Radiation and Activation with SoLID

Outline

Lorenzo Zana

The University of Edinburgh

August 27, 2016

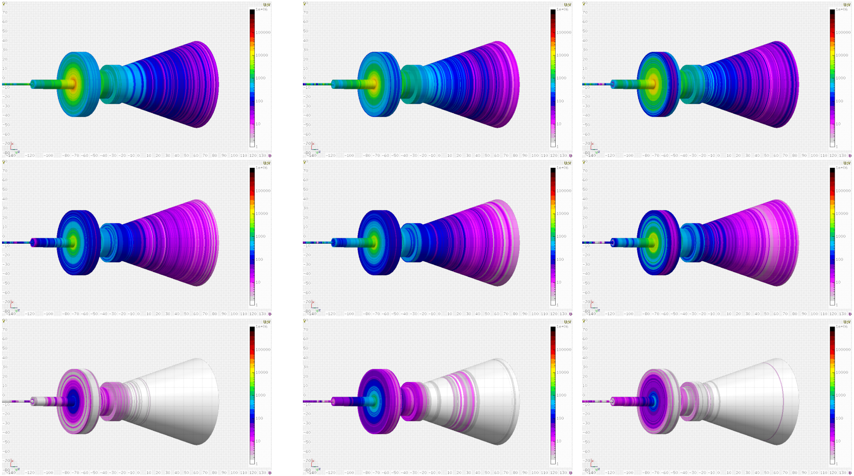
Director's Review: Suggestions

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
- Complete the set of possible configurations

Baffle Activation

LEAD | COPPER | TUNGSTEN



Baffle 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: Suggestions

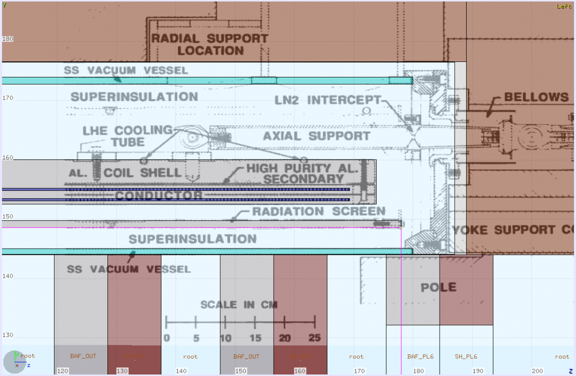
Areas of further investigation

- Baffle material optimization (more detail here)V
- 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
- Complete the set of possible configurations

Lifetime on NbTi superconductor carried by SoLID

Updated Coil design to CLEO

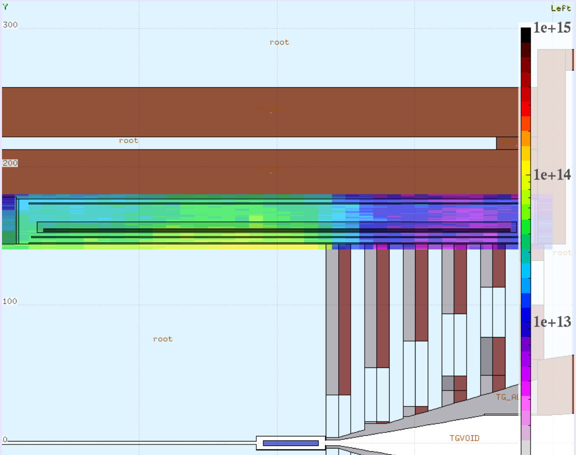
The PVDIS configuration with Deuterium target present the main source for neutron fluxes on the coils



Lifetime on NbTi superconductor carried by SoLID

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

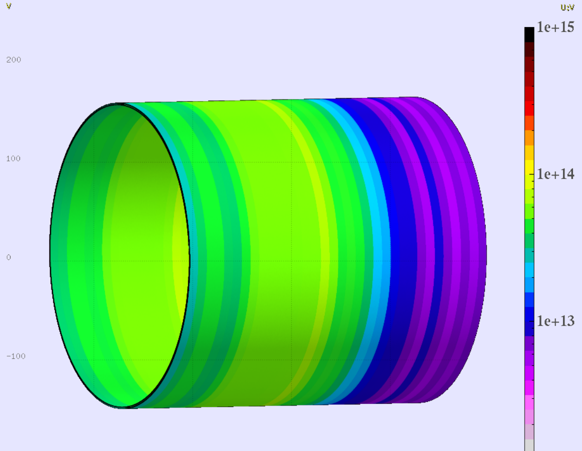
Dose for 2000h at $100\mu A$



Lifetime on NbTi superconductor carried by SoLID

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

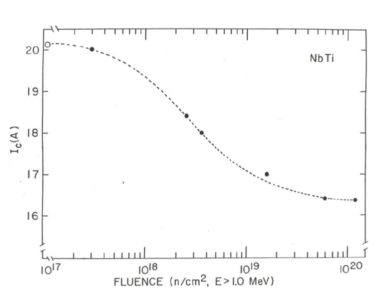
Dose for 2000h at $100\mu A$ (Flux on coils)



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 $< 10^{14}\frac{N}{cm^2}$**

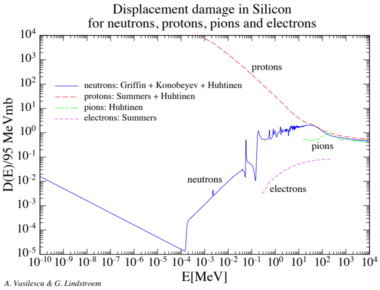
Director's Review: Suggestions

Areas of further investigation

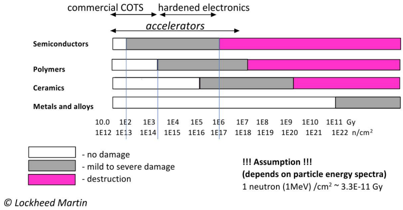
- Baffle material optimization (more detail here) V
- More detailed study on radiation on magnet's coil (more detail here) V
- More detailed on impact of radiation in the Hall with focus on areas where electronics will be present (Shown here)
- Complete the set of possible configurations

Radiation Estimates and Tolerance

Radiation Estimates



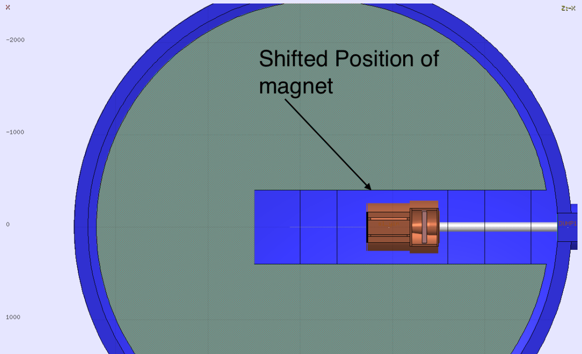
Tolerance (guideline)



More detail on Radiation in the Hall

Updating design

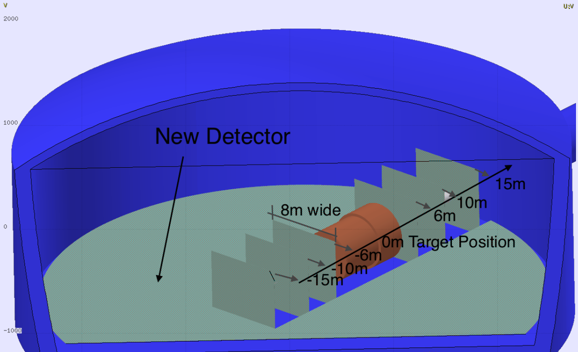
- Shifted position of the Magnet in the Hall
- Placed extra scan plane at 1m from the ground
- After simulation I will be able to scan the full Hall



More detail on Radiation in the Hall

Updating design

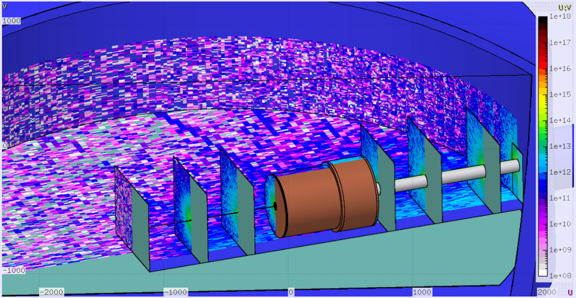
- Shifted position of the Magnet in the Hall
- Placed extra scan plane at 1m from the ground
- After simulation I will be able to scan the full Hall



More detail on Radiation in the Hall

Updating design

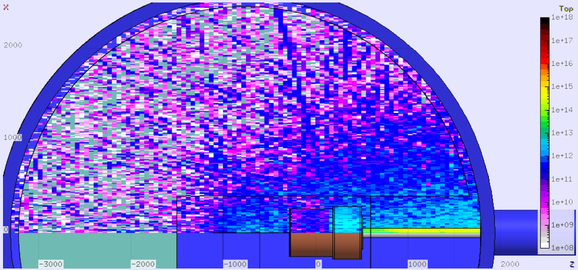
- Outside the beamline enclosure (2m) accumulated radiation dose should be below the $10^{13}\left(\frac{1MeVNeutron}{cm^2}\right)$
- At this level of accumulated radiation no expected damage is expected to detectors



More detail on Radiation in the Hall

Updating design

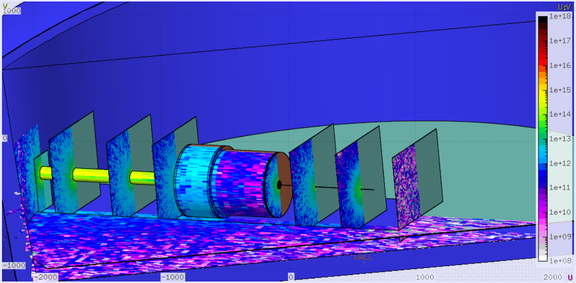
- Outside the beamline enclosure (2m) accumulated radiation dose should be below the $10^{13}\left(\frac{1MeVNeutron}{cm^2}\right)$
- At this level of accumulated radiation no expected damage is expected to detectors



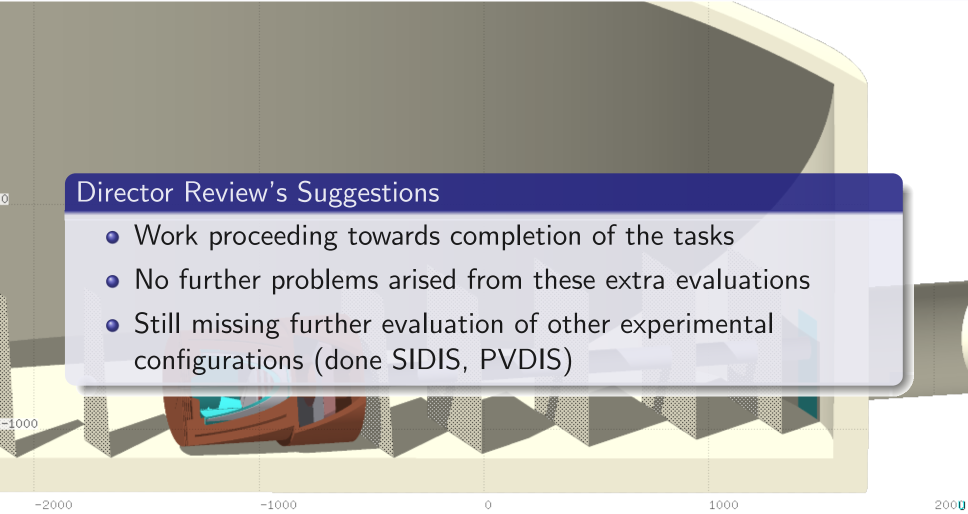
More detail on Radiation in the Hall

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



Conclusions



Director Review's Suggestions

- Work proceeding towards completion of the tasks
- No further problems arised from these extra evaluations
- Still missing further evaluation of other experimental configurations (done SIDIS, PVDIS)