International MUON Collider Collaboration

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Study of the radiation load to the magnets in the tapering region of the target area

MuColl Magnet meeting 1st February 2024

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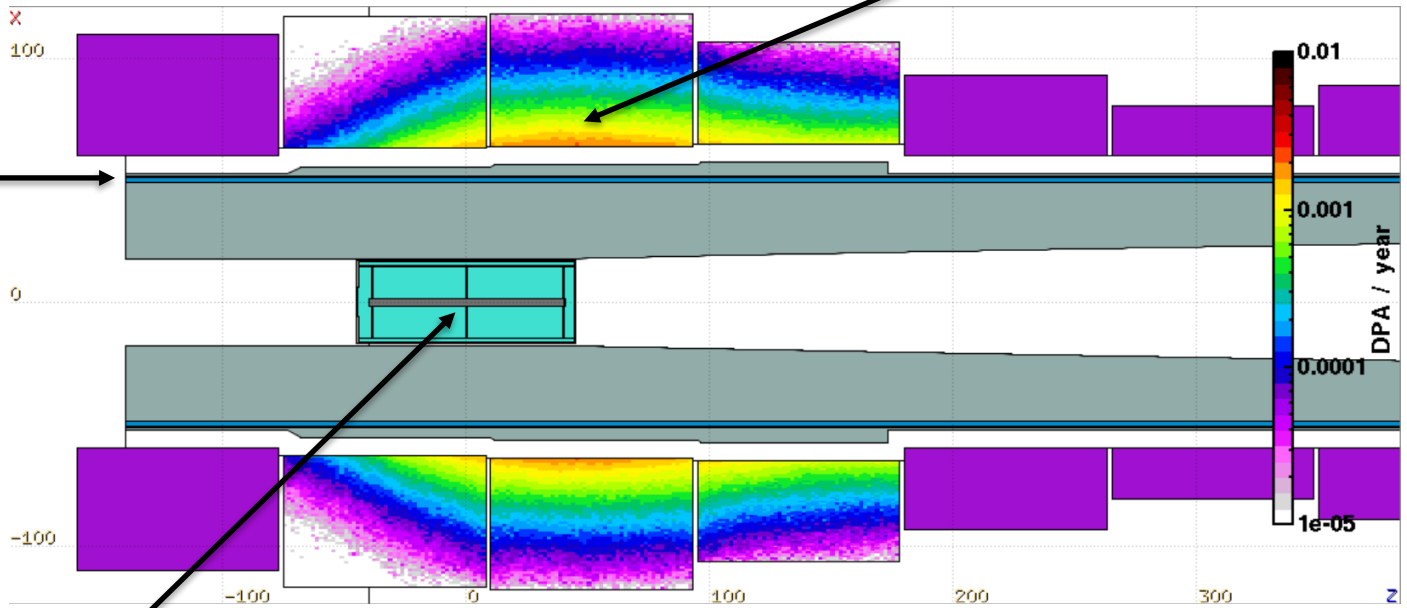
New tapering magnet layout

Coil 3 is the most exposed

Layer of Water + Boron-Carbide

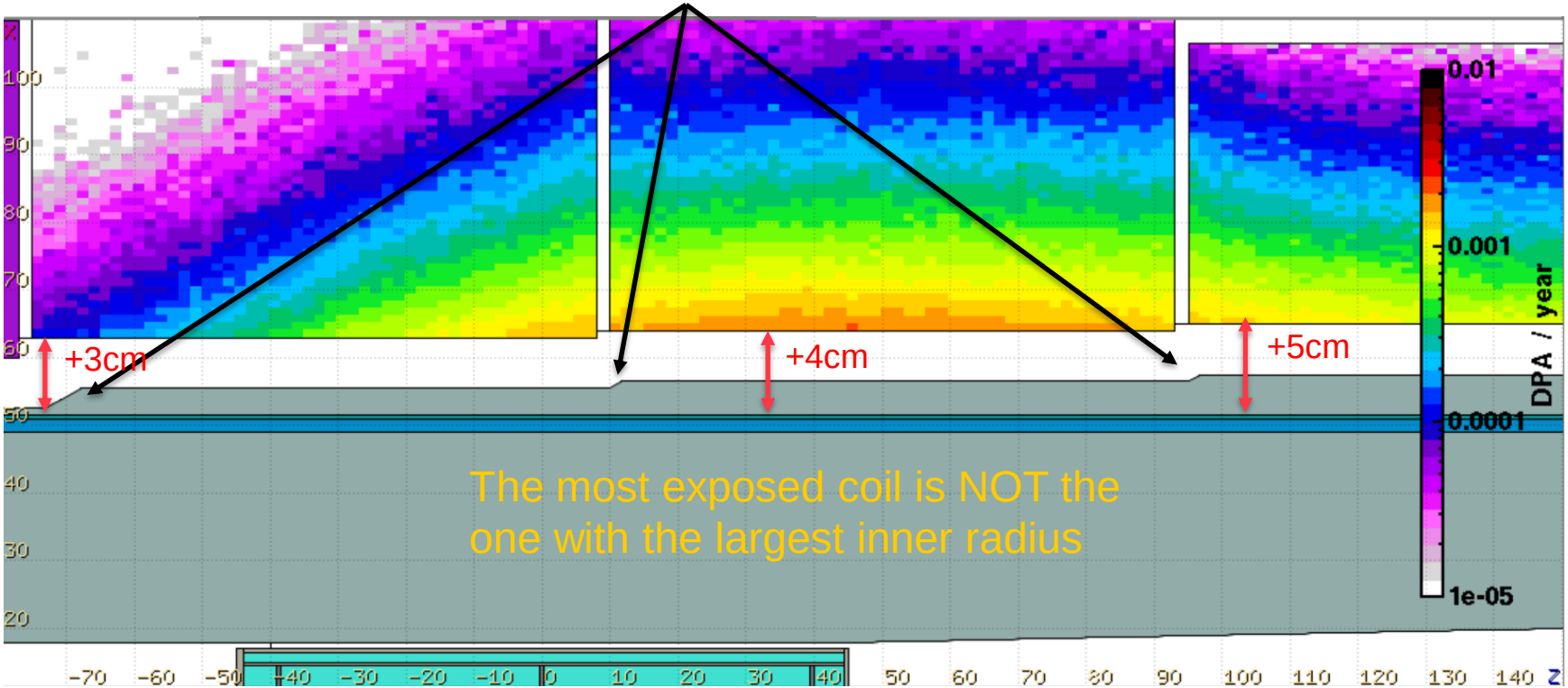
From the previous studies we know that this layer is necessary to keep the DPA below 1e-3/year even with the extended radius



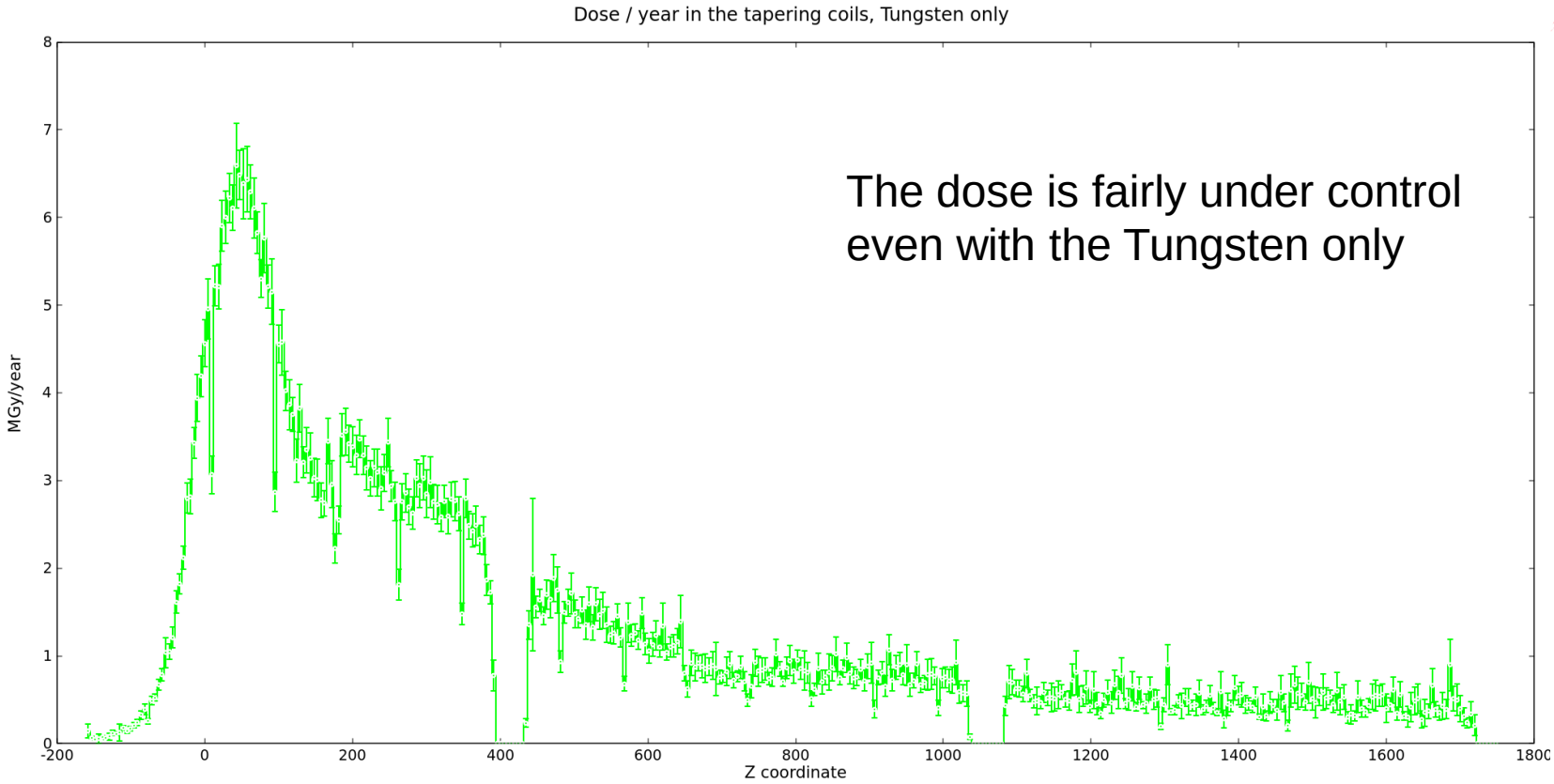
Target centered at Z=0

New tapering magnet layout

The edges are shaped so that the closest distance between the shielding and the magnets is always 7.5 cm.

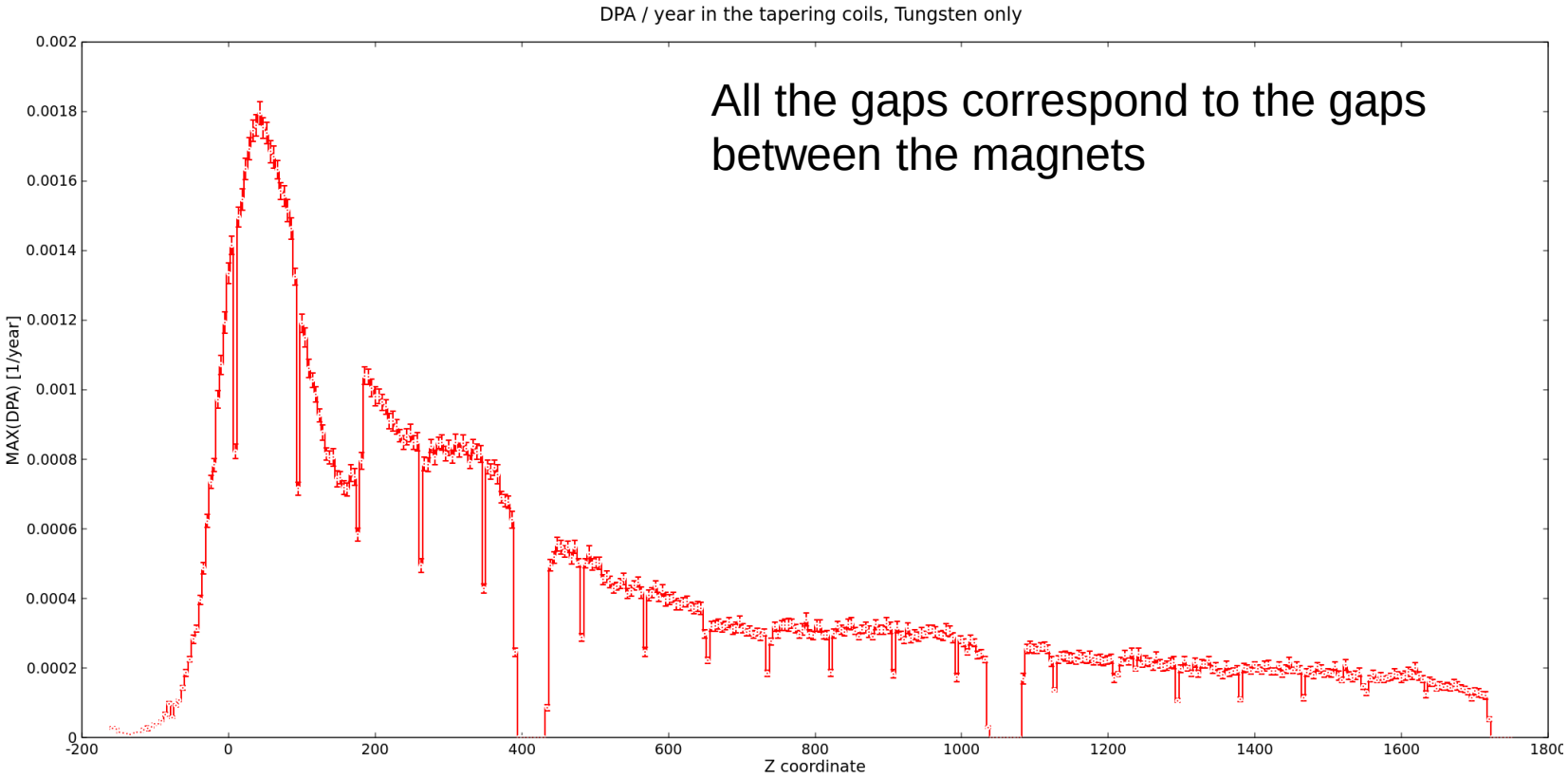


Dose in the magnets

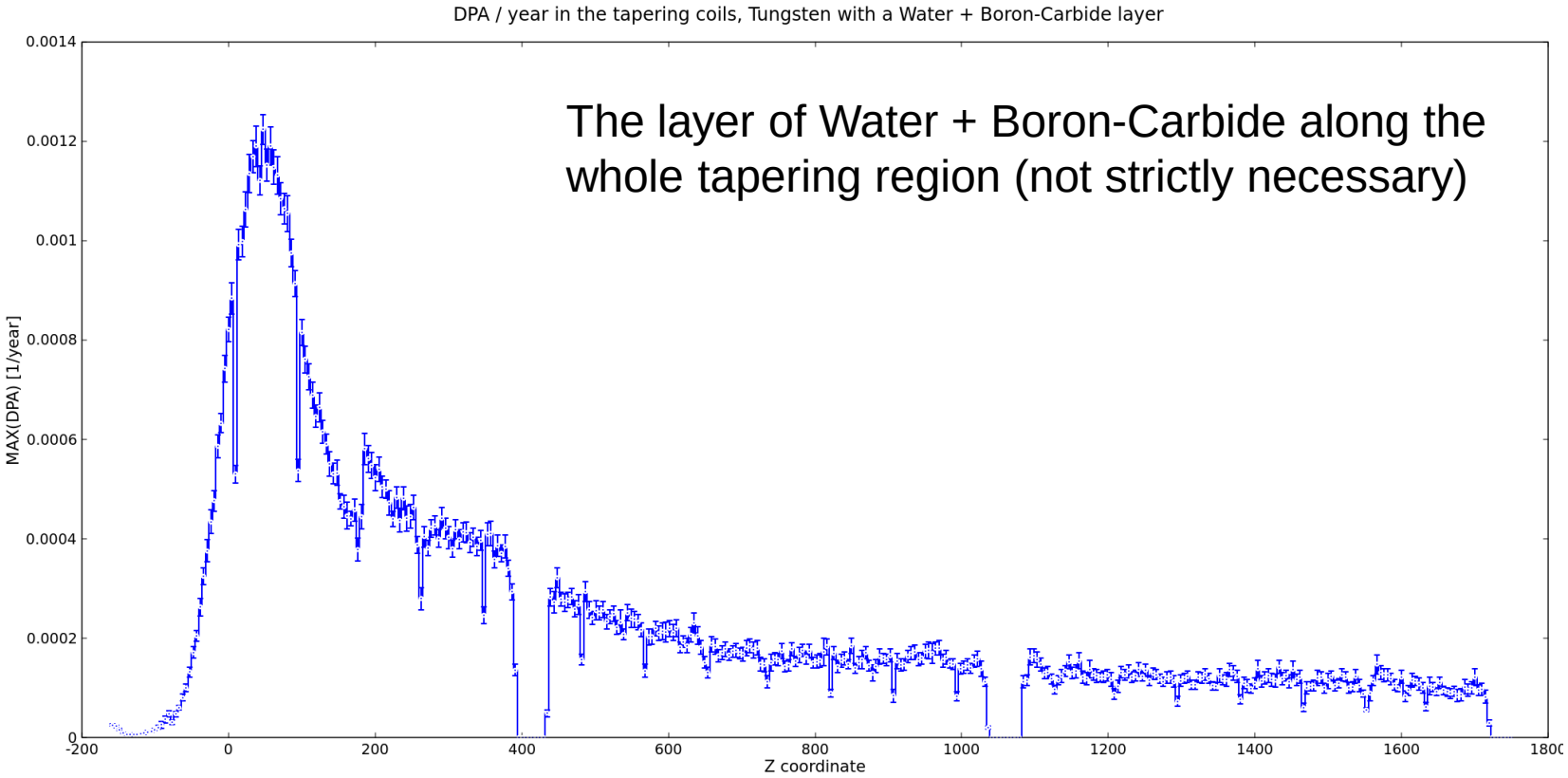


The dose is fairly under control even with the Tungsten only

Displacement per atom in the magnets

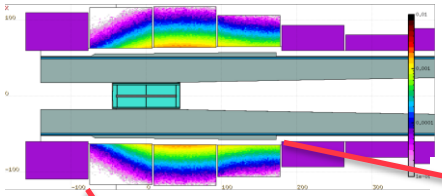


Displacement per atom in the magnets

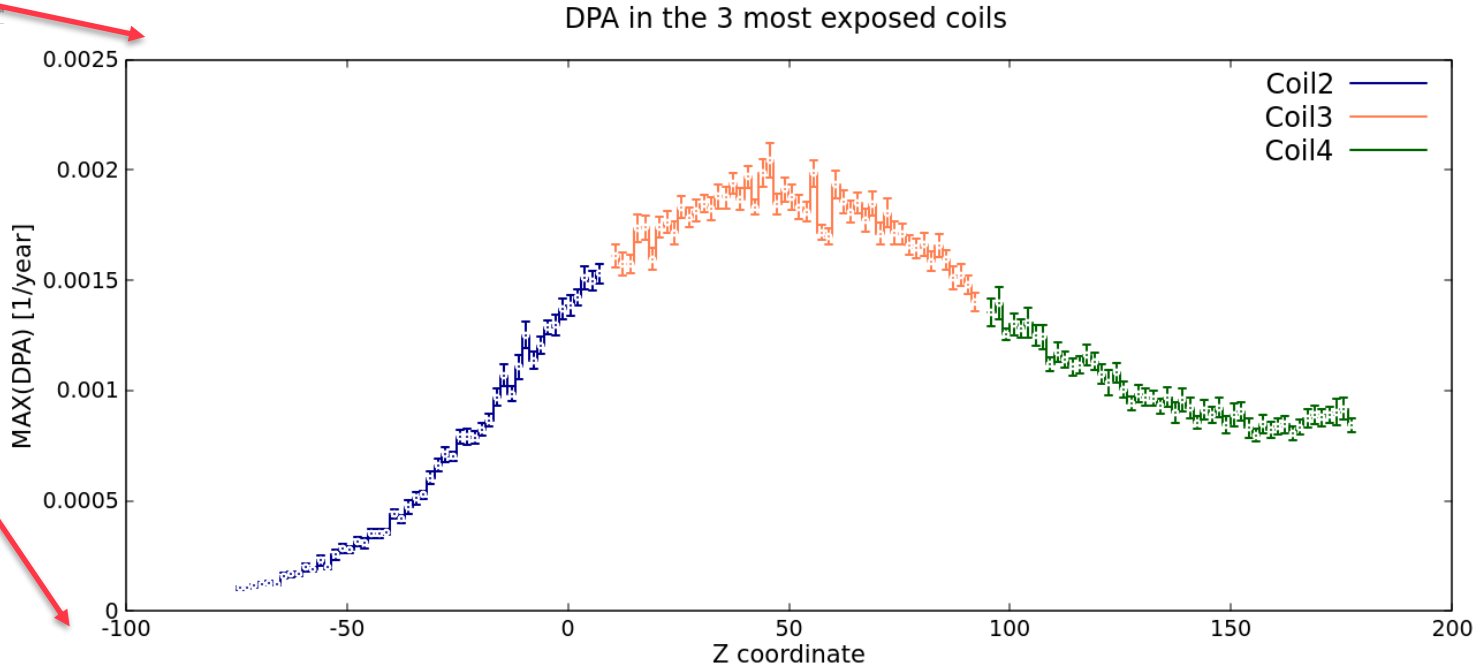


The layer of Water + Boron-Carbide along the whole tapering region (not strictly necessary)

Displacement per atom in the magnets

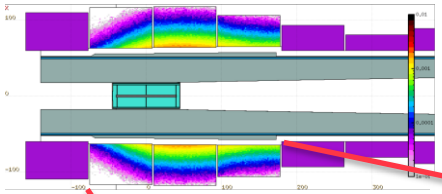


Only tungsten for shielding!
Finer binning

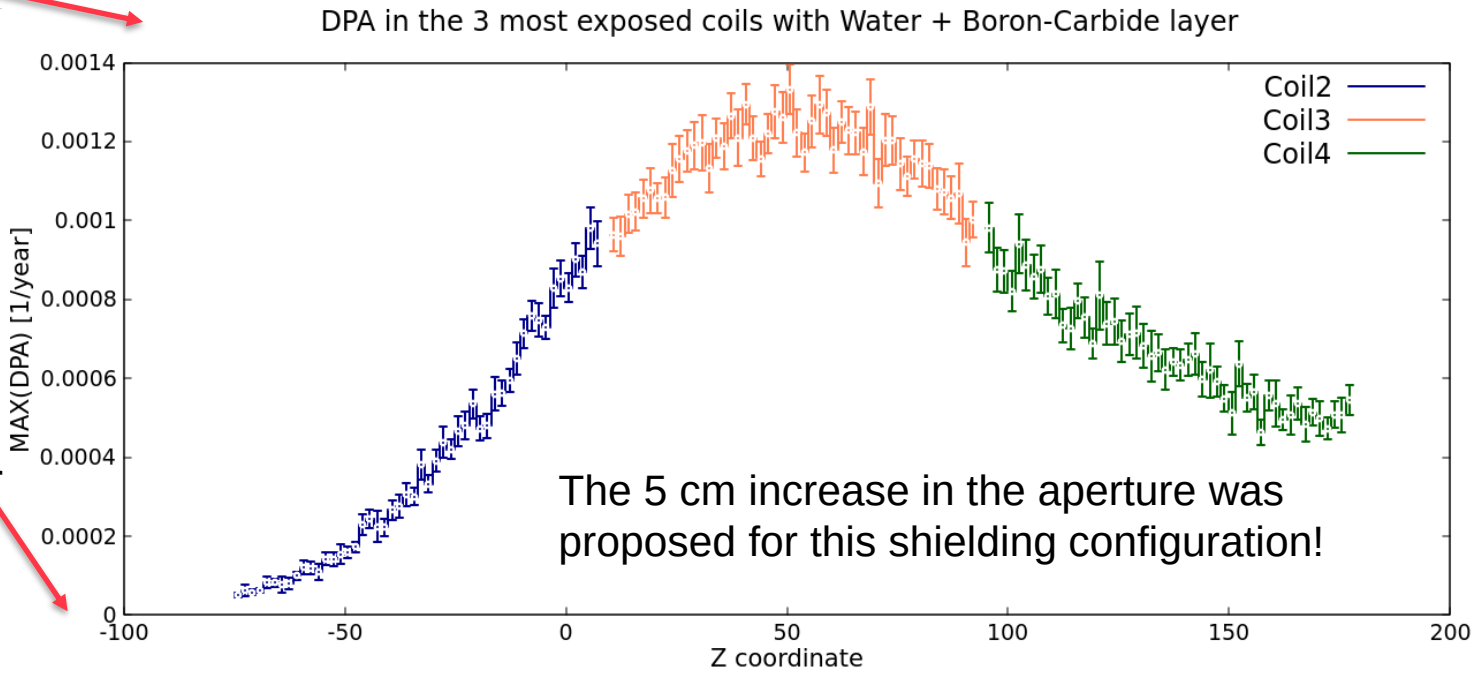


The DPA/year is most likely still too high

Displacement per atom in the magnets



Tungsten + Water + Boron-Carbide



Still the DPA might be too high – further studies needed!

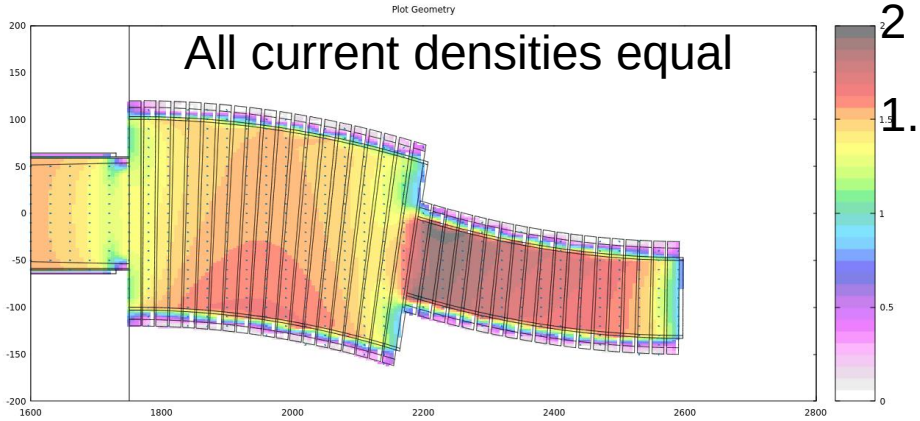
The 5 cm increase in the aperture was proposed for this shielding configuration!

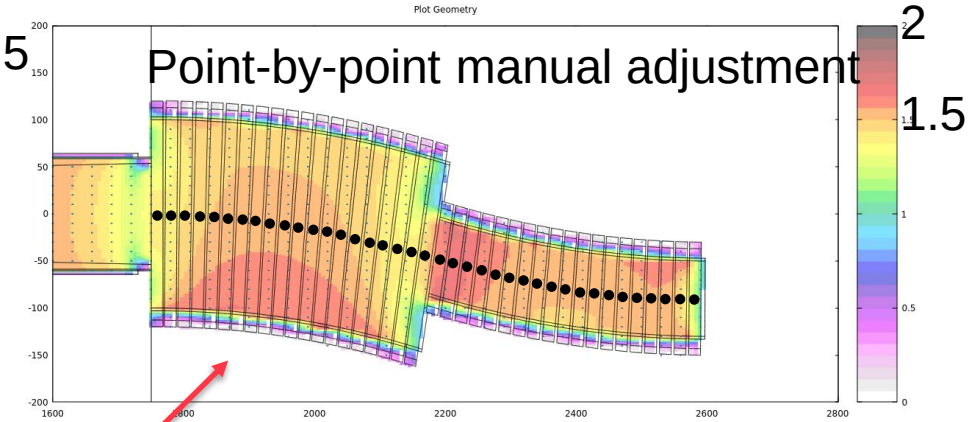
To do

- Study the impact of the thickness of Water and Boron-Carbide layers.
- Understand the critical DPA/year value that we can afford with the HTS coils given the neutron fluence.
- Possibly, look into a tilted target case

Spent proton beam extraction channel – magnetic field in the chicane

Other topic - magnetic field adjustment in the chicane



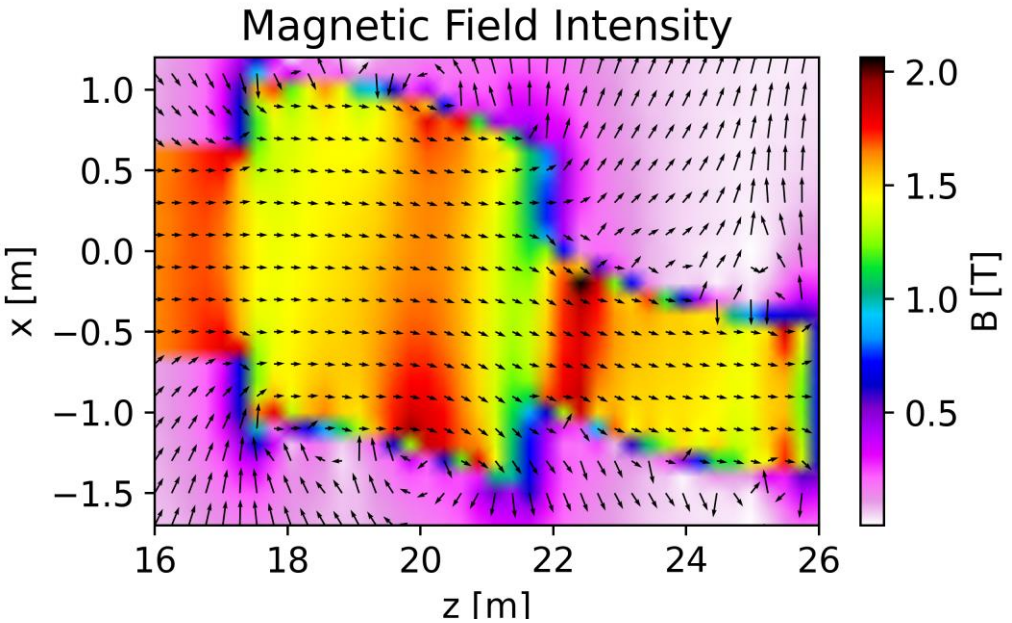


Target field B = 1.5T

The current density of each coil is adjusted assuming a linear relations between the magnetic field at the center pf the coil and the current denstiy only inside the given coil (the impact of the neighbouring coils is neglected in this approximation)

Other topic - magnetic field adjustment in the chicane

- Here, the MINUIT minimizer is used to adjust the current density of all the coils simultaneously. The data points are Bz=1.5 T at the center of each coils. The fitter looks only at the centers.
- The minimized metric is Mean Squared Error
- The fit result is not much better than the single coil at the time approach approach



Simultaneous fit of all the magnet center points – current densities are the fit parameters