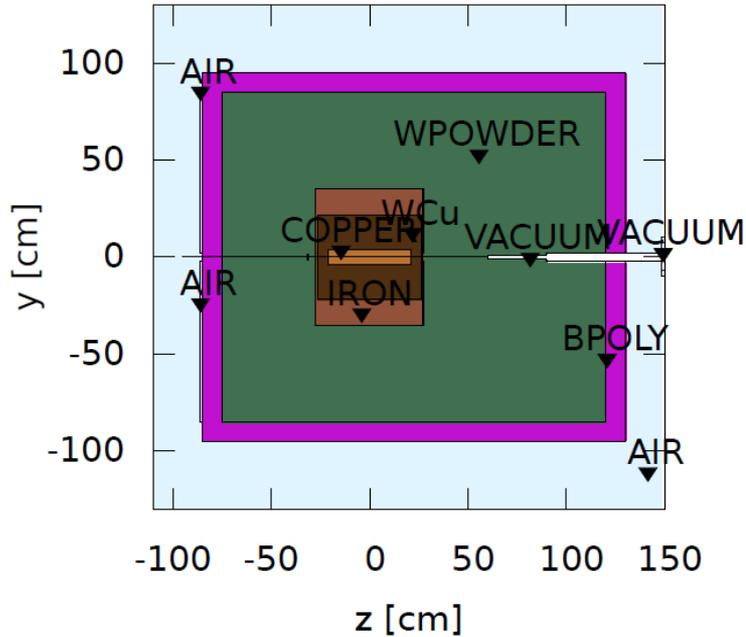


# CPS “conclusions” - March

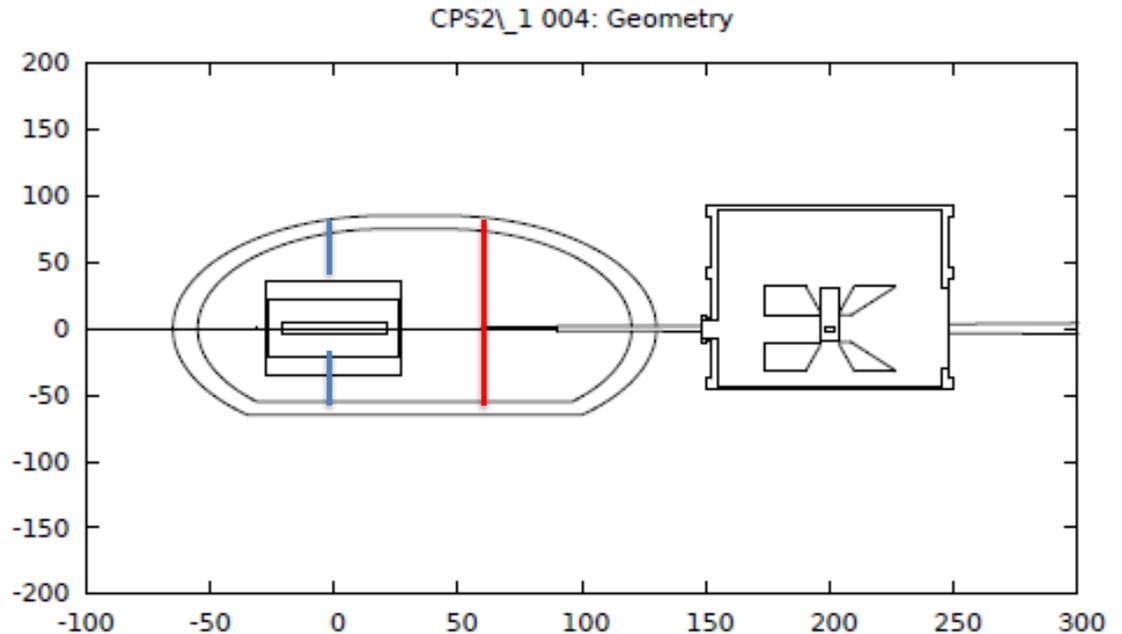
- 1) the impact of W close to the source is very clear when comparing the prompt radiation for 001 and W/Pb  $z = 0$ , a drastic rise in the curves below  $z = 0$ . Since that is already reduced for russian doll 10/40 and for mkIII (f/s/w) likely a thin 10 cm of W all around ("near-skin") really helps.
- 2) on the other hand, I never see a reduction of the prompt radiation (or activation) between 001 and the other models in the regions where one would expect impact of an outer Pb skin should show up, which leads me to believe it is either not there or there in all cases. It is just inconsistent.
- 3) this is the same for the "forward" region, in the earlier February simulations we saw a clear impact of adding a 5 cm lead skin also on activation in the forward/target region (Comparisons VIII of the February slides). Now it just does not show up in the graphs and we always have the "red" cone.

# CPS configurations



1. CPS 2\_1 001 geometry (Cadillac), all W with poly layer (no Pb skin) – just the default to compare with
2. CPS 2\_1 004 geometry: Football with Pb before  $z = 0$  and after  $z = 70$ , W between  $z = 0$  and  $z = 70$ , and everywhere a poly layer and then a 5 cm Pb skin
3. Same but with a 10 cm W inner skin around magnet for  $z < 0$  cm
4. Same with a 20 cm W inner skin

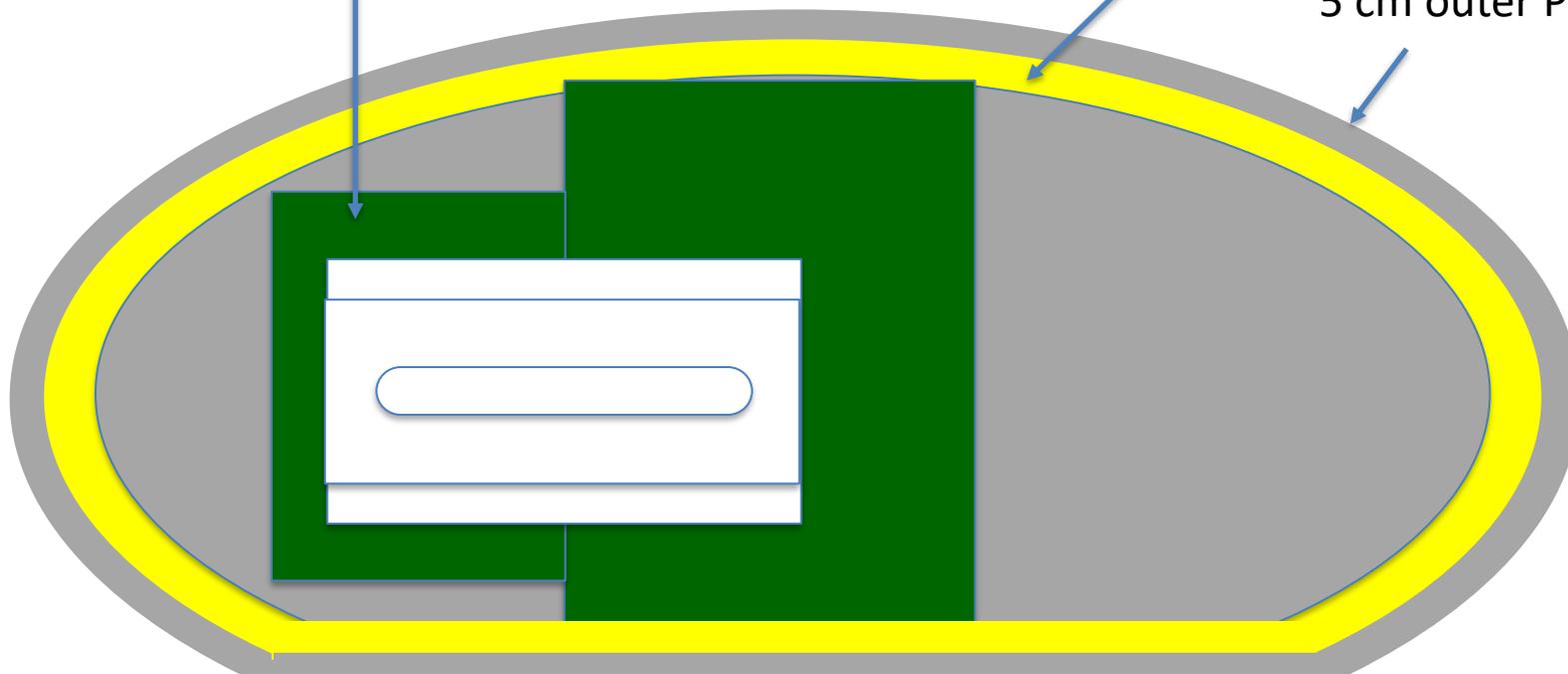
See next page  
for more details



Inner W skin, try  
0, 10 and 20 cm

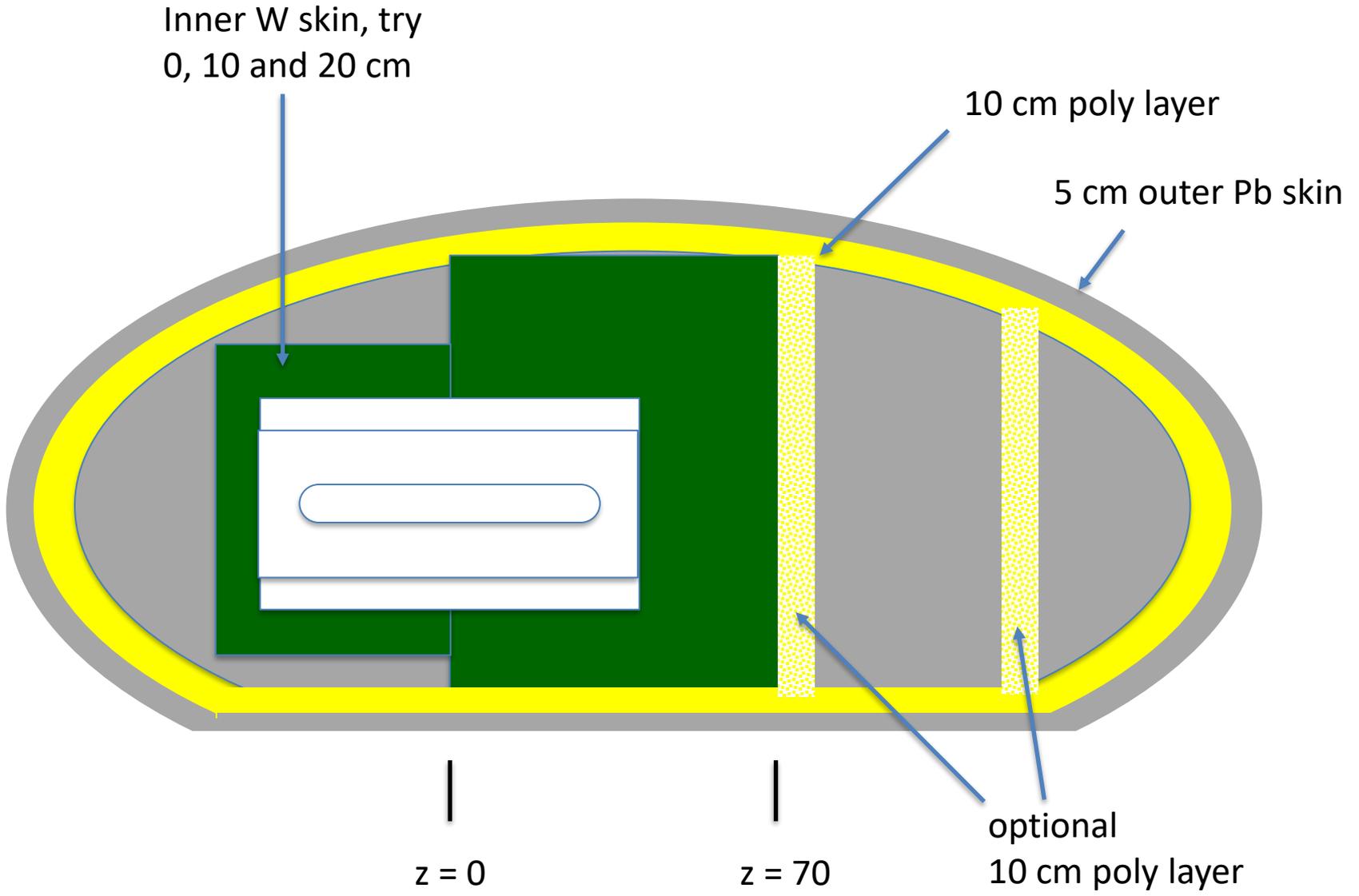
10 cm poly layer

5 cm outer Pb skin



|  
z = 0

|  
z = 70

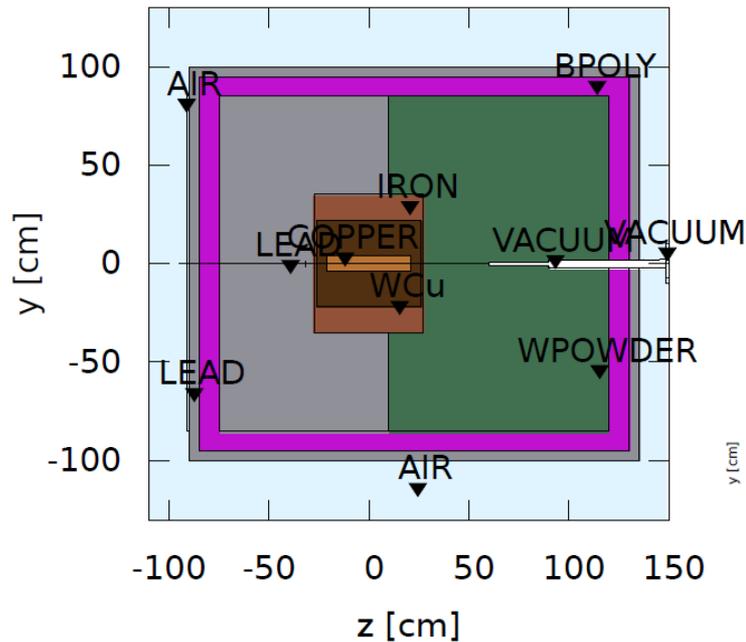
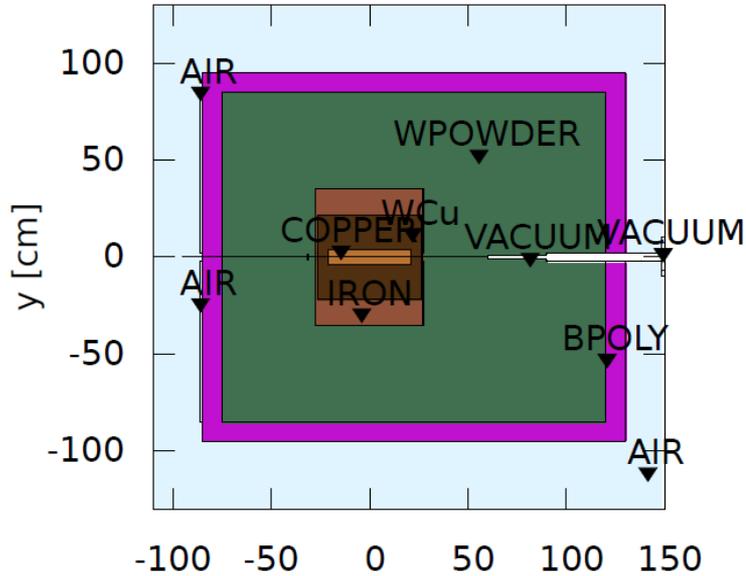


# CPS “conclusions” - February

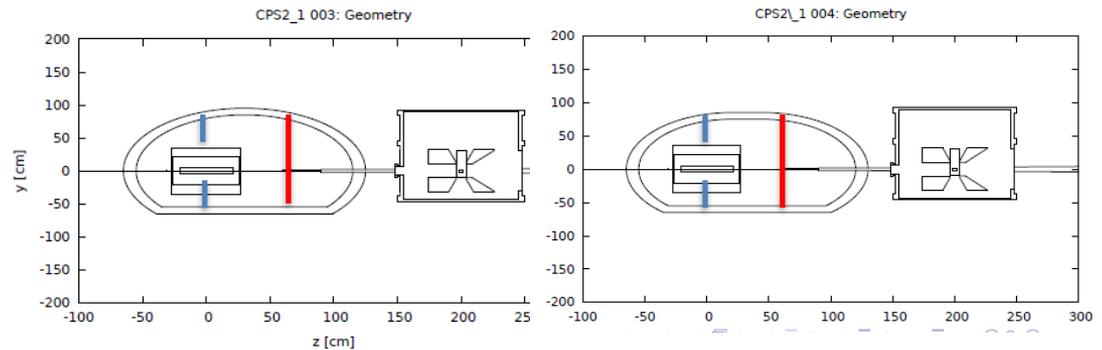
Note: “Comparisons” refers to Gabriel’s slides of Friday 02/21/2020

1. Comparisons (I): Comparing all W powder vs all Pb shows W much more effective to reduce prompt radiation. One can see that both outside the CPS box as inside the CPS box (Pb case is “all black”). Conclusion: need W in the central area.
2. Comparisons (II and I): having Pb instead of W upstream of  $z = 0$  makes the prompt radiation a bit worse laterally outside the CPS, maybe a factor of  $\sim 3$ . If one goes to  $z = 10, 20, 30,$  or  $40$  one sees slowly more prompt radiation “leaking out” and activation levels in the forward hemisphere growing. Conclusion:  $z = 0$  is good compromise.
3. Comparisons (VIII): Adding a Pb layer on the outside helps to further reduce prompt radiation (presumably as the energies are already low for the Pb to be more effective) and greatly reduces the activation levels. At appearance, this may get a reduction of a factor of  $\sim 3$  in prompt radiation levels laterally outside the CPS, balancing point 2 above. Conclusion: always add a 5 cm layer of lead outside the poly.
4. Comparison (VII): The W powder football has much less prompt radiation laterally out than the Russian doll (10, 40). This implies we likely need W laterally out to the poly layer at least in the region for  $z > 0$ . The activation levels for the W powder football are much higher than for the Russian doll (10,40). That simply reinforces we need some Pb layer (the 5 cm Pb skin).
5. Comparison (VI): The Russian doll (10,20) version allows more of the source radiation that we try to capture with W to “leak out”. One can see that from elevated prompt radiation levels between  $z = 50$  and  $200$  laterally out. The (10,40) seems safer, so extending the W up to 40 cm beyond the magnet may suffice, up to  $z \sim 70$ .

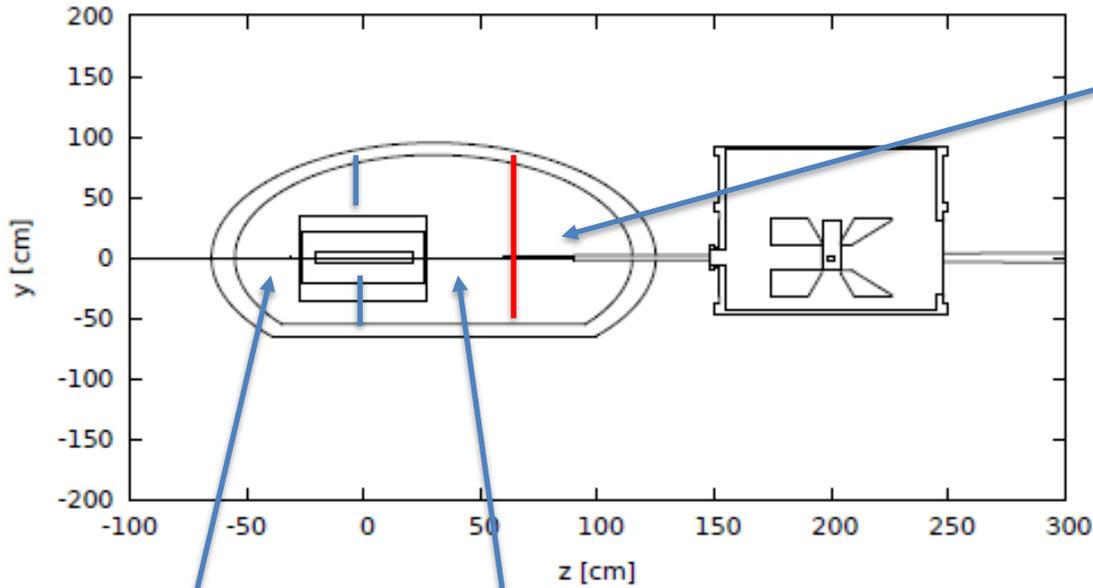
# CPS configurations



1. CPS 2\_1 001 geometry (Cadillac), all W with poly layer – just the default to compare with
2. CPS2\_1 001 geometry (Chimera 1 5skin) (i.e., Pb before  $z = 0$ , W after  $z = 0$ , a poly layer and then a 5 cm Pb skin)
3. CPS 2\_1 003 geometry: Cut sphere with same, Pb before  $z = 0$ , W after  $z = 0$ , a poly layer and then a 5 cm Pb skin
4. CPS 2\_1 004 geometry: Football with same, Pb before  $z = 0$ , W after  $z = 0$ , a poly layer and then a 5 cm Pb skin
5. CPS 2\_1 004 geometry: Football with same, Pb before  $z = 0$  and after  $z = 70$ , a poly layer and then a 5 cm Pb skin
6. Same for CPS 2\_1 003 geometry



CPS2\_1 003: Geometry



W powder or Pb

Always:  
10 cm of poly  
5 cm of Pb skin

W powder

Pb

CPS2\_1 004: Geometry

