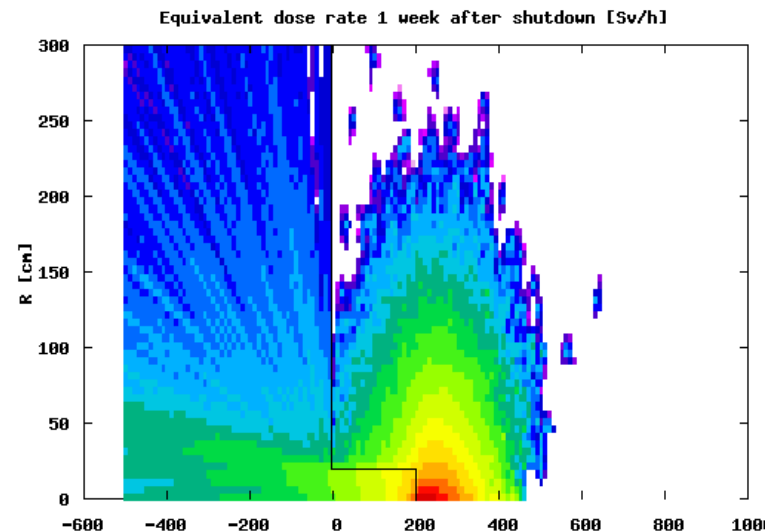
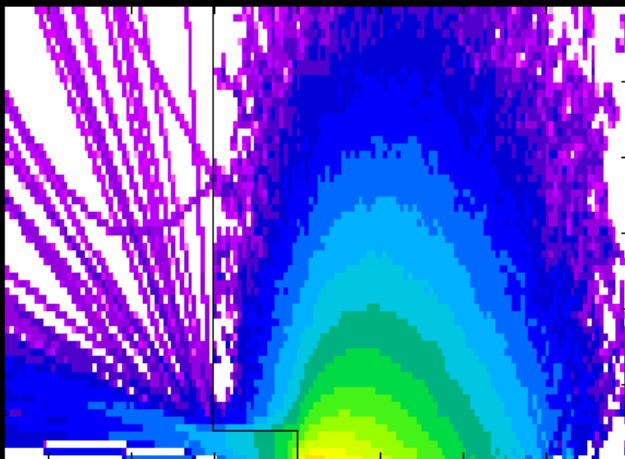
Equivalent dose rate 1 year after shutdown [Sv/h]



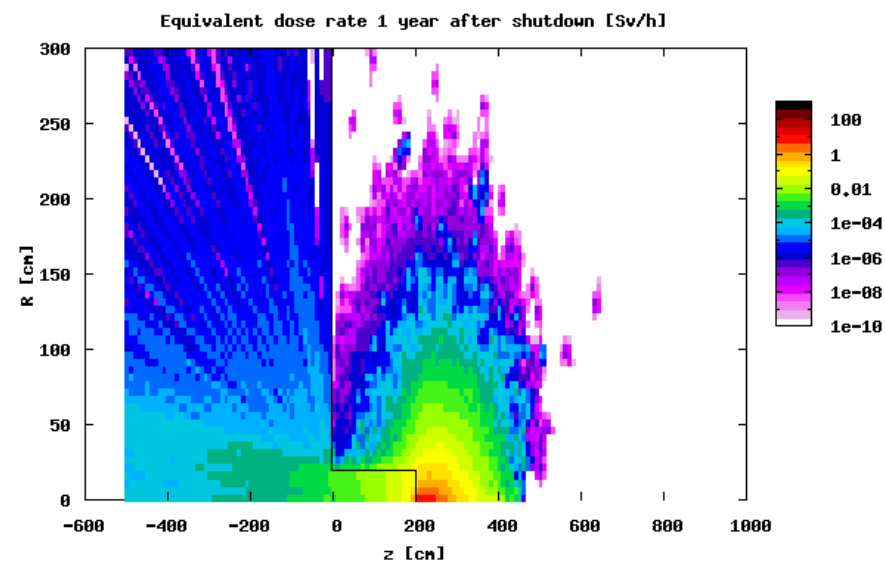
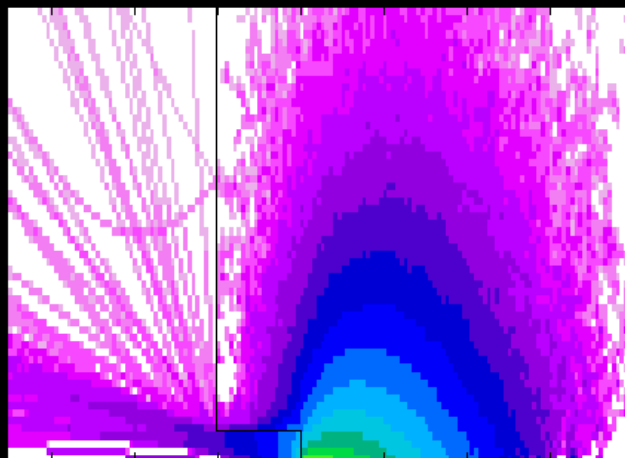
# Beam Dump. Graphite and iron



1 week



1 year

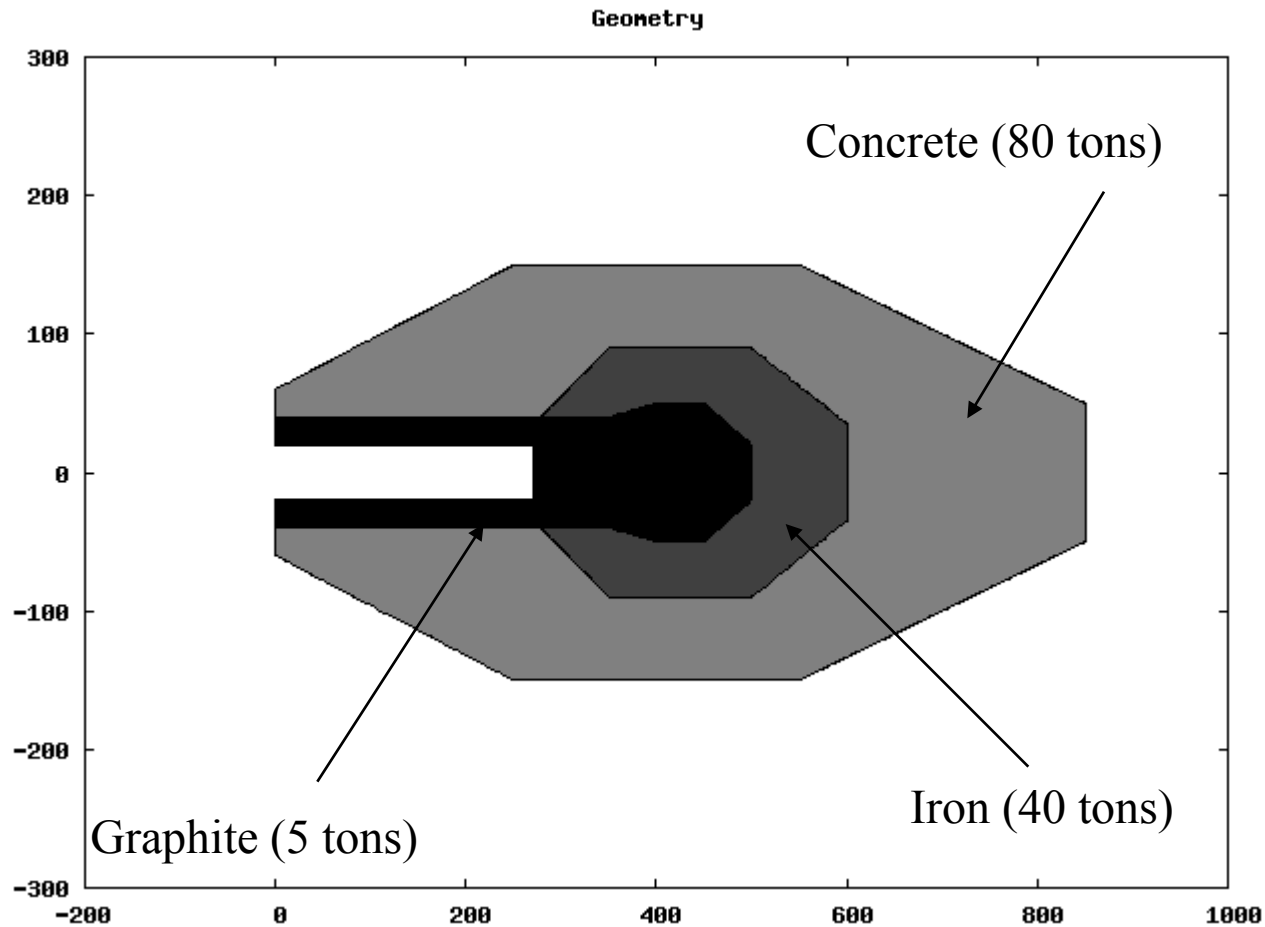


Graphite

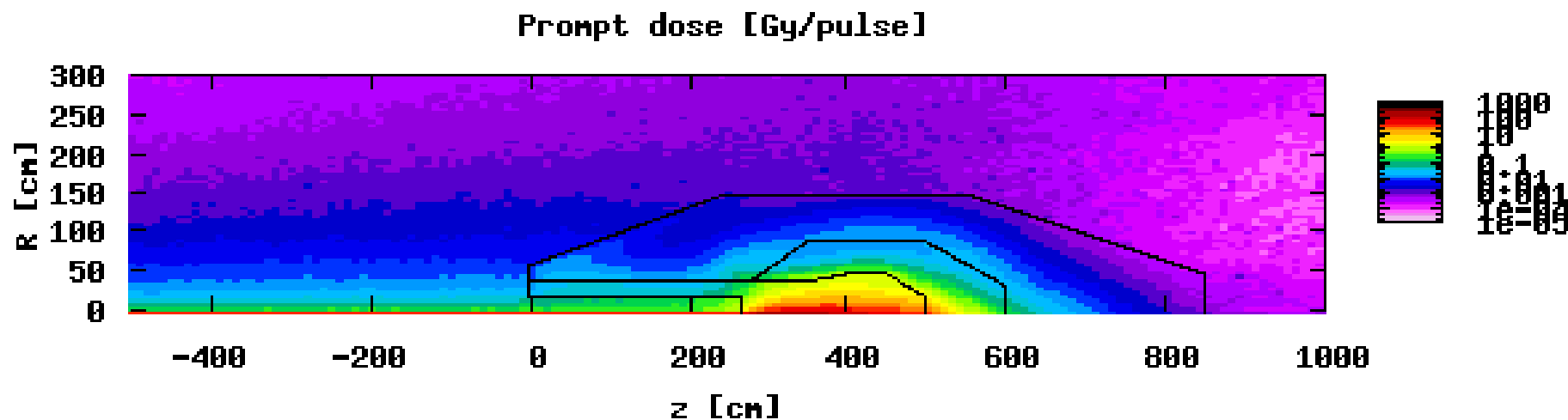
Iron



# Beam dump. Design

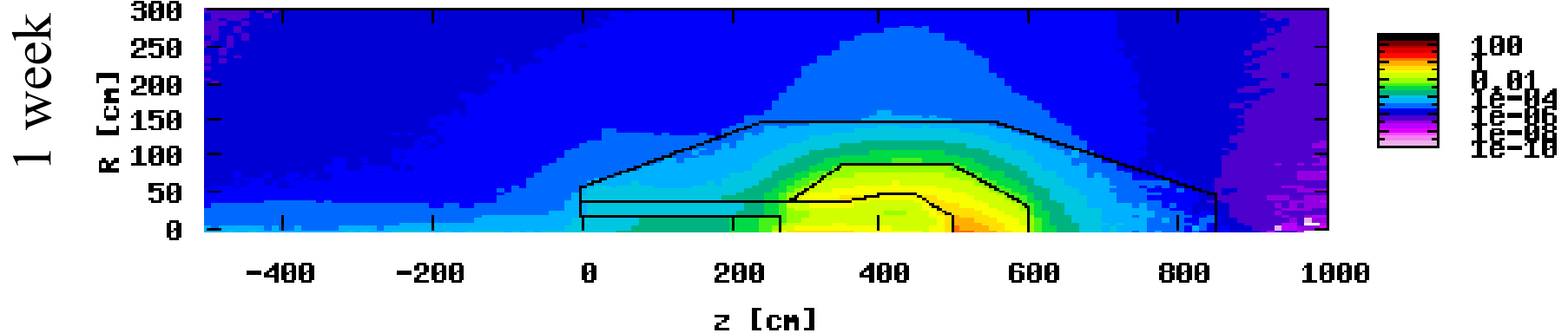


# Beam dump. Prompt dose

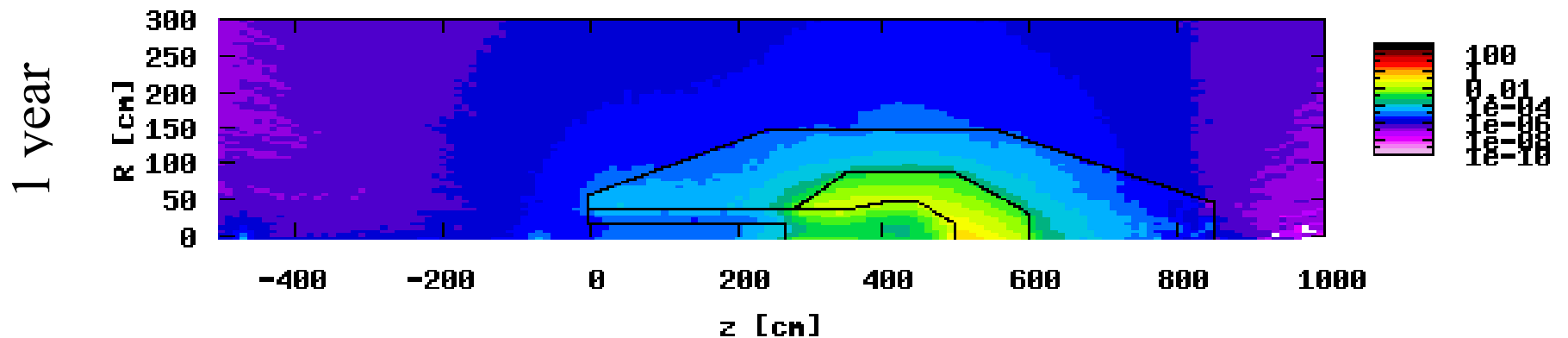


# Beam dump. Equivalent dose rate

Equivalent dose rate 1 week after shutdown [Sv/h]



Equivalent dose rate 1 year after shutdown [Sv/h]





Thank you for your attention!!!