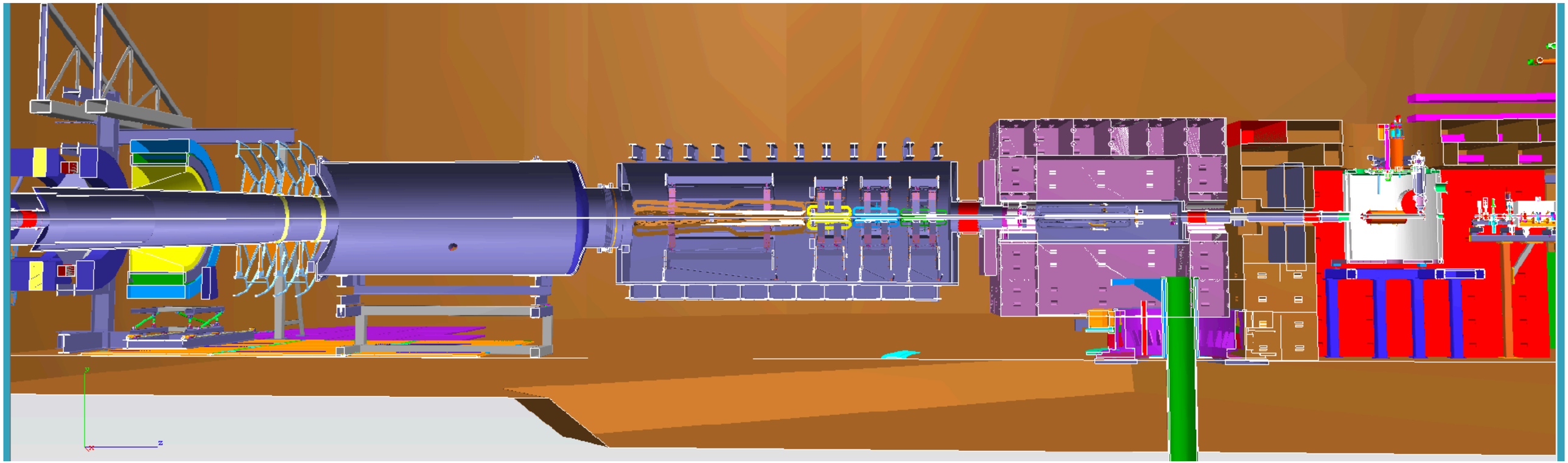
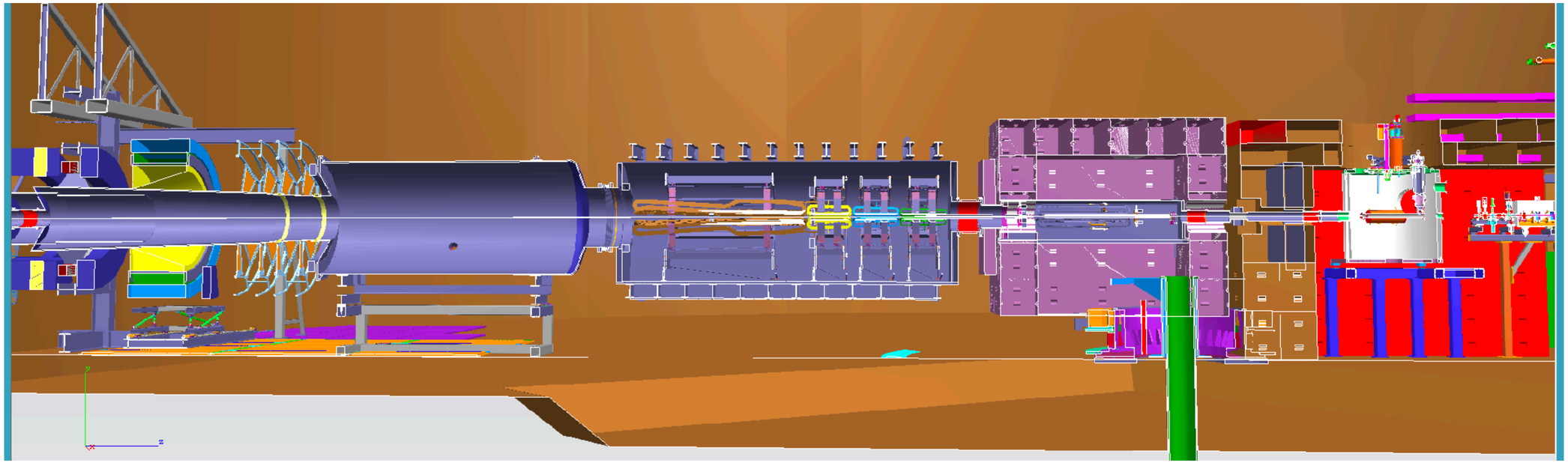
Technical Update

Kent Paschke



Progress

- Target-US Box optimization (CG)
- Site boundary dose estimated (LZ,VD)
- Electronics bunkers (ZD)
- Coil dose and shielding (progress) (SR)
- photon background investigation (SR)
- continued to look at MD tiling (ZD)
- MOLLER GEMs specification
- Compton electron detector progress
- Ferrous material - fasteners, tie rods, + more (CP,EK)
- MD “Ring 7” PMT/base shielding and dose estimates (CG)
- significant work toward alignment / optics plan (VD,KE)
- Ring 6 light guides (KK) (including tests)
- Ring 1 light guides (SR)
- Electronics, integrating ADCs (MG)
- Ancillary detector development
- PQB meetings restarting



Upstream beampipe optimization

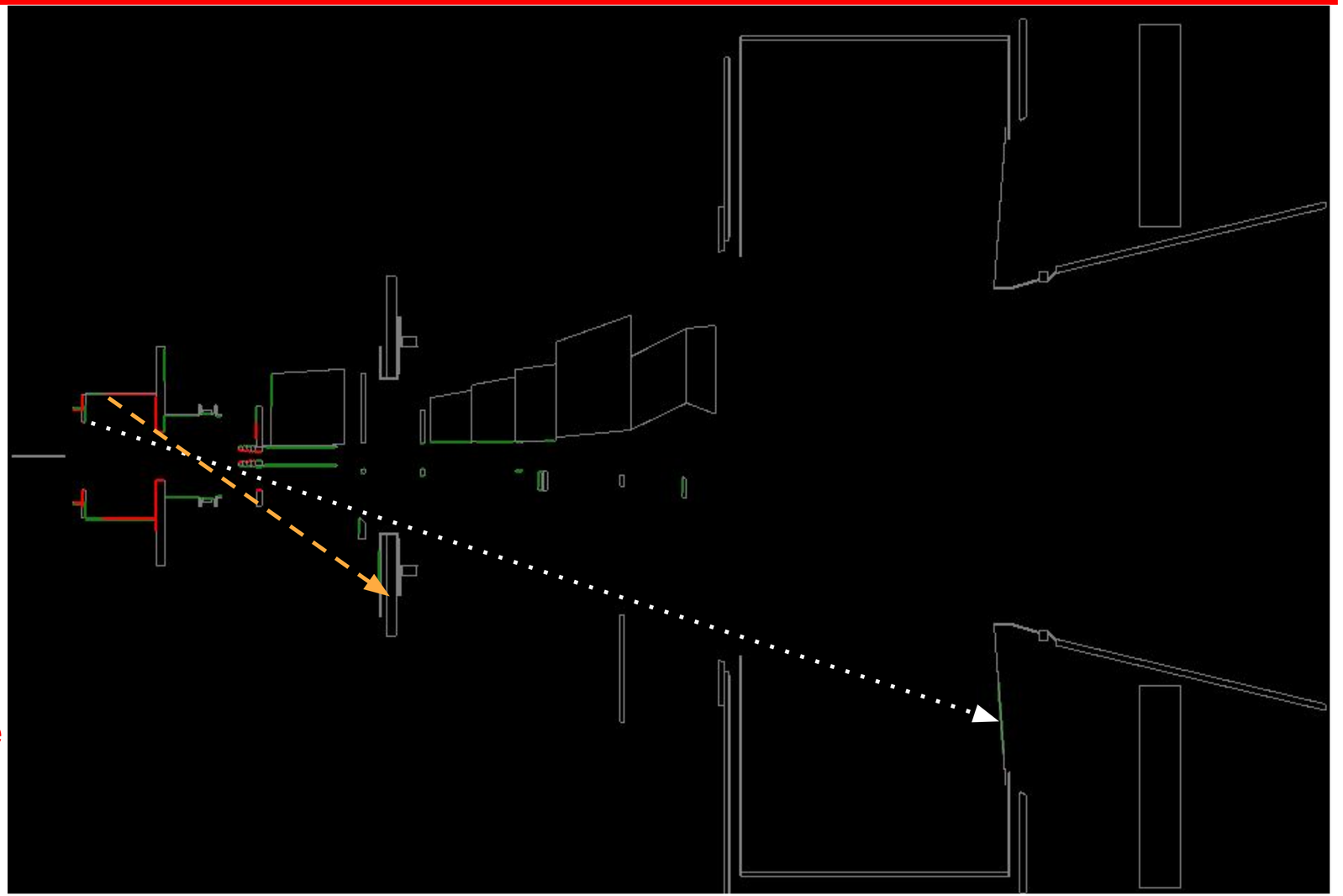
Two-bounce result with the proposed design

Tungsten-Ring: Z(us) =1050 mm
IR = 101.6 mm (4”)
Thickness 10 cm

Pipe 1: IR = 139.7 mm (5.5”)
From z=831.85 mm to z=1150mm

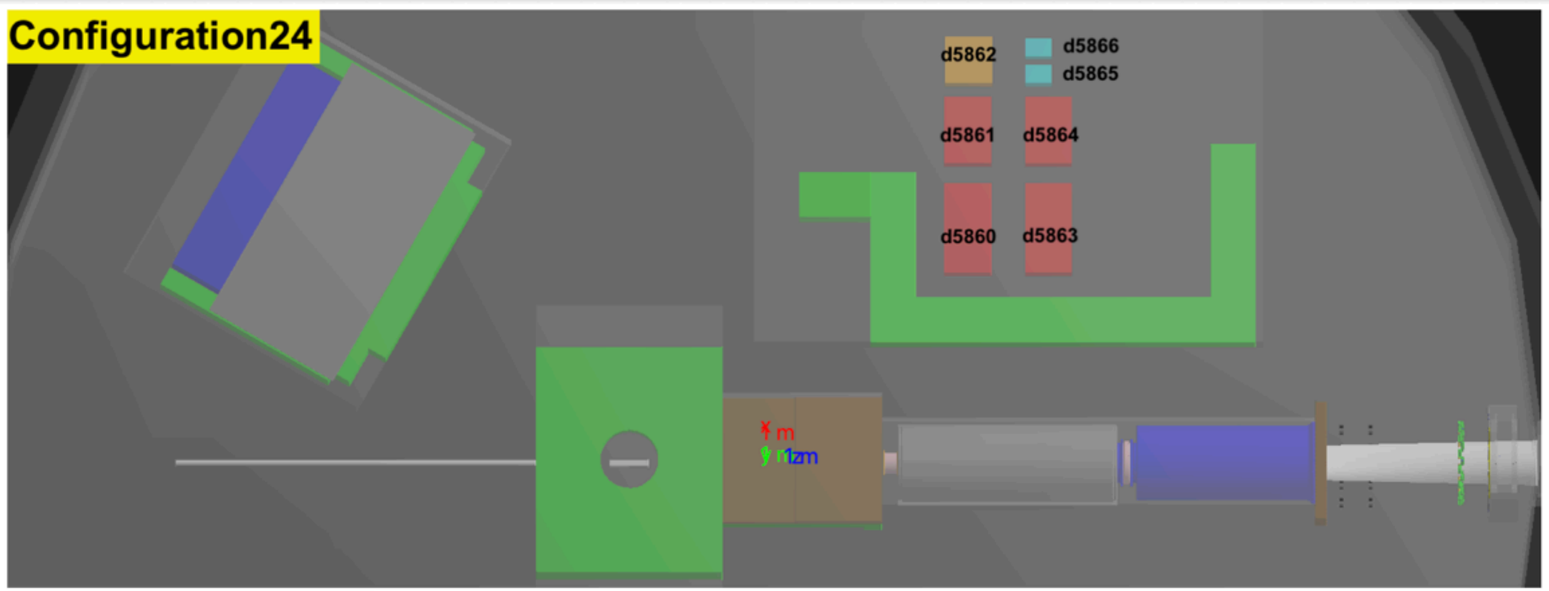
Pipe 2 & bellow : IR = 185 mm
From z= 1150mm to z=2851 mm

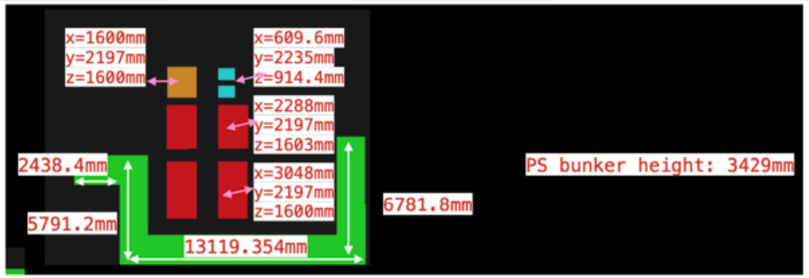
The green patch on the detector window is due to the Tungsten-ring (following the white dotted line), not from pipe 2.



[Chandan Ghosh, docdb:882]

Power Supply Bunker

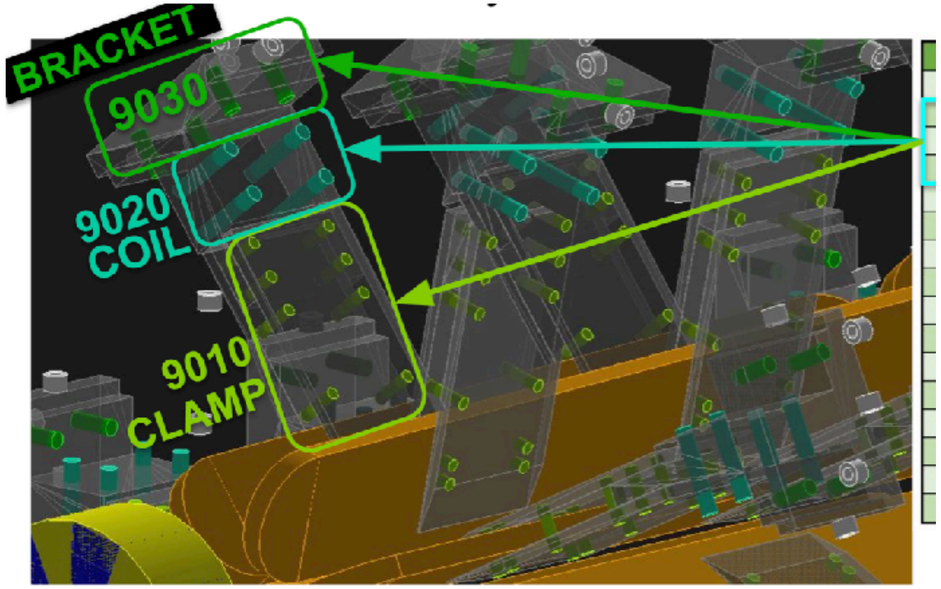


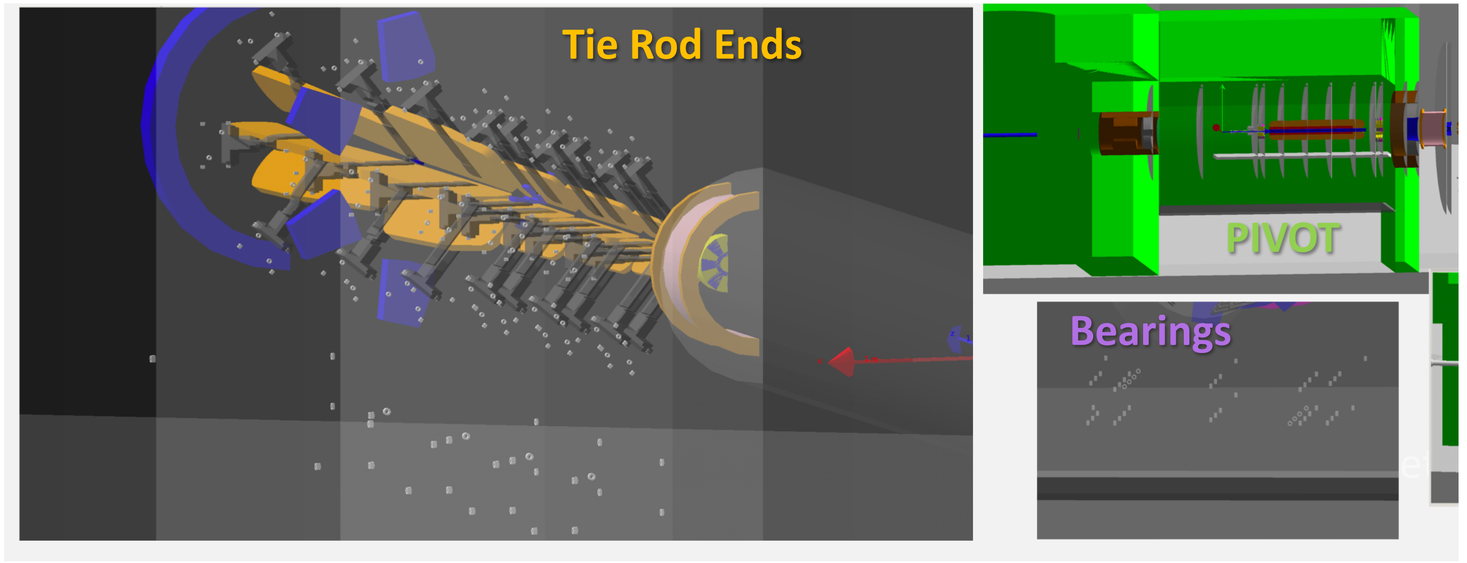


Now optimized

[Zuhal Demiroglu, docdb:875]

Ferrous Material





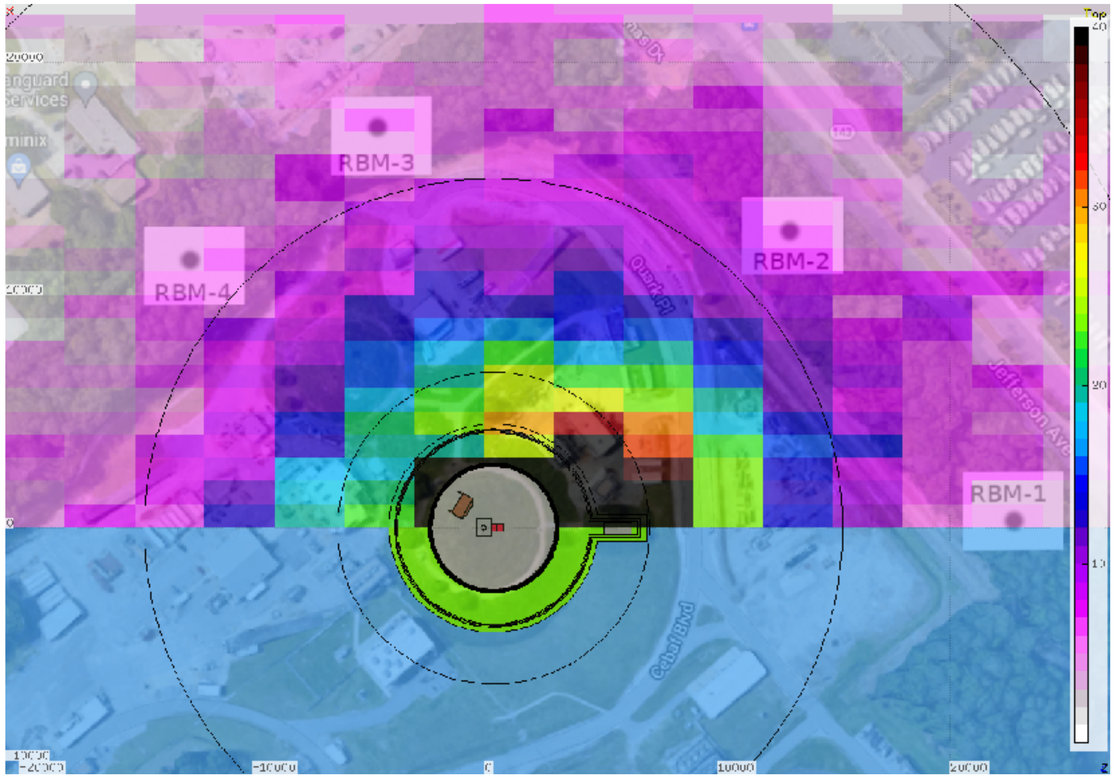
Vetting fasteners, tie-rod ends, water cooled leads, etc etc…

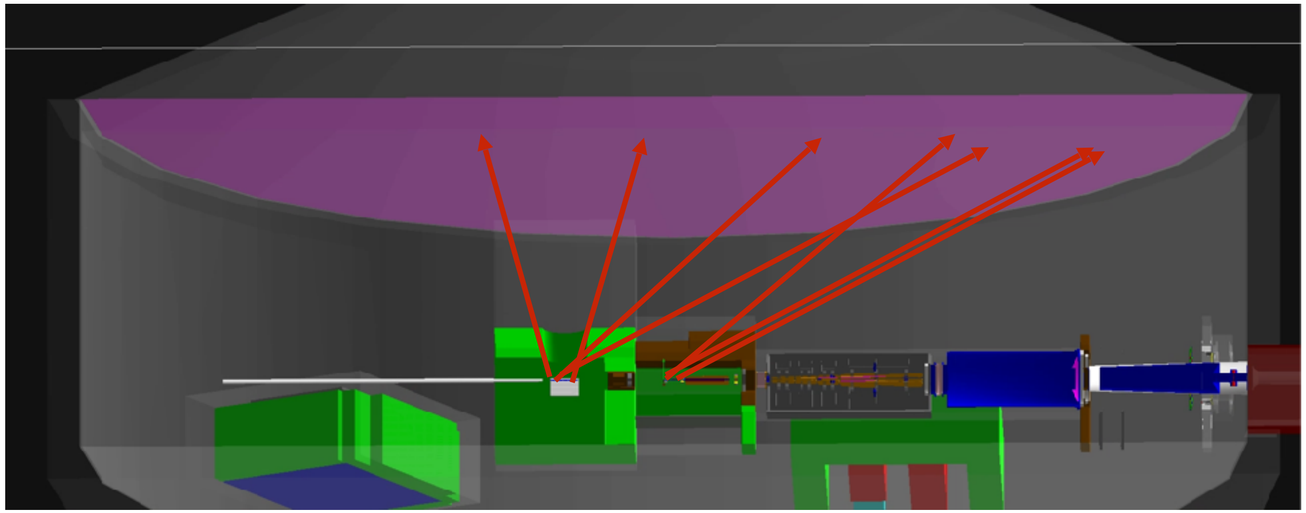
	χ_r	spin polarization P_f	Fraction of events per Møller event	Fraction of events per eoT
Mild Steel	2000	10^{-2}	10^{-7}	10^{-11}
Stainless Steel (worst case)	1	10^{-5}	10^{-4}	10^{-8}
Stainless Steel (ideal)	0.01	10^{-7}	10^{-2}	10^{-6}
Aluminum	0.0001	10^{-9}	1	10^{-4}

[Caryn Palatchi, Eric King]

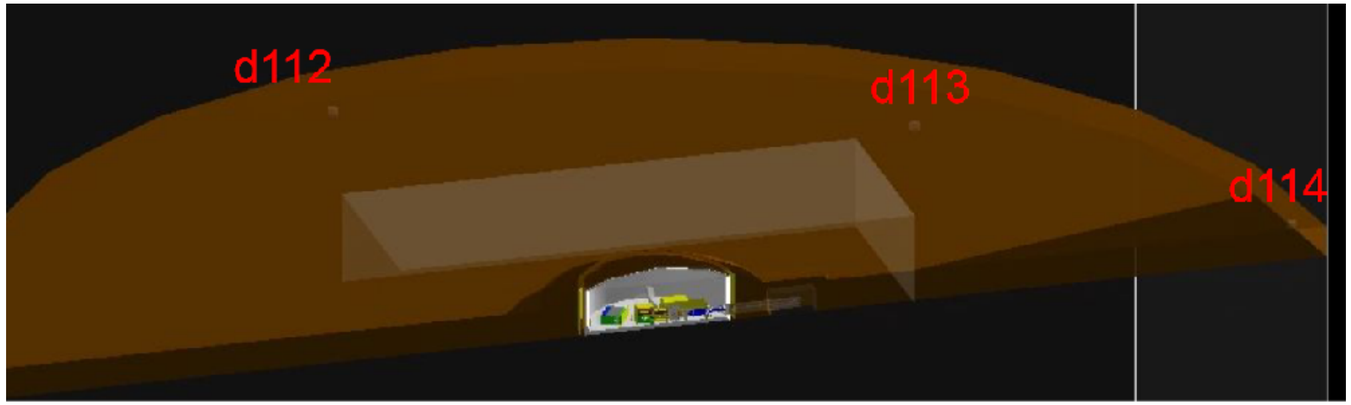
Site Boundary

FLUKA (Lorenzo)



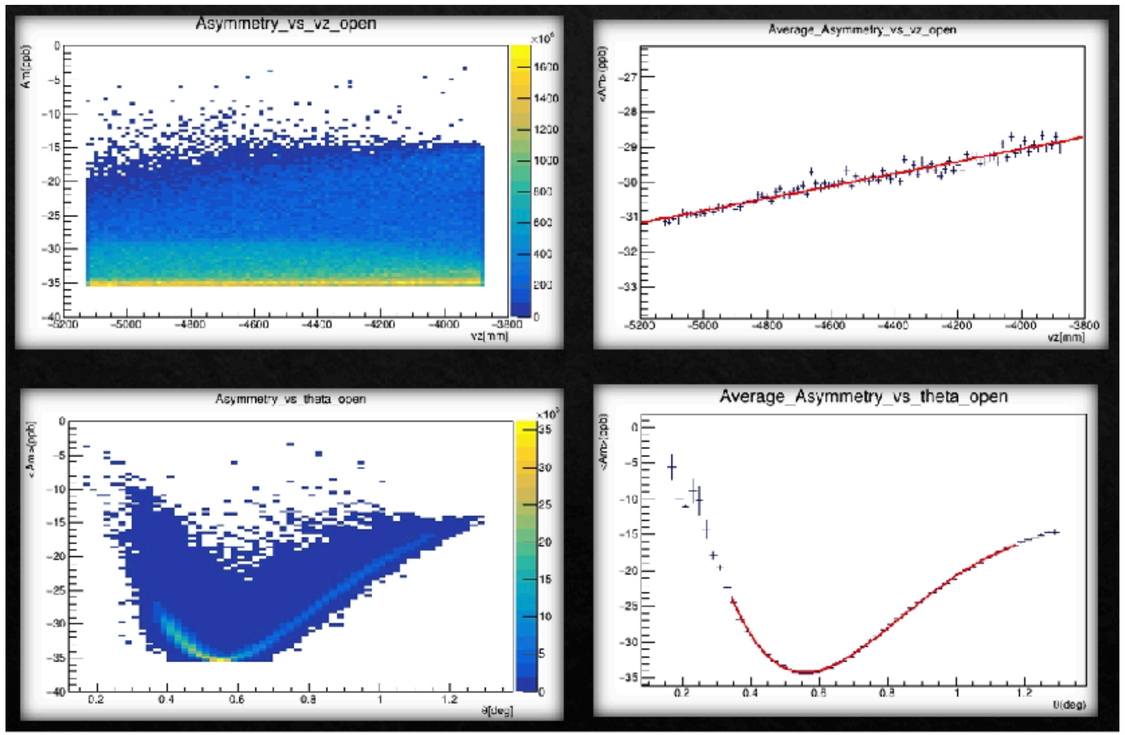


GEANT4 (Vassu Doomra)

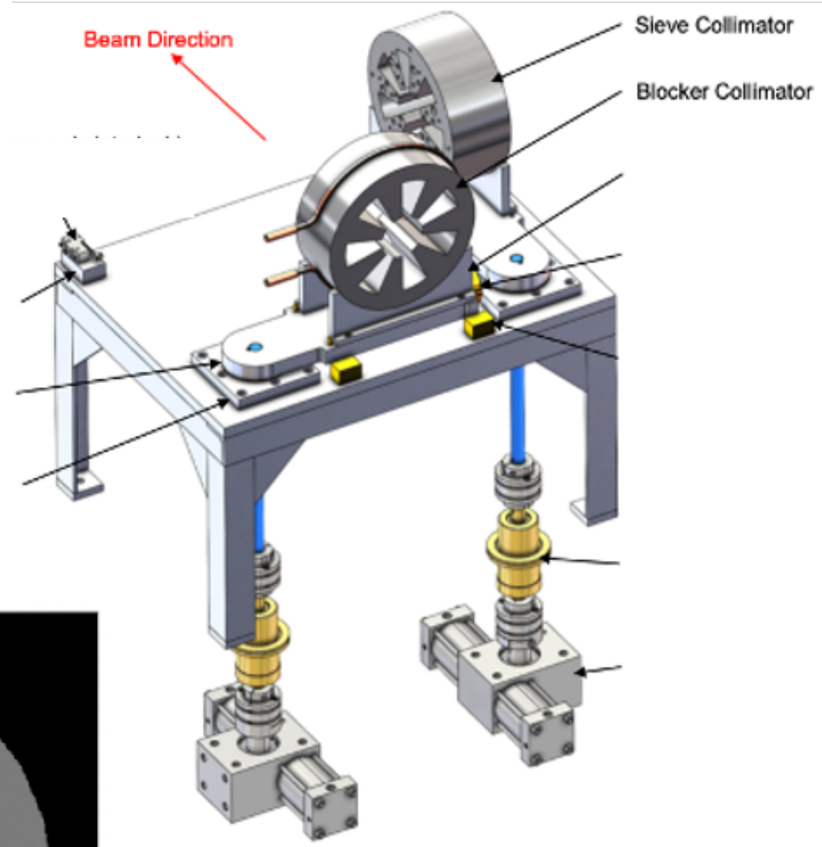


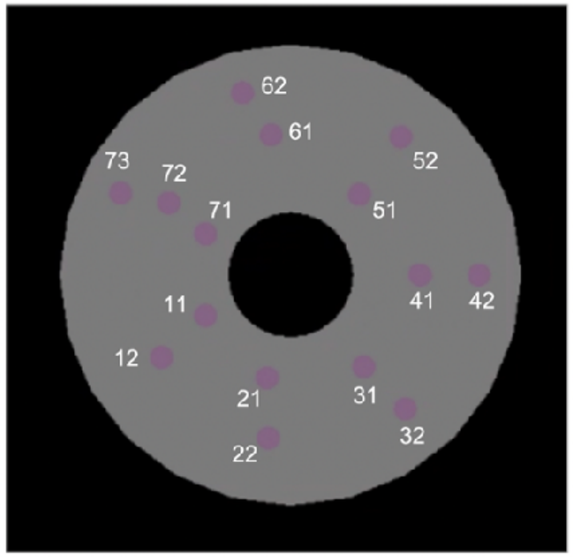
MOLLER will not exceed annual site boundary allocation

Optics Calibration Plans



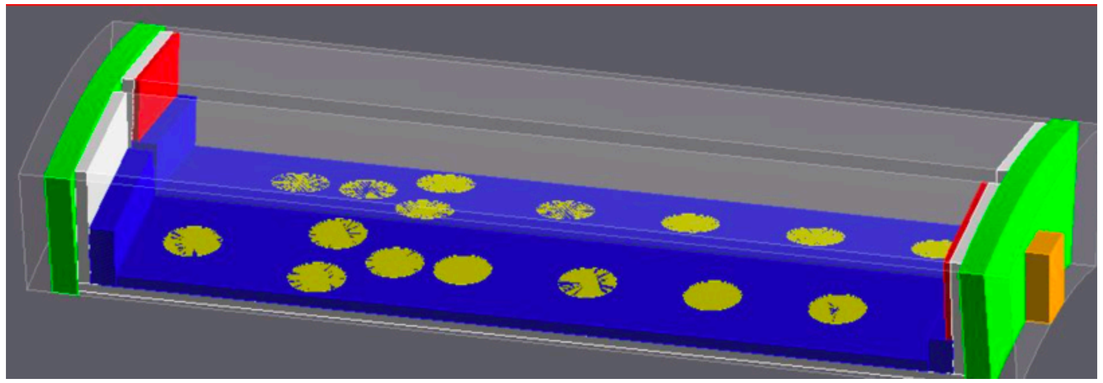
mapping acceptance over finite target

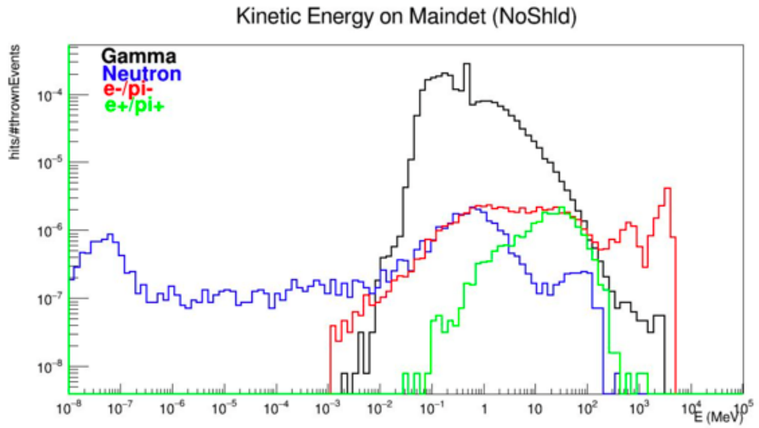


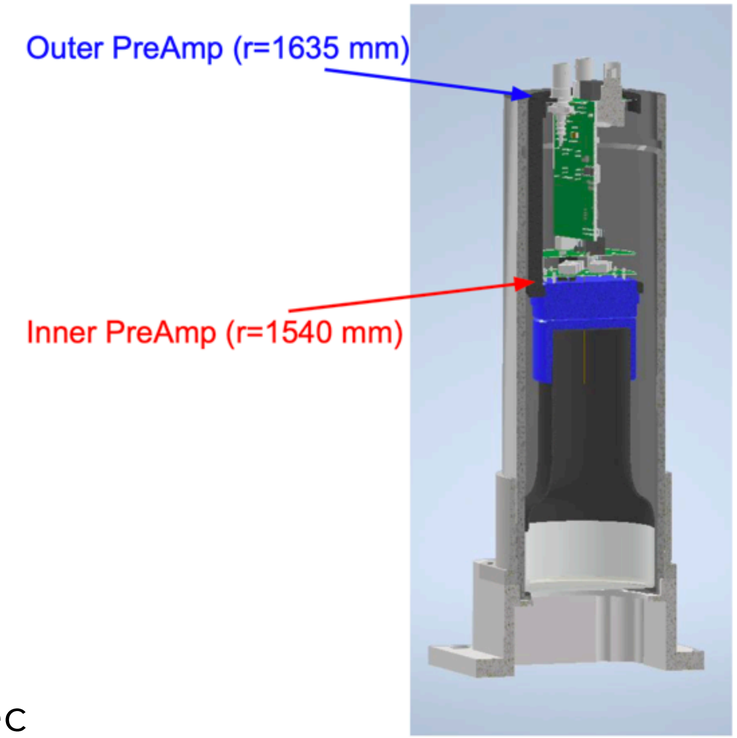


[Vassu Doomra, Kate Evans docdb:919]

“Ring 7” rates and shielding



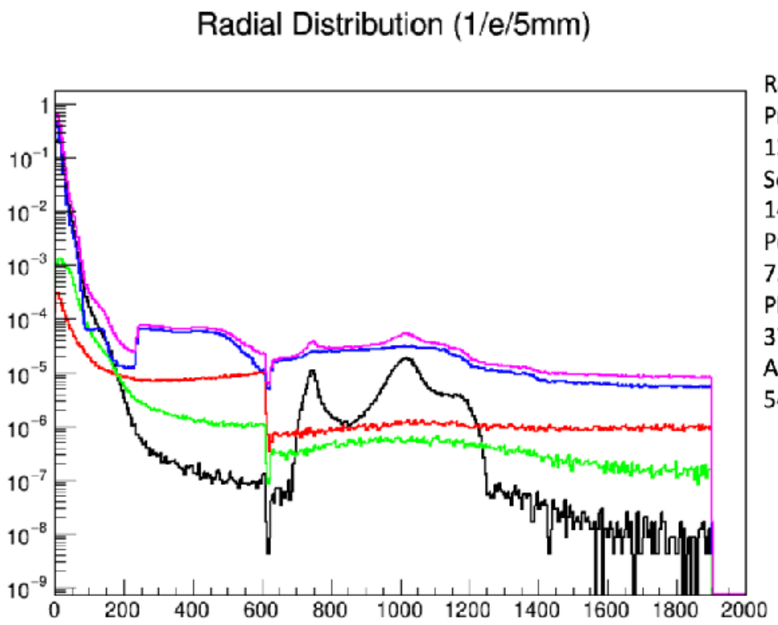




- Moderate total dose, within spec
- Some enhancement from scattering from floor, local shielding may help

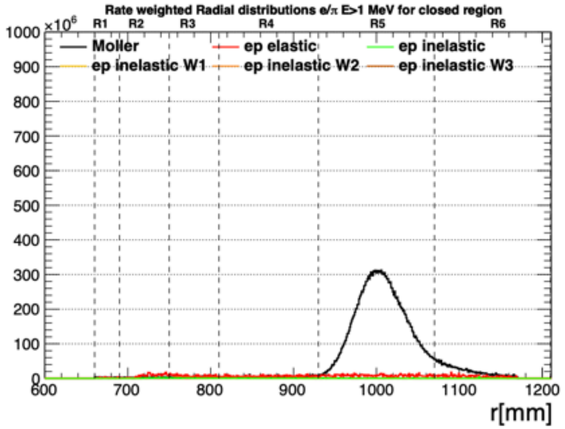
[Chandan Ghosh, docdb:906]

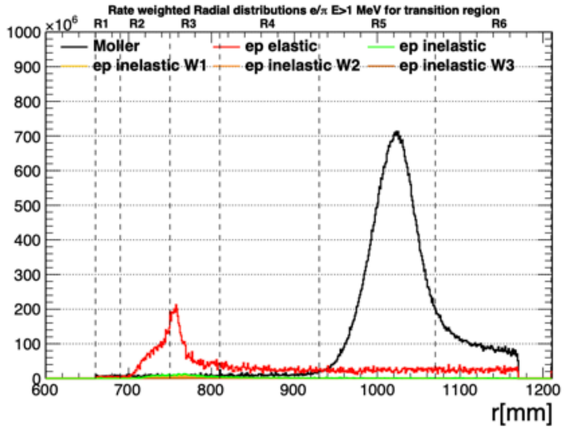
Background

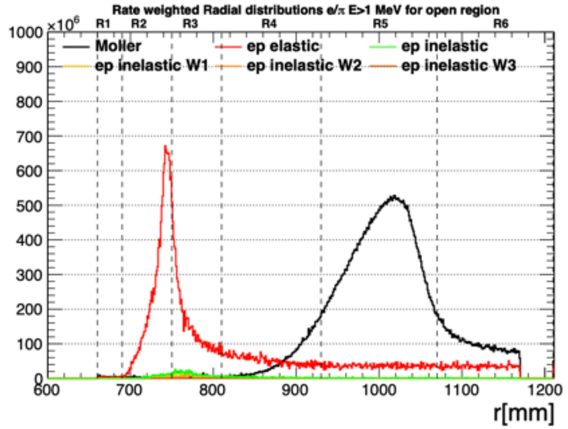


Photon backgrounds

[Sakib Rahman, docdb:892]



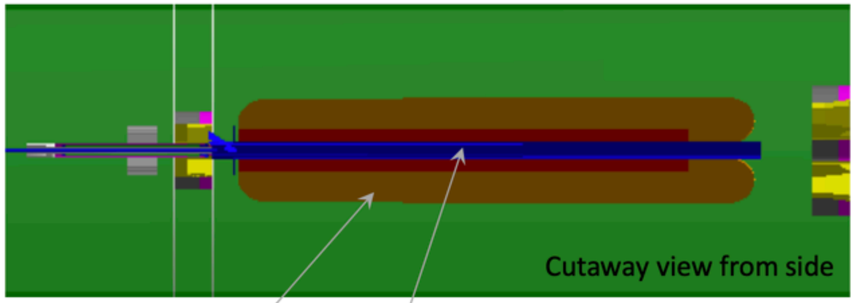




Investigating MD tiling and background deconvolution

[Zuhal Demiroglu, docdb:887]

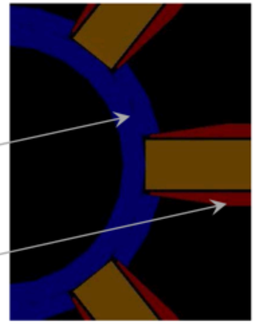
Coil dose and shielding design



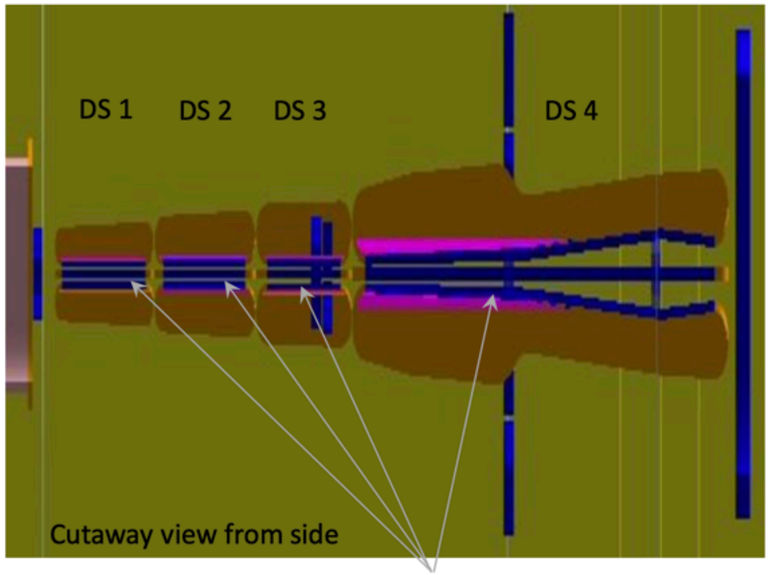
Coil epoxy encasing the conductors

2-bounce shield with cutouts for coils

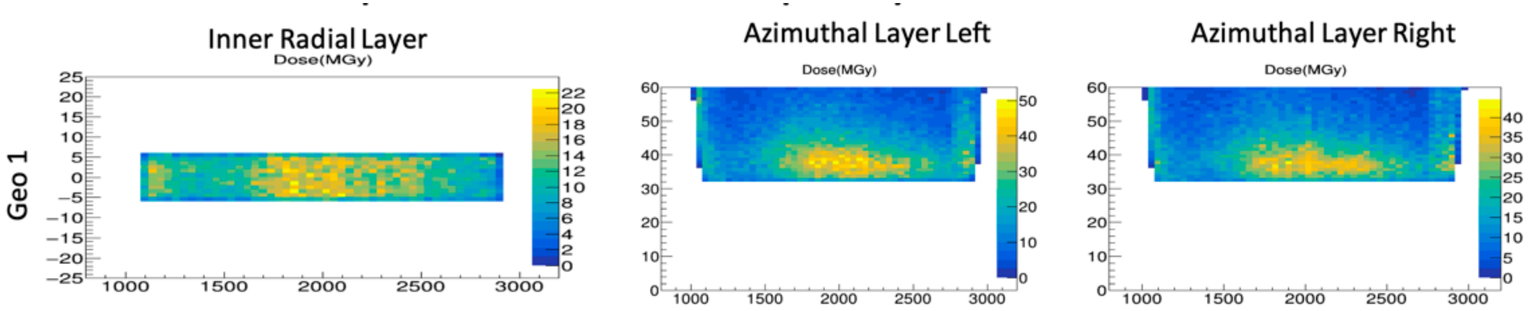
W wedges



View from downstream



Bottom plates (3mm W) on every coil



[Sakib Rahman, docdb:865, 892]

Project is progressing with Physics Support

Preliminary Design Reviews

Downstream Spectrometer Coil
Magnet Power Supplies, Leads and Jumpers
DAQ and Trigger — Last year
Beampipes, Bellows and Windows
Coordinate-GEM-Tracking-Detectors (and Trigger Scintillators)
Detector Systems
Target
Spectrometer — This year
Infrastructure

This completes our PDRs (60% design reviews) and maintains progress toward Technical Design Review

Technical Design Report

Section leads: Krishna Kumar, KDP, Mark Pitt, Caryn Palatchi, Silviu Covrig, Juliette Mammei, Michael Gericke, David Armstrong, Paul King, Don Jones, Ciprian Gal, Jim Fast

Goal: a concise but comprehensive description of the technical design demonstrating it will meet the physics goals

Technical Design Report will go to the Technical Design Review committee.

- all systems have passed 90% design review
- Summarize the apparatus and techniques as a whole
- then present engineered solutions for all systems

The report should focus more on summary and results, rather than process or alternatives. Some of the work to justify the design (e.g. simulation results, beam tests, etc) should be detailed in separate technical notes, which can be referenced separately from the TDR

Step on the path to CD2

Schedule: complete draft by end of summer, which can be completed as 90% design is reached

Continuing work

Spectrometer and beamline

- Complete coil dose estimates and shielding
- Add DS Torus and Drift region enclosure, quantify rescattering background
- Ferrous material: downstream supports, tie rod ends
- Check realistic exit window
- Evaluate collimator 1,2, 5,6 material CW80-CW95
- Activation studies

Alignment/Optics

- refine optics calibration
- refine initial alignment plan

Detectors

- MD PMT base/pre-amp shielding and dose
- continue to refine MD background deconvolution
- Pion detector signal-noise + lead donut
- Pion detector backsplash
- SAM detector shielding

Ongoing review

- Two bounce hygiene
- Ferrous hygiene

Next steps

The engineering continues to lead the way.

One aspect we physicists should pay close attention to: plans and specification for quality control.

As we get to 90% Design in the project, we can also spend more time on achieving the physics goals with the hardware we have designed

- Simulations don’t stop with minimum requirements and 90% hardware
  - continue to refine optics calibration
  - continued background studies, including additional failure mode testing
  - beam parameter sensitivities
- beam monitor testing
- Designing and writing analysis code, online and offline
- Polarimetry - design for use / optimization, testing, analysis code, maybe even analysis of data?
- Polarized beam - beam test planning and execution