Fermilab

Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

MARS analysis, Radiation maps

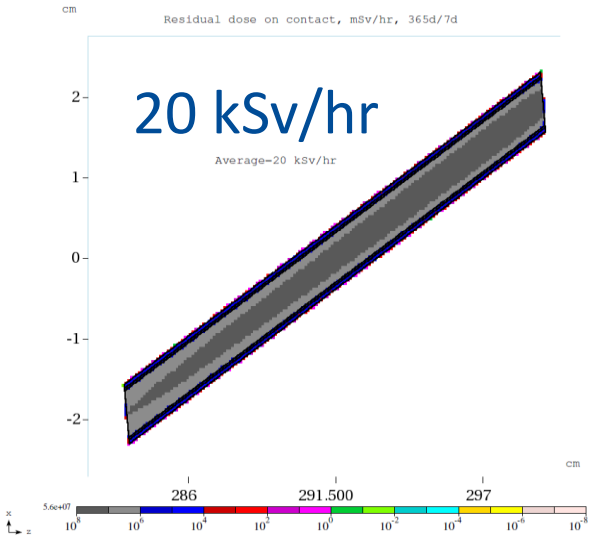
Vitaly Pronskikh

Remote Handling Review Dry Run

16 February 2015

Residual dose from the target (Au-198, 25 kW)

Contact dose 1yr/7d



Size scaling factor

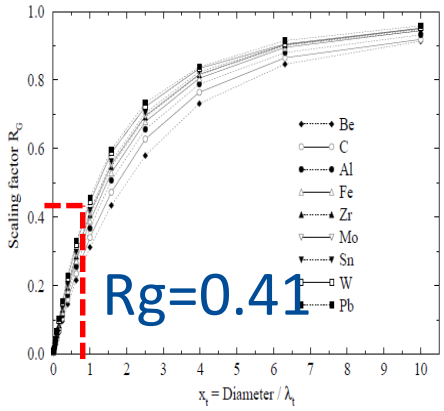


Figure 5: The calculated dose scaling factors, R_G, for solid cylinders of various materials *vs.* the normalized diameter. The lines are drawn to guide the eye.

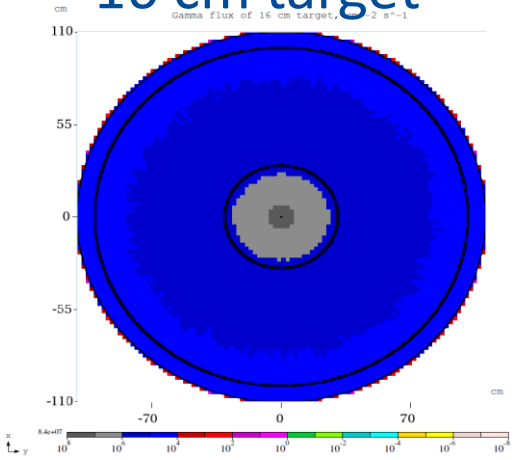
Distance scaling factor

$$D(x,y,z) = k_d \emptyset(x,y,z)$$
$$= k_d \int dS \frac{A_s}{2\pi\rho^2}$$

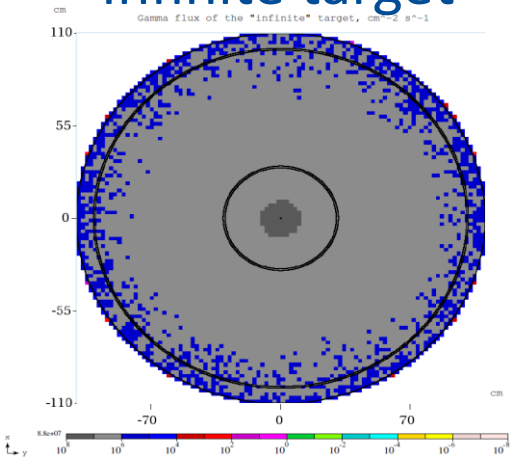
$$f(r-R) \equiv \frac{D(r)}{D_0}$$

f(100) = 0.0023

16 cm target



Infinite target



The finite length correction factors

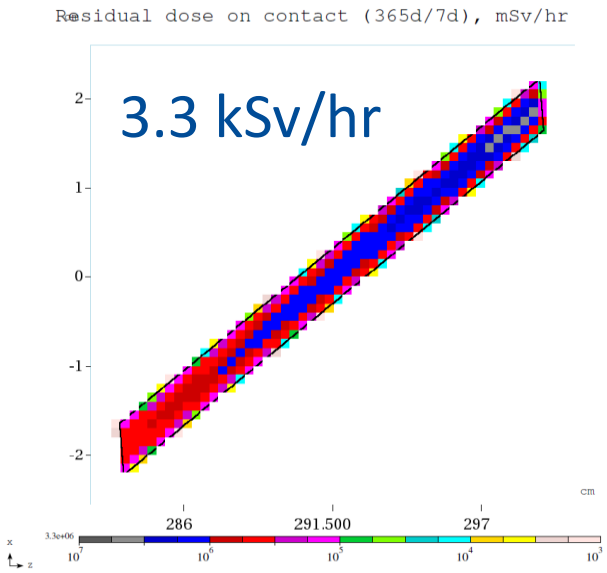
$$f^{fs} = \frac{\emptyset^{short}}{\emptyset^{long} * k_{vol}},$$

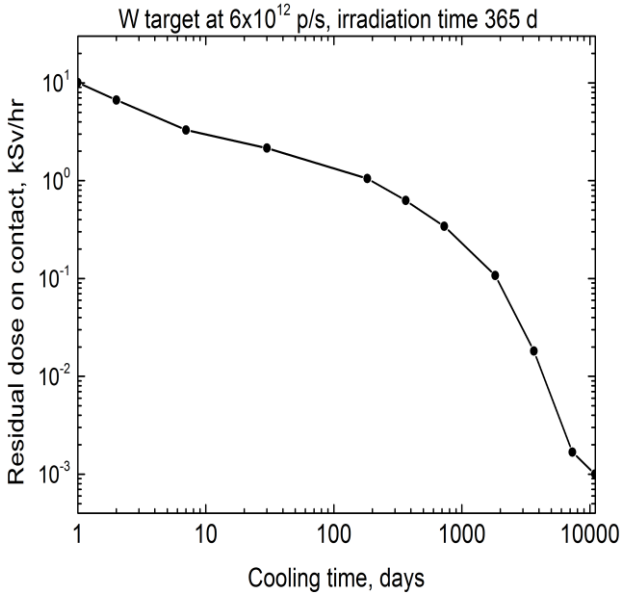
$f^{fs}(100)=0.0611$.

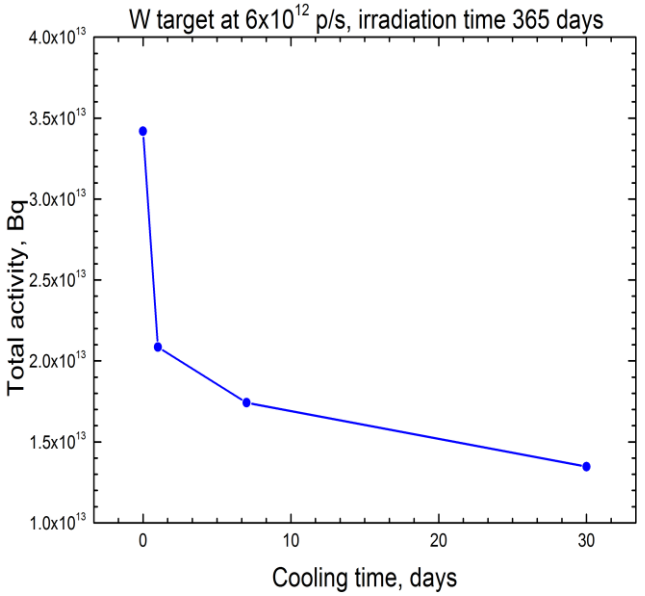
D(100 cm) = 1.15 Sv/hr

Fermilab

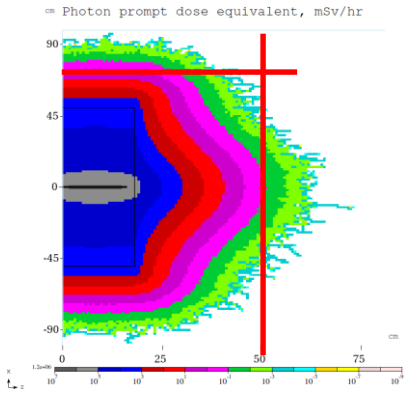
Residual dose from the target (W-184) and cask thickness







~1350 nuclides,1.7 E13 Bq (365/7), 1 MeV



Cooling time	Lt, steel, in	Ll, steel, in
0 d	10.6	11.8
1 d	10.0	11.3
7 d	10.0	11.0
30 d	9.6	11.0

Steel (in)	DoseRate (mrem/hr)
1	1.06E+06
2	4.61E+05
4	7.00E+04
6	9.09E+03
8	1078
10	120
12	13
14	1.3
16	0.1

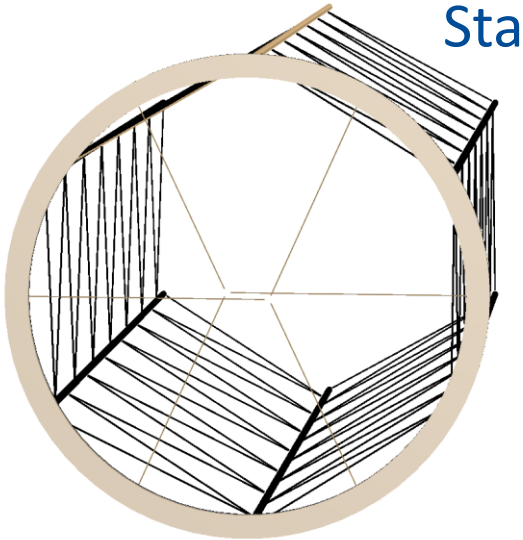
To reduce the dose to 1 mSv/hr

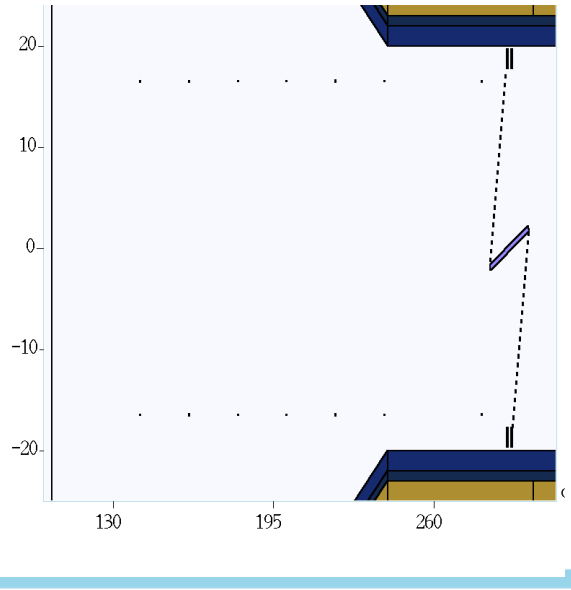
Kamran Vaziri

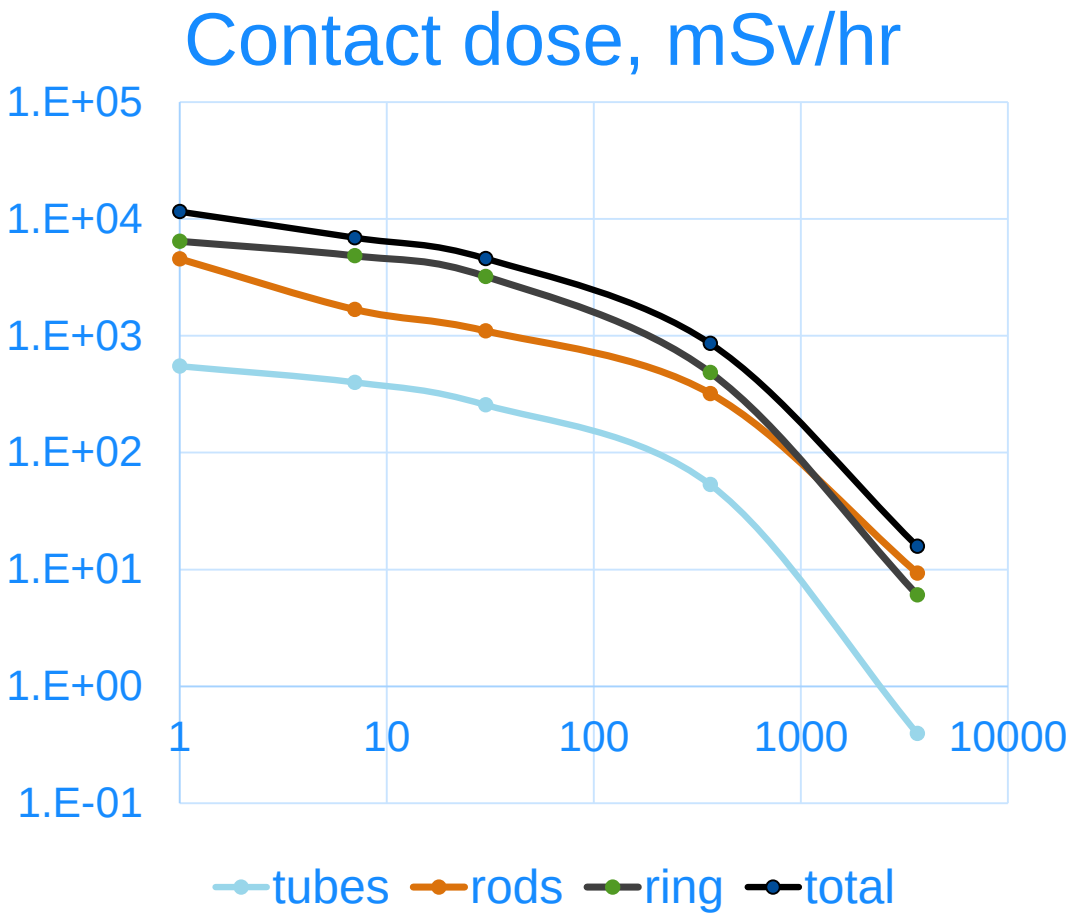
Fermilab

Space frame residual activation

Stainless steel (tubes and ring), W (rods), W(target)

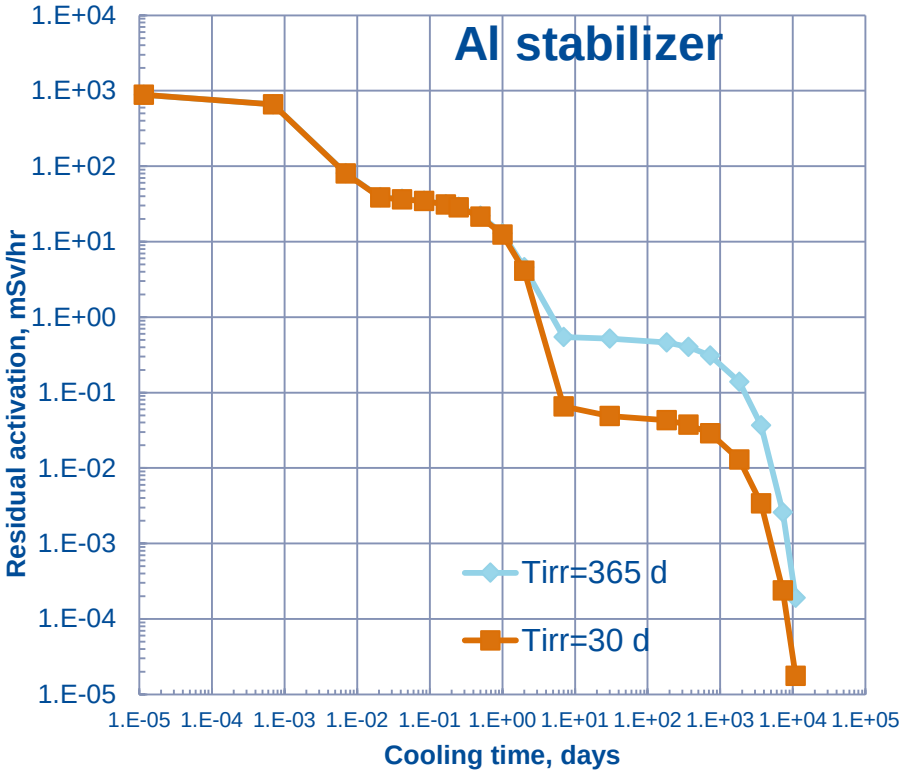


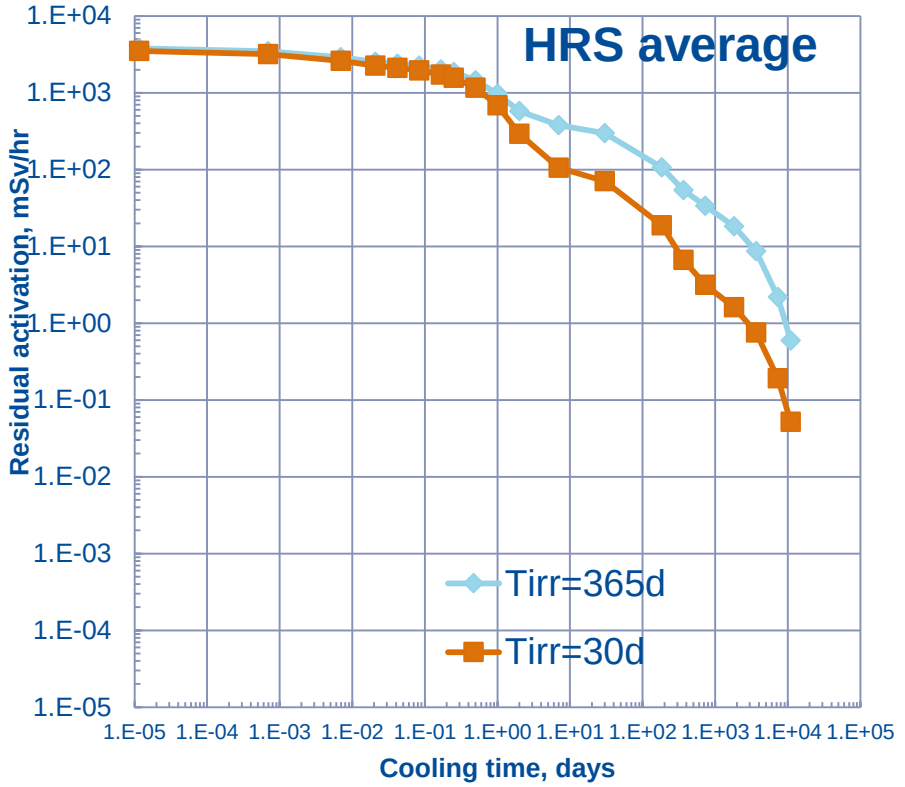




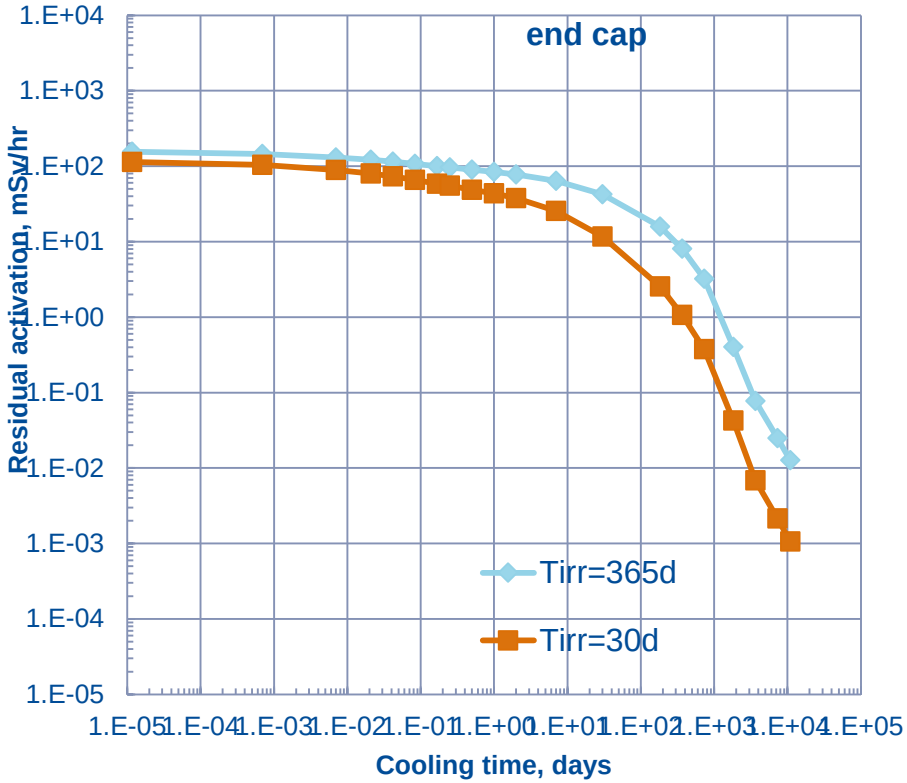
Fermilab

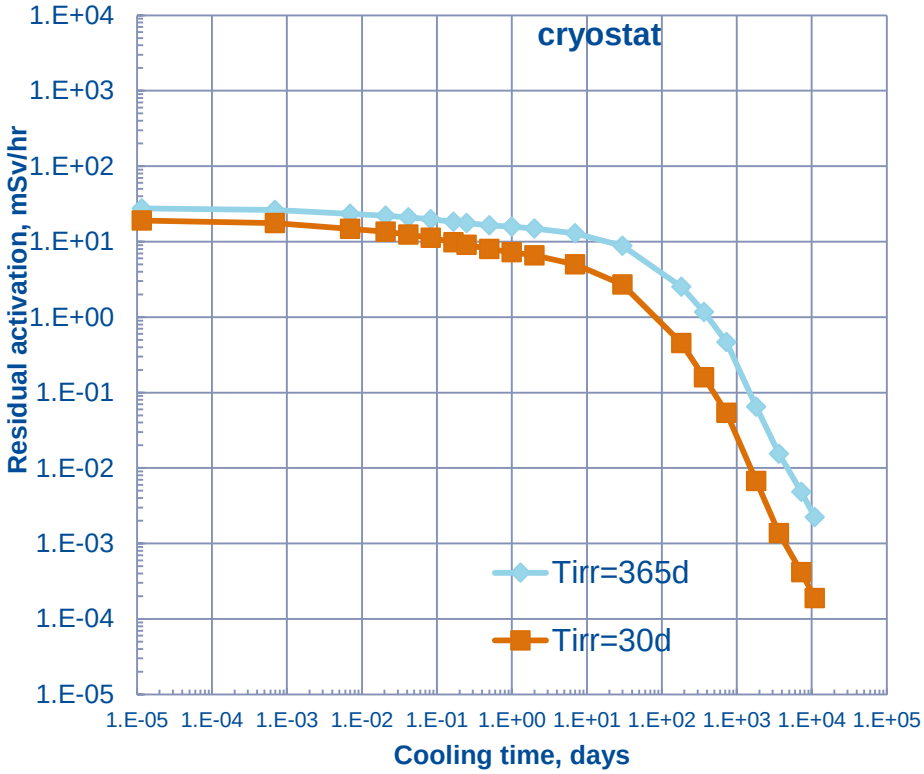
Contact dose on HRS and Al magnet stabilizer



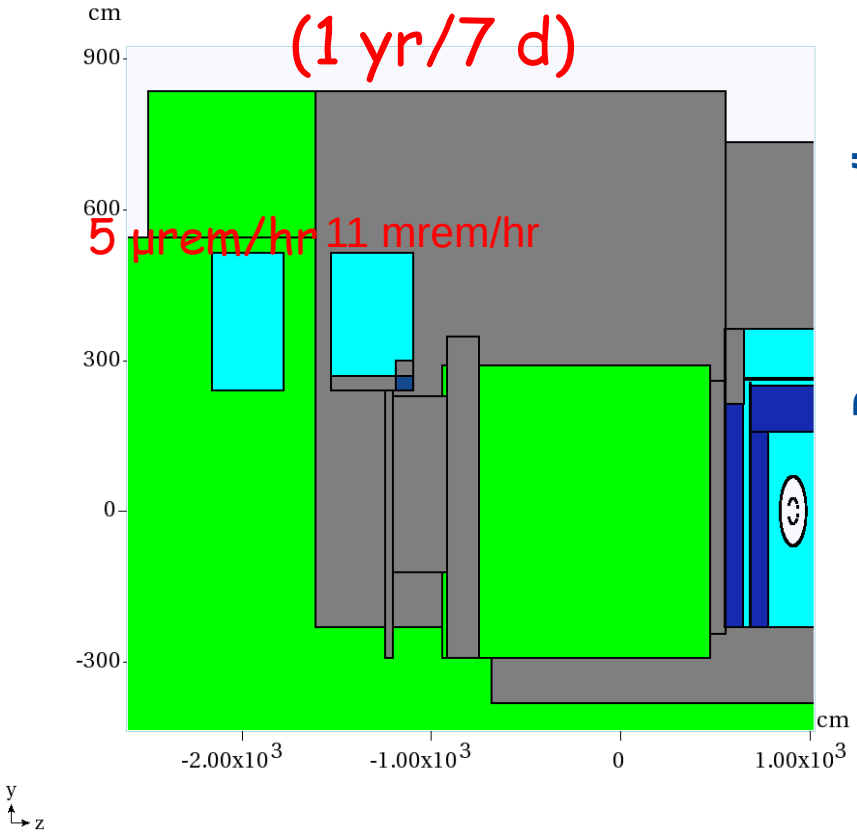


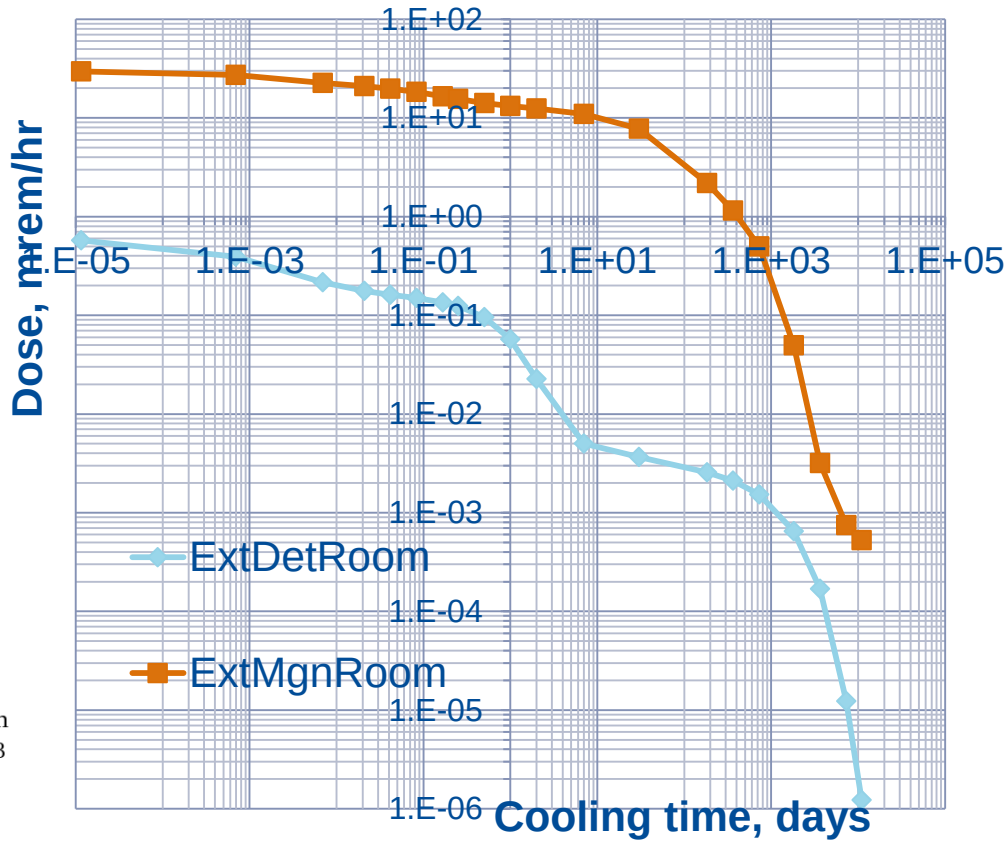
Contact dose on HRS and Al magnet stabilizer





Residual doses in the extinction rooms





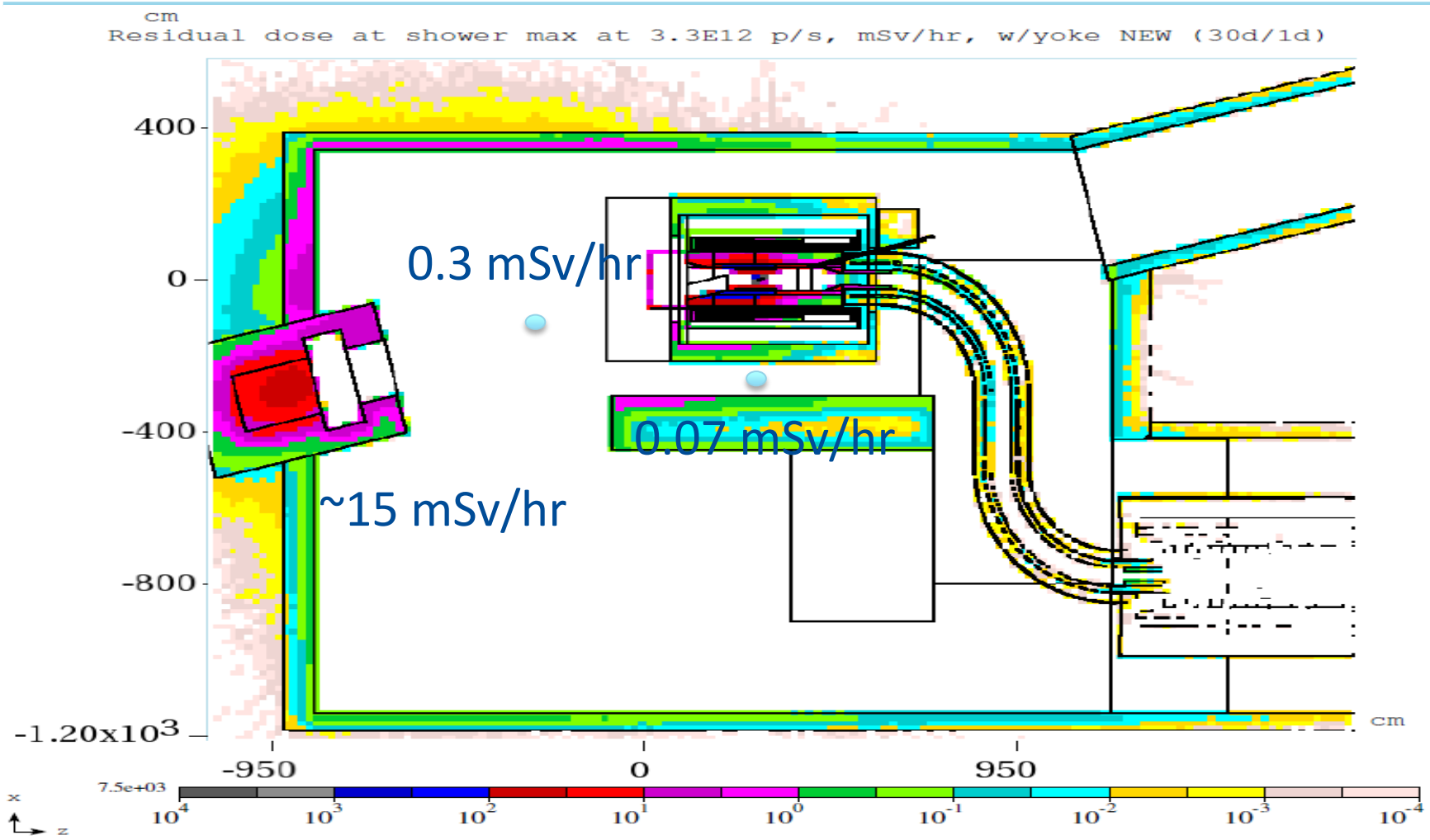
For 1 yr/ 4 hr the dose is 17 mrem/hr and 0.14 mrem/hr.
The doses are given at the centers of the rooms.

Residual doses in the RHR (1yr/7d), mrem/hr

Surface	Max	Min
Ceiling	1.9	0.08
Floor	1.6	0.1
West	0.3	0.1
East	0.2	0.09
North	0.04	0.03
South	1.3	0.1

The data bins are ~1x1 m sized

Residual dose due to the beam absorber



- irr\cool,d 1 2 7 30 183
  30 1.00E+00 4.10E-01 9.25E-02 4.69E-02 9.23E-03
  365 1.16E+00 5.68E-01 2.47E-01 8.54E-02 6.48E-02