SoLID

Radiation and Activation with SoLID

Outline

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Director's Review: Replies to the Report

Areas of further investigation

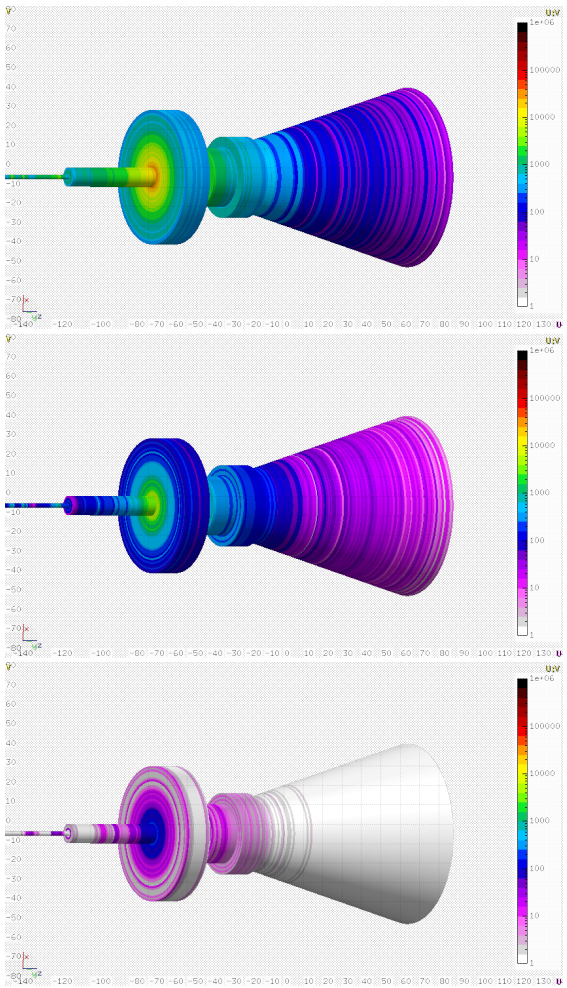
- Baffle material optimization
- More detailed study on radiation on magnet's coil
- More detailed on impact of radiation in the Hall with focus on areas where electronics will be present
- Planning on how to change from one SoLID configuration to another: Better understanding of effort involved and potential issues on radiation levels

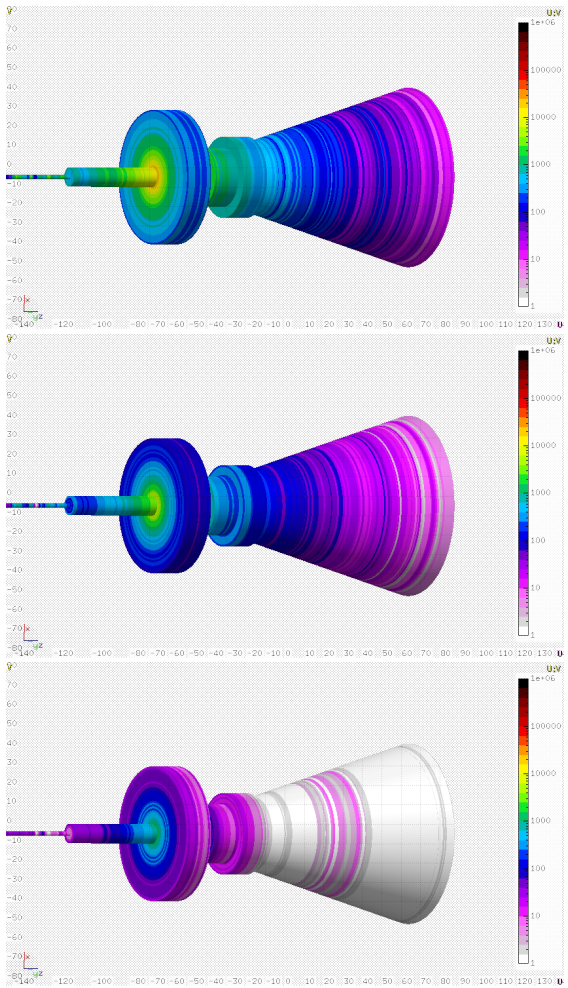
Baffle: Different Material Activation

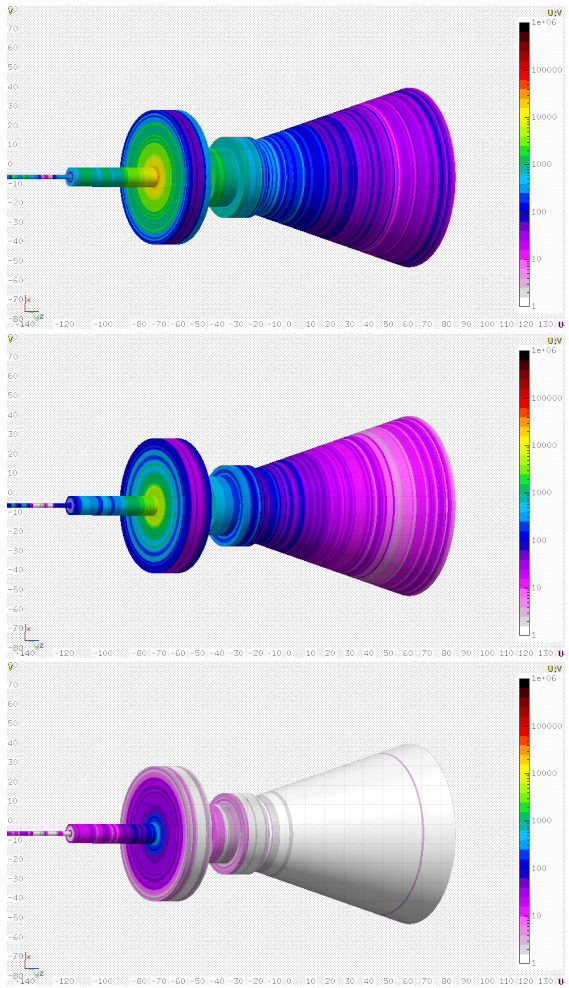
LEAD

COPPER

TUNGSTEN







Baffle: Different Material Activation

Baffle's material Activation

- Different material were tested for the first 3 layers of baffle/shielding
- At this presentation just shown the first baffle, but material dependence is comparable also for the other baffles analyzed
- Copper shows a longer decaying time for the activated isotopes (after 1month radiation is ¡ 1 order of magnitude respect to Lead and Tungsten)
- If Copper is chosen some shielding enclosure will be needed to be placed for dispose of the baffle.

Director's Review: Replies to the Report

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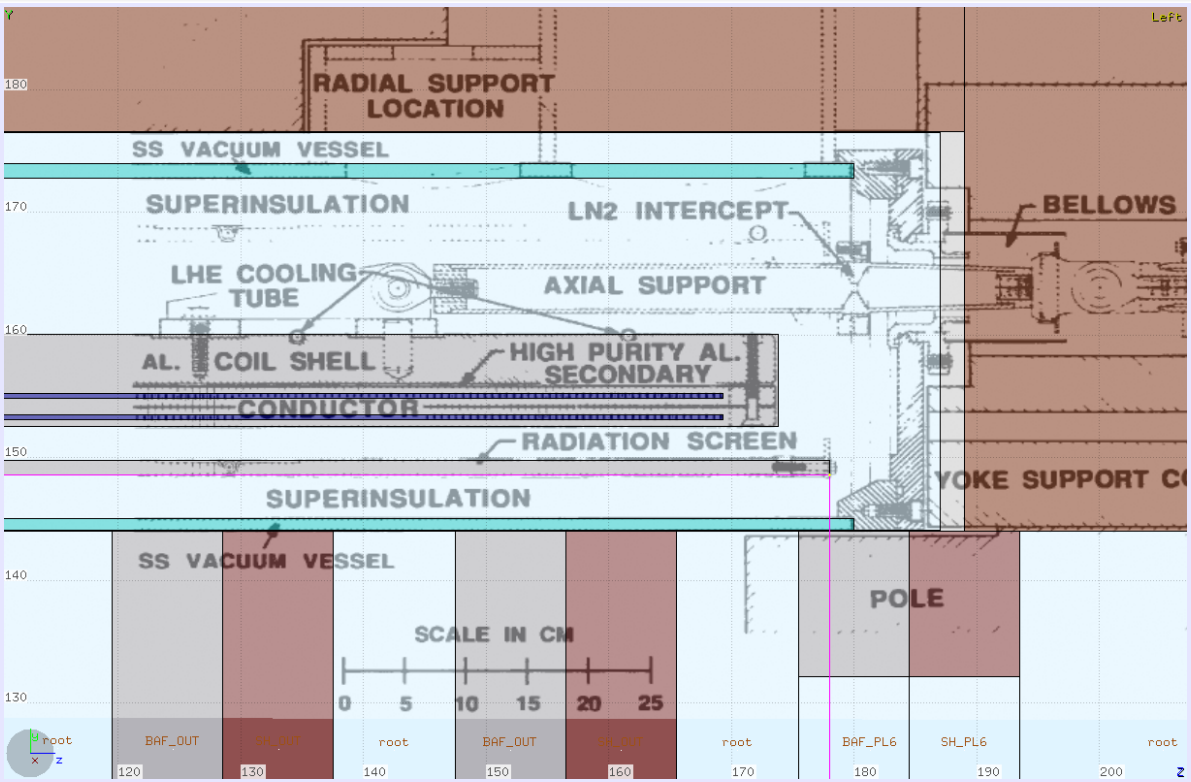
Lifetime on NbTi superconductor carried by SoLID

Updated Coil design to CLEO

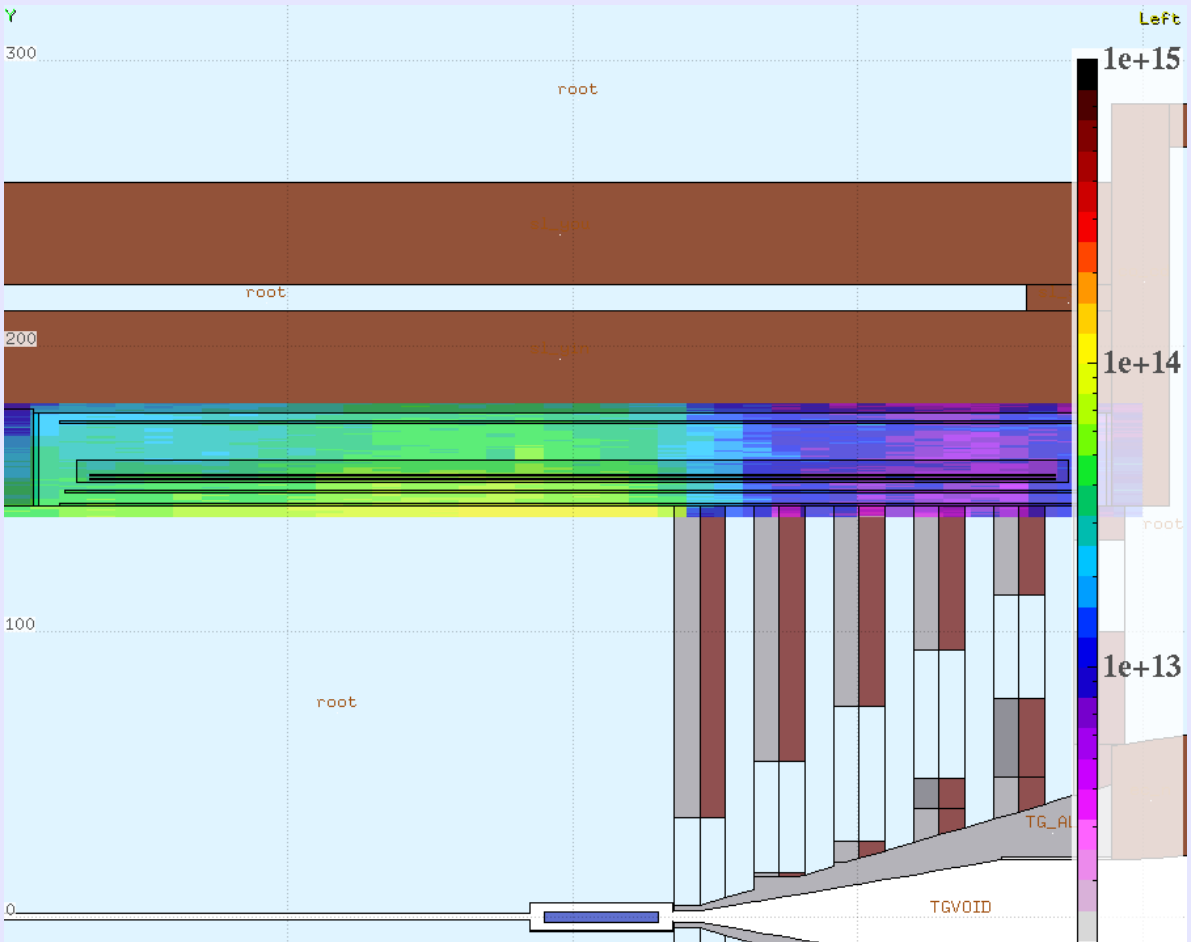
The PVDIS configuration with Deuterium target present the main source for neutron fluxes on the coils



Lifetime on NbTi superconductor carried by SoLID

Expected PVDIS neutron fluence $\frac{N}{cm^2}(E > 1MeV)$

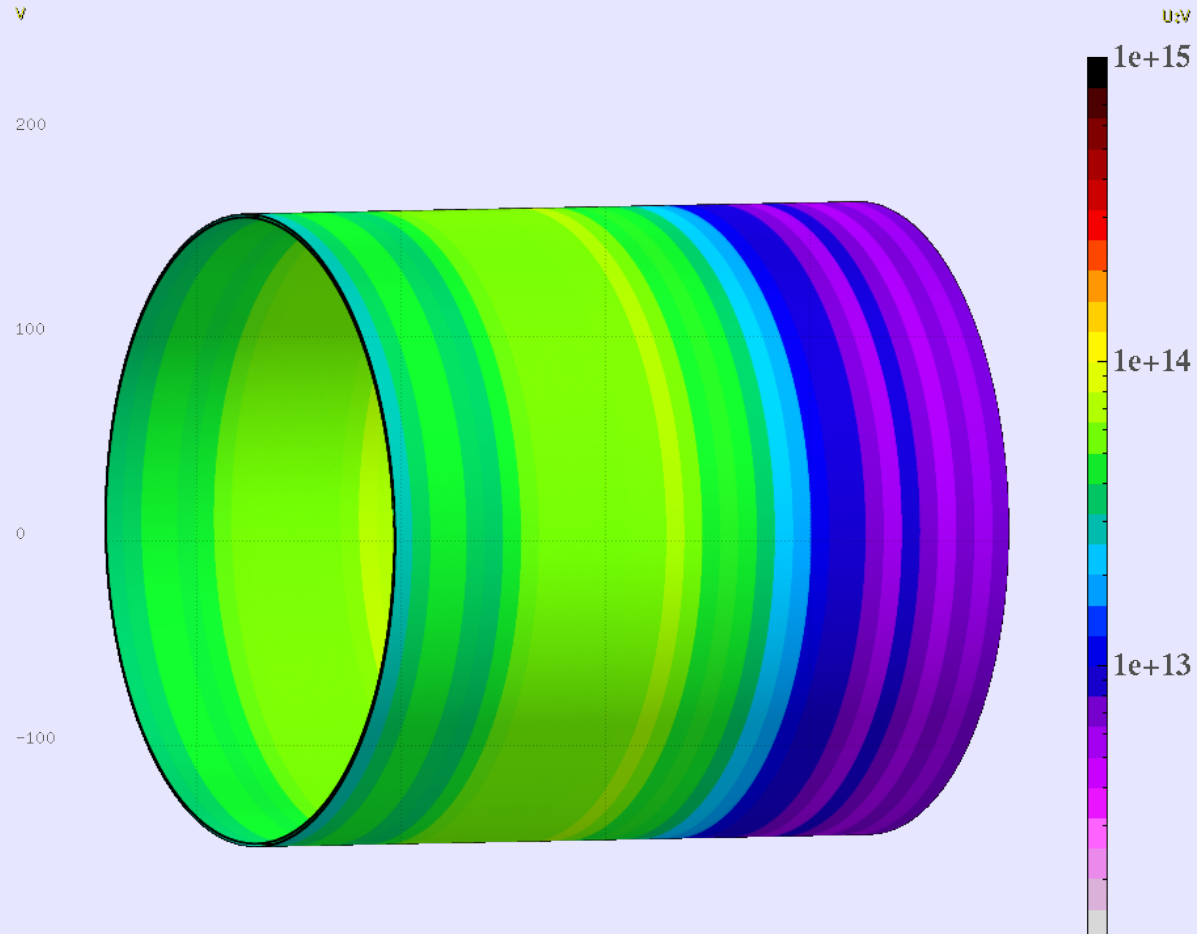
Dose for 2000h at $100\mu A$



Lifetime on NbTi superconductor carried by SoLID

Expected PVDIS neutron fluence $\frac{N}{cm^2}(E > 1MeV)$

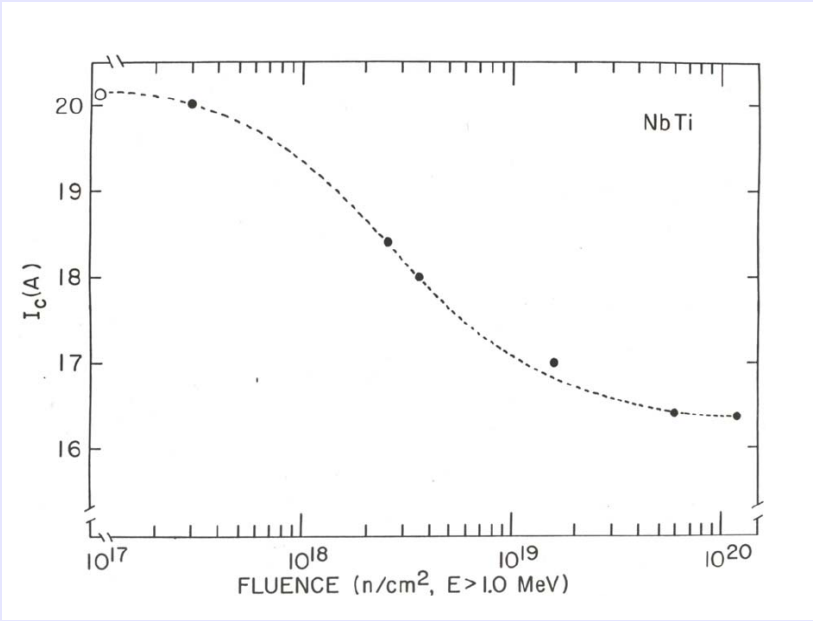
Dose for 2000h at $100\mu A$ (Flux on coils)



Lifetime on NbTi superconductor carried by SoLID

Expected PVDIS neutron fluence $\frac{N}{cm^2}(E > 1MeV)$

Dose



- A reduction of $\sim 20\%$ in I_c is expected in the range $2x10^{17} < \frac{N}{cm^2} < 2x10^{19}$
- **The expected accumulated fluence for PVDIS is $< 10^{14} \frac{N}{cm^2}$**

Director's Review: Replies to the Report

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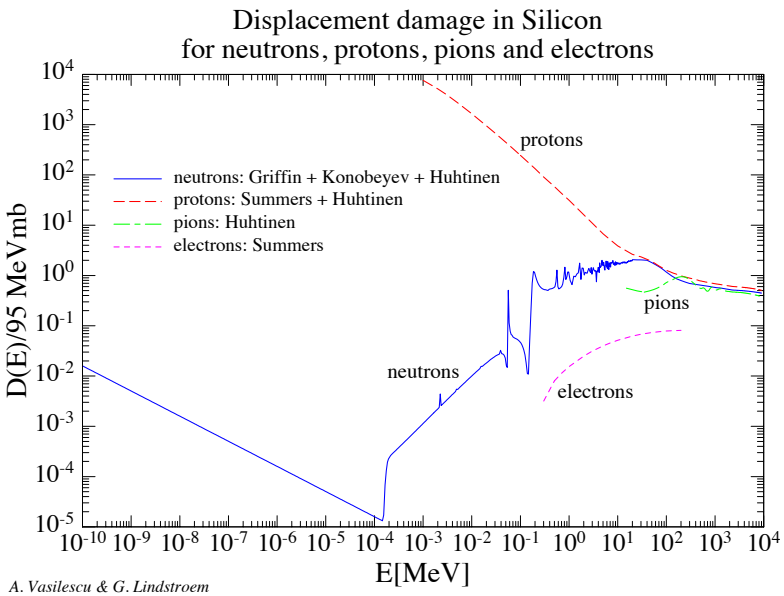
Radiation Estimates and Tolerance

Radiation Estimates



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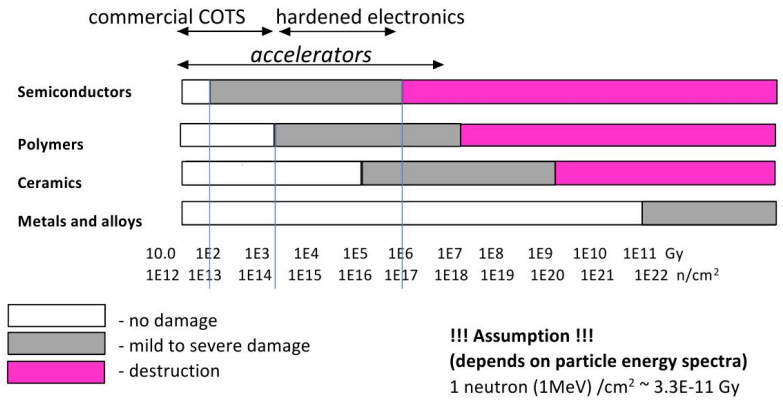
Tolerance (guideline)



!!! Assumption !!!
(depends on particle energy spectra)
1 neutron (1MeV) /cm² ~ 3.3E-11 Gy

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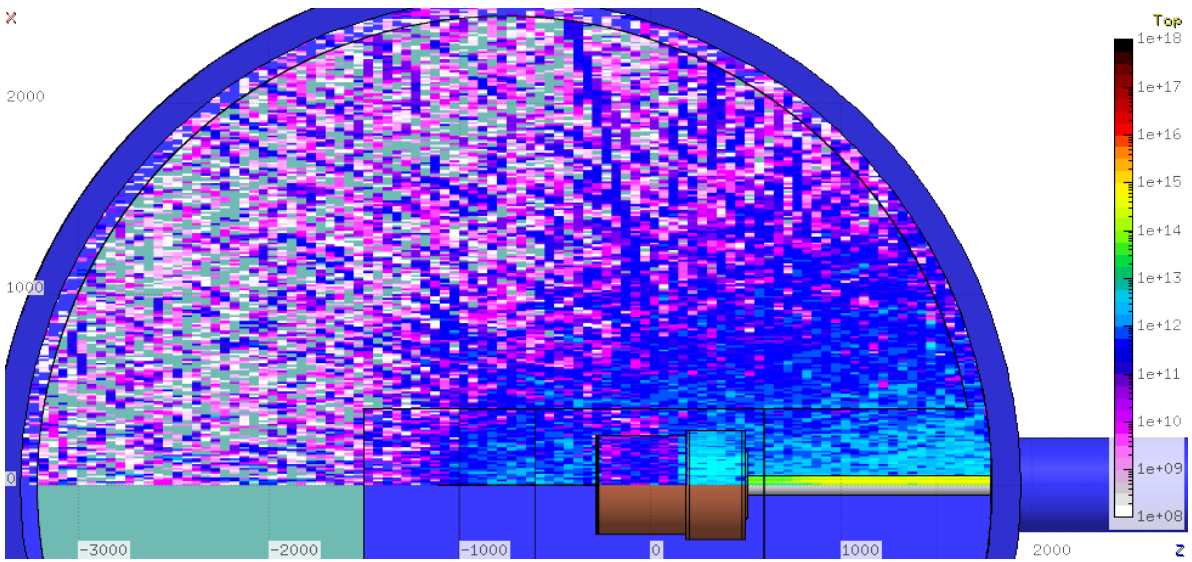
More detail on Radiation in the Hall

Updating design

- Outside the beamline enclosure (2m) accumulated radiation dose should be below the 10^{13} $\left(\frac{1MeVNeutron}{cm^2}\right)$
- At this level of accumulated radiation no expected damage is expected to detectors



Director's Review: Replies to the Report

Areas of further investigation

- Baffle material optimization (more detail here) V
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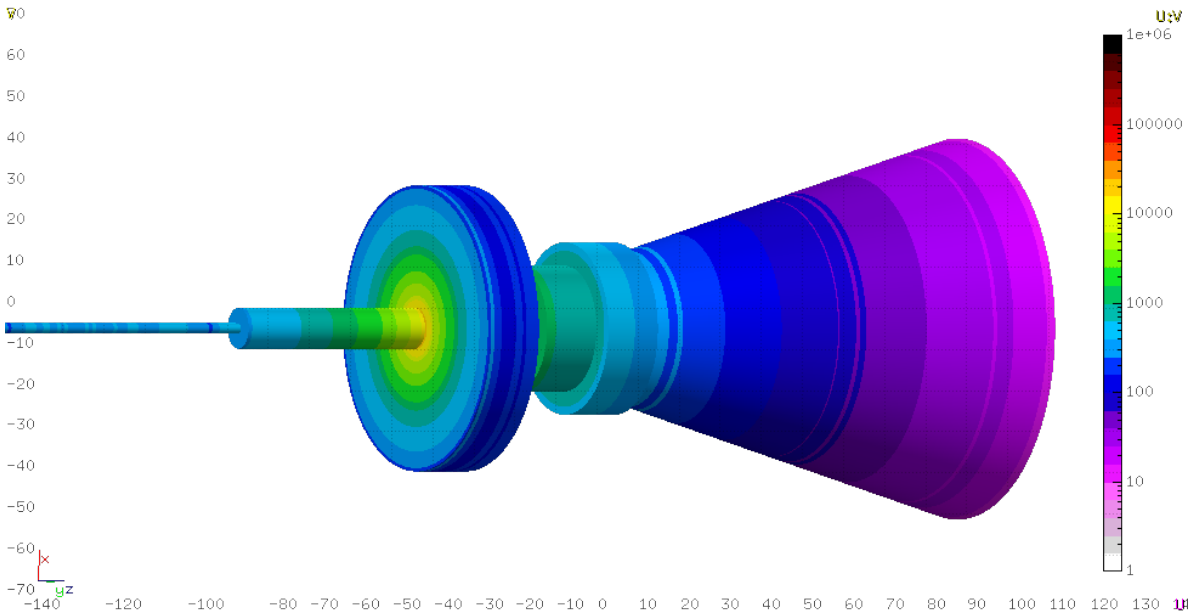
- Planning on how to change from one SoLID configuration to another: Better understanding of effort involved and potential issues on radiation levels (shown here)

Change of SoLID configurations

Considering just radiation level issues

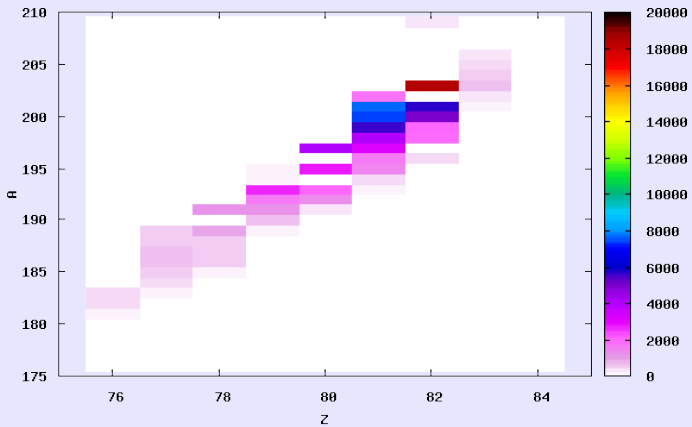
The PVDIS configuration with Deuterium target presents strong activation on the first baffle



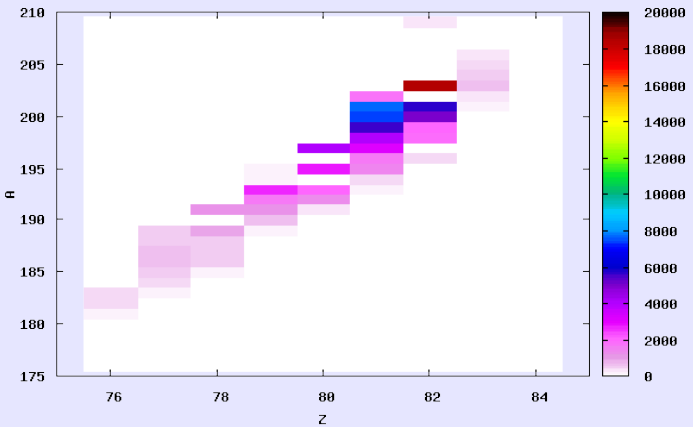
Change of SoLID config: baffle activation for PVDIS

Residual Nuclei (Main nuclei ^{203}Pb with half-life $\sim 52 hours$)

After 1hour from irradiation



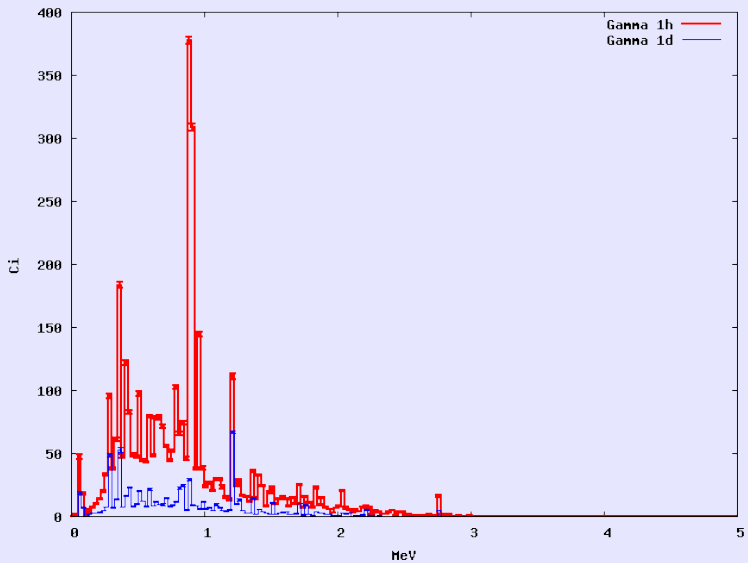
After 1day from irradiation



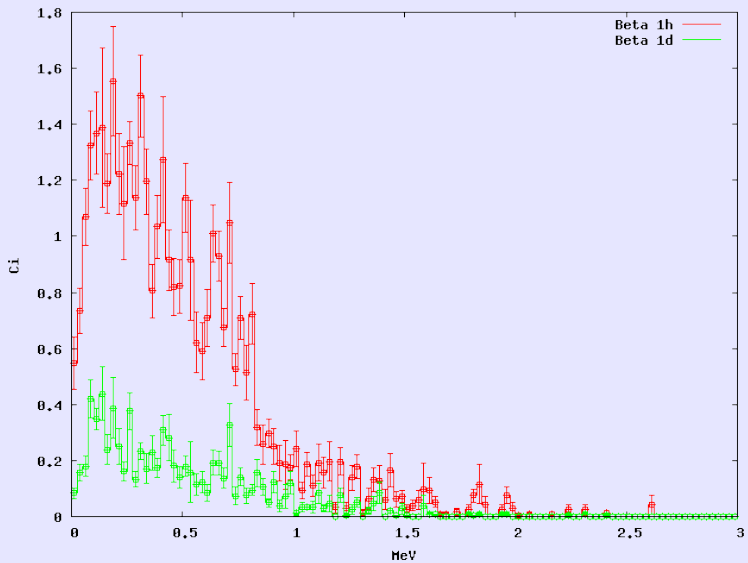
Change of SoLID config: baffle activation for PVDIS

Spectrum from activation

Gamma



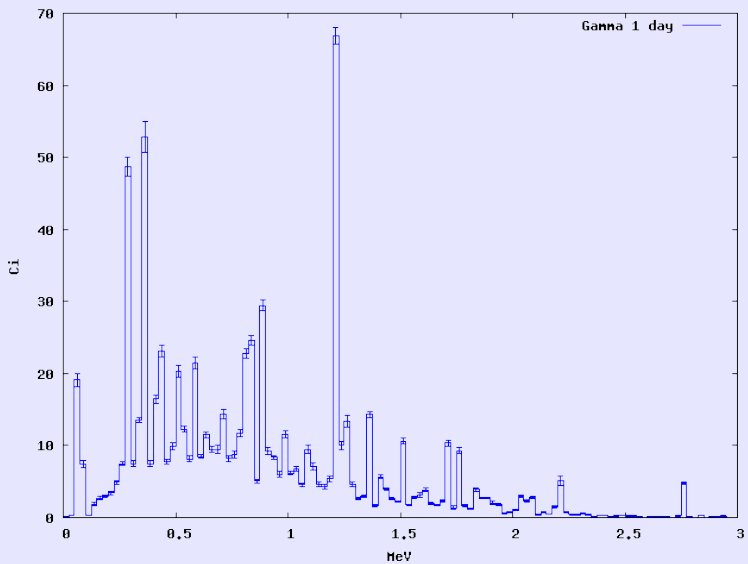
Beta



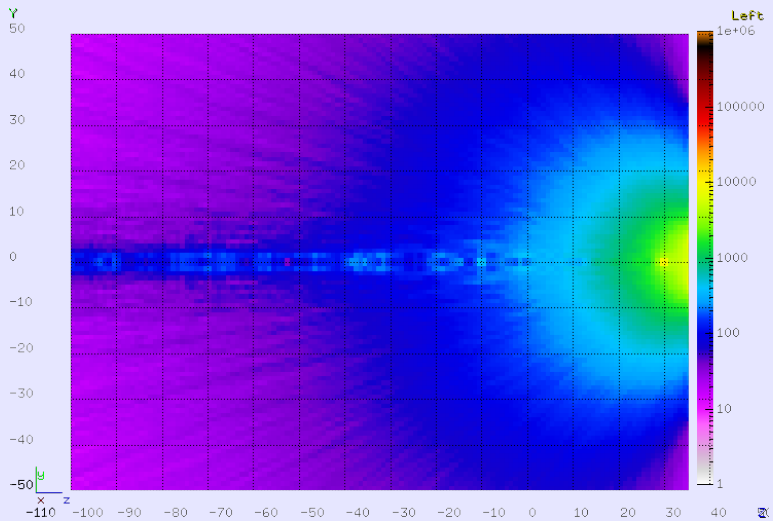
Change of SoLID config: baffle activation for PVDIS

Goal for activation $\Rightarrow < 10 mrem/h$

Gamma Spectrum after 1day



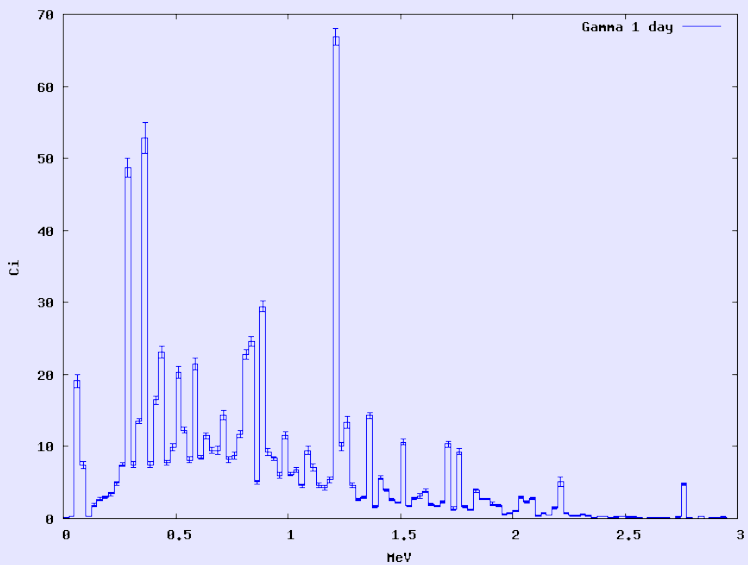
Dose (mrem/h) after 1 day
(ZY plane; baffle at 35cm)



Change of SoLID config: baffle activation for PVDIS

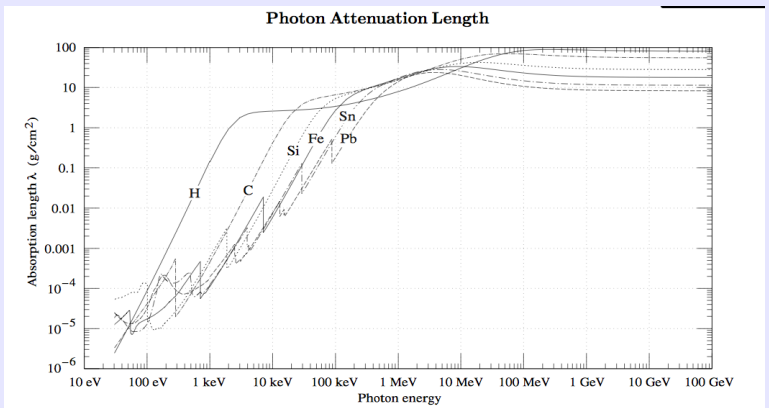
Goal for activation $\Rightarrow < 10 mrem/h$

Gamma Spectrum after 1day

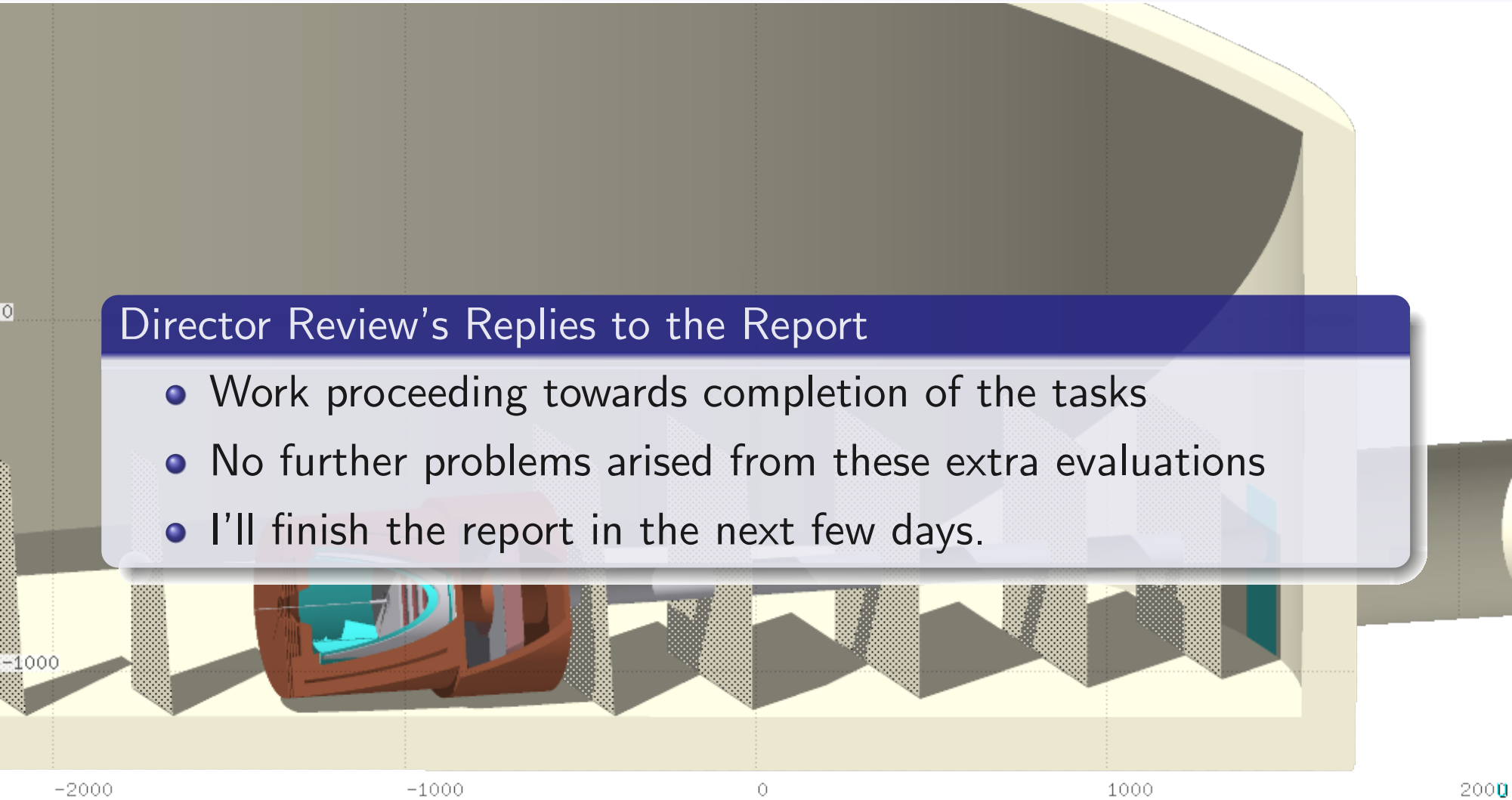


$\sim 8cm$ of Lead for goal

- factor of ~ 20 reduction
- (Real baffle has 50% of this activation)



Conclusions



Director Review's Replies to the Report

- Work proceeding towards completion of the tasks
- No further problems arised from these extra evaluations
- I'll finish the report in the next few days.