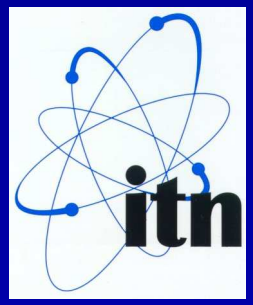

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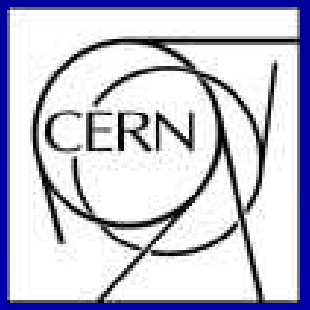
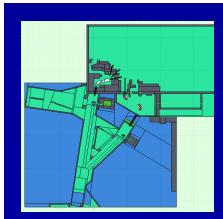


Radiation protection and radiation safety issues for HIE-ISOLDE. FLUKA calculations

Y. Romanets

ISOLDE Workshop and Users meeting 2010

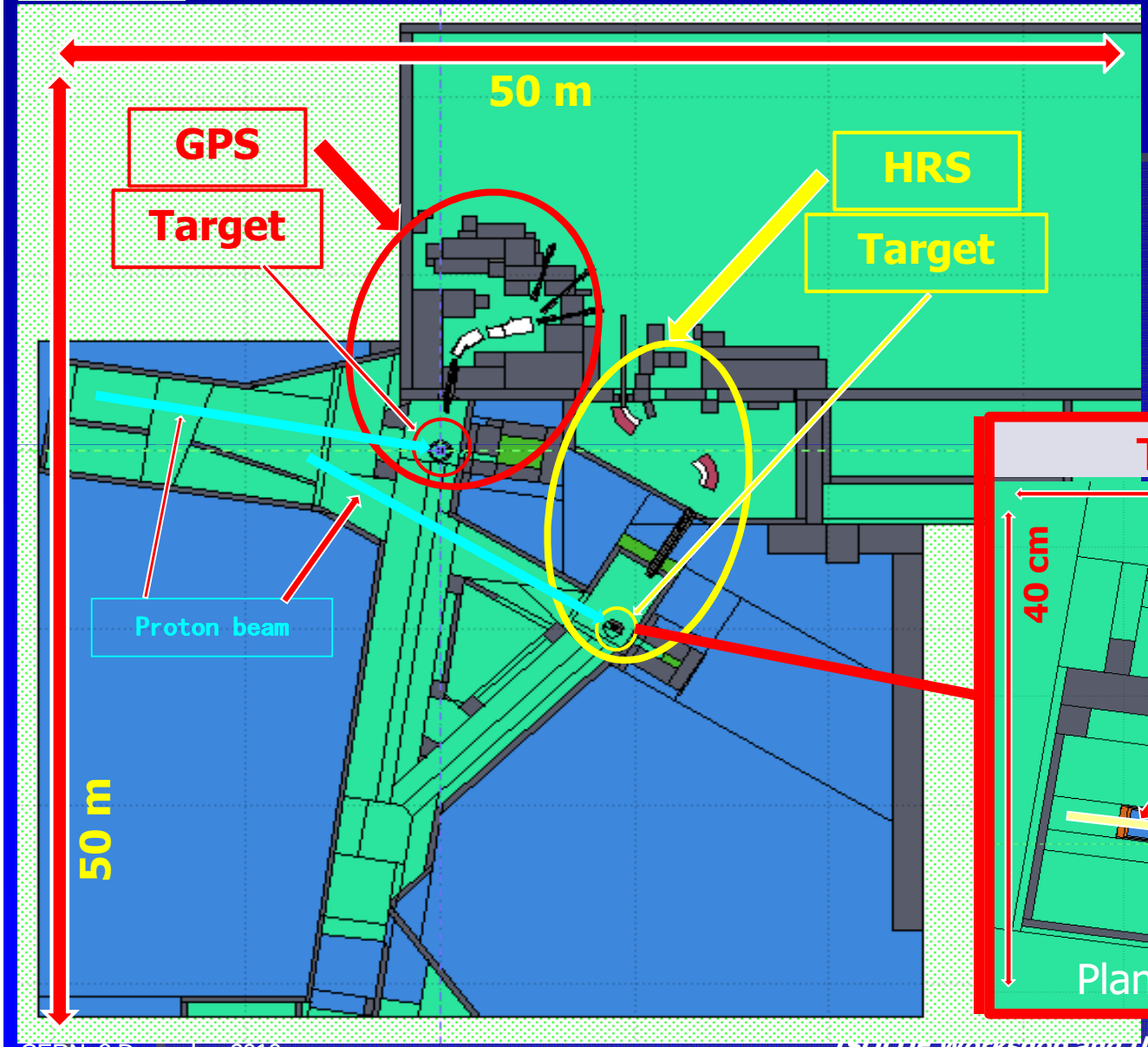
CERN, 8 December 2010



Summary

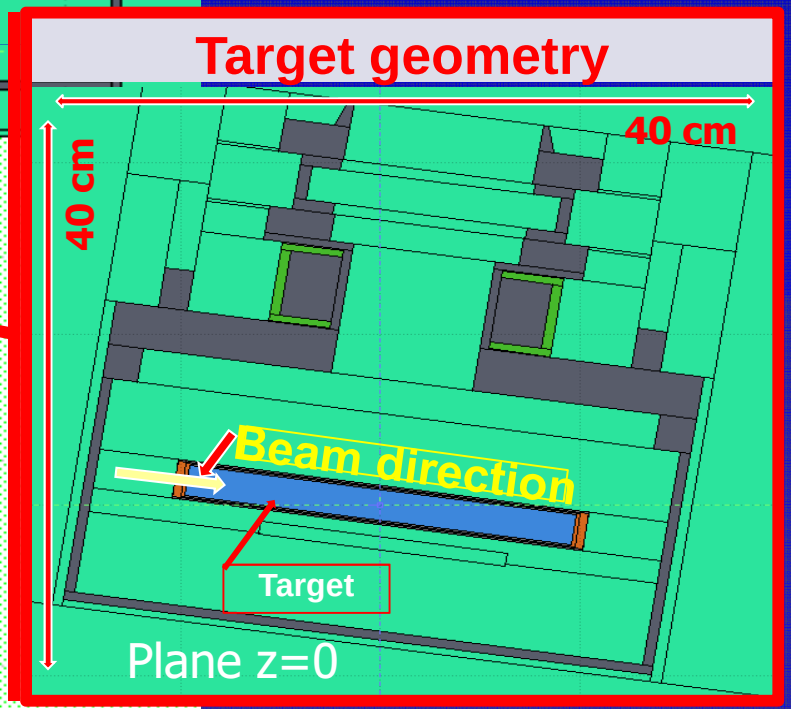
- Geometry
  - ✓ Installation
  - ✓ Targets' areas
    - ❑ ***HRS (High Resolution Separator)***
    - ❑ ***GPS (General Purpose Separator)***
  - ✓ Targets configuration
- Dose rate simulations (FLUKA)
  - ✓ Parking area
  - ✓ Gas storage
- On-going work
- Conclusions

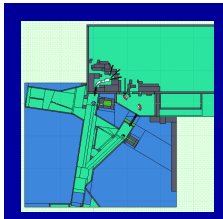
ISOLDE facility, geometry



Ta (Tantalum) target
Density 16.654 g/cm³

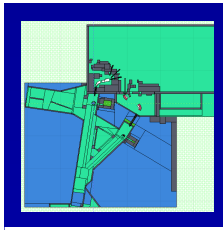
UC_x (Uranium Carbide)
Density 3.25 g/cm³





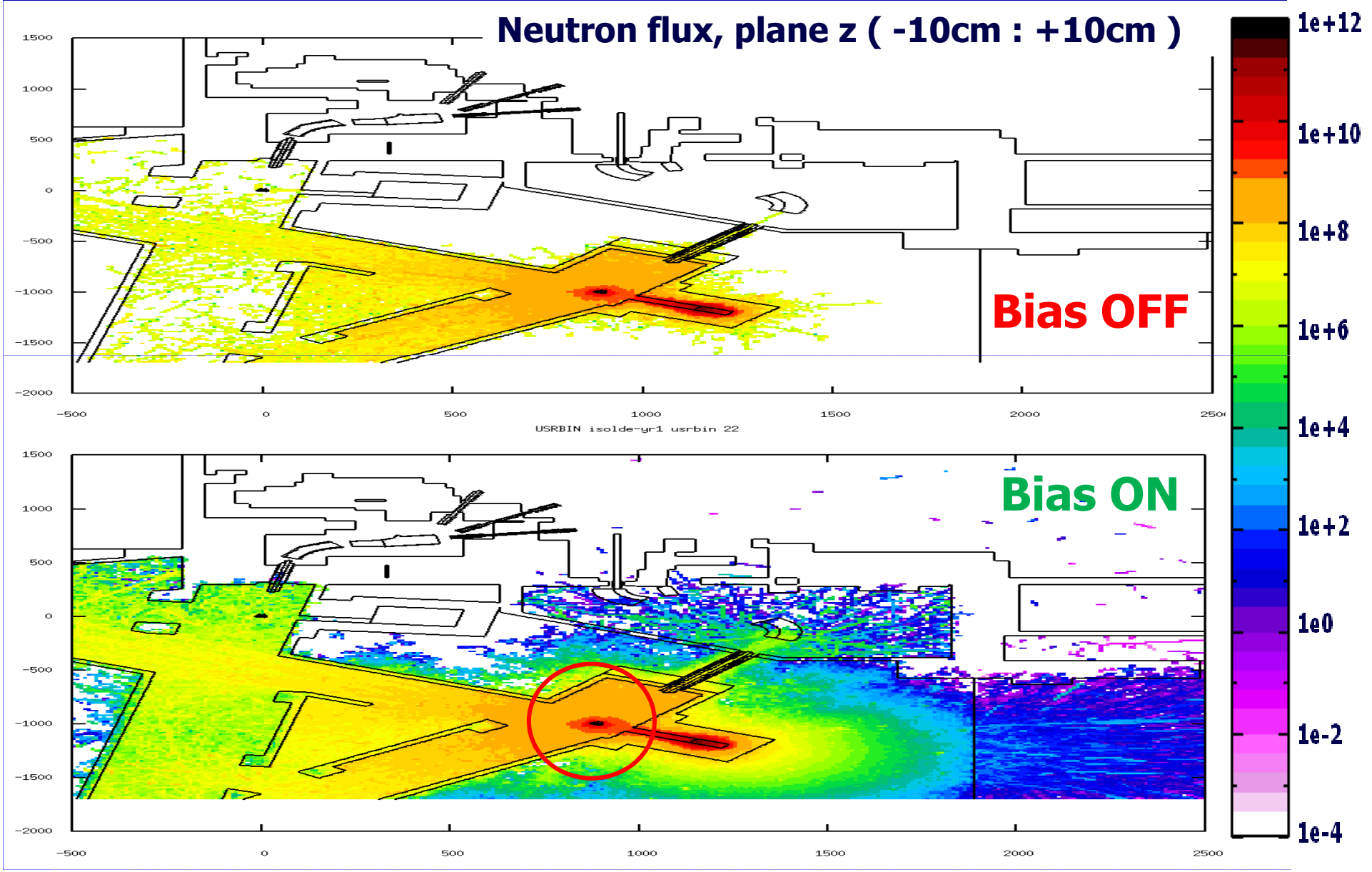
Simulation

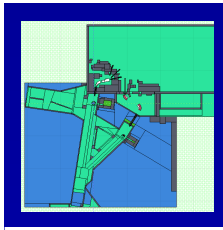
- Bias
  - ✓ ON/OFF
  - ✓ Selected bias direction
- Proton beam characteristics
  - ✓ Energy: 1.4 GeV and 2 GeV
  - ✓ Normalization to 1 μA (6.24e12 protons/second)



Simulations, HRS

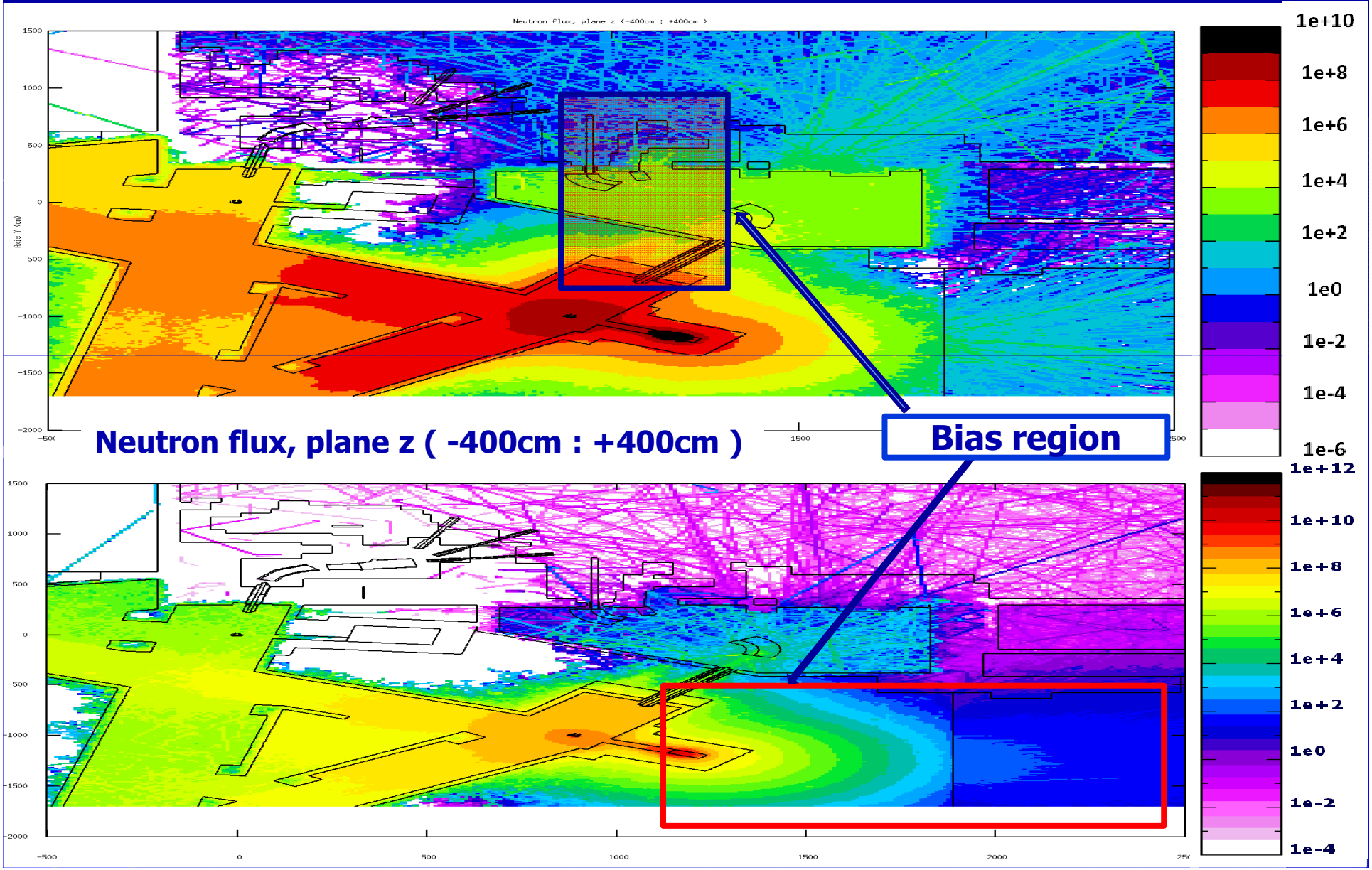
Tungsten convertor + Tantalum target

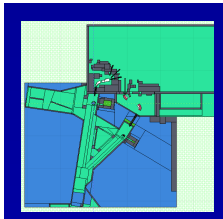




Simulations, HRS

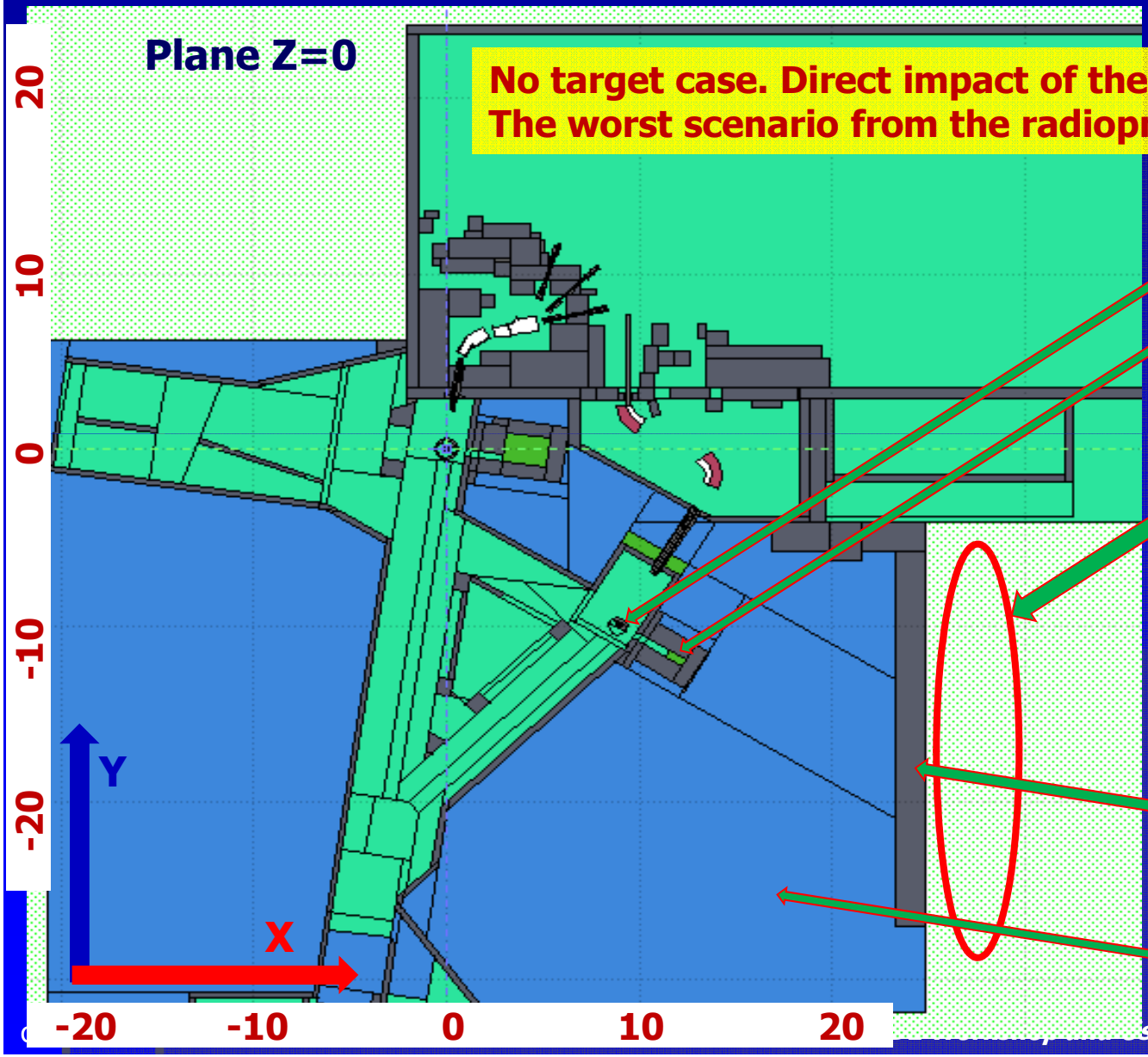
Tungsten convertor + Tantalum target





Dose rate, HRS

Parking area



No target case. Direct impact of the beam on the beam dump
The worst scenario from the radioprotection point of view

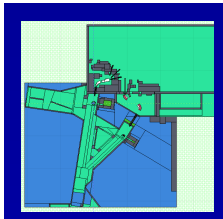
HRS target

HRS beam dump

Parking area

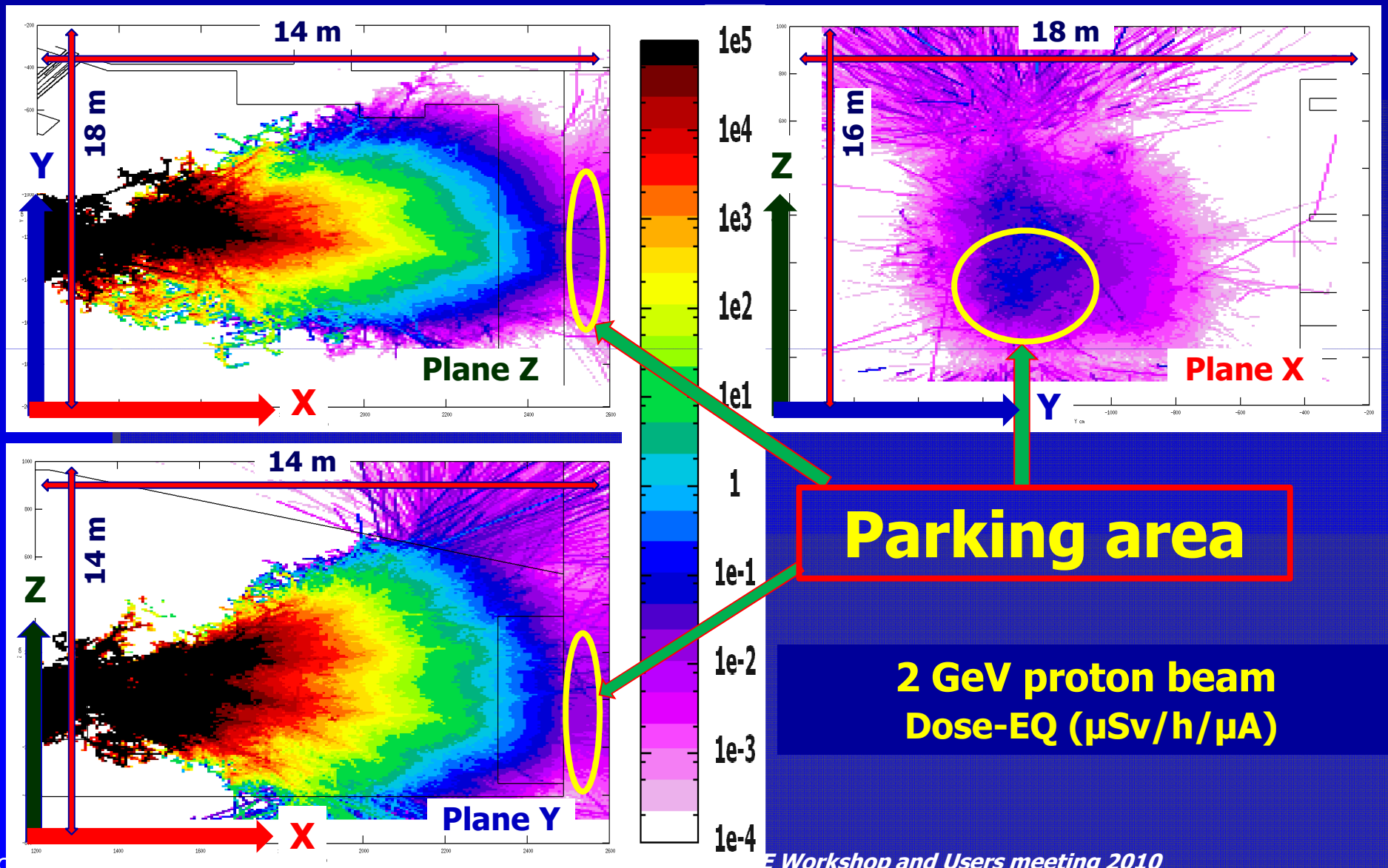
Concrete wall

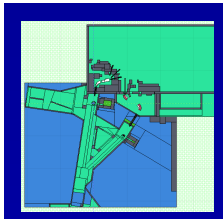
Earth, beam dump shielding



Dose rate, HRS

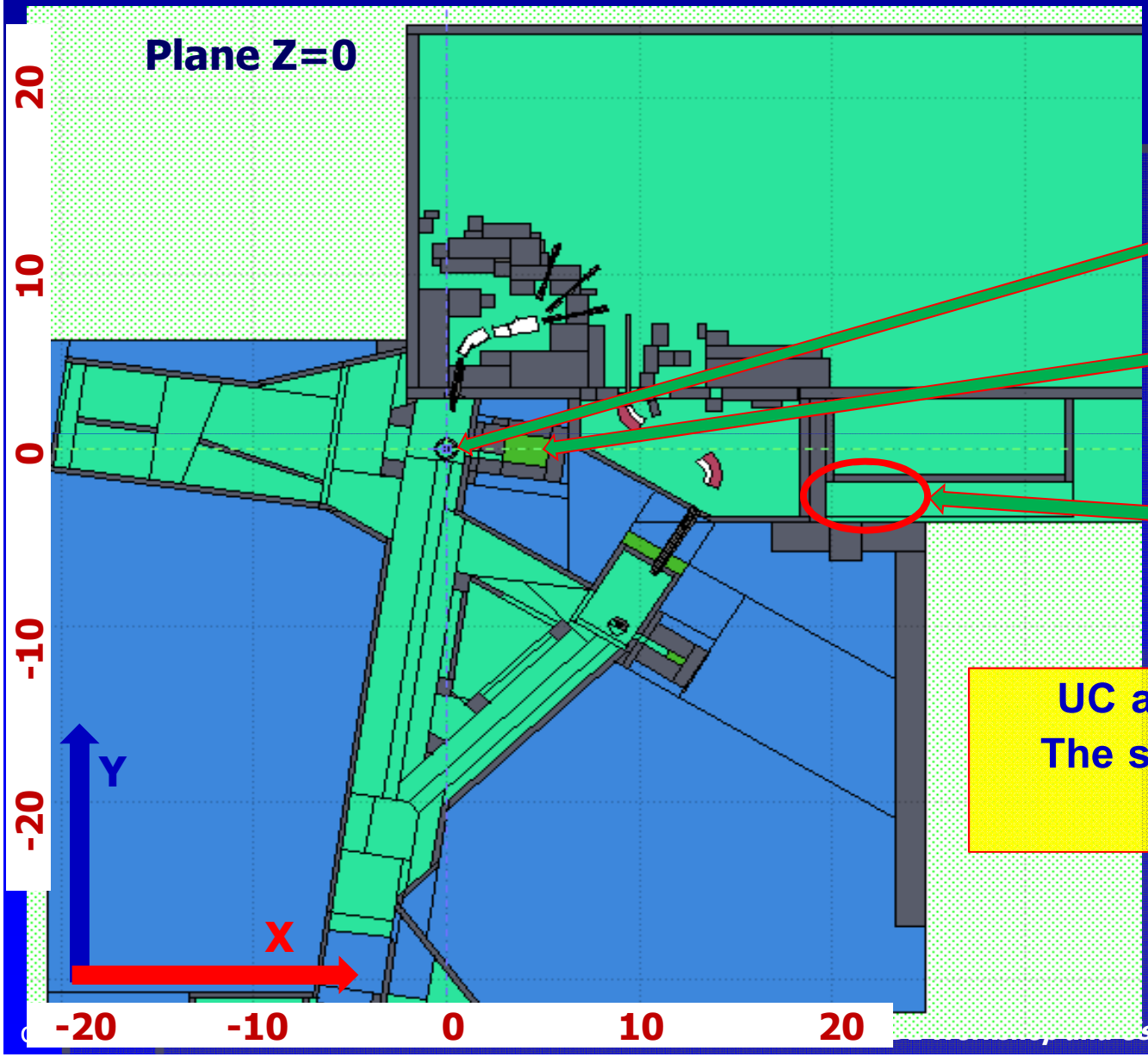
Parking area





Dose rate, GPS

Gas storage

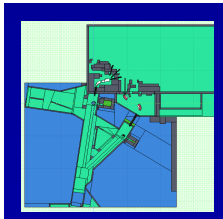


GPS target

GPS beam dump

Gas storage

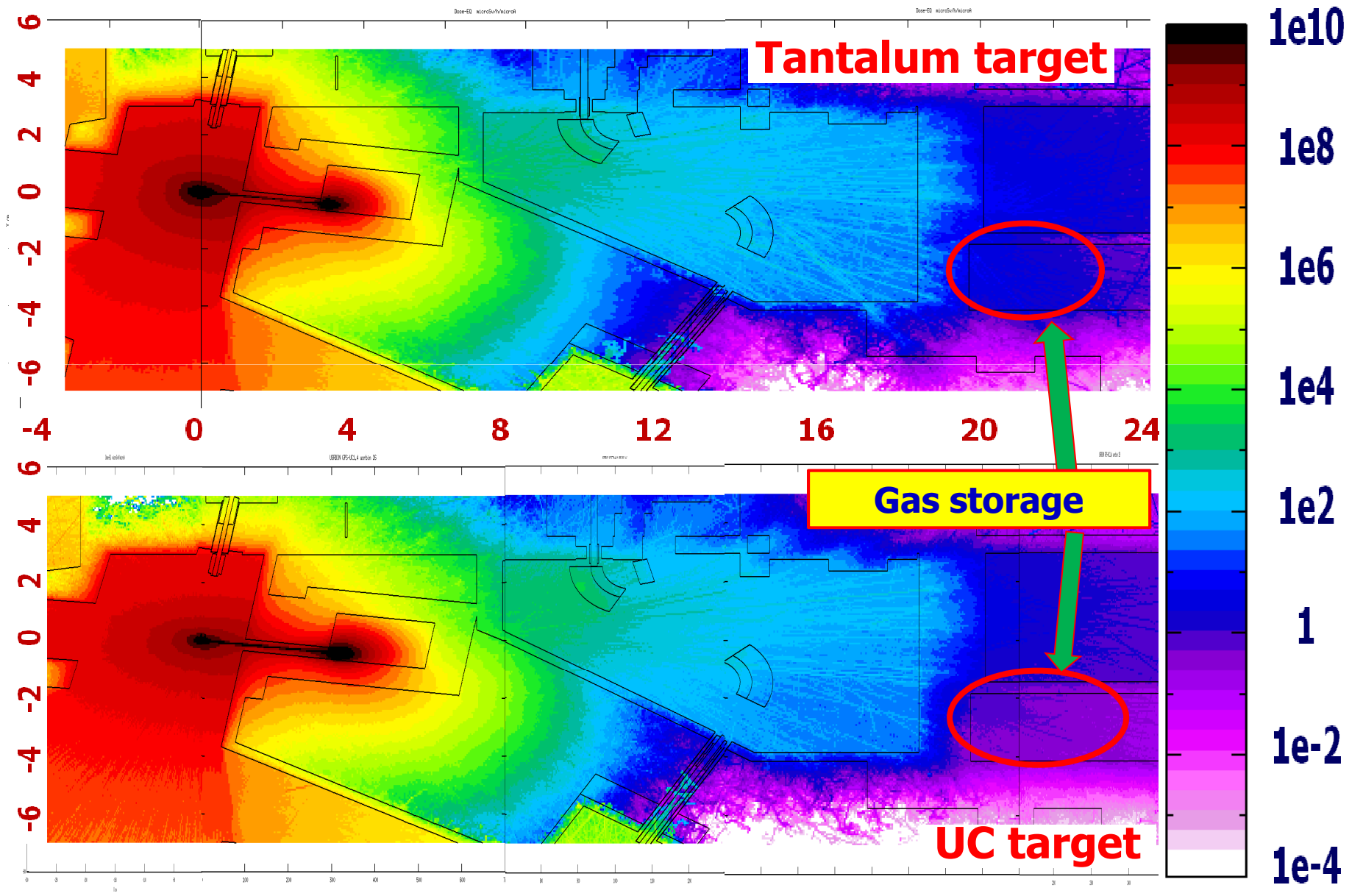
UC and Ta target cases.
The scenario for the most used targets



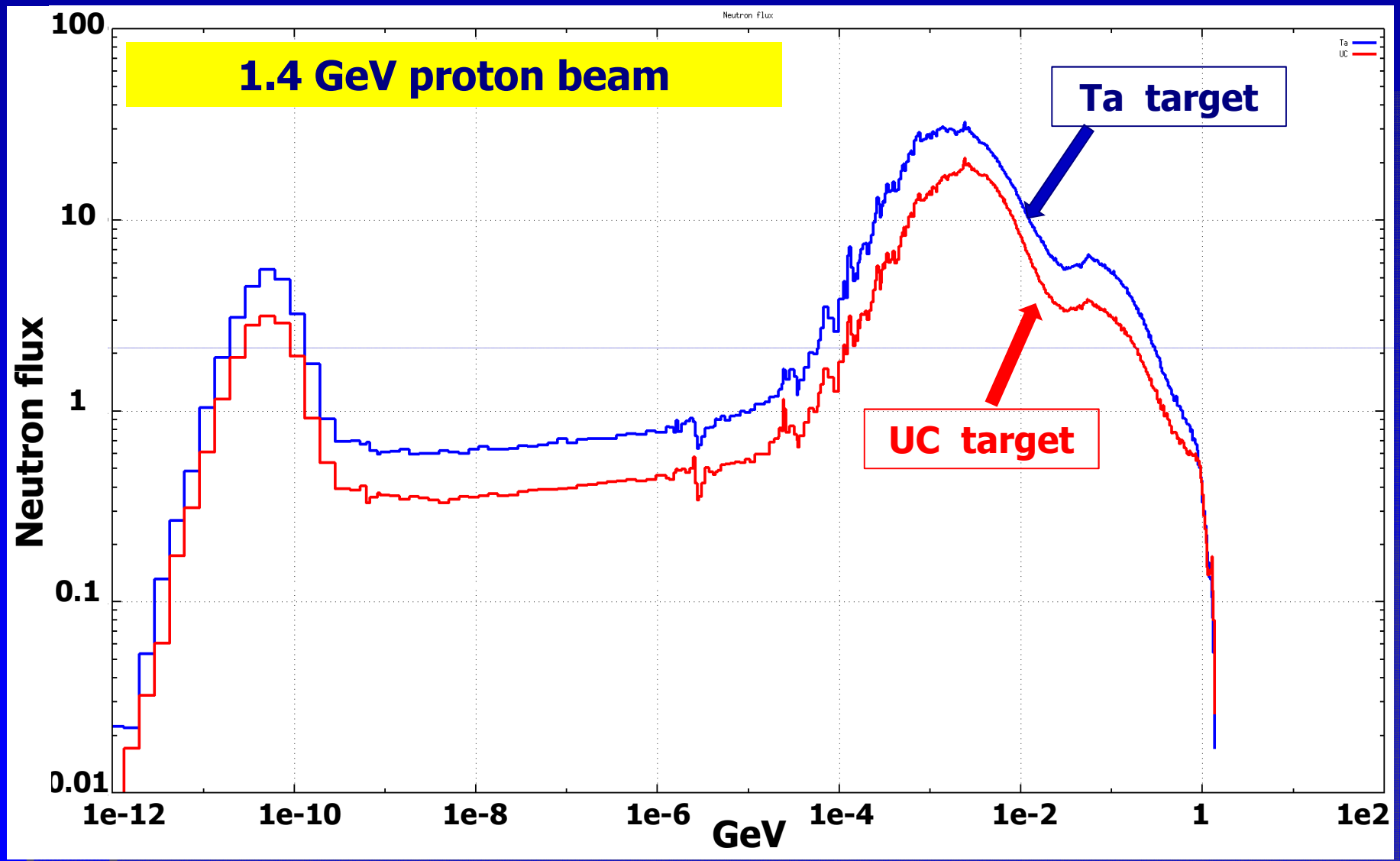
Dose rate, GPS

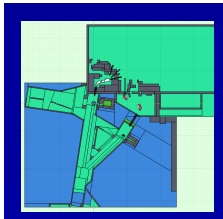
Gas storage

1.4 GeV proton beam
Dose-EQ (μSv/h/μA), Plane Z



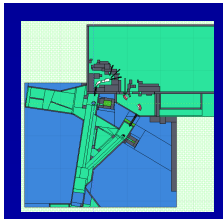
Neutron production rate, GPS





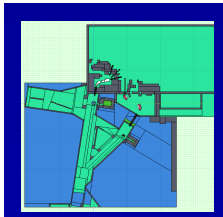
On-going work

- Comparison of simulation results with measurements
- Simulation of the critical parts of the installation. Evaluation of possible impact of upgrade on existing shielding
- Activation calculation of the shielding-soil and air inside installation.

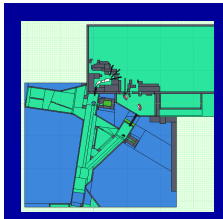


Conclusions

- The GPS area needs more attention from the radiation protection point of view taking into account upcoming upgrade of the installation. The dose rate of the adjunctive and supply areas depends on the type(material) of the target in use.
- HRS area represent sufficient beam dump shielding which is adequate to support increasing power of the beam due upgrade.
- Some part of the installation (shielding between active zone and experimental area) need to be revised with more precision due possible radiation leaks



Thank you



Proton flux, GPS