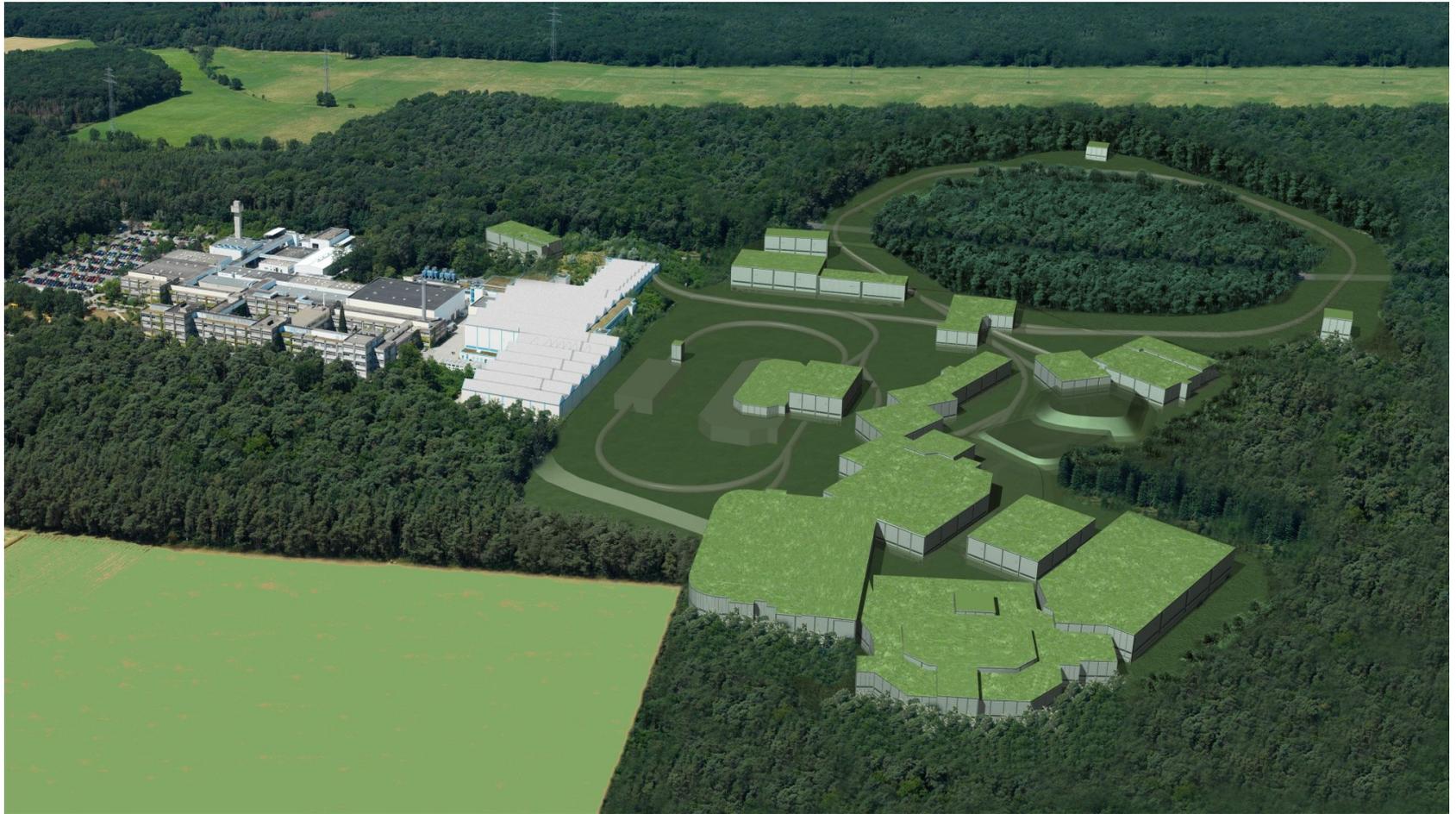
A wireframe model of a particle accelerator ring, showing a large circular structure with a smaller section extending from the top. The model is composed of many thin lines forming a grid-like structure.

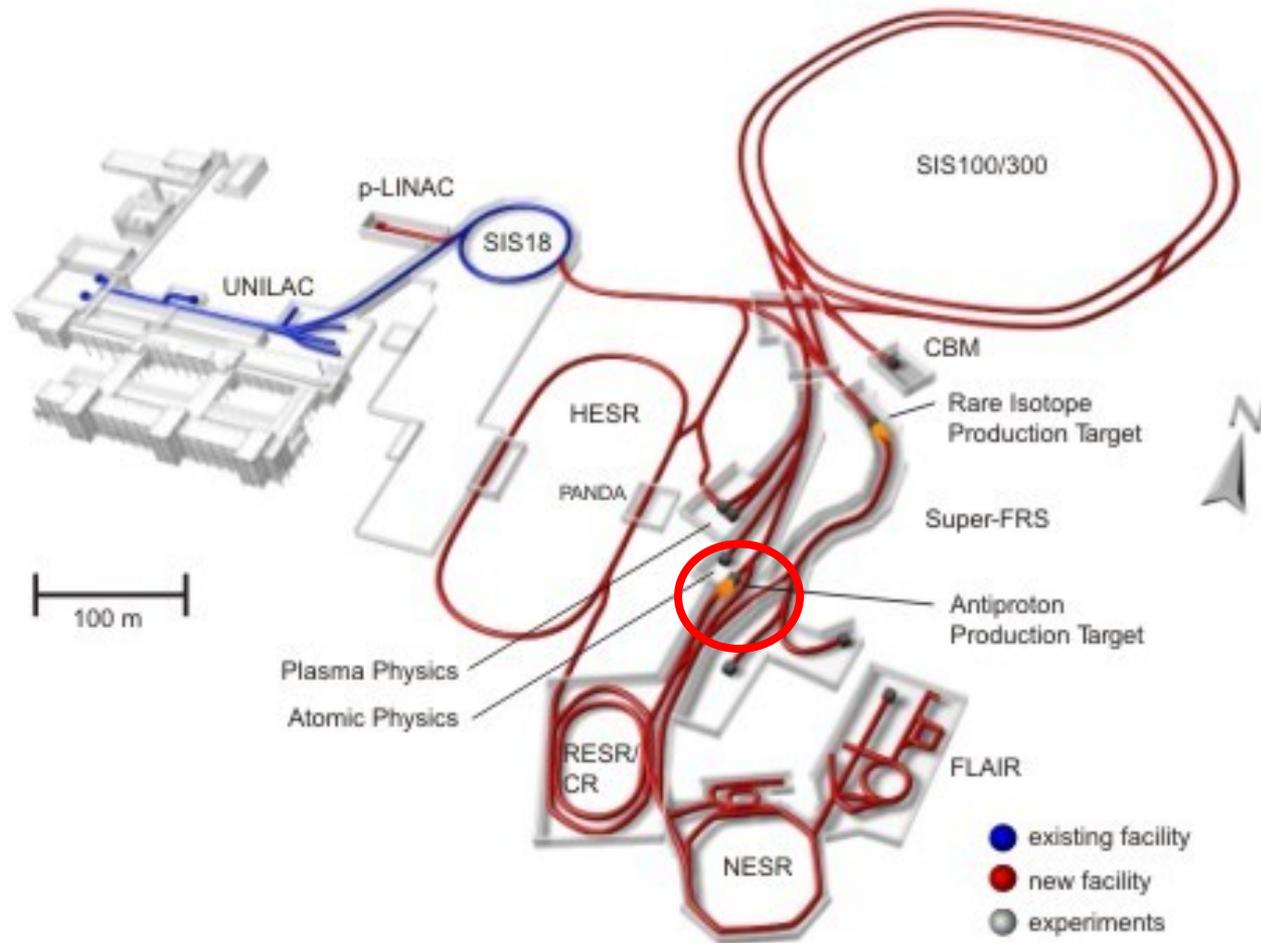
FLUKA calculations for the pbar separator at FAIR

Vitaliy Gostishchev

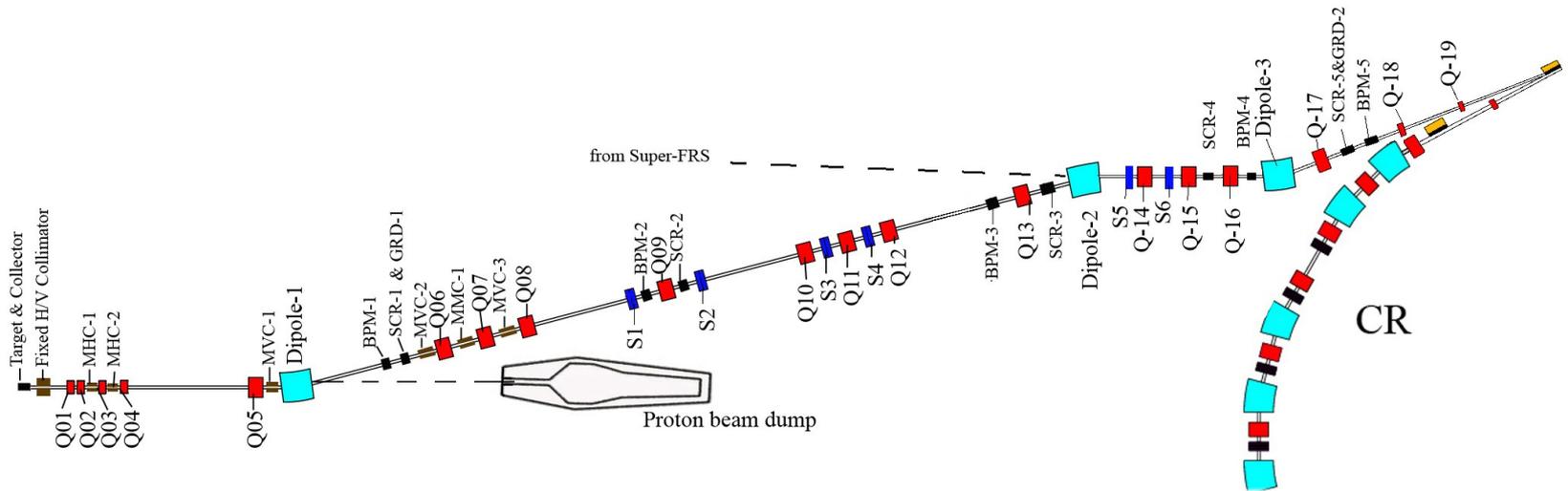
GSI and FAIR facility



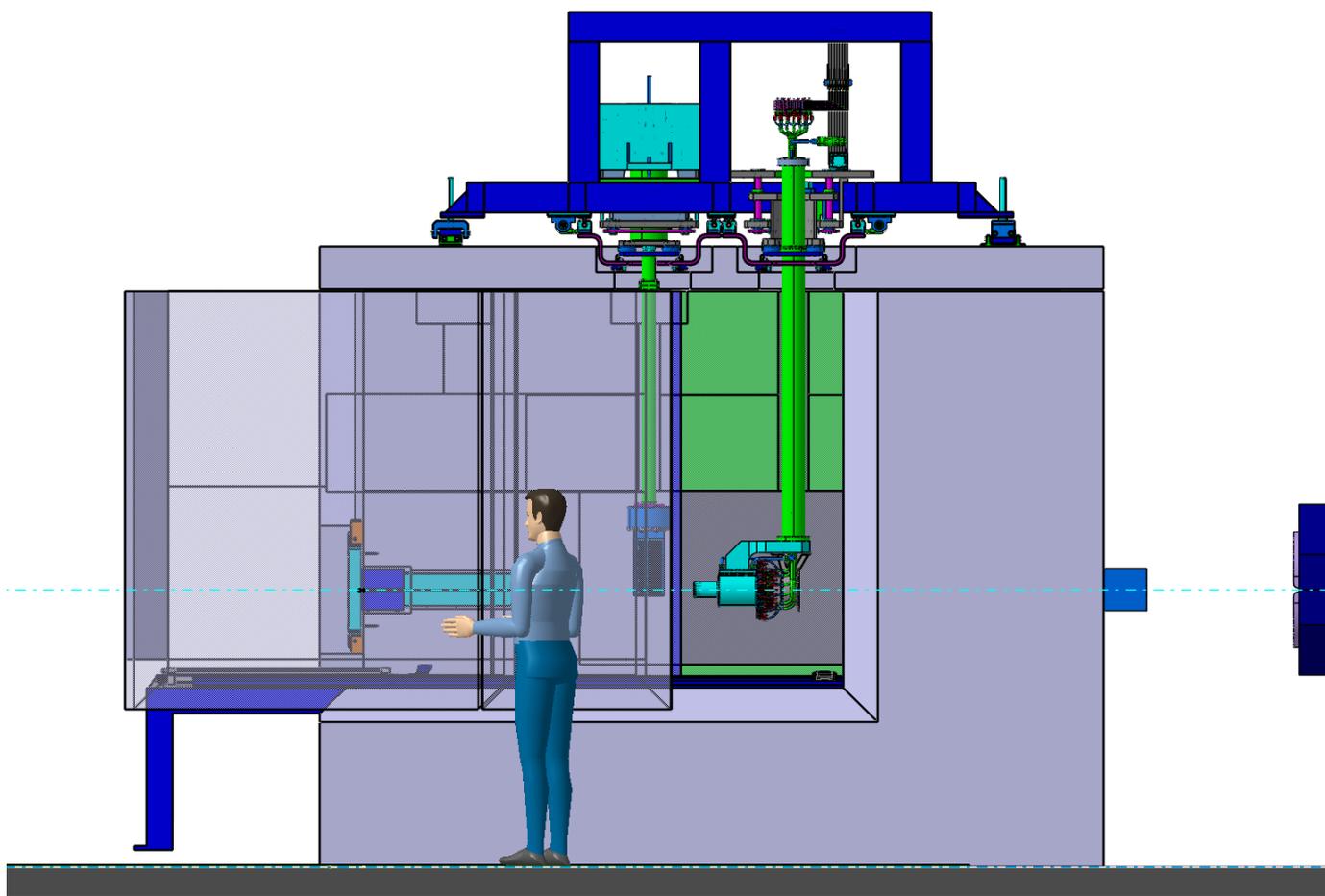
FAIR facility



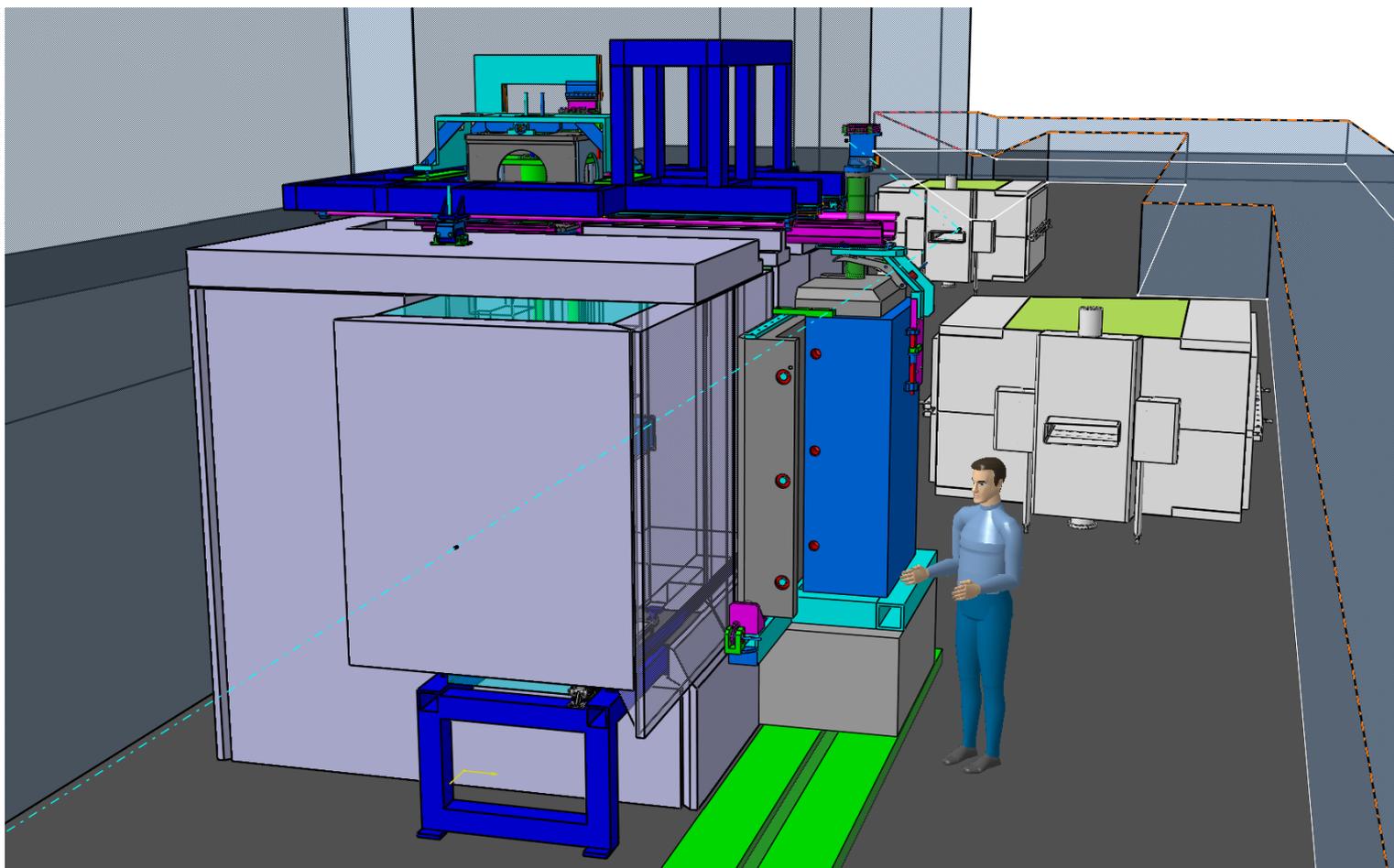
Layout of the pbar target area



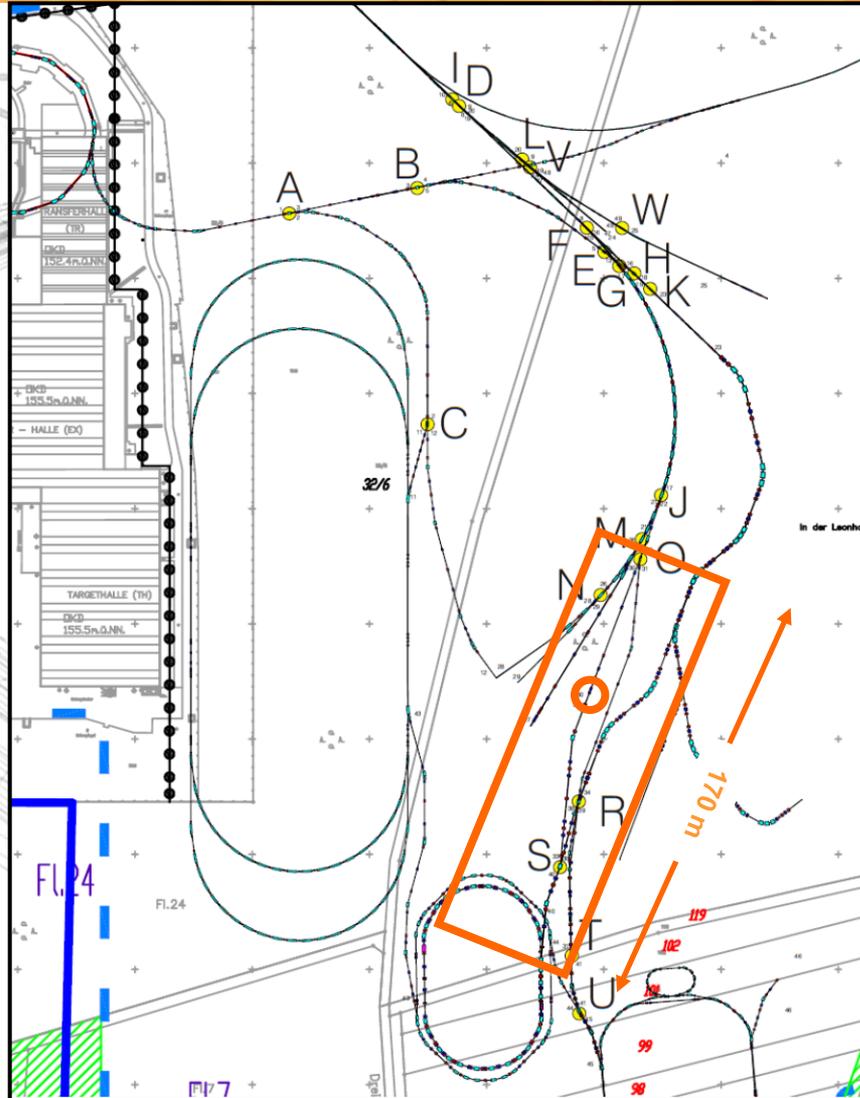
Target Station



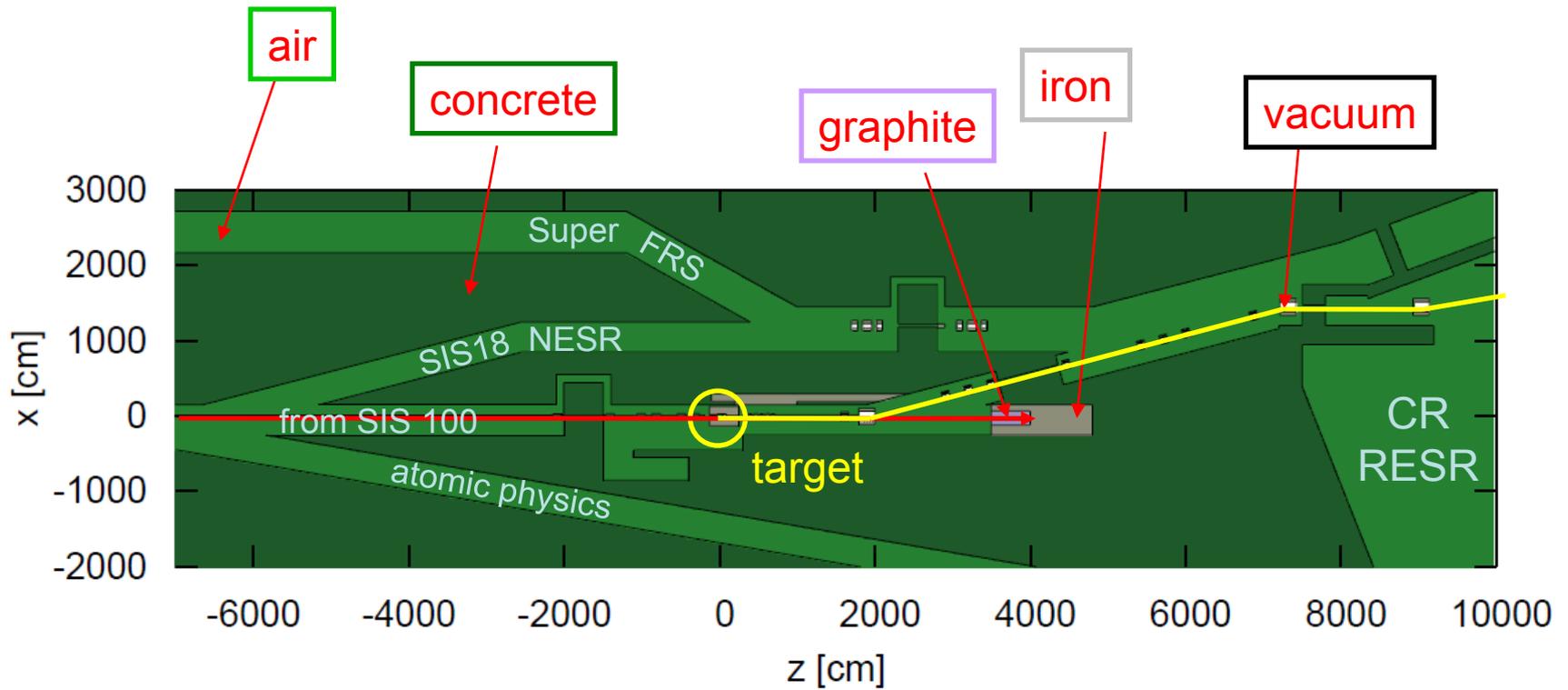
Target Station



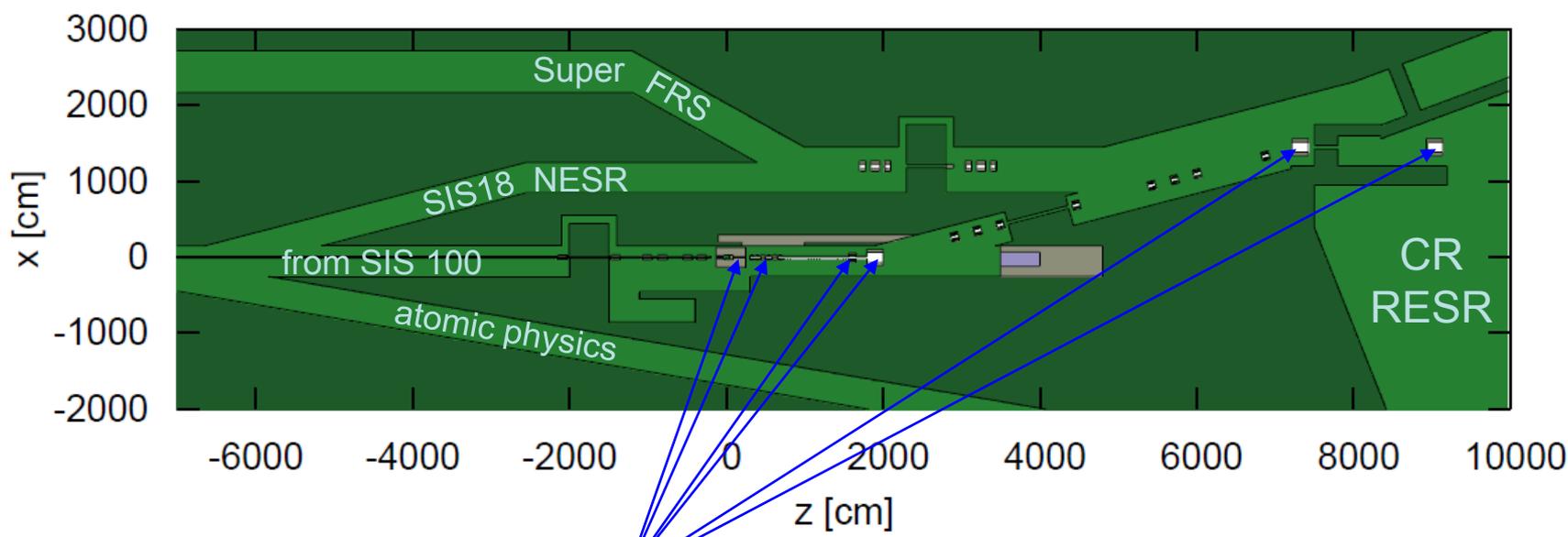
Dose rates around the pbar target



Fluka input, top view 1

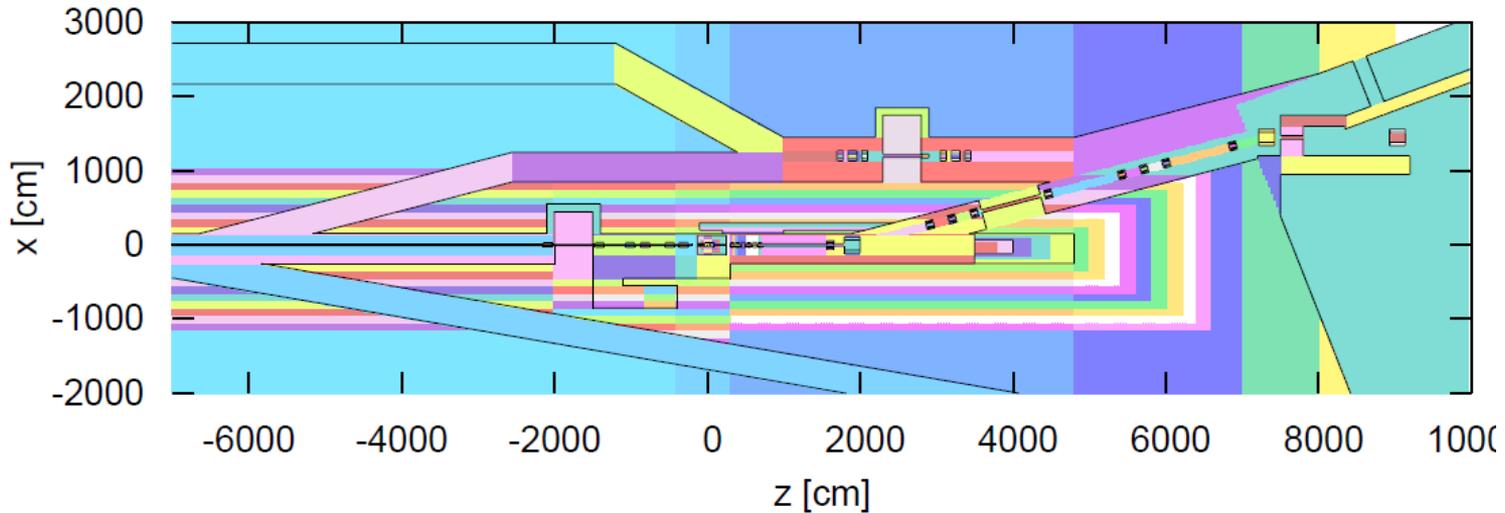
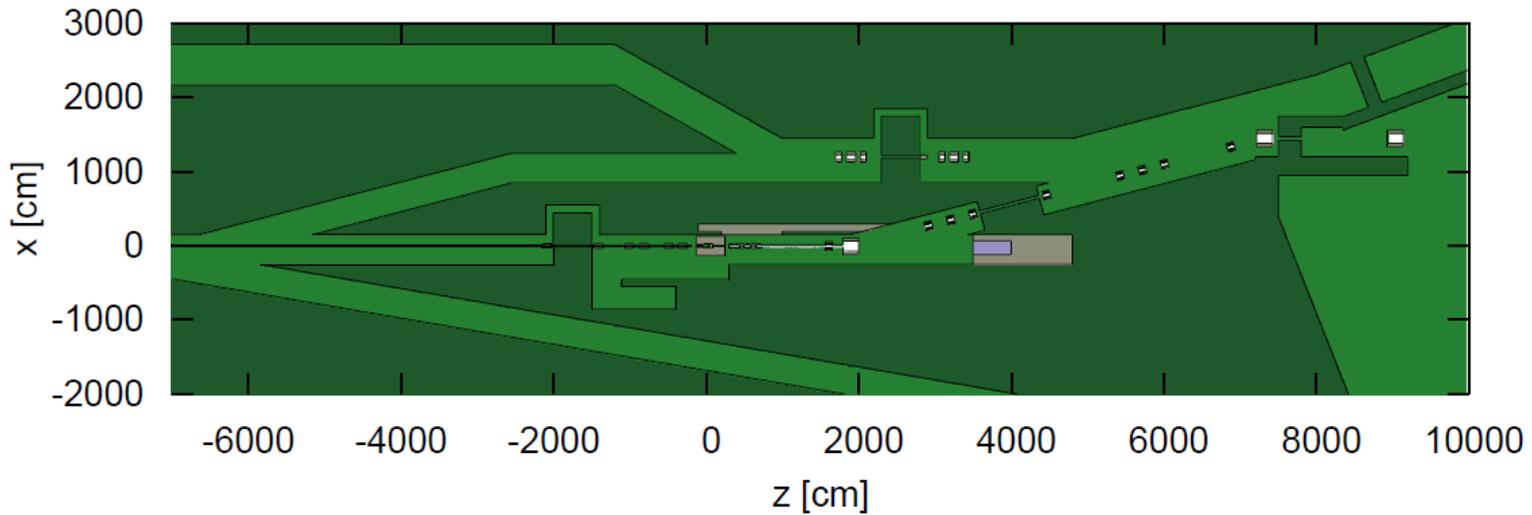


Fluka input, top view 2

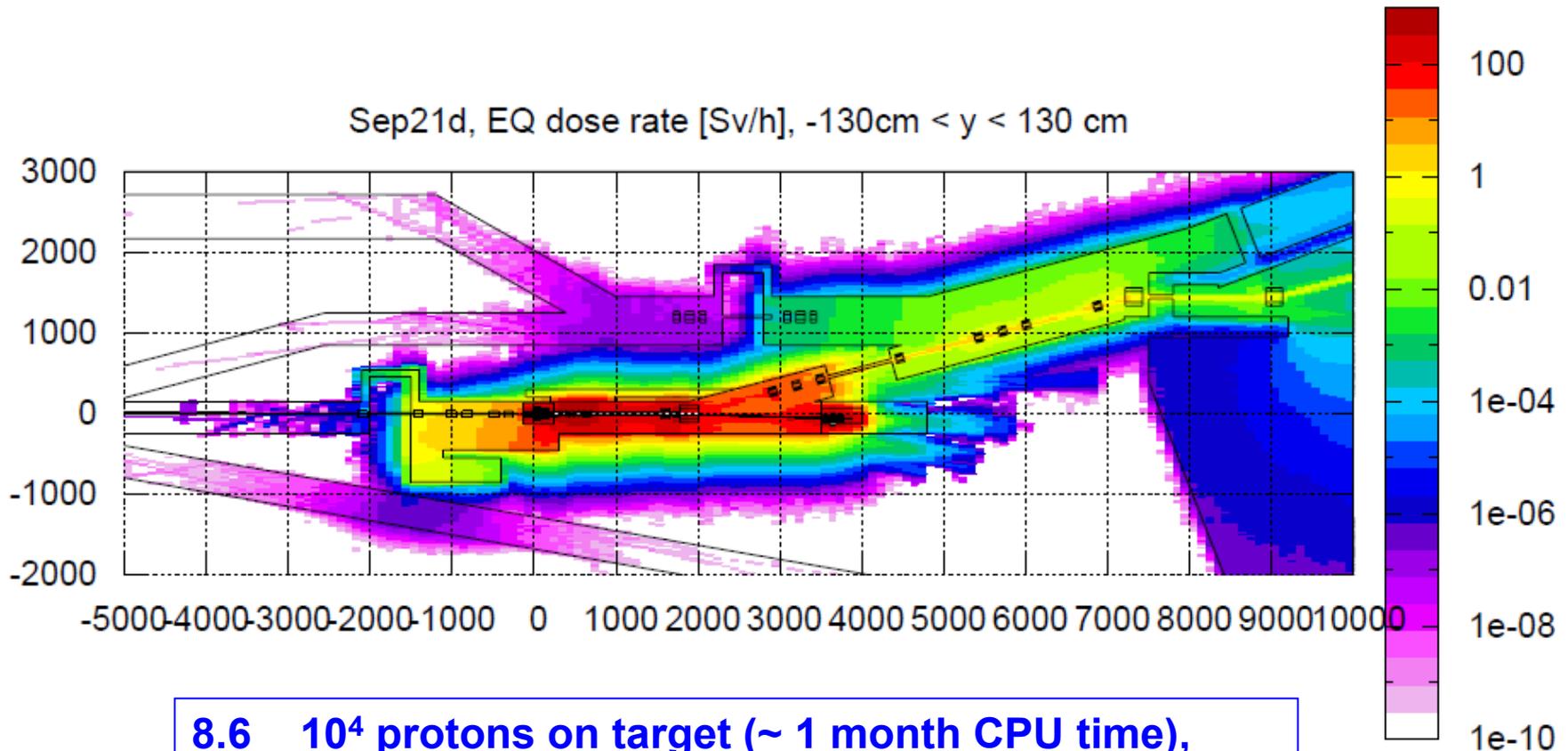


magnetic field in horn, Q1-Q5, D1-D3

Good statistics in a reasonable CPU time: Importance Biasing

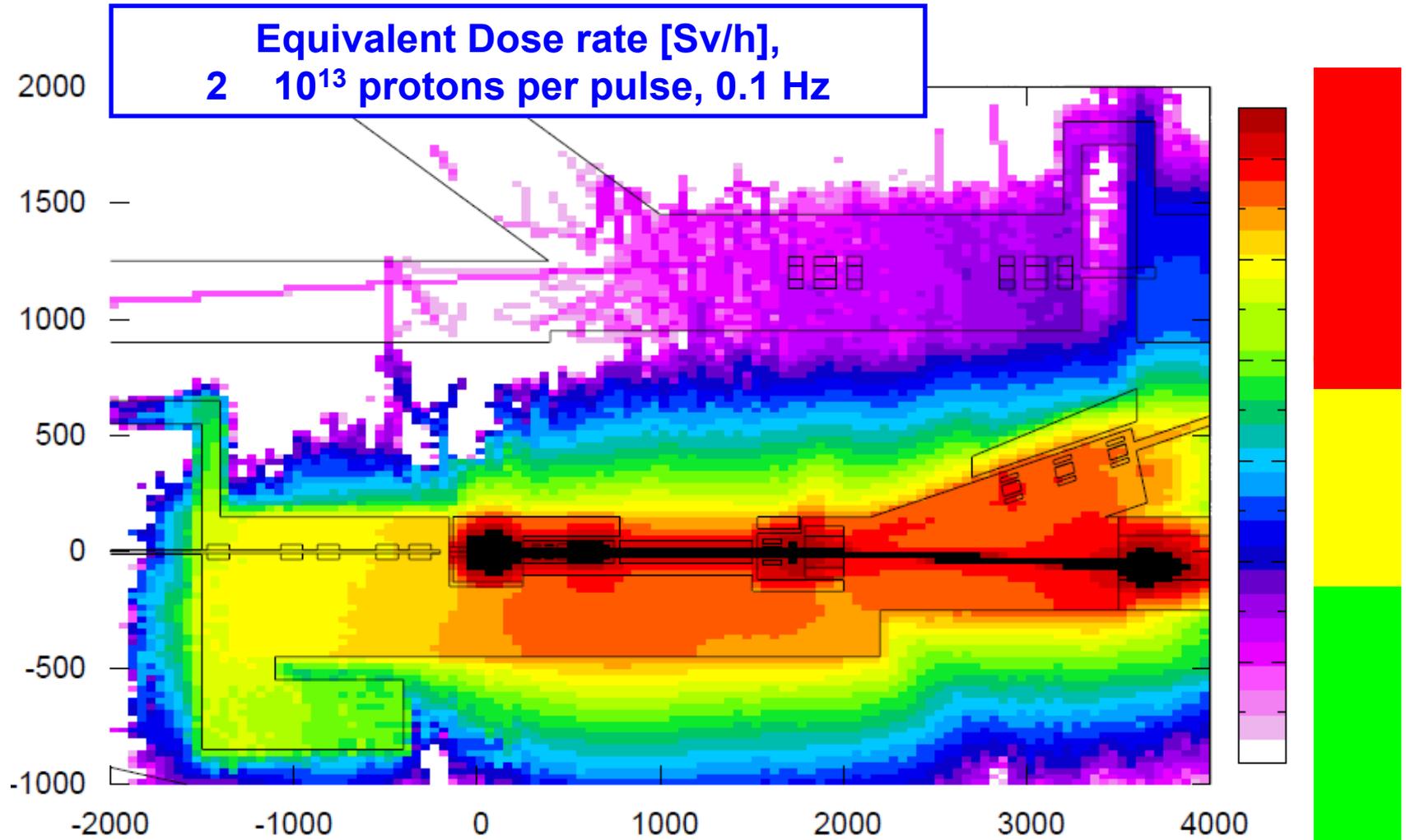


Equivalent dose rates during operation

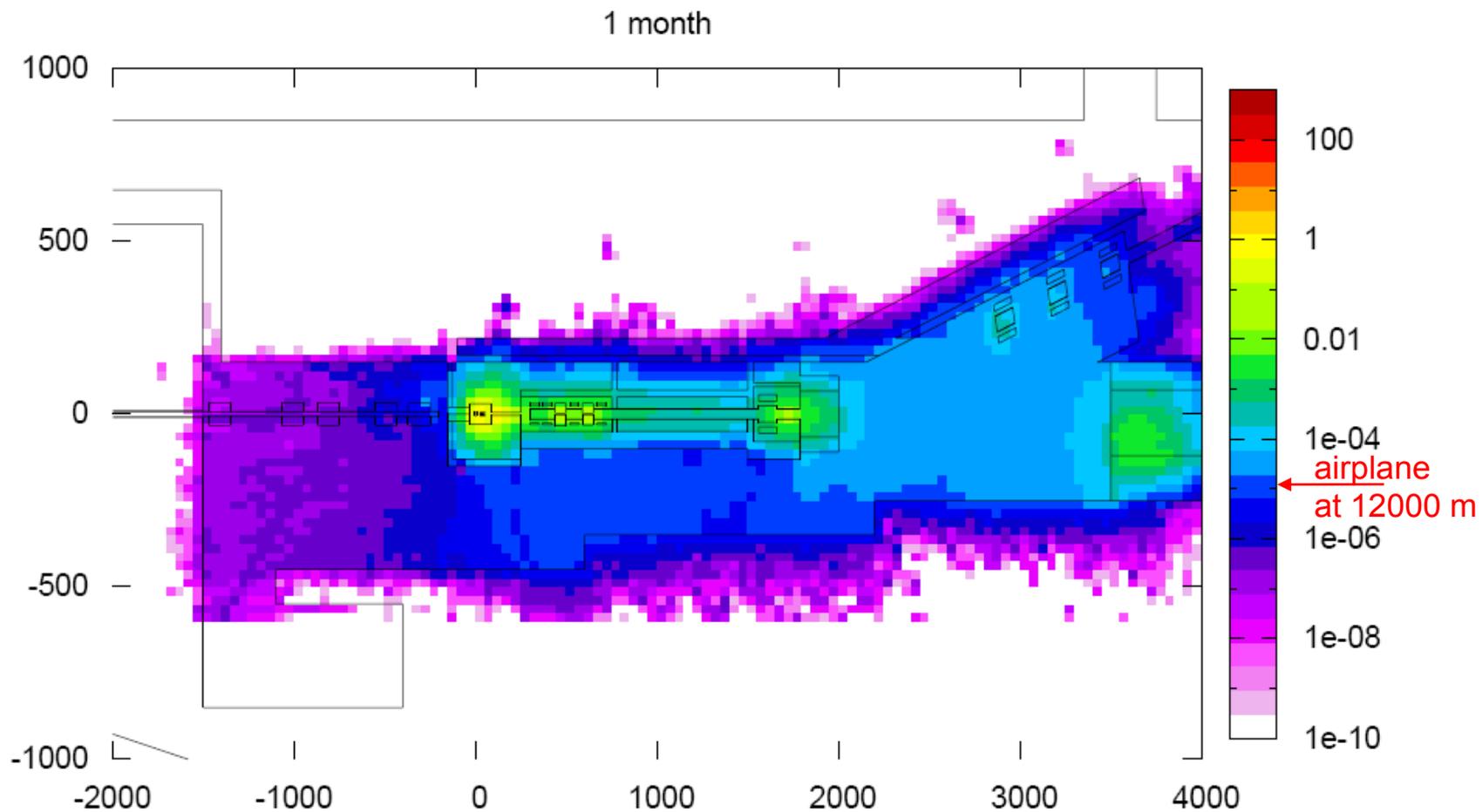


8.6 10^4 protons on target (~ 1 month CPU time),
importance 10^{-4} (target) – 10^4 (Super FRS tunnel)

Equivalent dose rates during operation

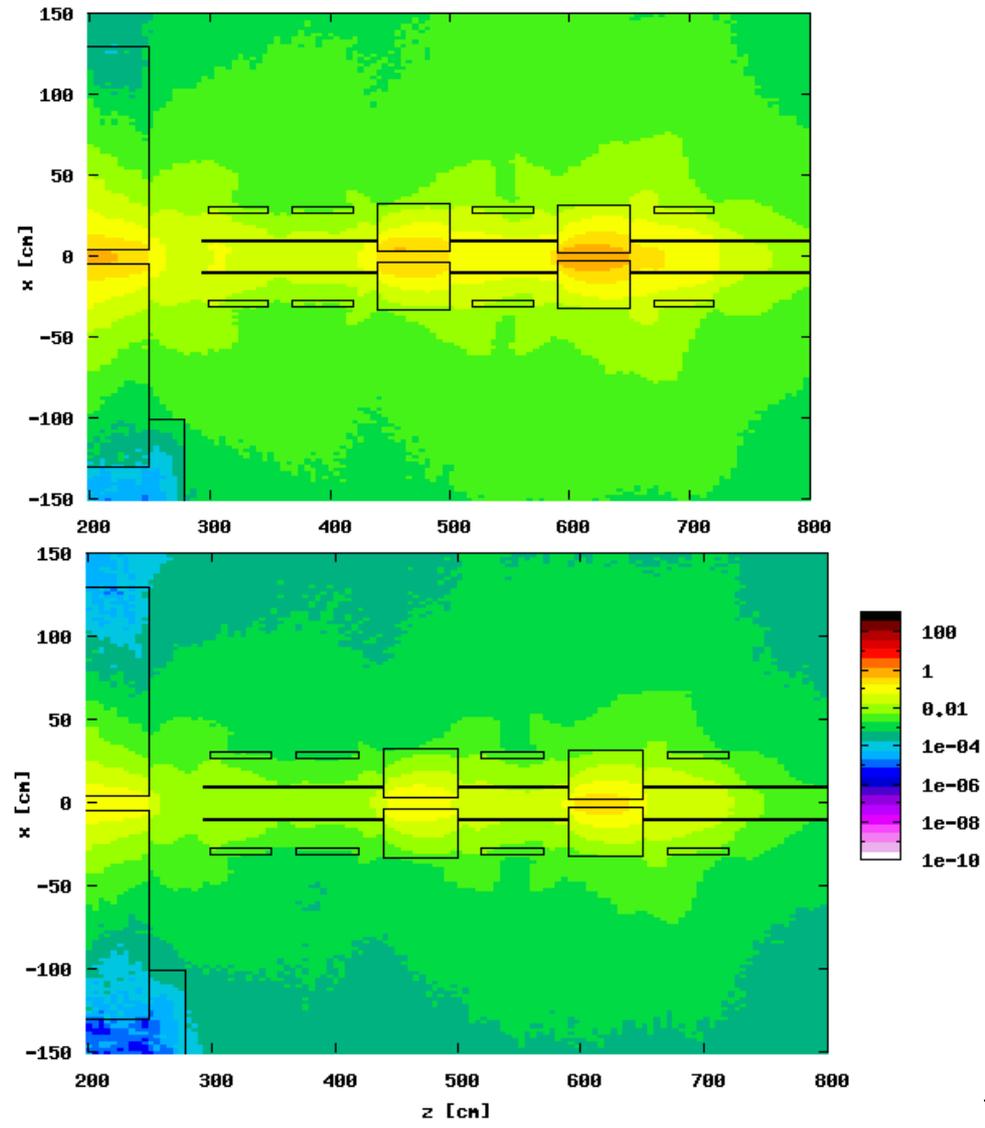


Induced Activity after Shut-Down



FLUKA: Induced Activity

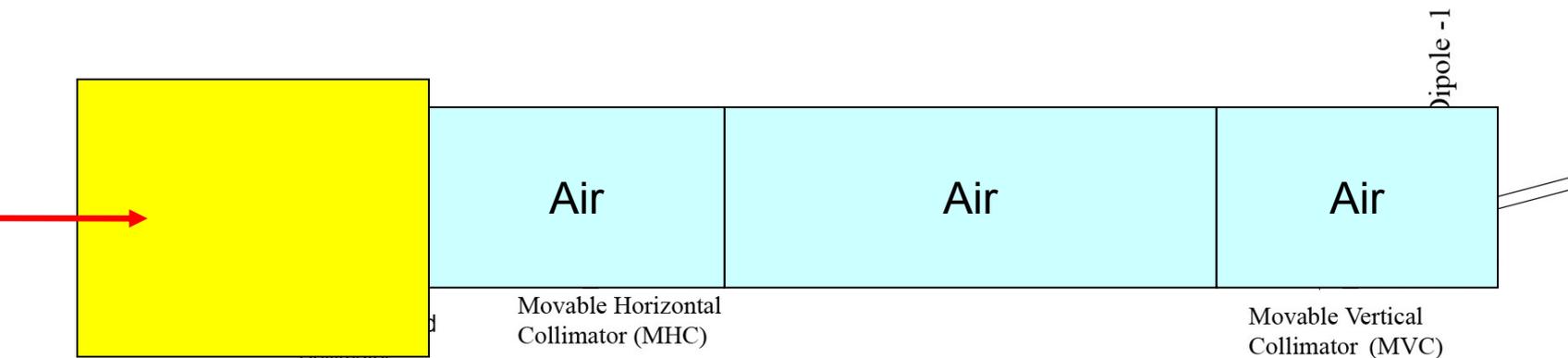
Cooling time
1 week
1 year



Step by step calculations

The calculations were performed with two codes:

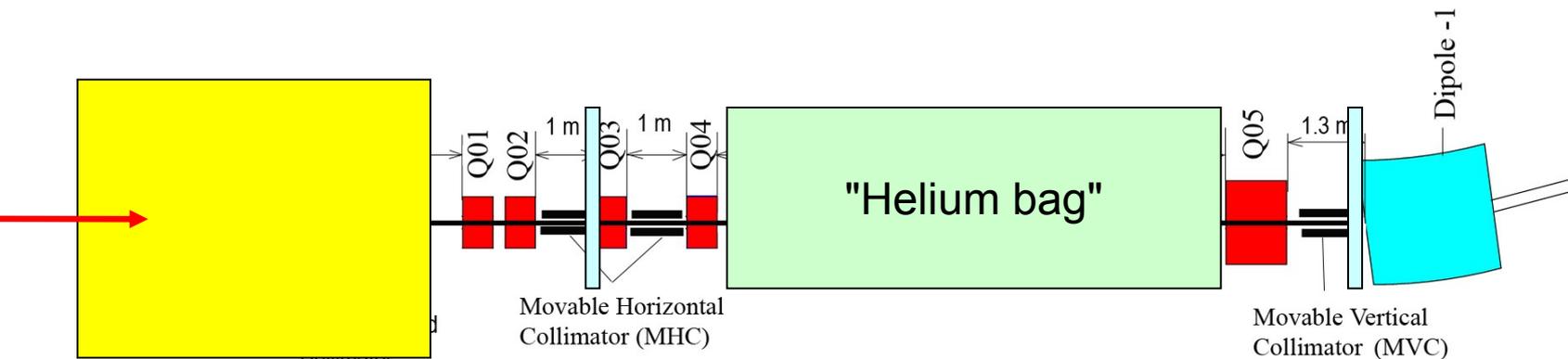
- FLUKA: interaction with matter
particle tracking in regions without magnetic fields
- Pbartrack: particle tracking in vacuum



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		

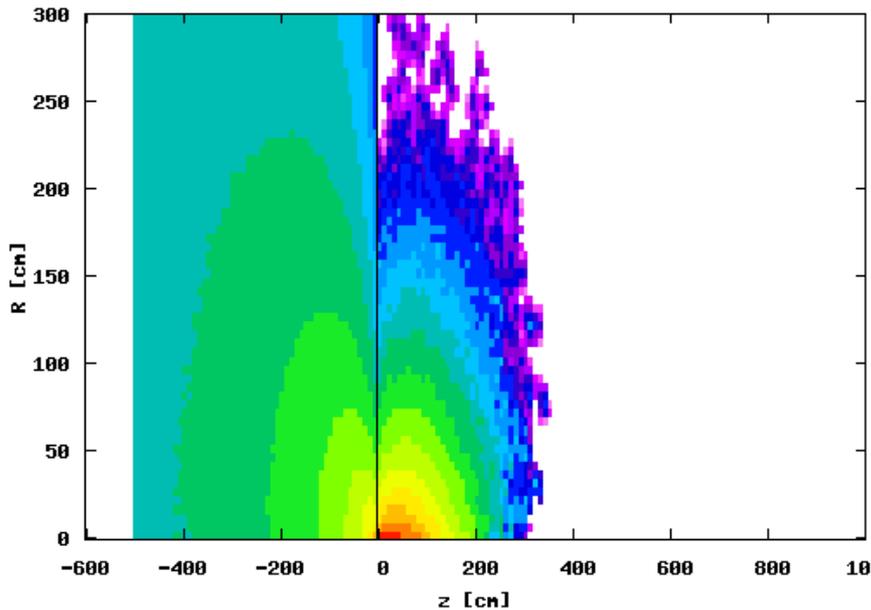
Annihilation: (0.9 0.3) %

Beam dump. Iron 1

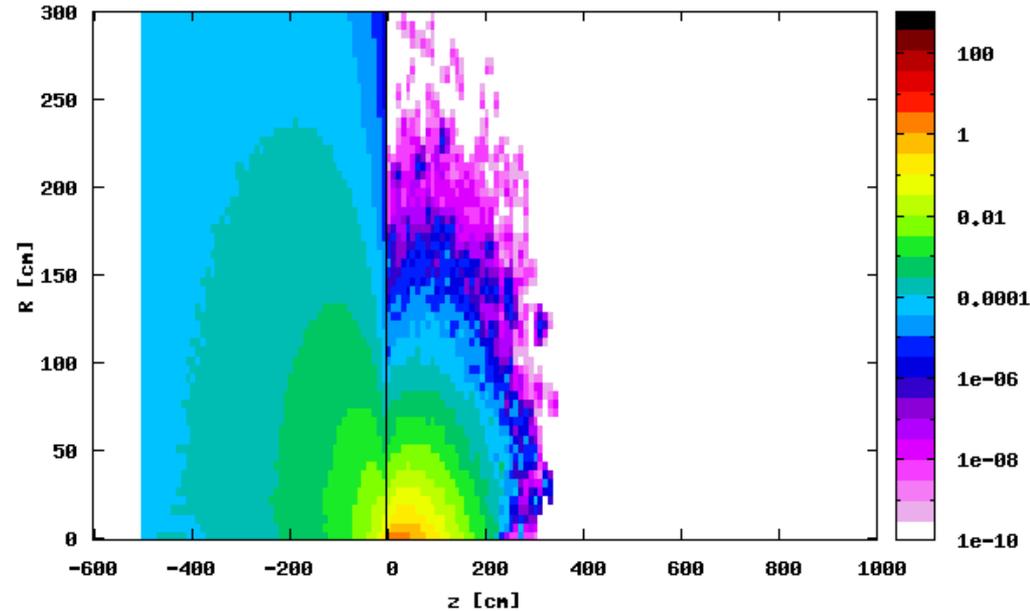
1 week

1 year

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



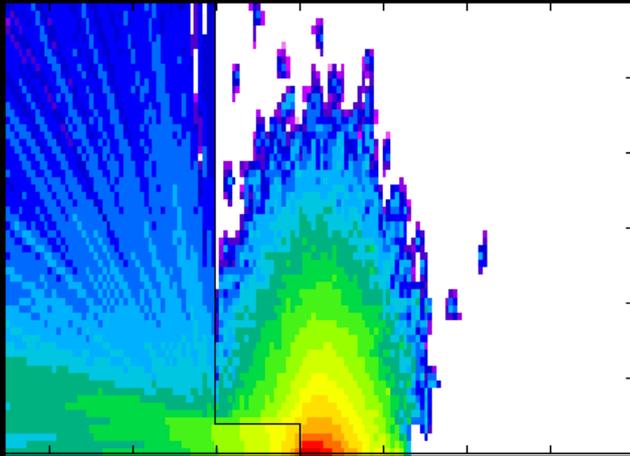
Equivalent dose rate 1 year after shutdown [Sv/h]



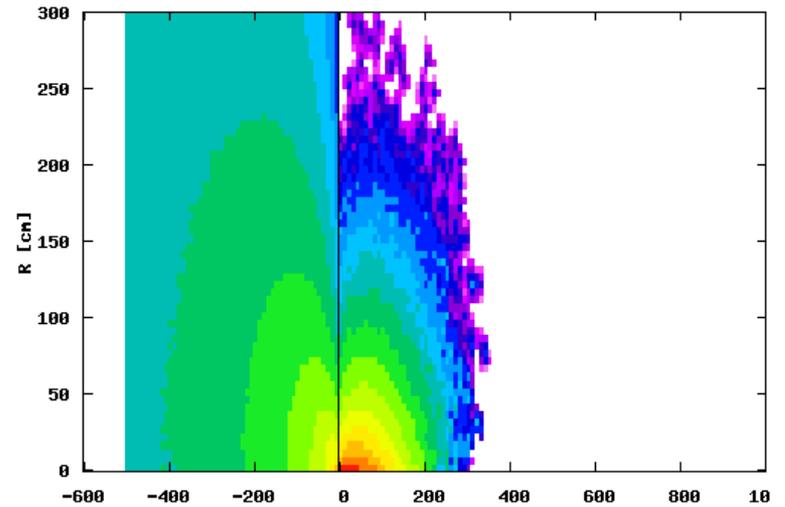
Purple means free access!
Blue means restricted access!

Beam Dump. Iron 2

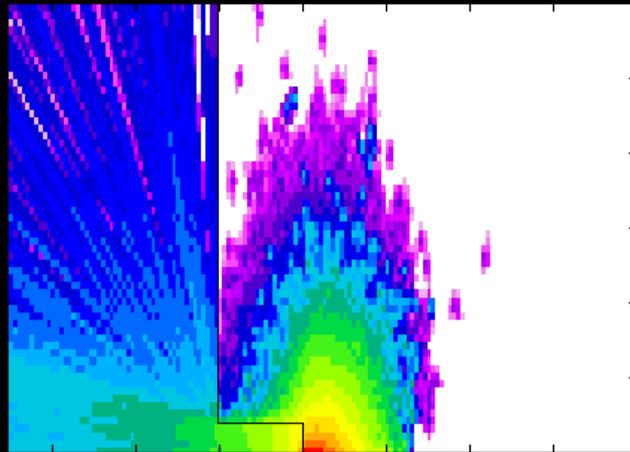
1 week



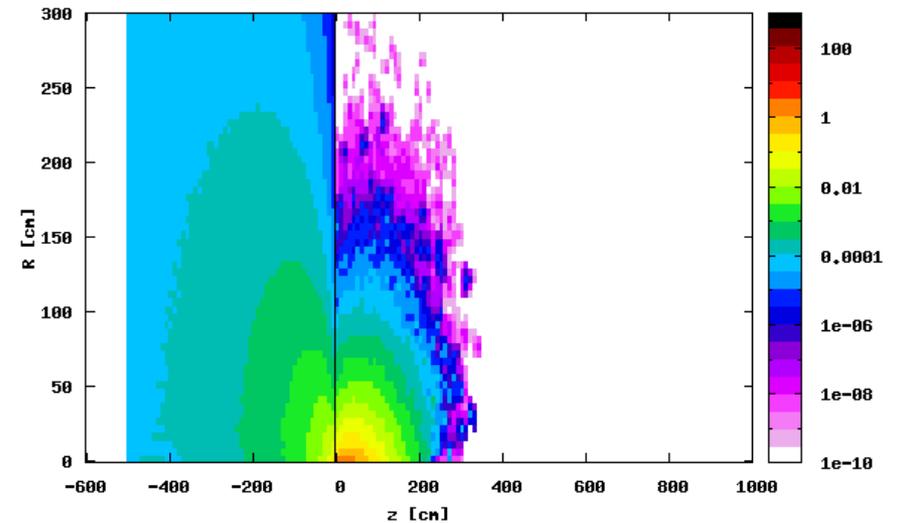
Equivalent dose rate 1 week after shutdown [Sv/h]



1 year



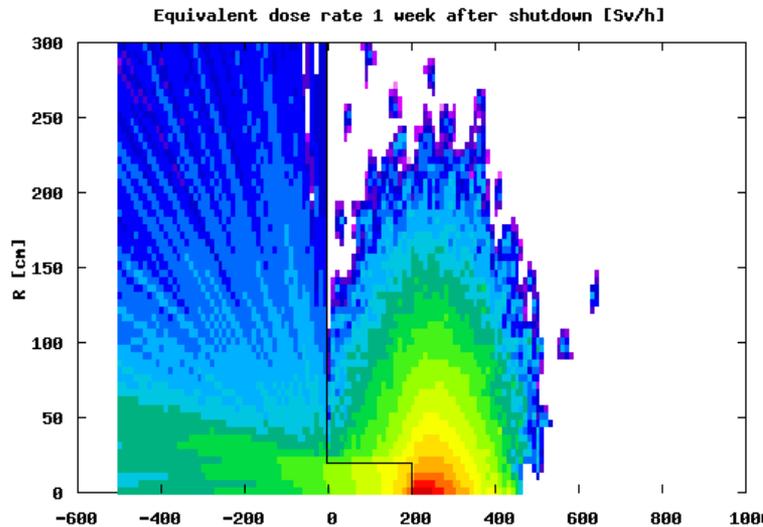
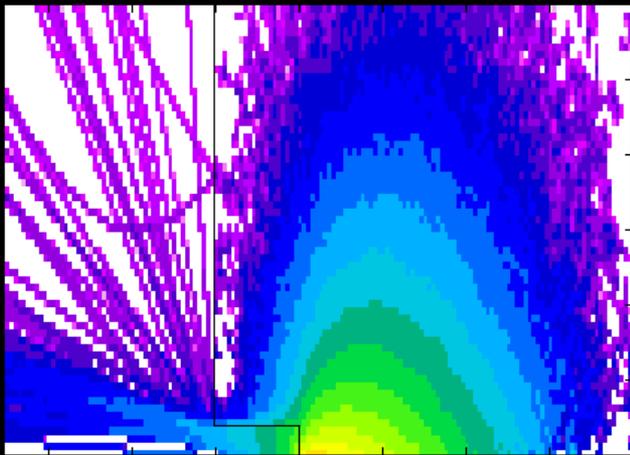
Equivalent dose rate 1 year after shutdown [Sv/h]



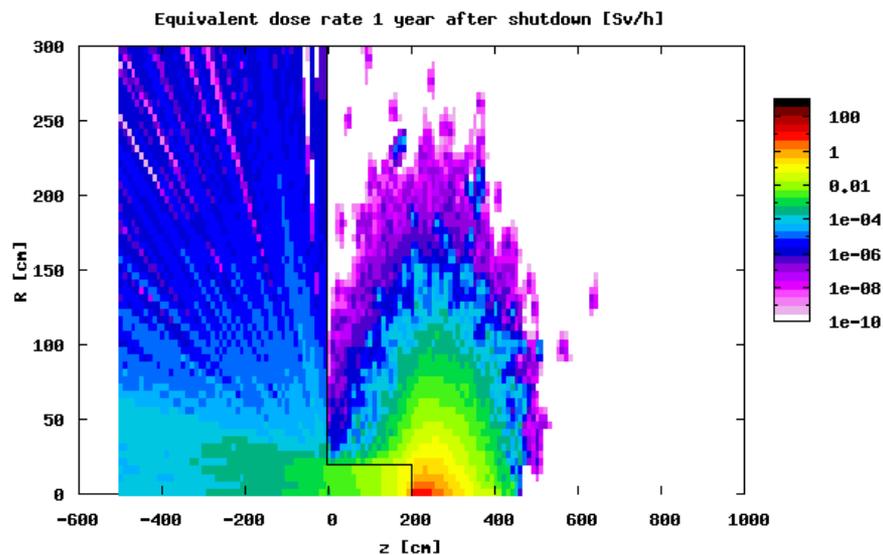
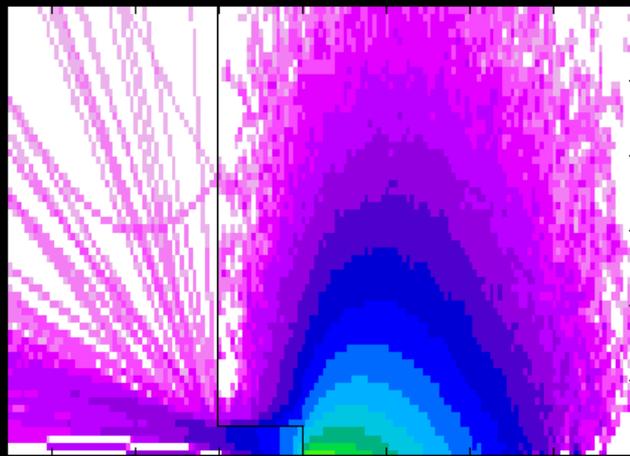
Beam Dump. Graphite and iron



1 week



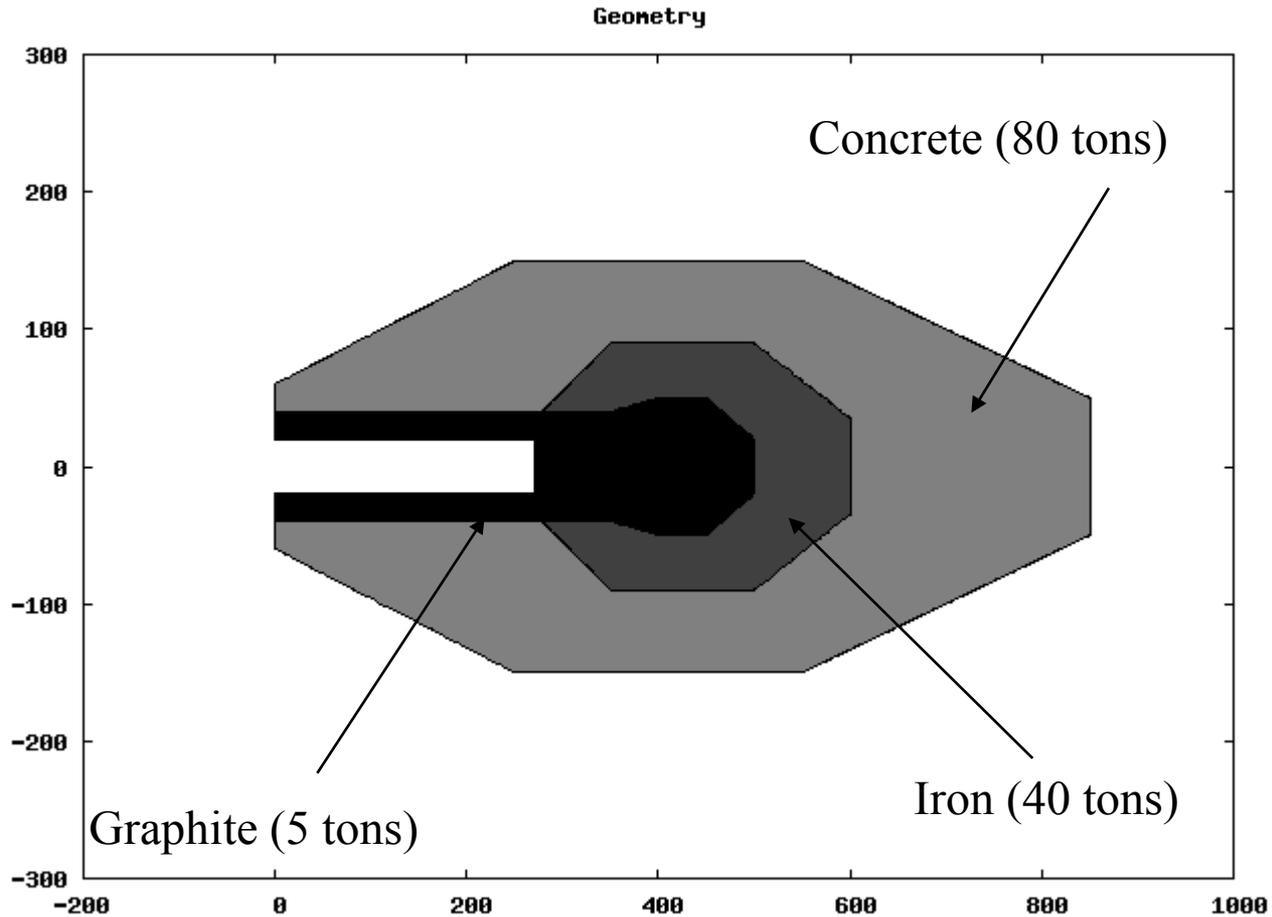
1 year



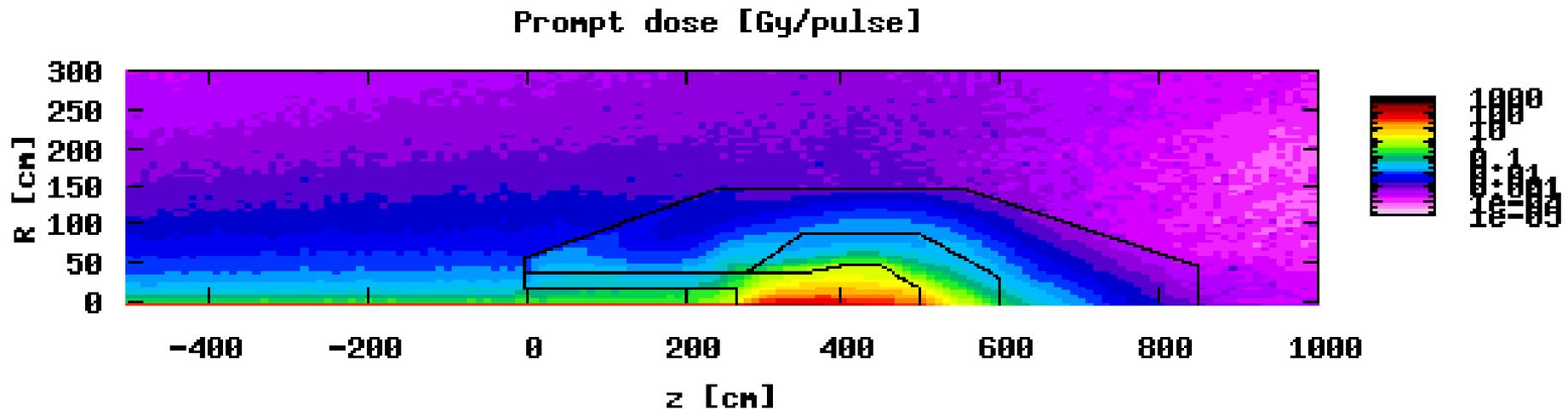
Graphite

Iron

Beam dump. Design



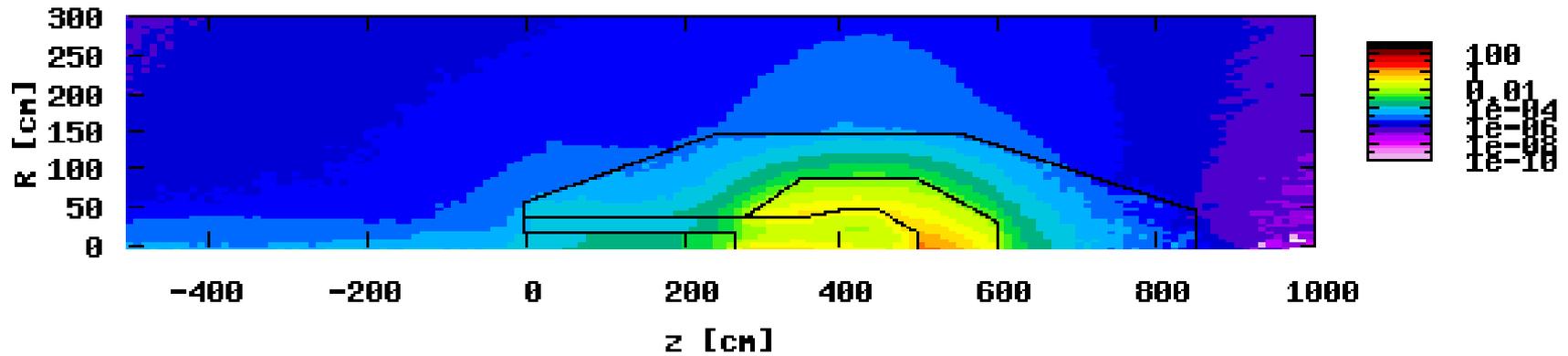
Beam dump. Prompt dose



Beam dump. Equivalent dose rate

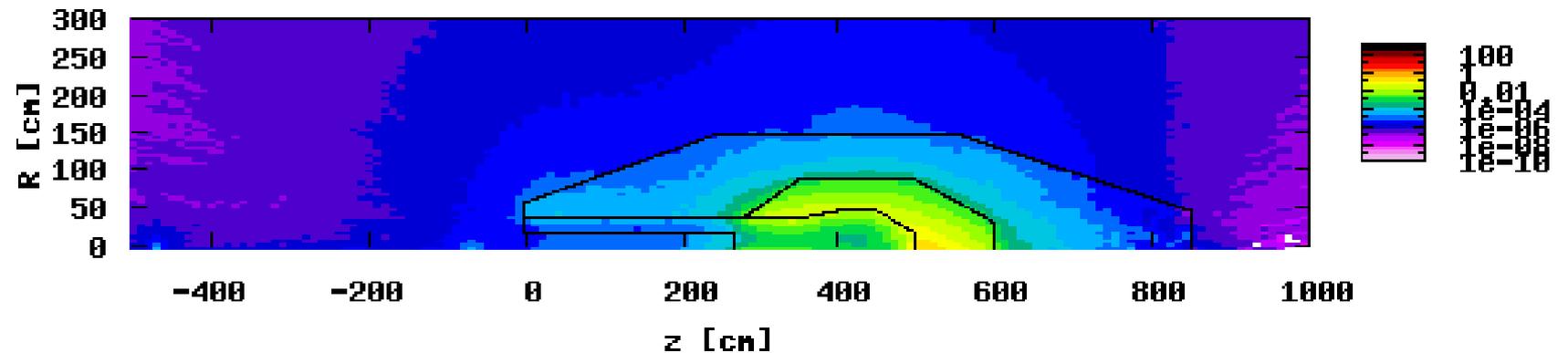
Equivalent dose rate 1 week after shutdown [Sv/h]

1 week



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

1 year





Thank you for your attention!!!