SHIELD OPTIMIZATION
for 2018 Drell-Yan RUN

- Goals:
  - Decrease the radiation dose in the environment around Bat. 888
  - Based on radiation shield used during run 2015
  - Design a absorber that allow to run at maximum intensity, ie. 10^9 π^-/spill – SPS cycle 33.6s
  - The real dose must be scaled from this intensity

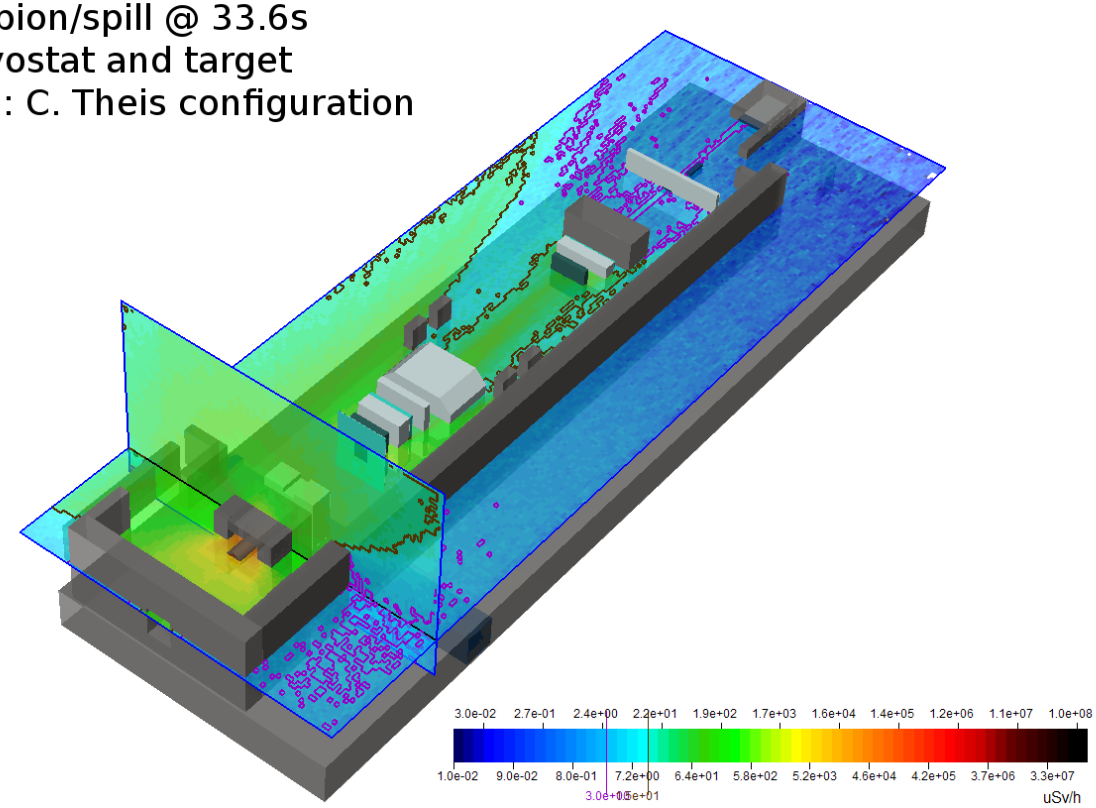
Old starting point:
FLUKA and Chris Theis input file (Sept. 2010)

- Dose with C. Theis input files.
  - Beam: π^-
    - p = 191 GeV/c; Δp = 4.22 GeV/c FWHM; gaussian
    - x = y = 0 cm;
    - $\sigma_x = \sigma_y$ = 1cm ; $\Delta x = \Delta x = 0$; **pencil like beam**
  - Absorber:
    - Large external concrete

•Conversion from pSv/prim to uSv/h

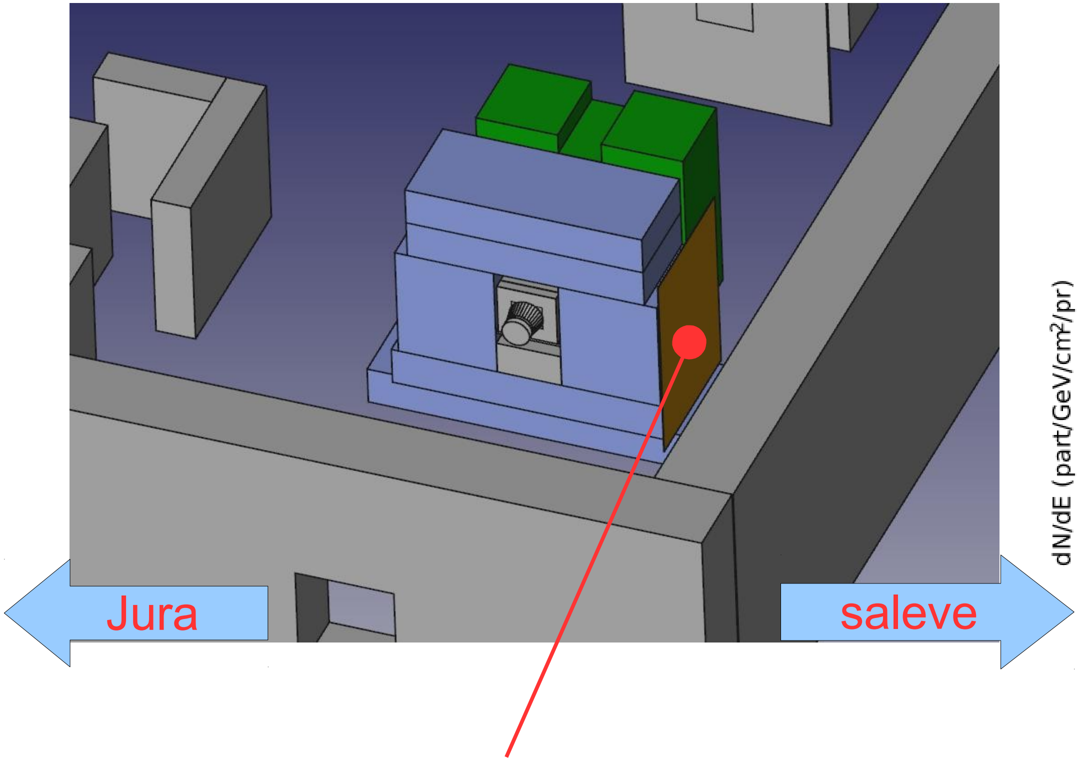
- Spill in one hour:
  - SPS cy 33.6s: 107
  - SPS cy 45.6s: 79
- Beam rate
  - $6\text{x}10^8$
  - $1\text{x}10^9$
- 6e8@33.6s: c = $6.42\text{x}10^4$
- 1e9@33.6s: c = $1.07\text{x}10^5$
- 1e9@45.6s: c = $7.90\text{x}10^4$

10^9 pion/spill @ 33.6s
old cryostat and target
screen: C. Theis configuration

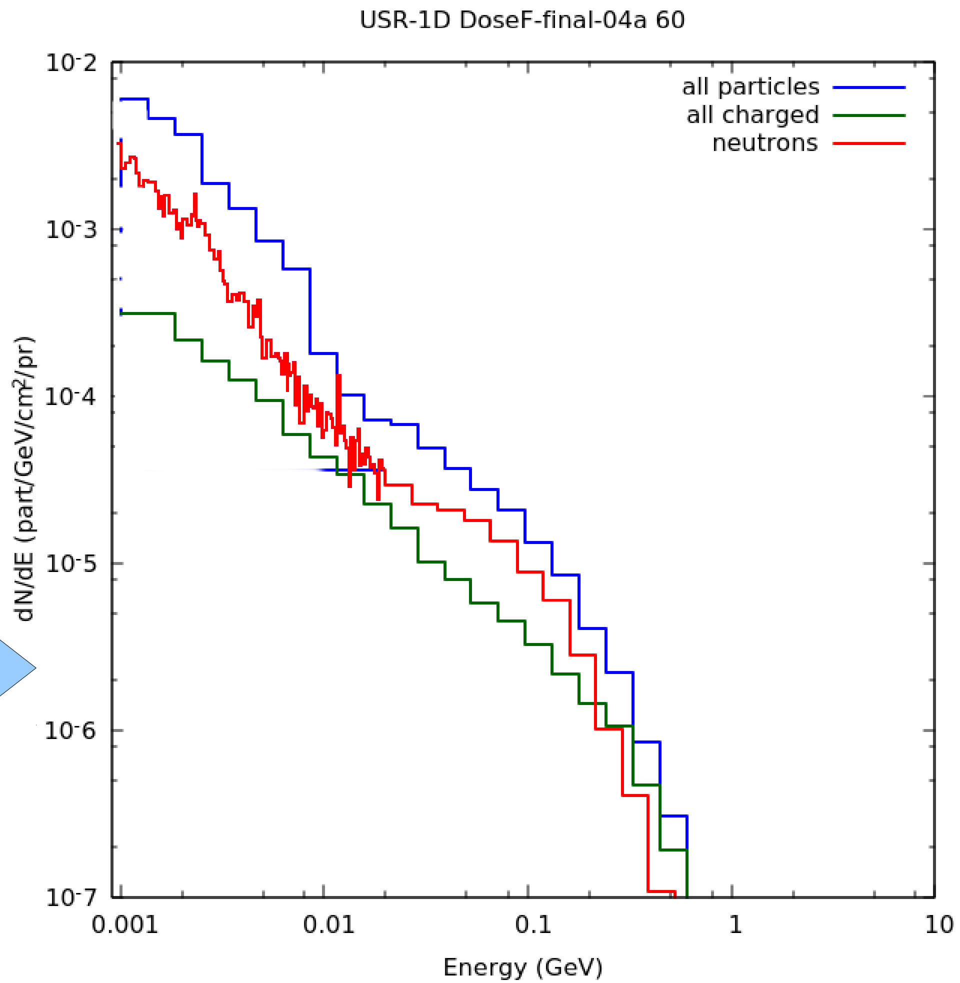


Same results Of C. Theis

Study of outgoing particles from concrete shield



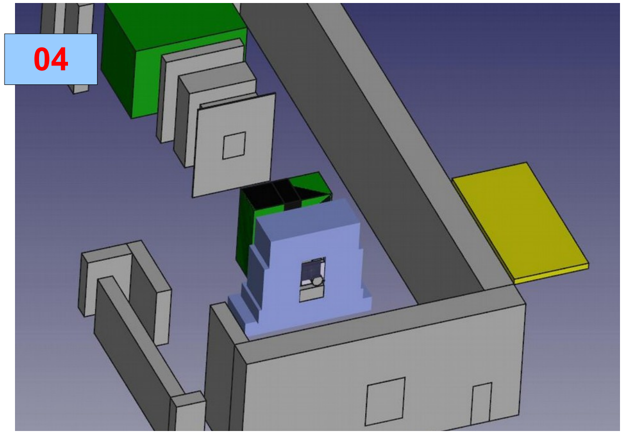
Pseudo-detector 400x300x1 cm^3

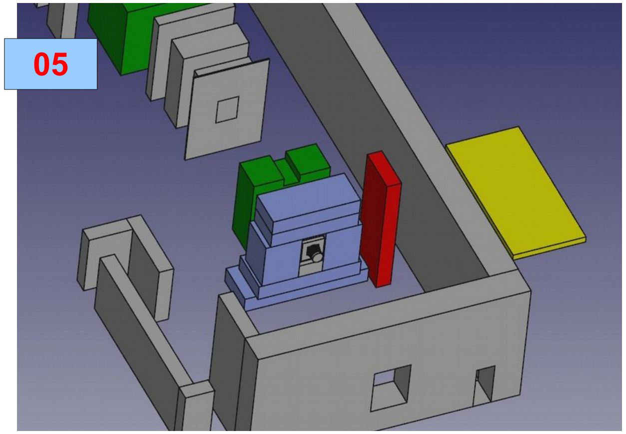


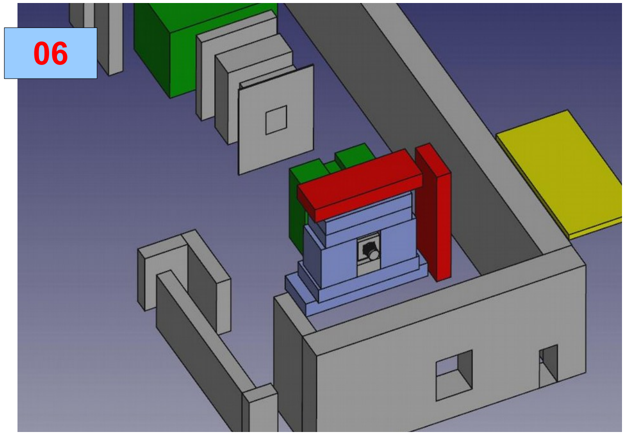
Particles x primary, to be scaled by 10^9 $spill^{-1}$

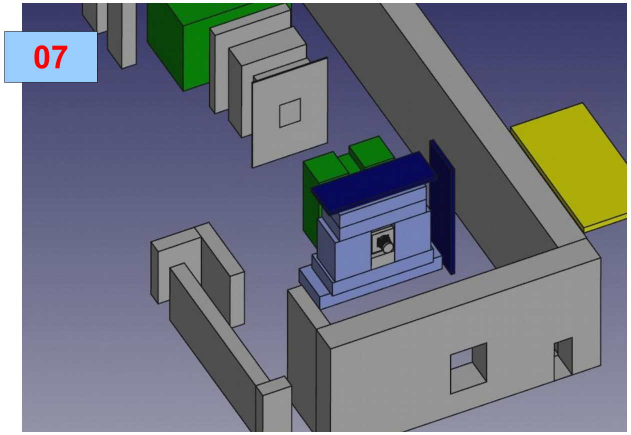
Summary of the simulations

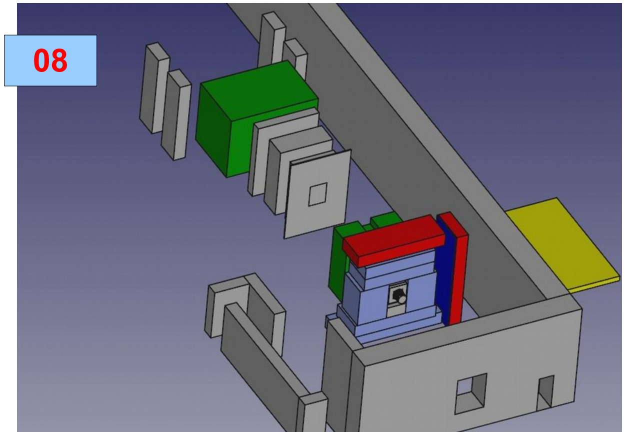
configu ration	note
Final-04	configuration of 2015 run
Final-05	Final-04 + 80cm of concrete blocks on the Saleve side only
Final-06	Final-06 + 80cm of concrete blocks on top
Final-07	Final-06 but with 20cm of borated polyethylene (5%) instead of concrete
Final-08	Final-06 + 10cm of polyethylene on the concrete side blocks





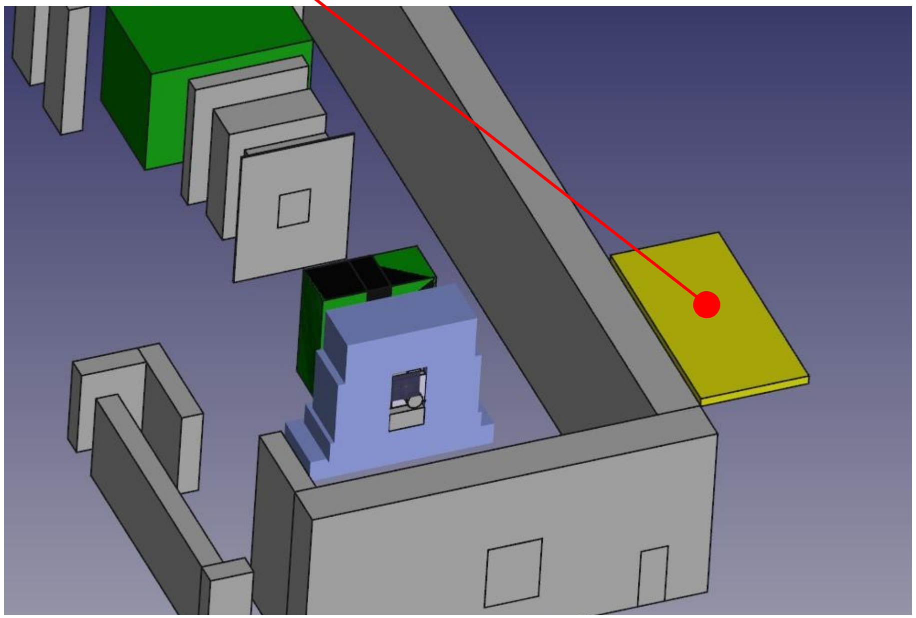


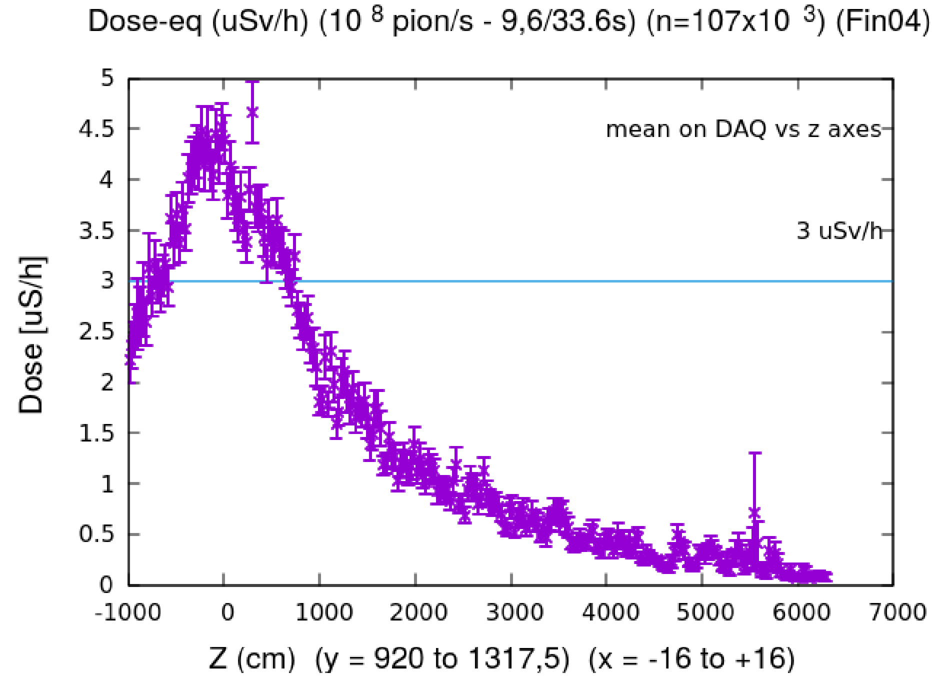


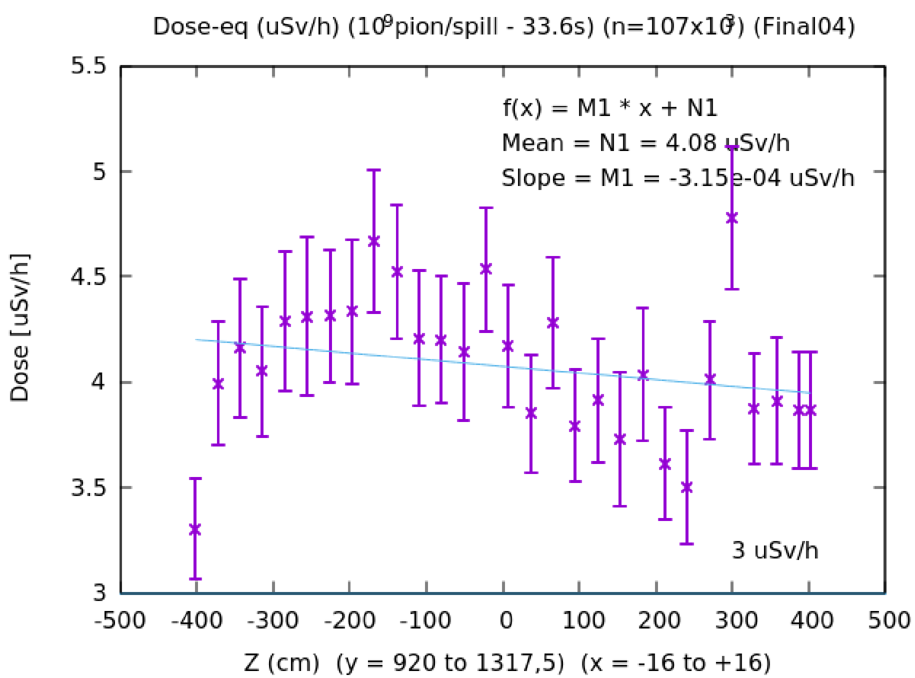


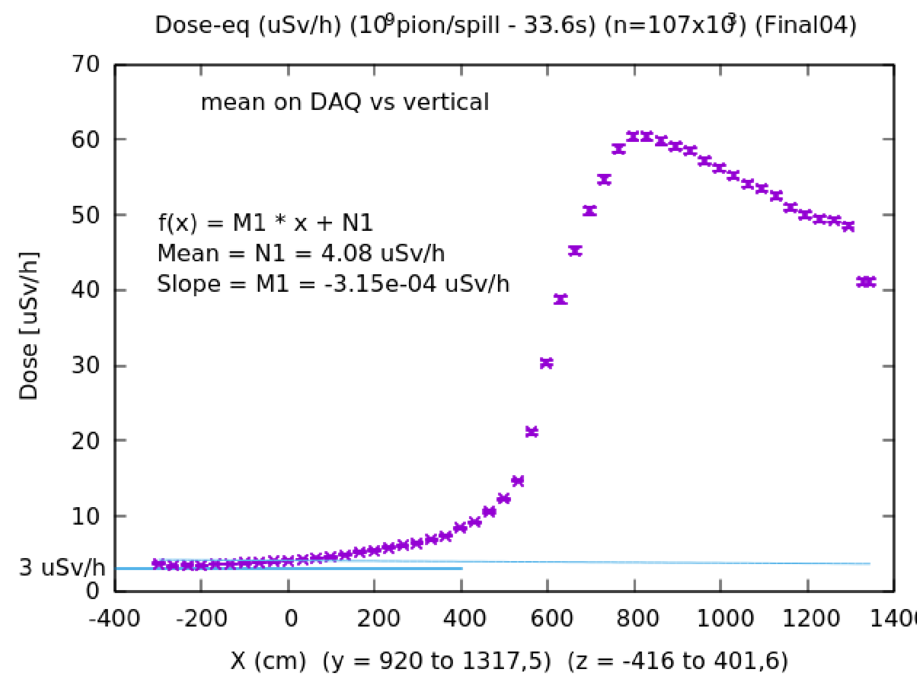
Configuration Final-04

DAQ Mean: 4.08 uSv/h



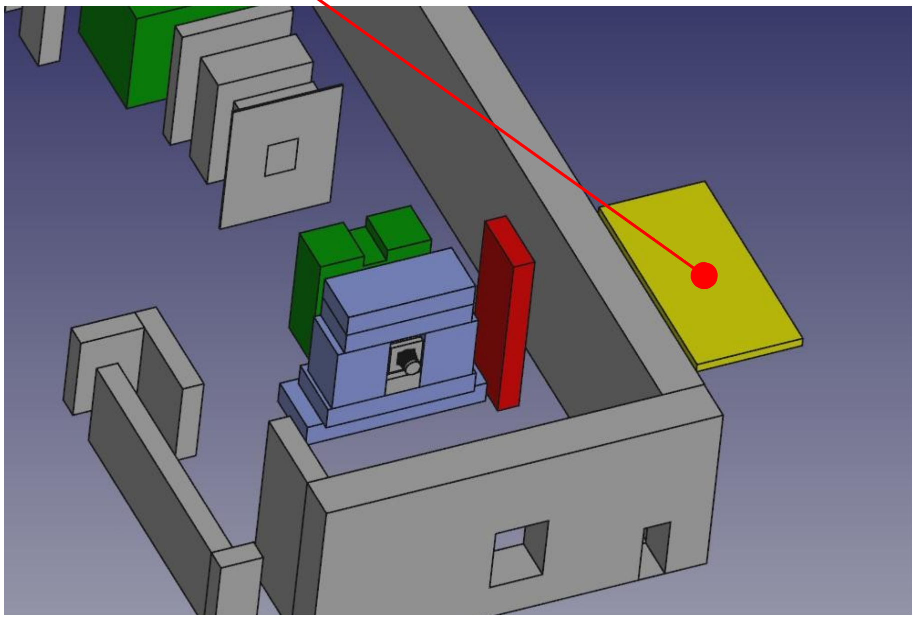


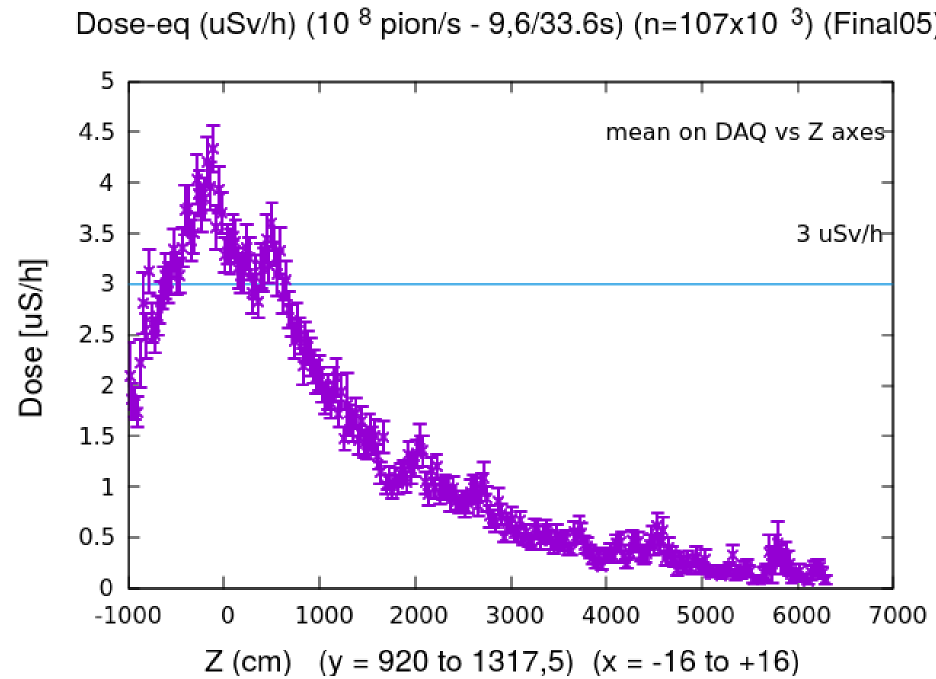


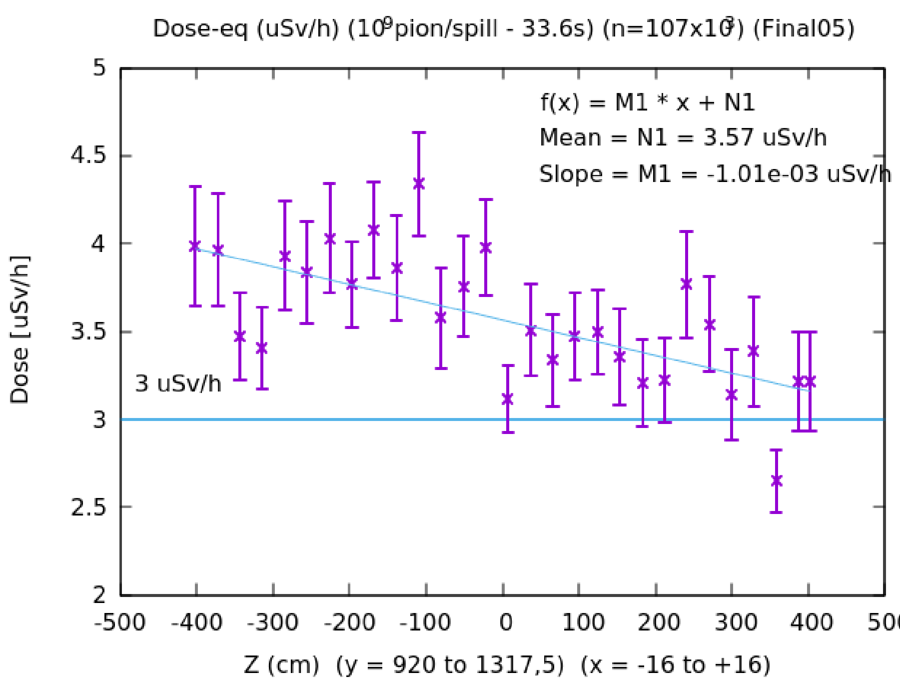


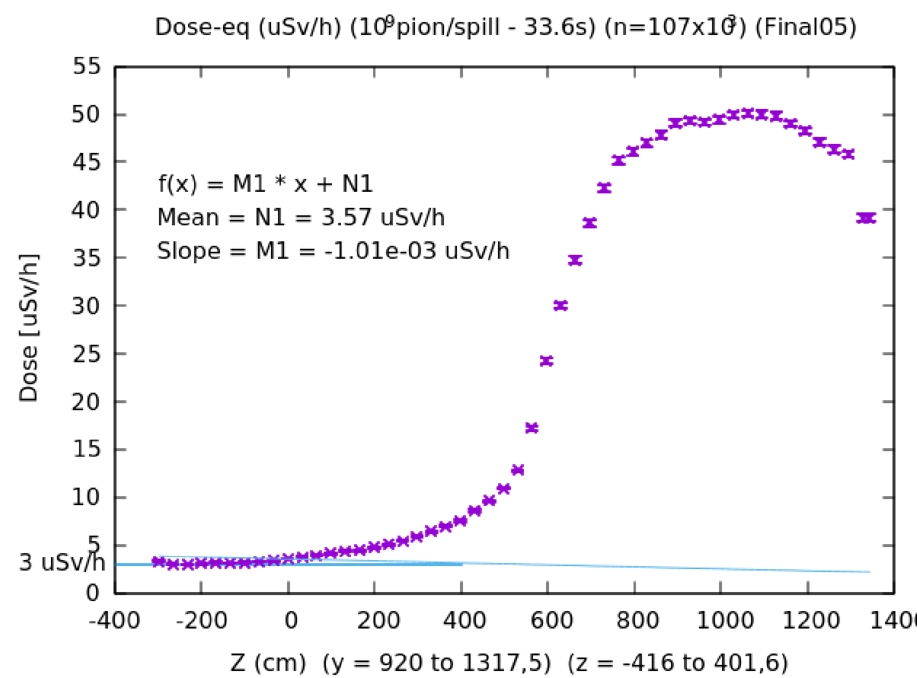
Configuration Final-05

DAQ Mean: 3.57 uSv/h



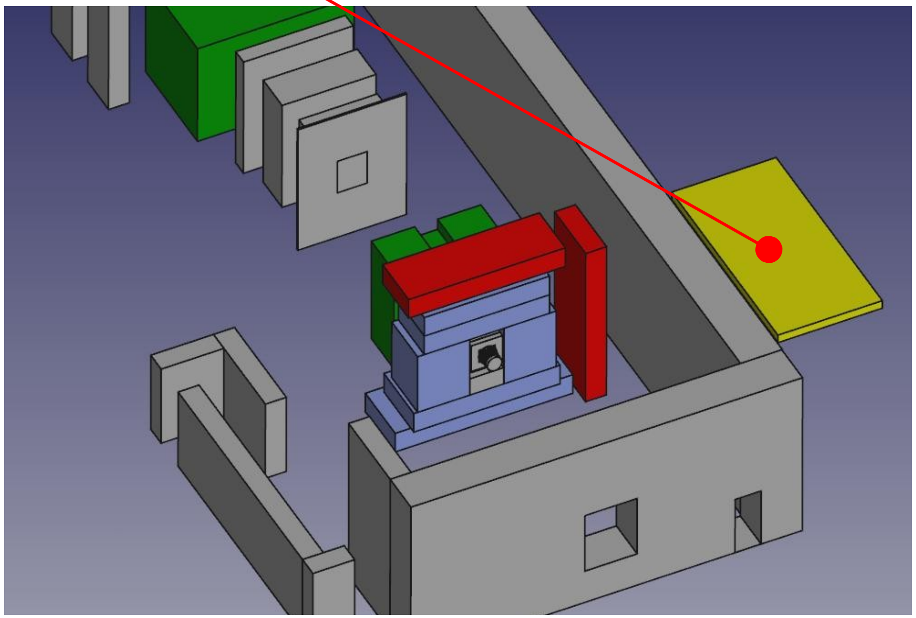


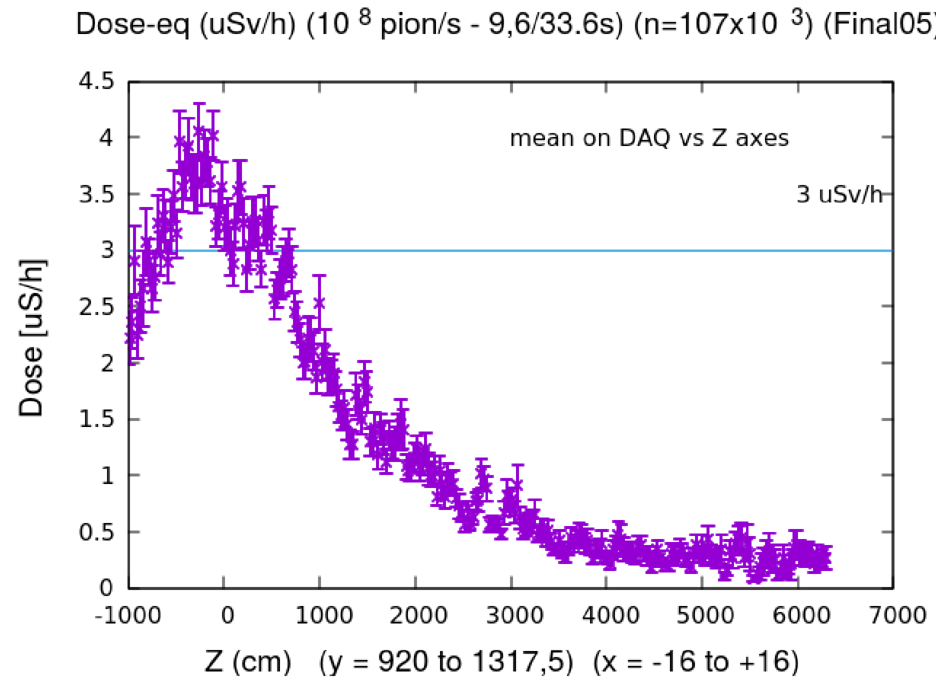


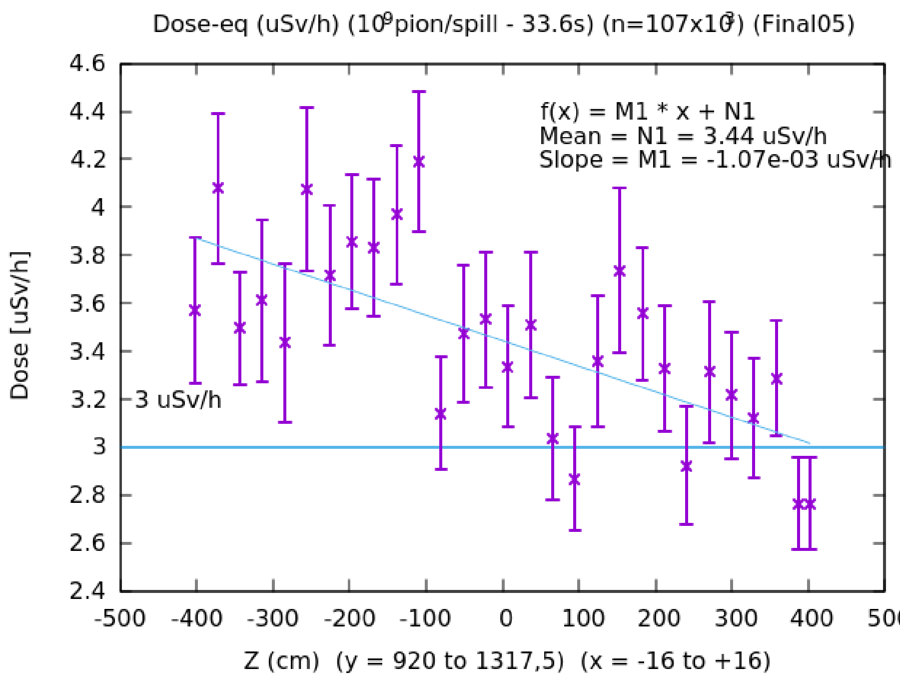


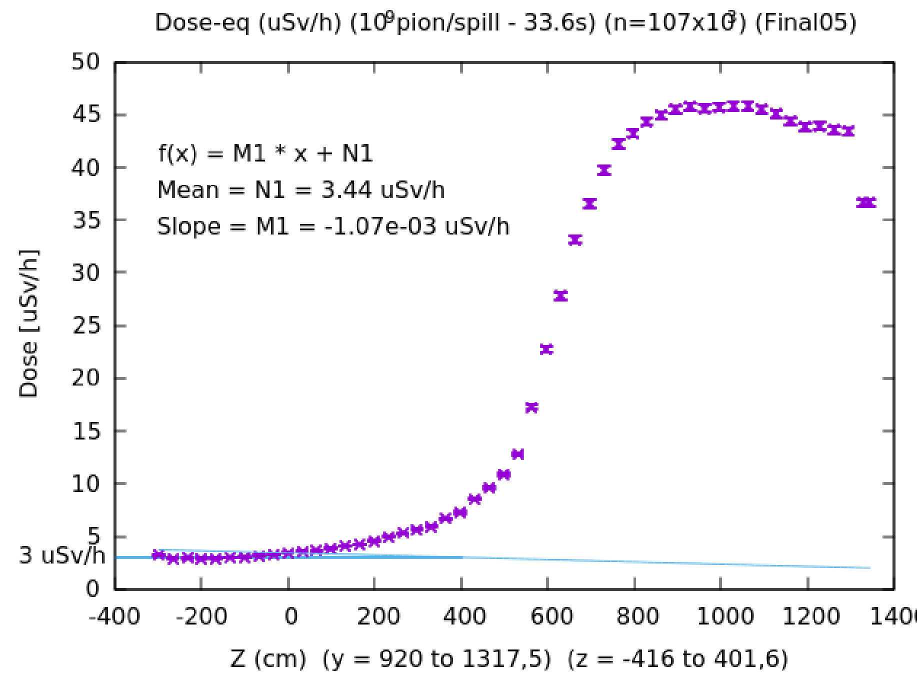
Configuration Final-06

DAQ Mean: 3.44 uSv/h



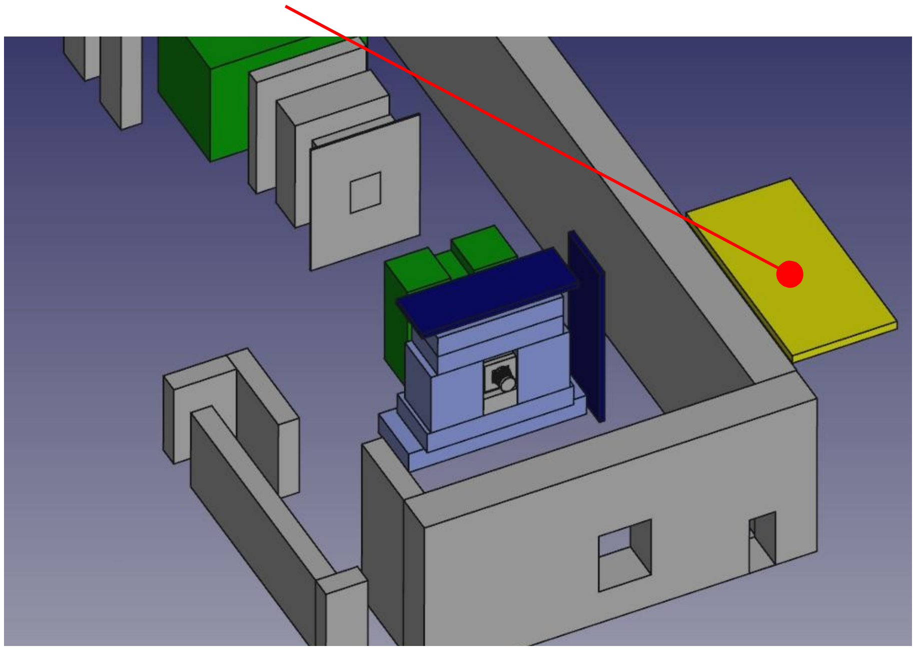


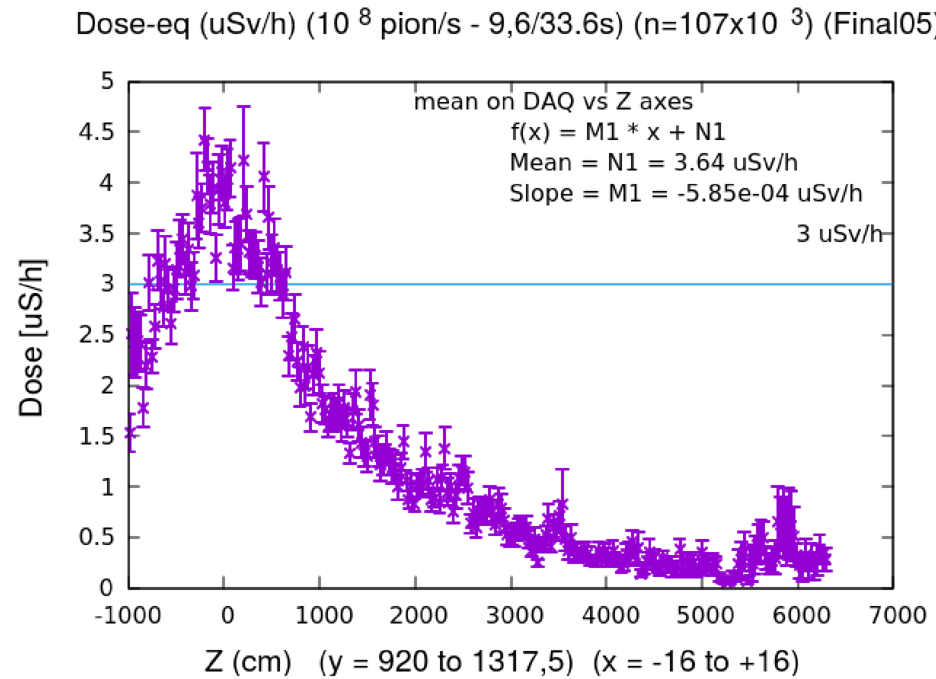


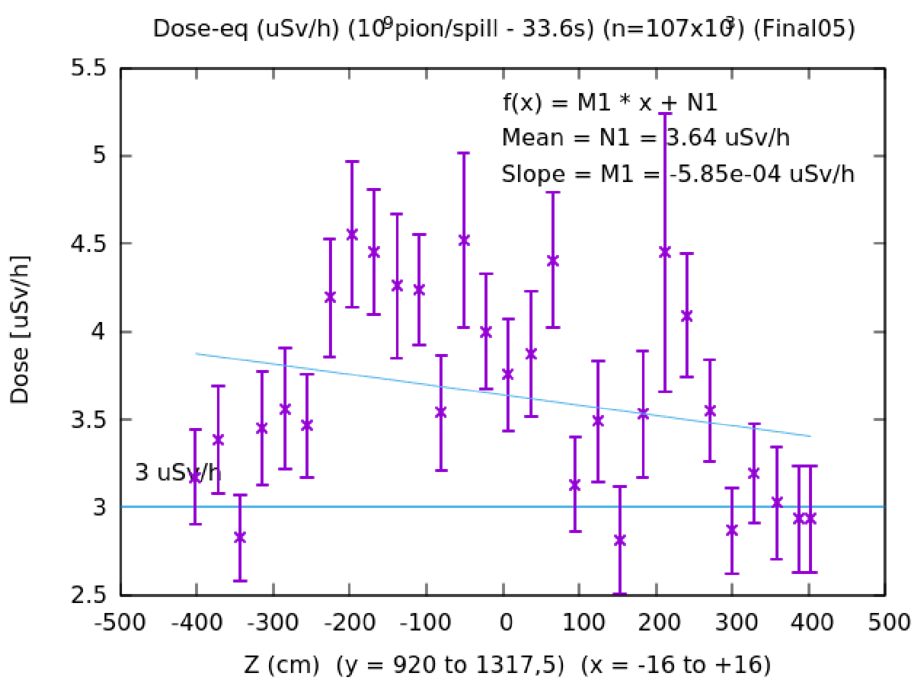


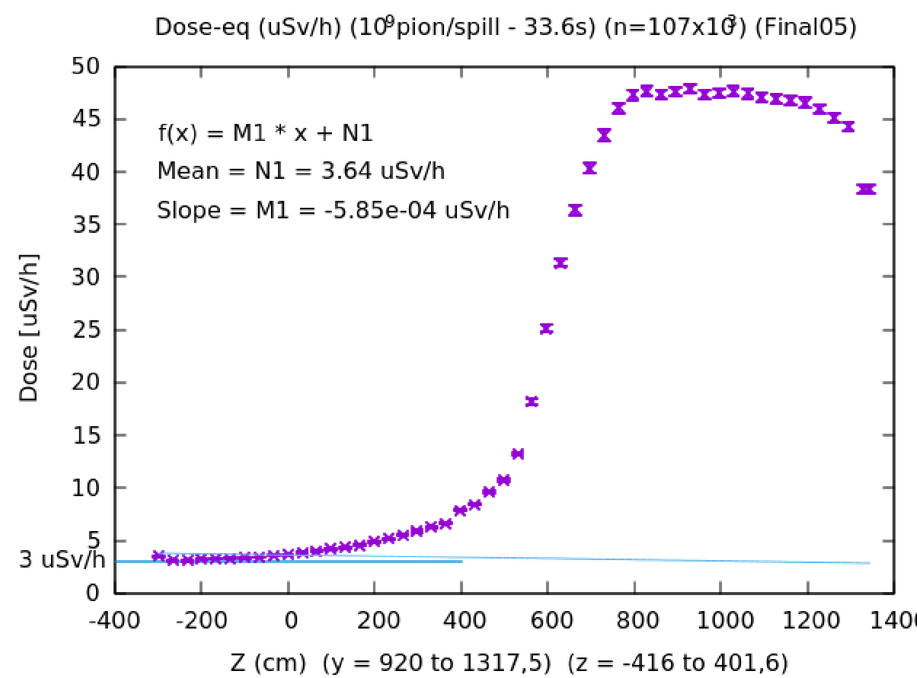
Configuration Final-07

DAQ Mean: 3.64 uSv/h



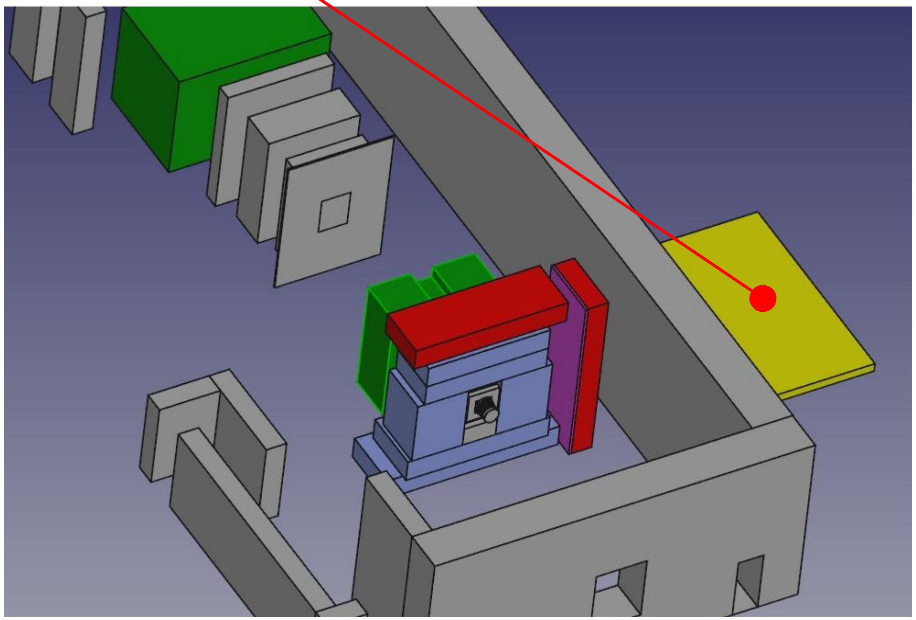


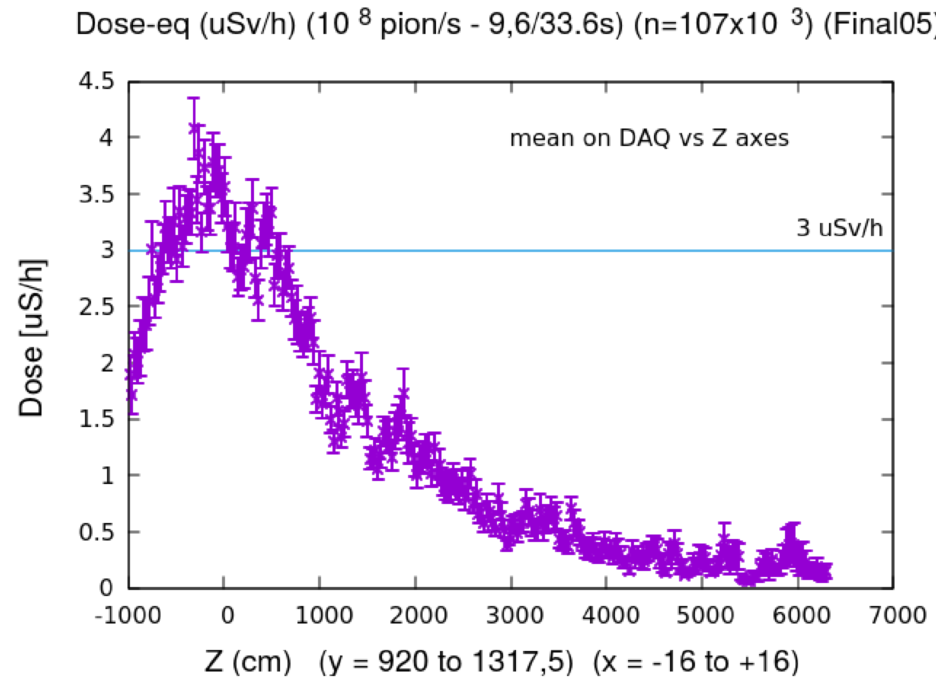


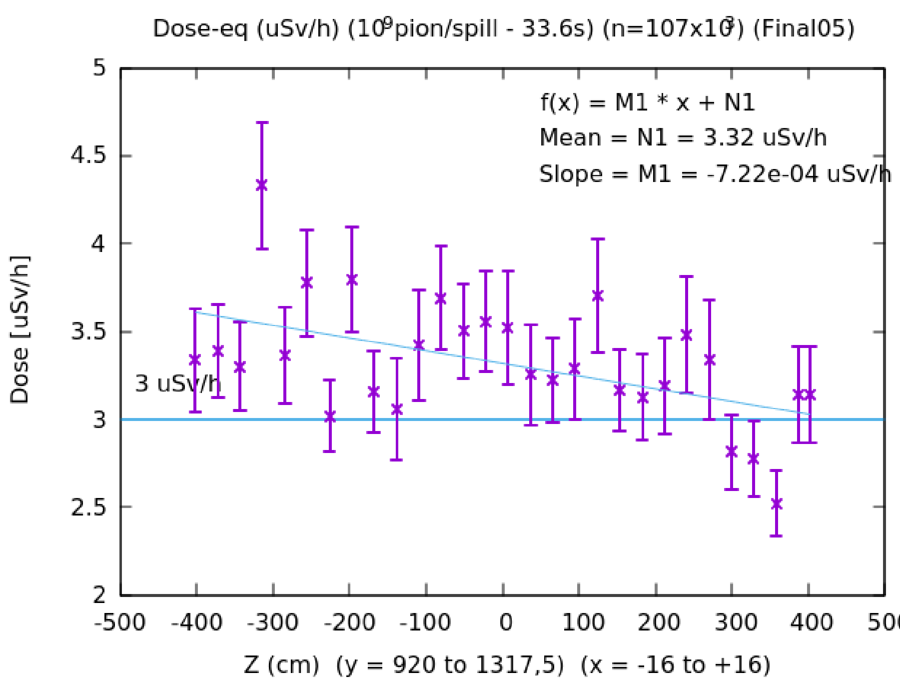


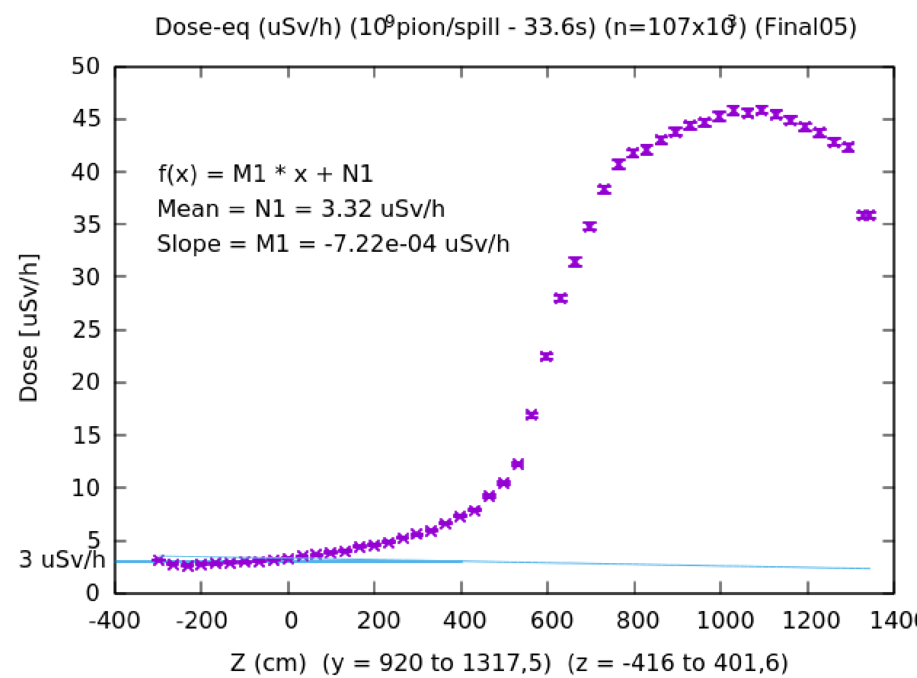
Configuration Final-08

DAQ Mean: 3.32 uSv/h









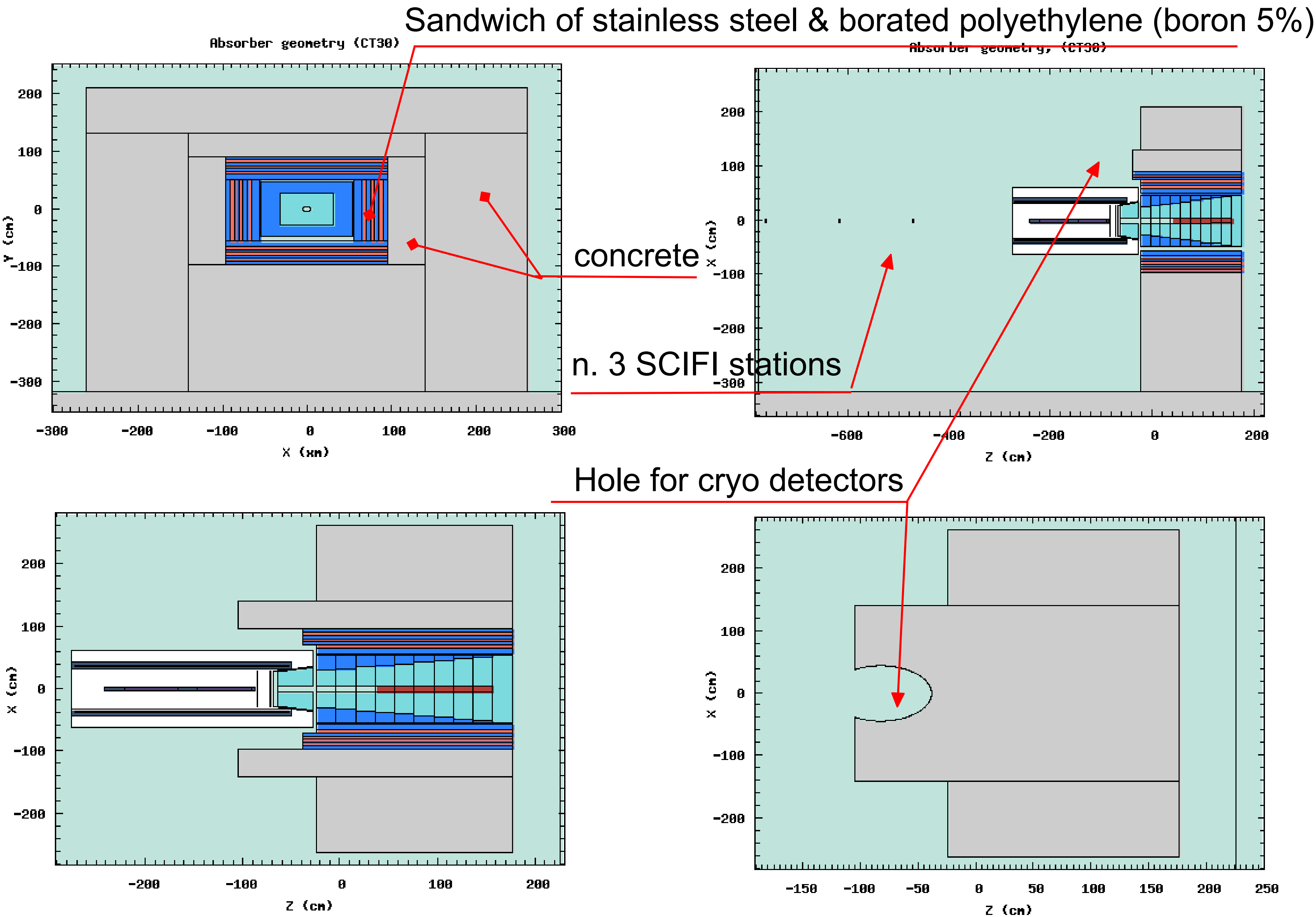
Conclusions

configu ration	Mean dose in control room (μSv/h)	Dose Reducti on	note
Final-04	4,08	0%	configuration of 2015 run
Final-05	3,57	-12.5%	Final-04 + 80cm of concrete blocks on the Saleve side only
Final-06	3,44	-15.7%	Final-06 + 80cm of concrete blocks on top
Final-07	3,64	-10.8%	Final-06 but with 20cm of borated polyethylene (5%) instead of concrete
Final-08	3,32	-18,6%	Final-06 + 10cm of polyethylene on the concrete side blocks

radioprotection group check required

- 50% of particles outside concrete shield are low energetic neutrons
- The dose can be considerably reduced in the DAQ floor (beam level) adding 80 cm of concrete on Saleve side
- The concrete top help to lower the dose under the ceiling, small effects on DAQ floor
- 20-25 cm of borated polyethylene are more or less equivalent to 80cm of concrete
- Absorbtion by the buiding walls is unknown
- Other radical solutions are possible, but with costs and work enourmous

Configuration CT30



Configuration CT30

Mean: 2.16 uSv/h