SoLID

Radiation and Activation with SoLID

Outline

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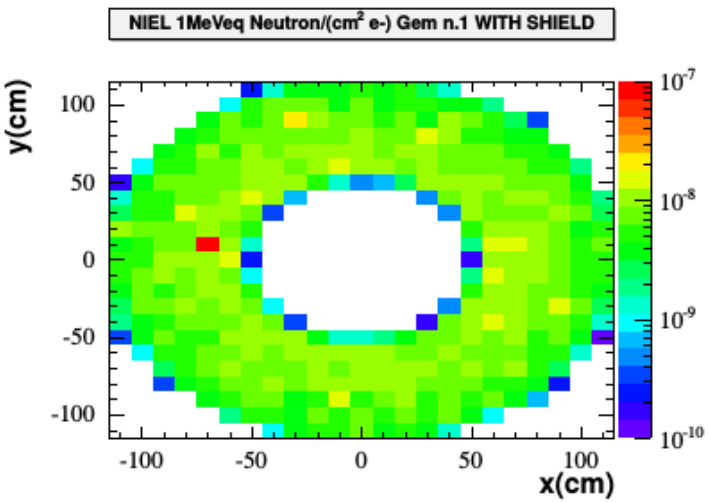
Director's Review: Replies to the Report

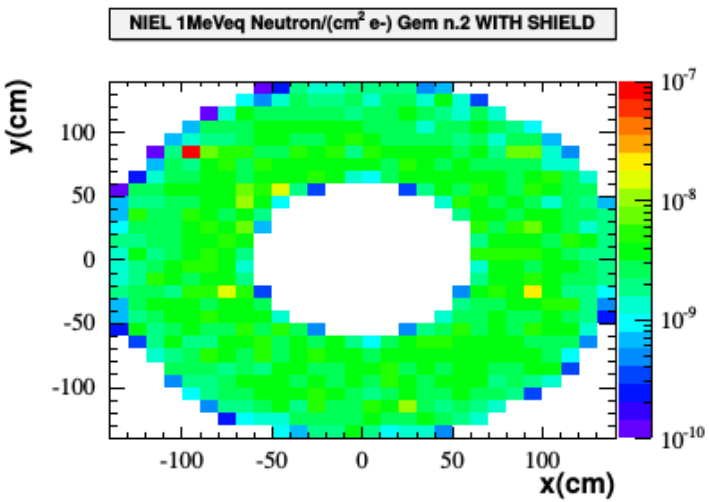
Areas of further investigation

- 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
- Complete different configurations for SoLID

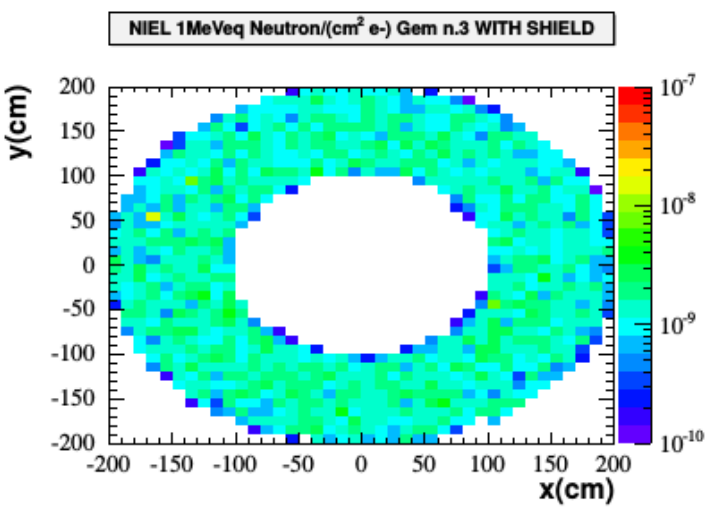
Updates in pCDR : GEM radiation

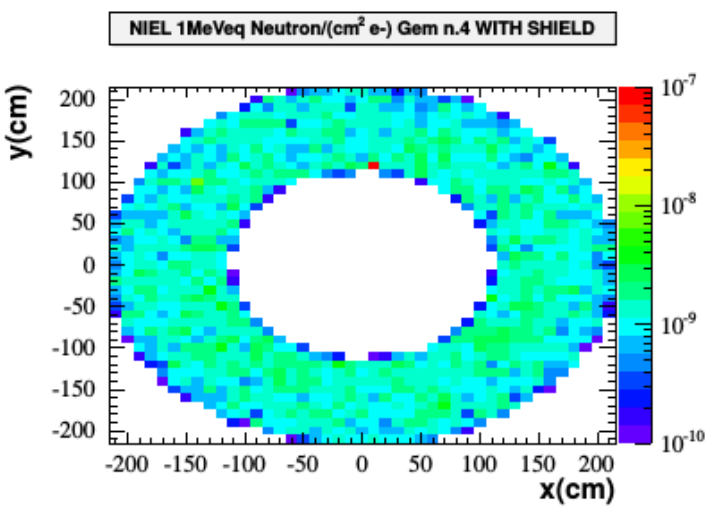


(a) NIEL weighted 1MeV equivalent neutron flux per cm^2 per incident electron on the 1^{st} GEM foil



(c) NIEL weighted 1MeV equivalent neutron flux per cm^2 per incident electron on the 2^{nd} GEM foil



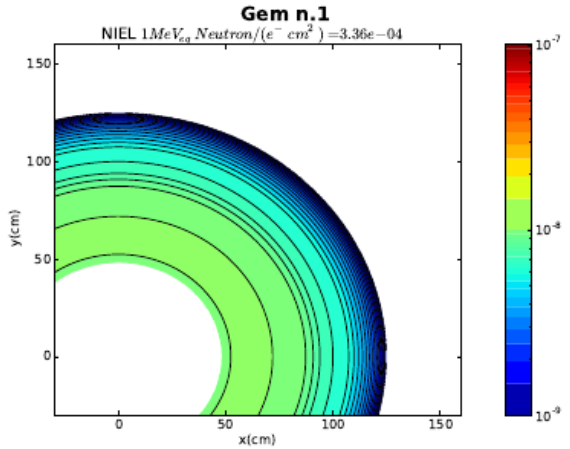


Updates in pCDR : GEM radiation

Radiation on GEMs

- Statistical fluctuation were causing fluctuations in some areas
- The fluctuation due to the baffle design in front of the GEMs (ϕ rotation) was negligible respect to the variation over polar angle
- Statistic was increased 4 times and a circular binning was used in order to use the found ϕ simmetry. No difference, assuming statistical fluctuation from the previous study.

Updates in pCDR : GEM radiation



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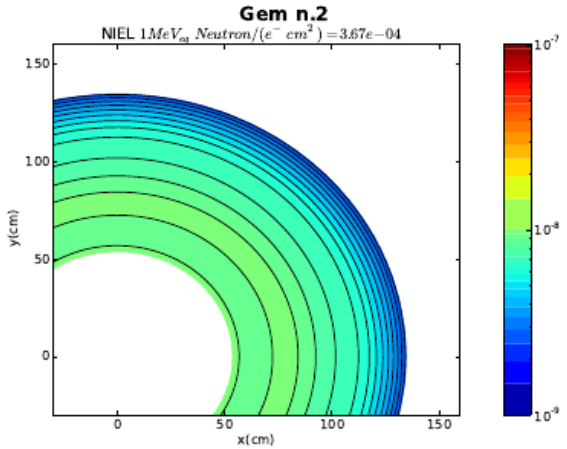
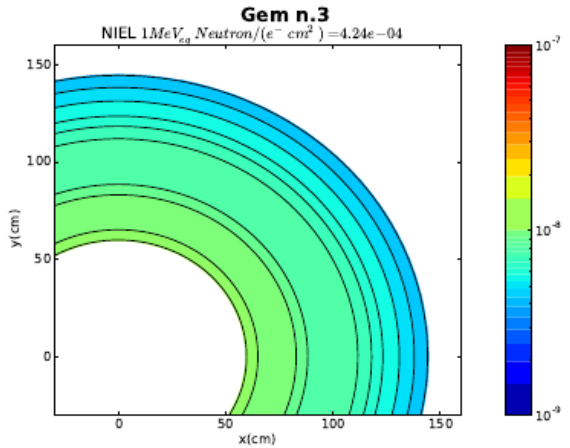
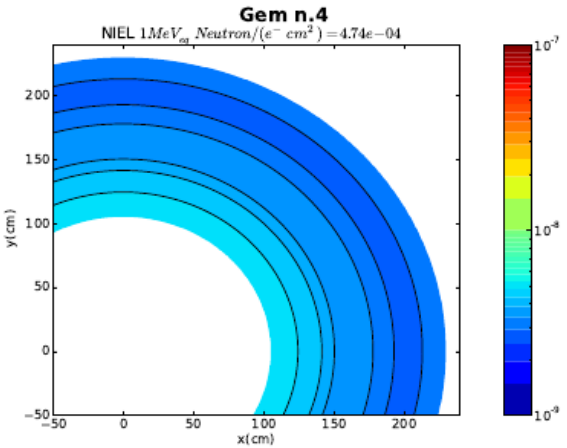


(c) NIEL weighted 1MeV equivalent neutron flux per cm^2 per incident electron on the 2^{nd} GEM foil

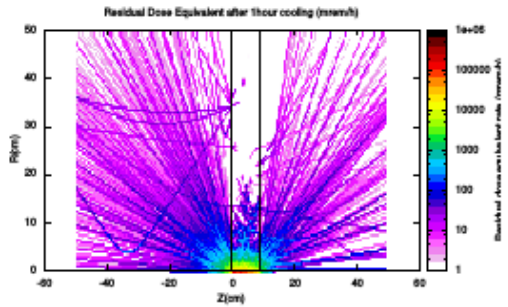


(b) NIEL weighted 1MeV neutron equivalent neutron flux per cm^2 per incident electron on the 3^{rd} GEM foil

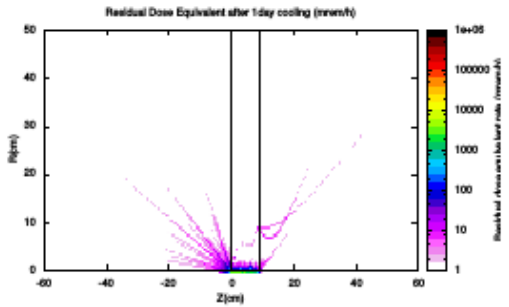


(d) NIEL weighted 1MeV equivalent neutron flux per cm^2 per incident electron on the 4^{rt} GEM foil

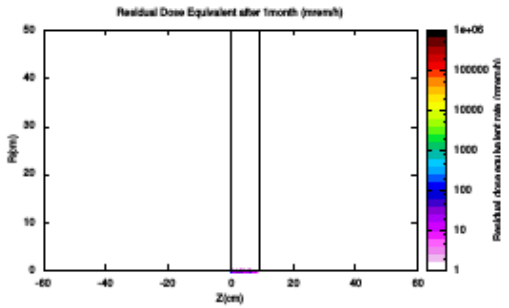
Updates in pCDR : Baffle optimization



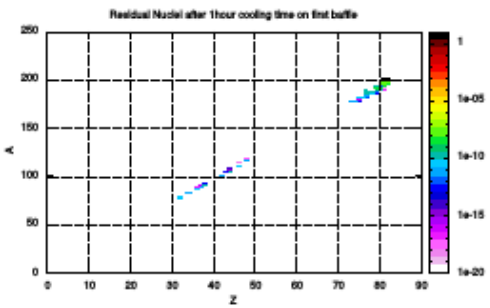
(a) Activation 1hour cooling



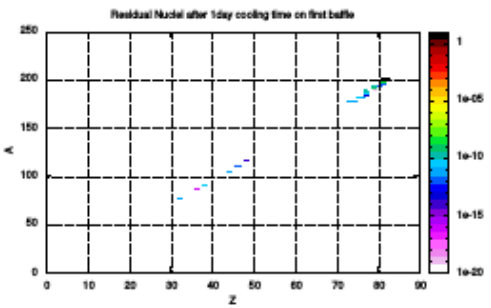
(b) Activation 1day cooling



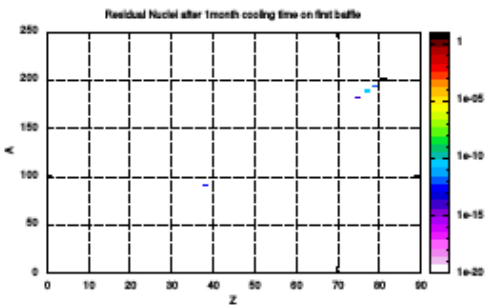
(c) Activation 1month cooling



(d) Residual 1hour cooling



(e) Residual 1day cooling



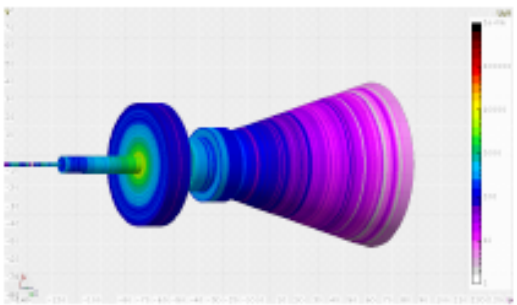
(f) Residual 1month cooling

Updates in pCDR : Baffle optimization

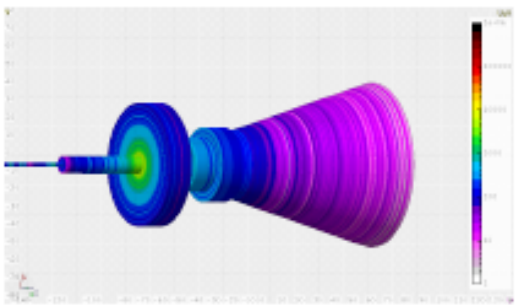
Baffle optimization: Activation

- Activation was studied at different times from beam exposure
- Activation was studied for different baffle materials
- Increased statistic studies are available (see my previous presentation)

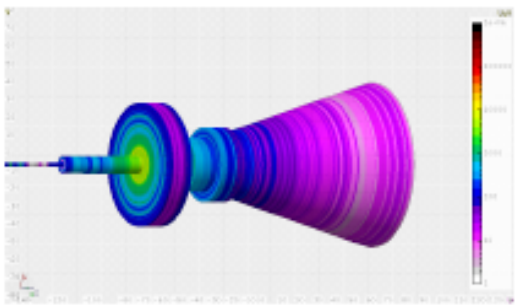
Updates in pCDR : Baffle optimization



(a) Copper 1day cooling



(b) Lead 1day cooling



(c) Tungsten 1day cooling

Updates in pCDR : Detailed study on radiation on coils

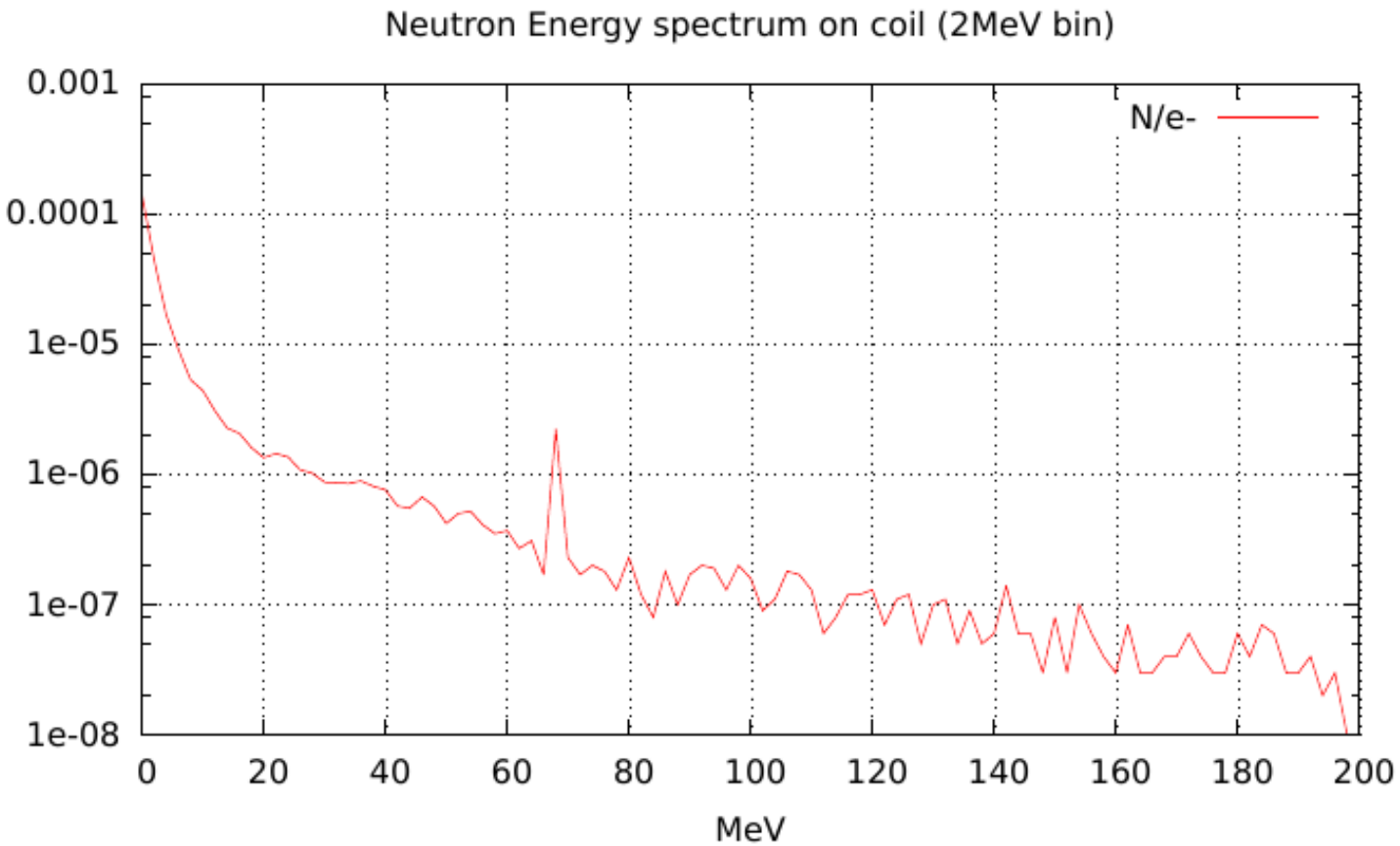


Figure 39: Neutron energy spectrum per electron on the magnet cryostat

Updates in pCDR : Detailed study on radiation on coils

More details on radiation on coils

- Improved design of the coils
- Increased statistics
- Full map of expected integrated radiation on coils and estimated effects.

Updates in pCDR : Detailed study on radiation on coils

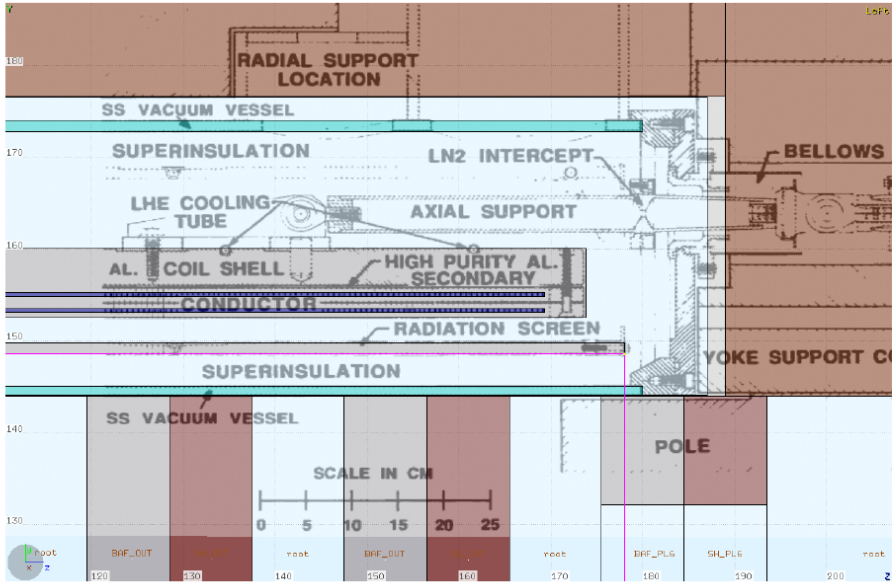
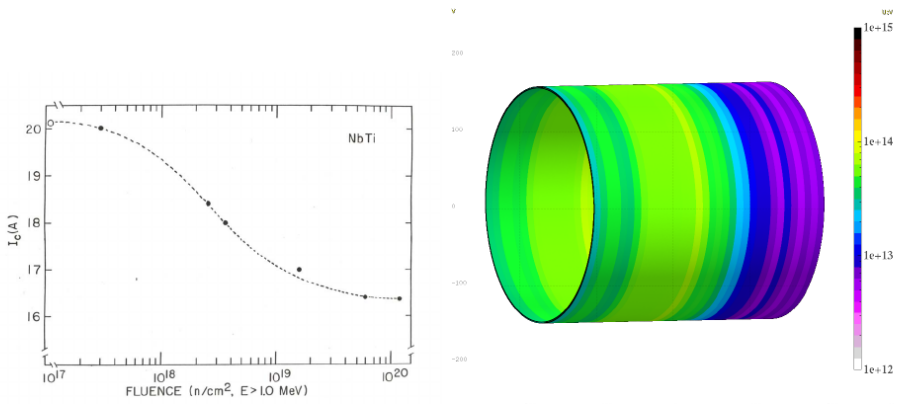


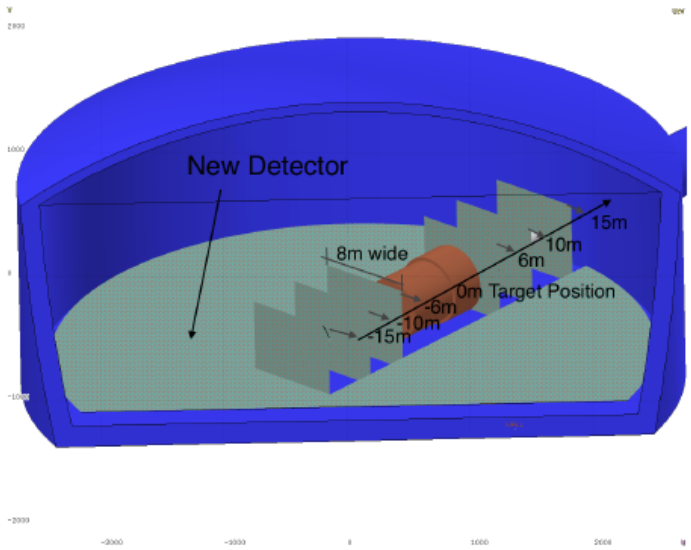
Figure 154: Existing engineering design for the CLEO magnet are put in comparison with the simulation design used for this study.



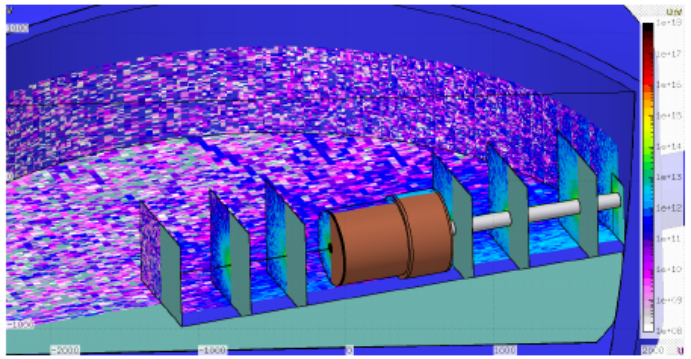
(a) Inpact on the Critical Current (I_C) of different neutron fluences for coils like the one in the SoLID spectrometer

(b) Expected PVDIS neutron fluence $\frac{N}{cm^2}$ on the coils of the magnet assuming 2000h and 100μA

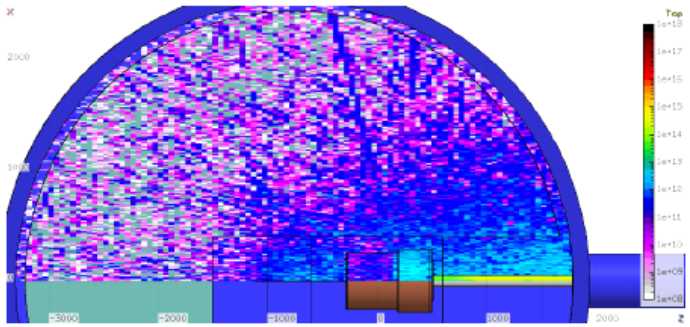
Updates in pCDR : More details in radiation in the Hall (FULL MAP)



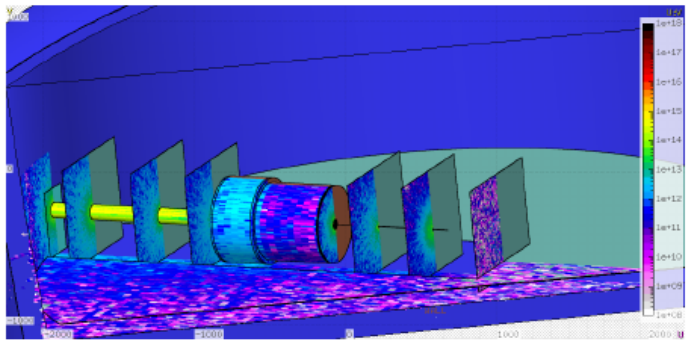
(a) Position of the different planes where in the next plots is shown the expected $\frac{N_{1MeV-eq}}{cm^2}$ integrated flux. Different planes are put at different positions perpendicular to the beam-line; A plane is also put parallel to the floor at 1m of hight



(b) Estimate of radiation damage in the Hall with the SoLID spectrometer and the PVDIS configuration: A different view



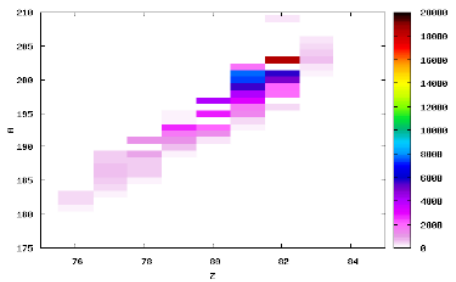
(c) Estimate of radiation damage in the Hall with the SoLID



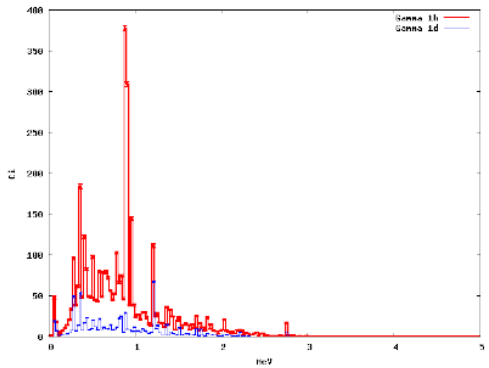
(d) Estimate of radiation damage in the Hall with the SoLID

Updates in pCDR : understanding of radiation levels while changing configuration

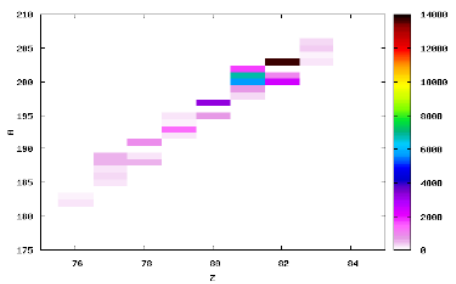
Activation levels studied on first baffle and possible shielding evaluated.



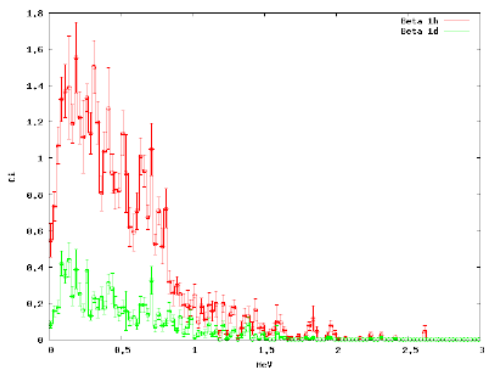
(a) Residual Nuclei for Lead Target after 1hour cooling (Z vs A)



(c) Photon Energy spectrum in Curie due to activation at 2 different cooling times



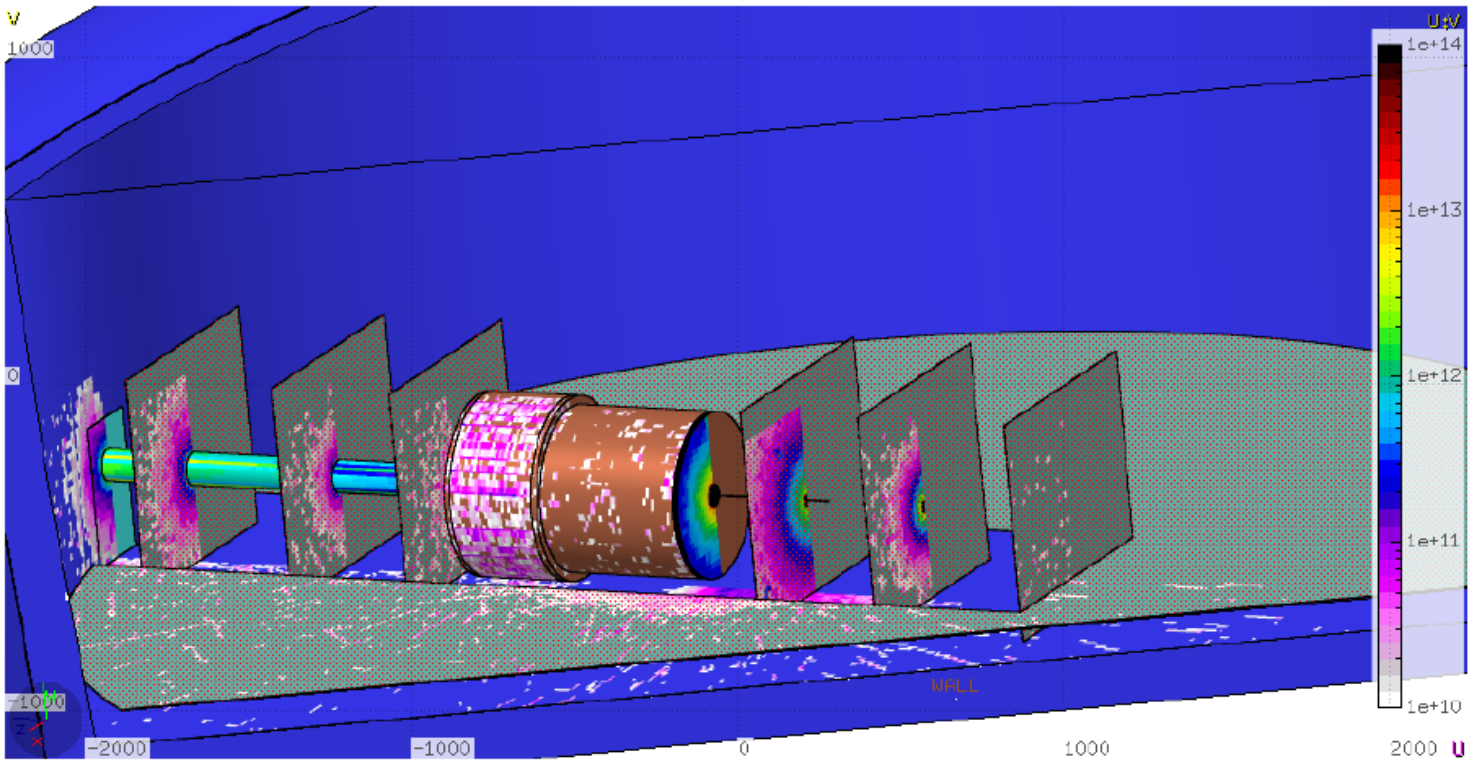
(b) Residual Nuclei for Lead Target after 1day cooling (Z vs A)



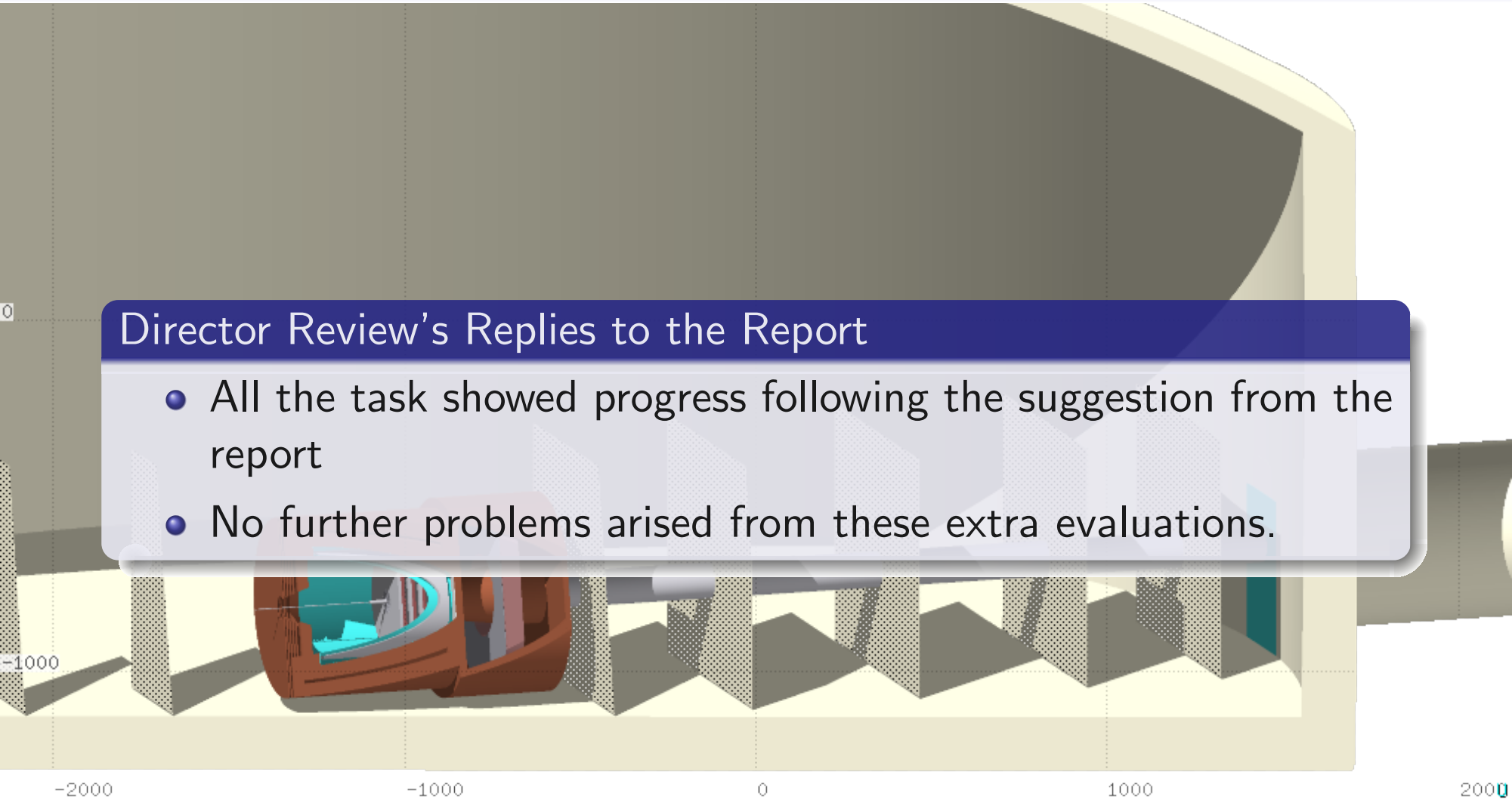
(d) Electron Energy spectrum in Curie due to activation at 2 different cooling time

Updates in pCDR : Complete different configuration

Added J/ψ configuration



Conclusions



Director Review's Replies to the Report

- All the task showed progress following the suggestion from the report
- No further problems arised from these extra evaluations.