Residual activation after the Mu2e baseline run and studies needed

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Mu2e-II workshop

Outline

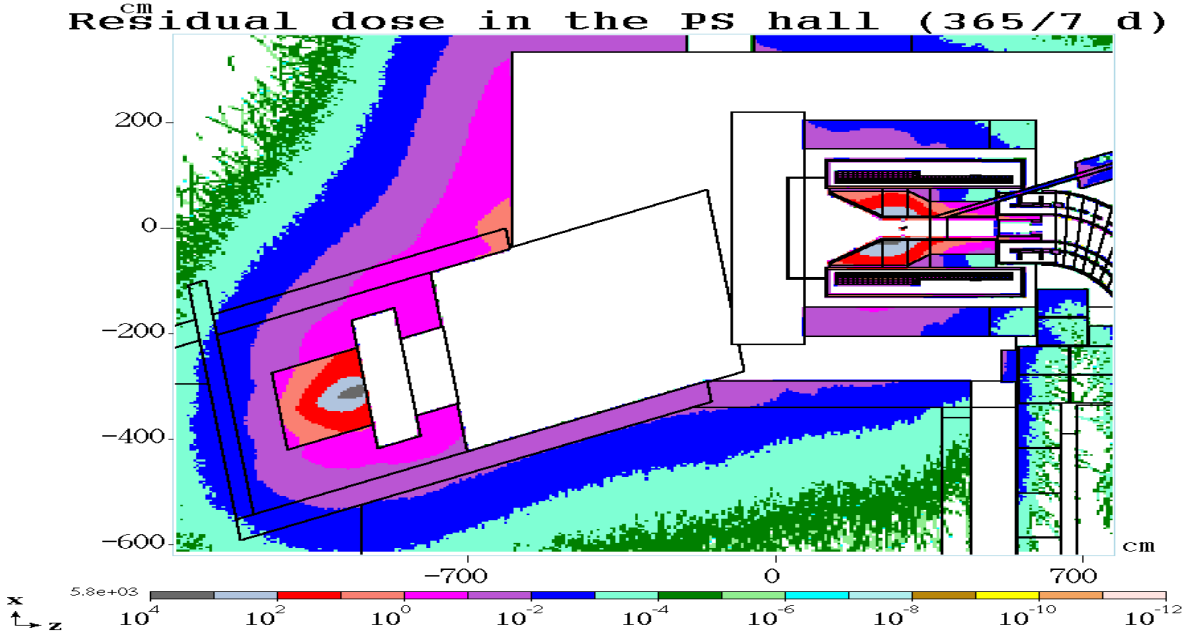
- Two kinds of residual doses:
- On contact with surfaces (the parts that need to be manually maintained or serviced, floor that is walked on)
- At a distance (from walls, equipment, if one has to walk there during maintenance). Takes into account contributions of radiation ”shining” from all walls, floor, ceiling, HRS, target, etc.
- Reference numbers:
- DOE and Fermilab limit is <= 5000 mrem/year for radiation workers.
- Radiation areas: 5 mrem/hr – 100 mrem/hr
- High Radiation area: 100 mrem/hr – 500 rad/hr (~500 rem/hr for gamma)

Residual doses on contact

1 yr of irradiation and 1 week of cooling time

V.Pronskikh, doc-db 5235, target elevation

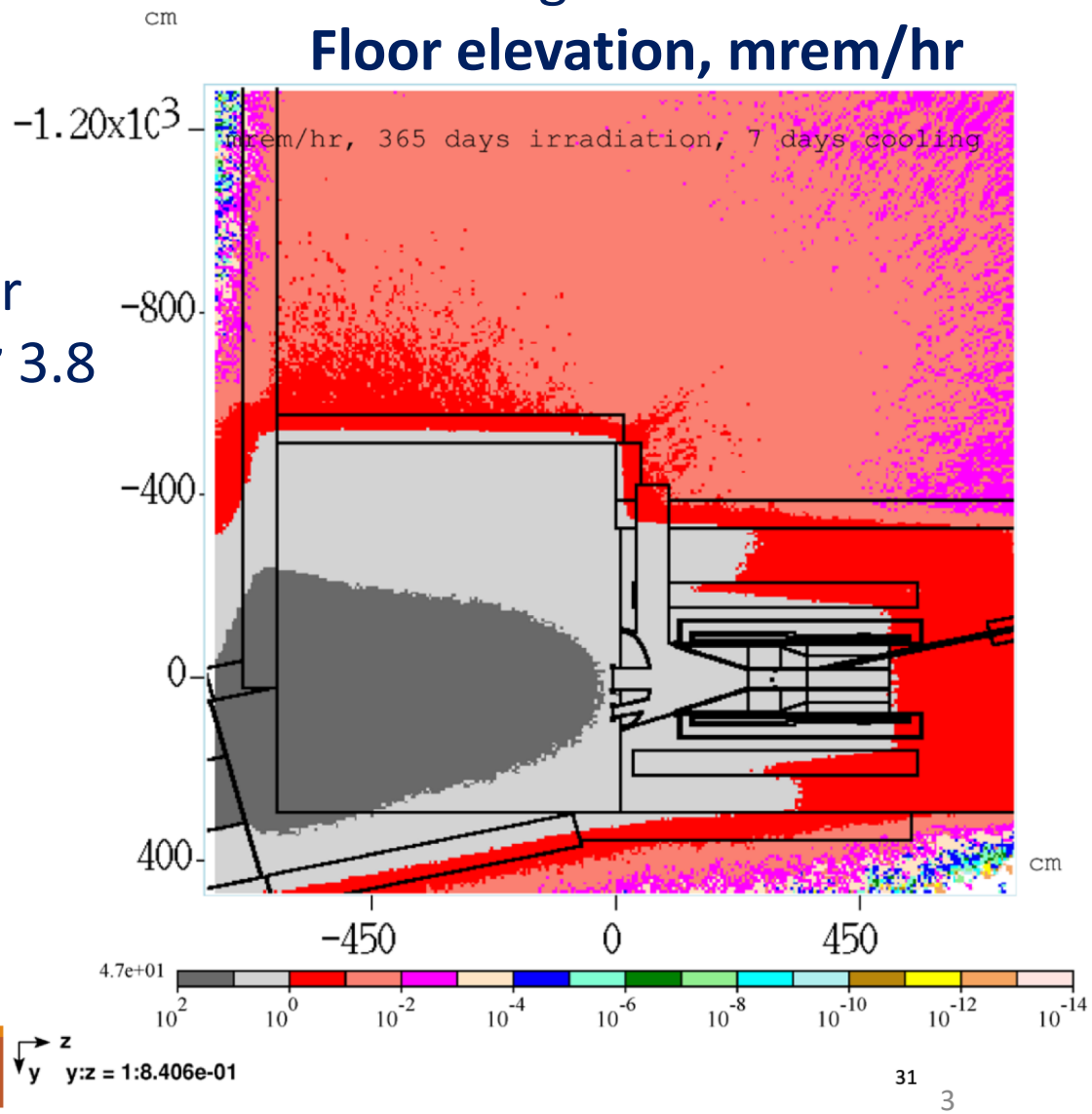
Peak in walls is ~500 mrem/hr, in floor ~50 mrem/hr
Scale factor in concrete (365d/7d) to (365d/183d) ~ 3.8



mSv/hr

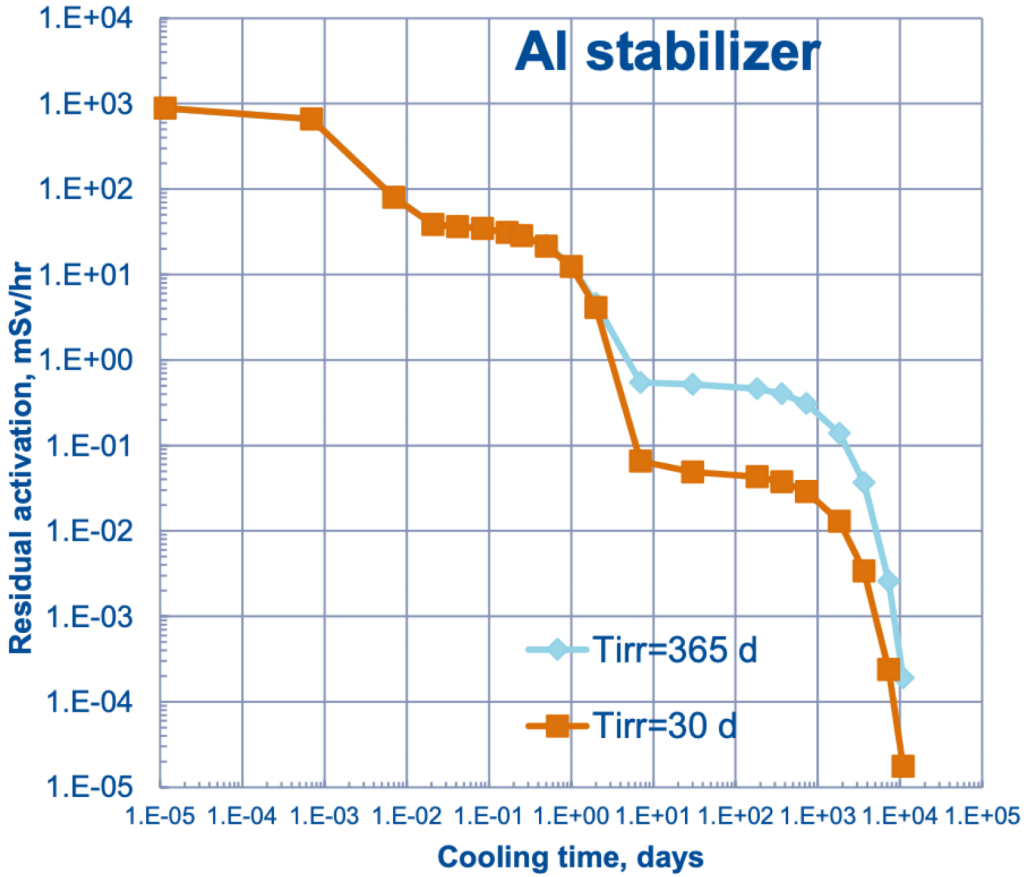
A.Leveling doc-db 5572

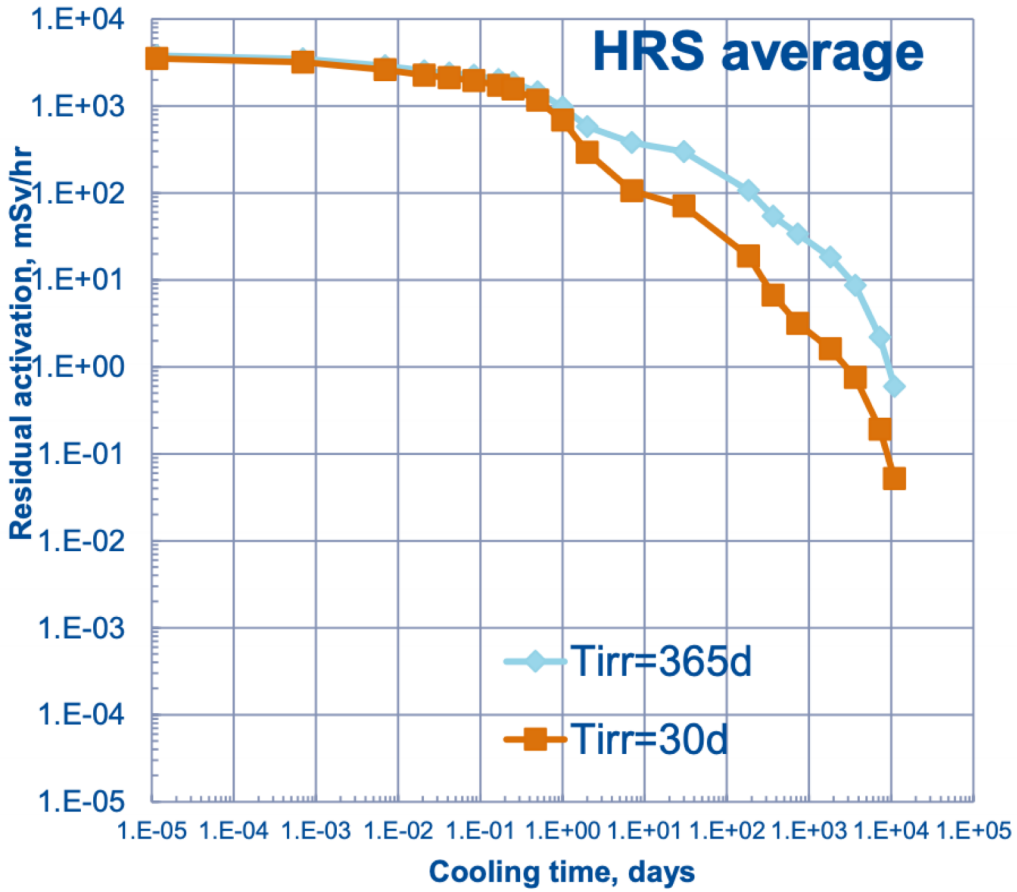
Floor elevation, mrem/hr



Residual dose on contact

V.Pronskikh doc-db **5188**





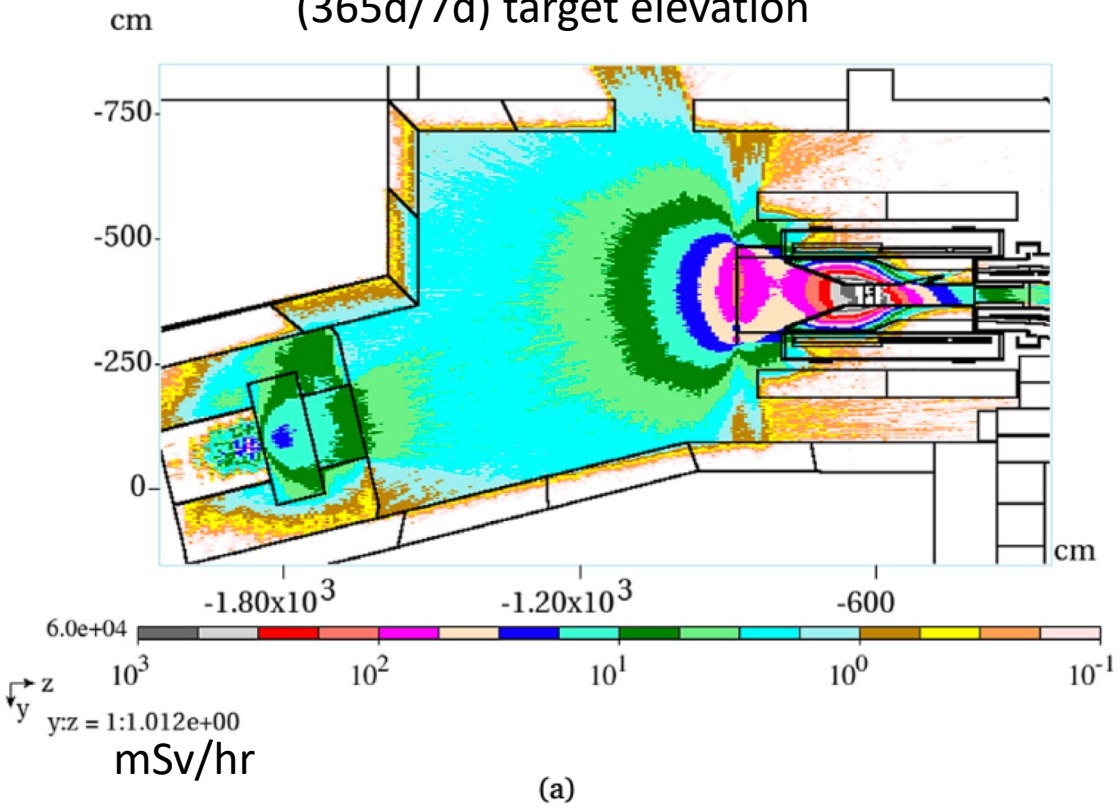
Options:

1) Replace HRS: how soon? Dose on surface (future study) ?

2) Re-use HRS (use robot to replace target) ?

Residual dose at a distance from equipment

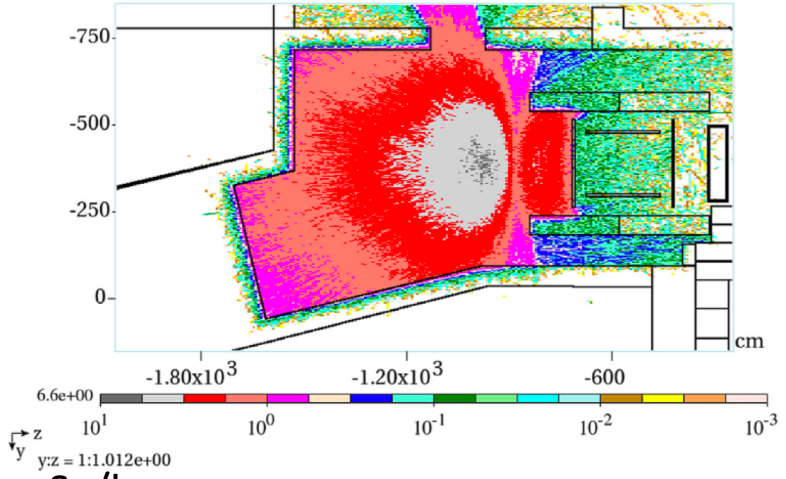
(365d/7d) target elevation



mSv/hr

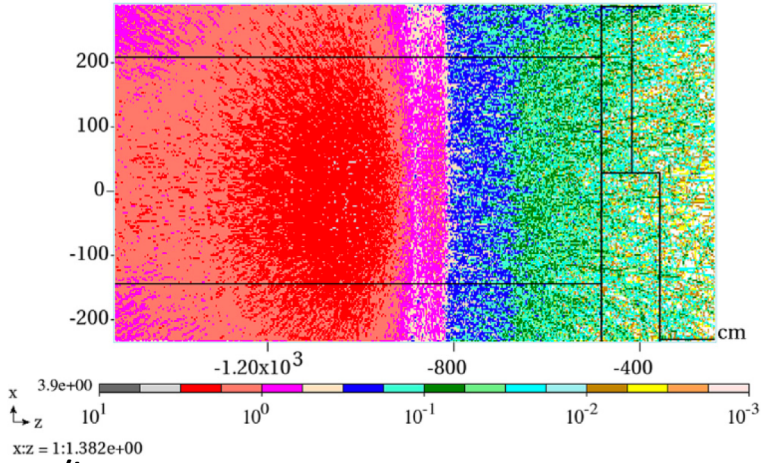
(a)

~30 cm above the floor (under HRS level)



mSv/hr

~40 cm away from the North wall



mSv/hr

(c)

Further study: 1)remove target, 2) remove HRS ?

The MARS15-based FermiCORD code system for calculation of the accelerator-induced residual dose by A. Grebe, A. Leveling, T. Lu, N. Mokhov, V. Pronskikh, *Nuclear Inst. and Methods in Physics Research, A 877 (2018) 339–345.*

Summary

- Peak contact doses in concrete elements of PS Hall are 50-500 mrem/hr floor/wall (365d/7d).
- Most maintenance areas in PS Hall have dose at a distance ~ few mSv/hr (~100 mrem/hr) (365d/7d)
  - Recalculate w/o target ?
  - Shield ?
  - Longer cooling times ?
- What to do with HRS after run ?