CPS Radiation Simulation Update

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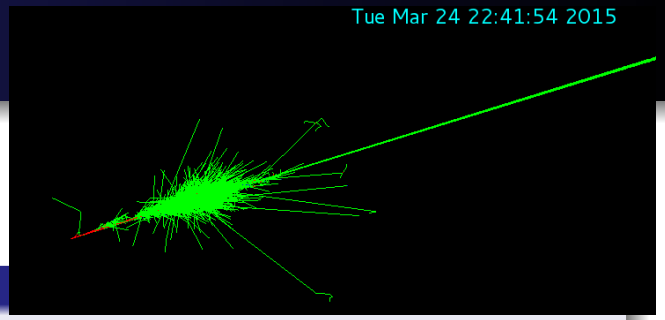
CPS Meeting 02/21/2020

February 21, 2020

From last collab. meeting...



...

- **CPS** optimization wrt: co$t, size/geom, materials
- Subject to constraints from: prompt radiation, activation
- As I'm still waiting for update #'s for the latter...
- I shall update you on:
- **Latest*** simulation results
- CPS (software) **toolmaking**
- Outlook

Disclaimer

- ...as usual!

Memento (as in "reminder")

...

- Already have a **Cadillac** (T?, L?, F?) version that we cannot afford.
- Need to find an **acceptable** substitute we can live with (...)
- Afaikt several avenues (dimensions?) have been proposed:

(possible) Optimization dimensions:

- pure geometry alone (cut corners, bottom)
- geom. and materials (substitute **Pb**?, **Fe**? for **W**)
- geom., mat., layering (Cu/WCu/Fe/W/Pb/$(C_2H_4)n$/Pb?)

- Considering possible variations of all of the above that's quite a few settings to be **implemented** and **simulated**.
- I explored some of these avenues the past few weeks.

CPS configurations

List of CPS21 setups (thus far)

Name	pdf	Description.
001a_phibins	111	Large off-center cube. All WPowder.
001a_pb	111	Same as above. All Pb.
chimera01	111	Large... WPowder/Pb boundary z=0.
chimera01_10	111	Large... WPowder/Pb boundary z=10.
chimera01_20	111	Large... WPowder/Pb boundary z=20.
chimera01_30	111	Large... WPowder/Pb boundary z=30.
chimera01_40	111	Large... WPowder/Pb boundary z=40.
chimera01_50		

Only newest stuff (and relevant older settings for comparison) are included in this list.

CPS configurations (II)

List of CPS21 setups (thus far)

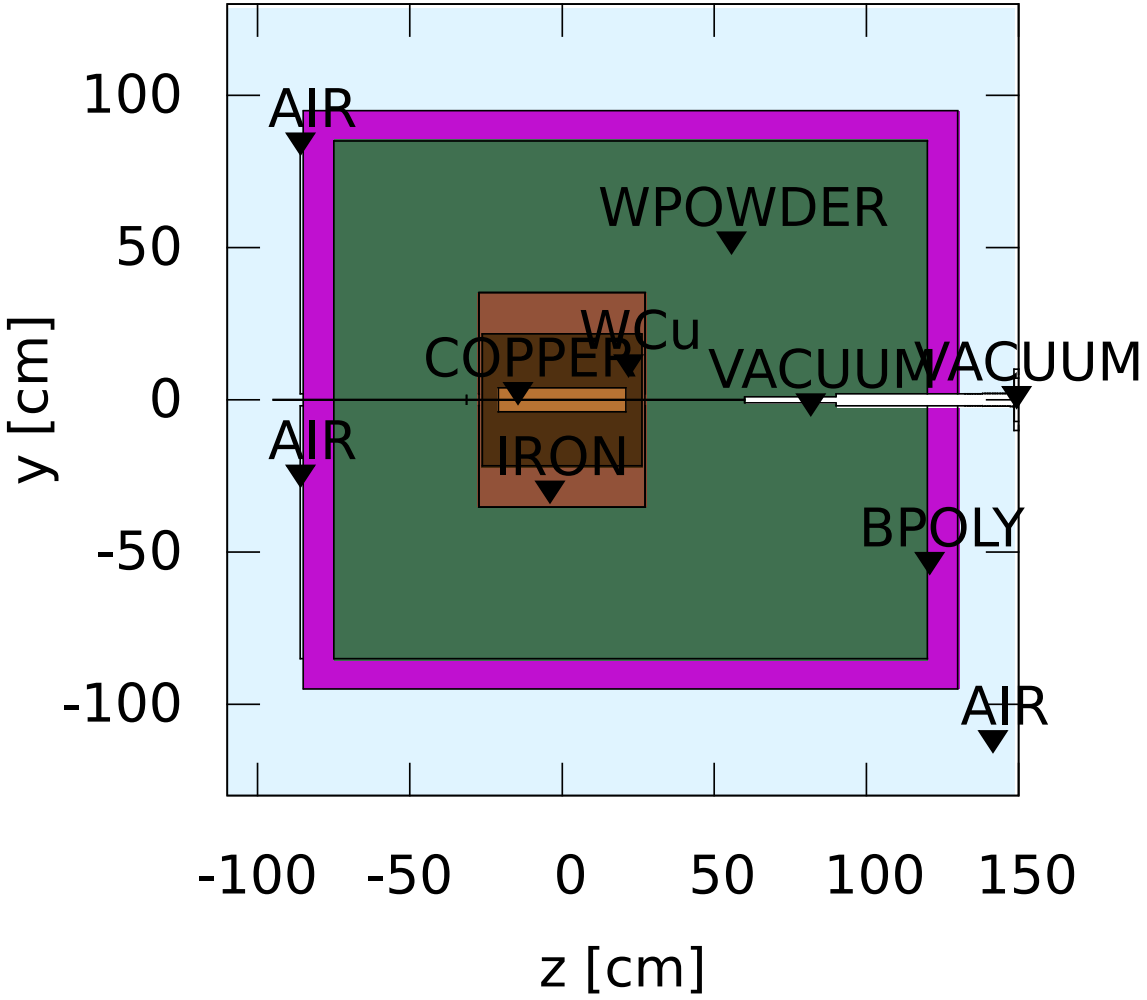
Name	pdf	Description.
chimera04_cyl01	111	cut football. Pb filler. Large Cone in front.
matrioshka_10_30	111	cut f. Pb filler. 10+30 cm WPowder box.
matryoshka_10_20	111	cut f. Pb filler. 10+20 cm WPowder box.
matryoshka_10_40	111	cut f. Pb filler. 10+40 cm WPowder box.
chimera01_10_pb5	111	L. box, w/pb z=10. 5 cm Pb skin
chimera01_10_pb2_5	111	L. box, w/pb z=10. 2.5 cm Pb skin
chimera01_30_pb5	111	L. box, w/pb z=30. 5 cm Pb skin

Second column tells me if I generated/or not pdf files for: geometry, prompt rad. (combined), and activation (1h cooldown). Other distr. exist; just did not plot them yet.

Instead of squeezing several geometries per slide I shall show them one at a time. We can always go back/forth between slides.

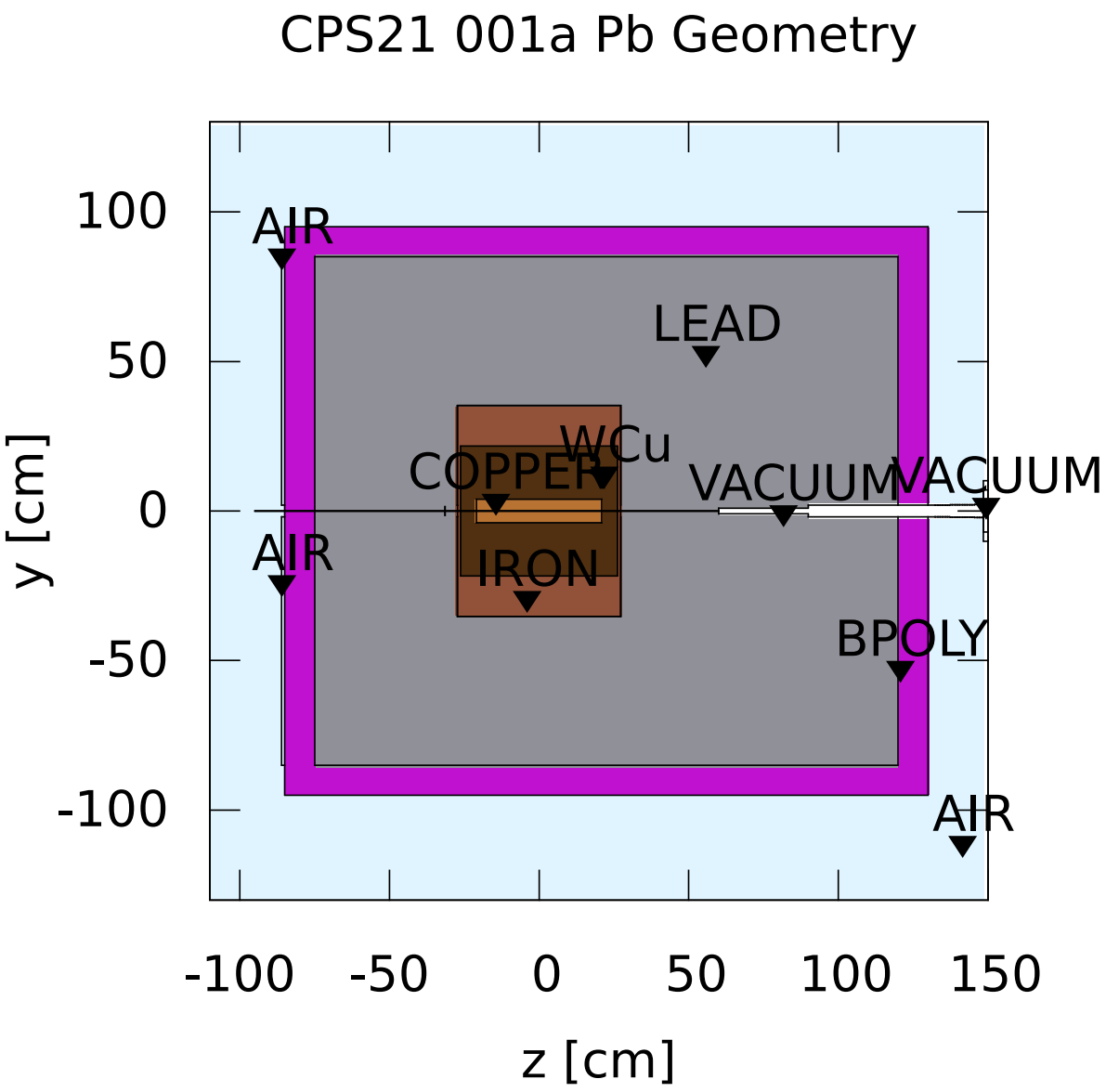
Geometries and Mats. (I)

CPS21_001 Geometry



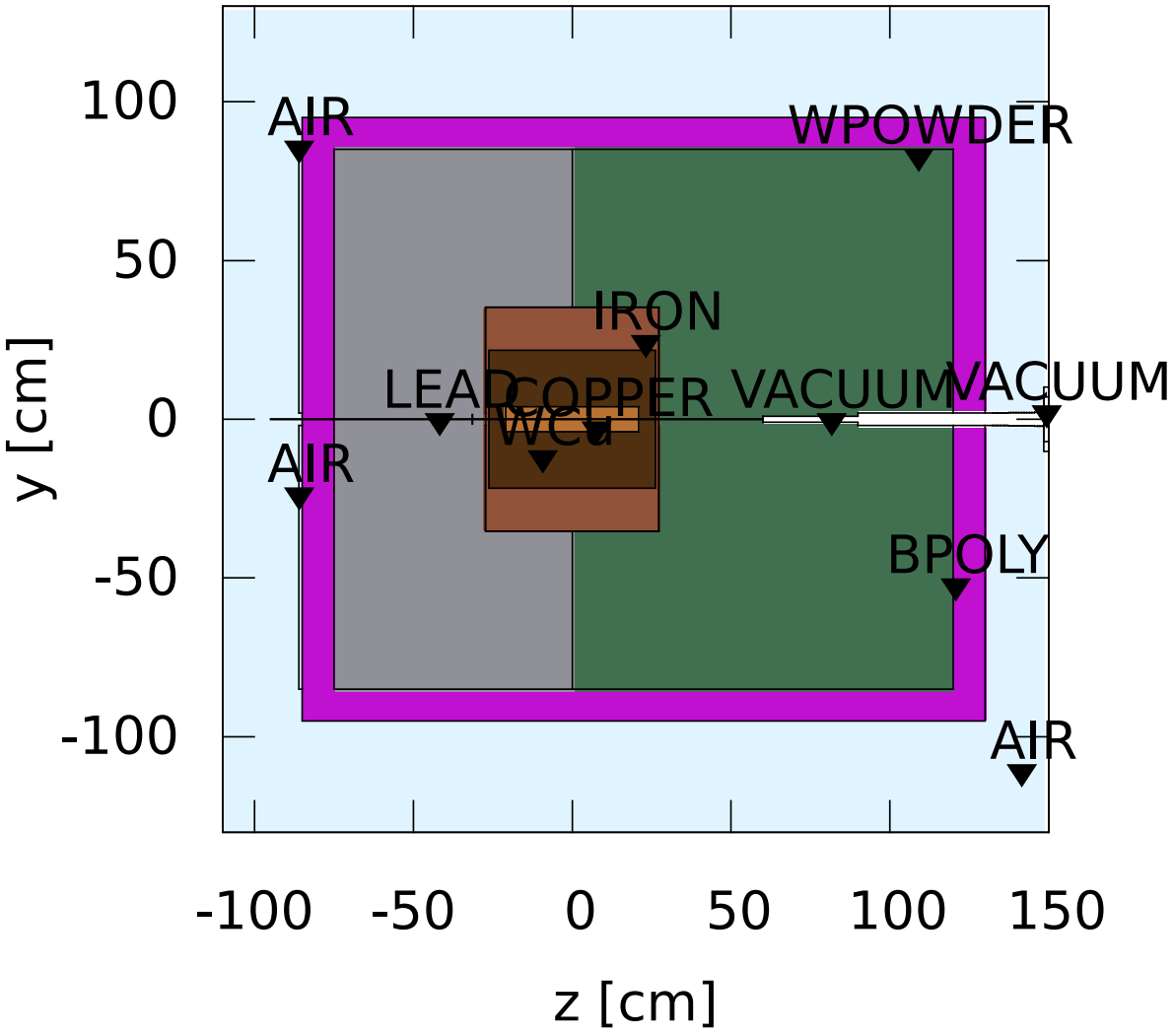
LPT is also implemented, just not shown here.

Geometries and Mats. (II)



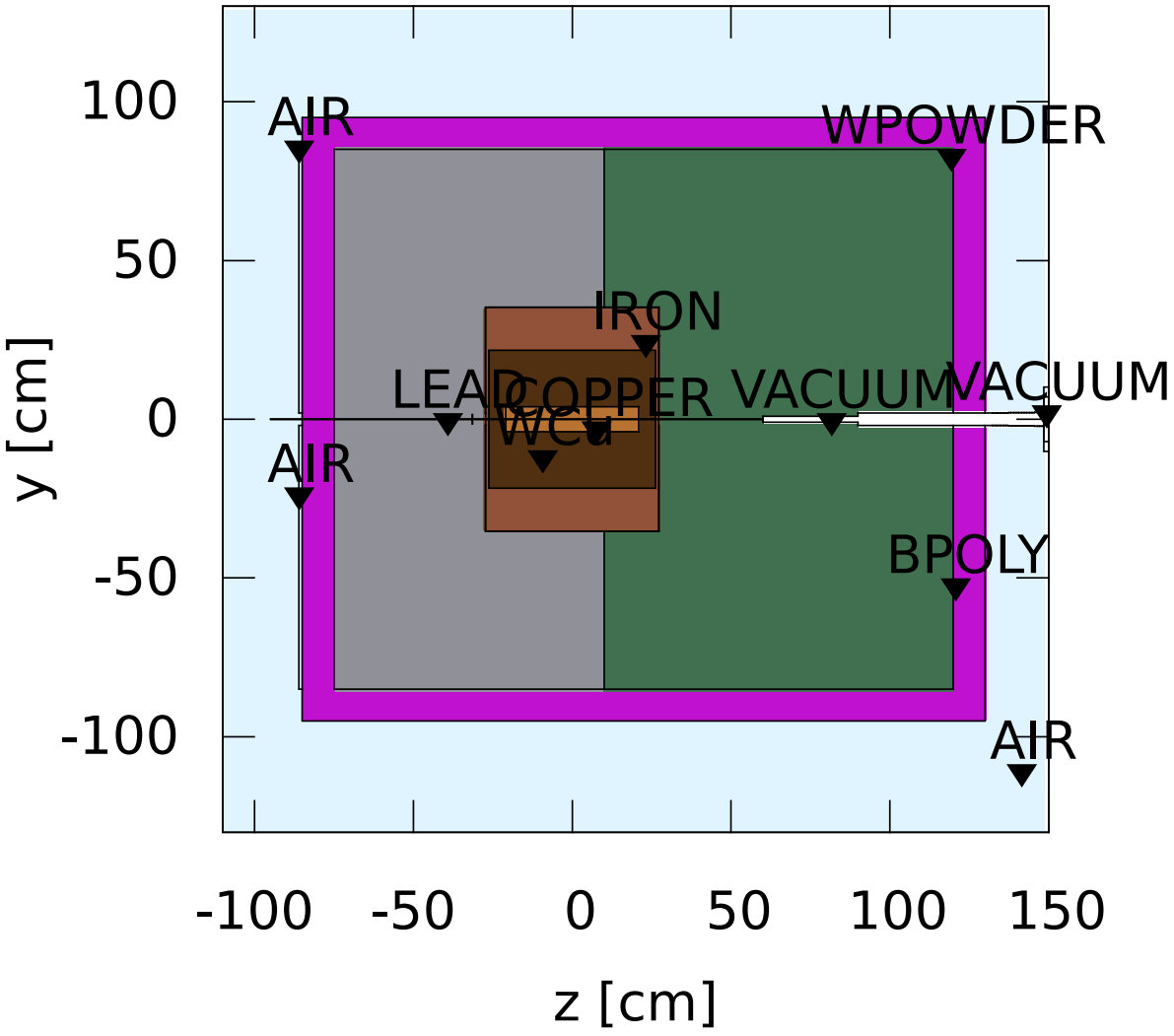
Geometries and Mats. (III)

Chimera1 Geometry

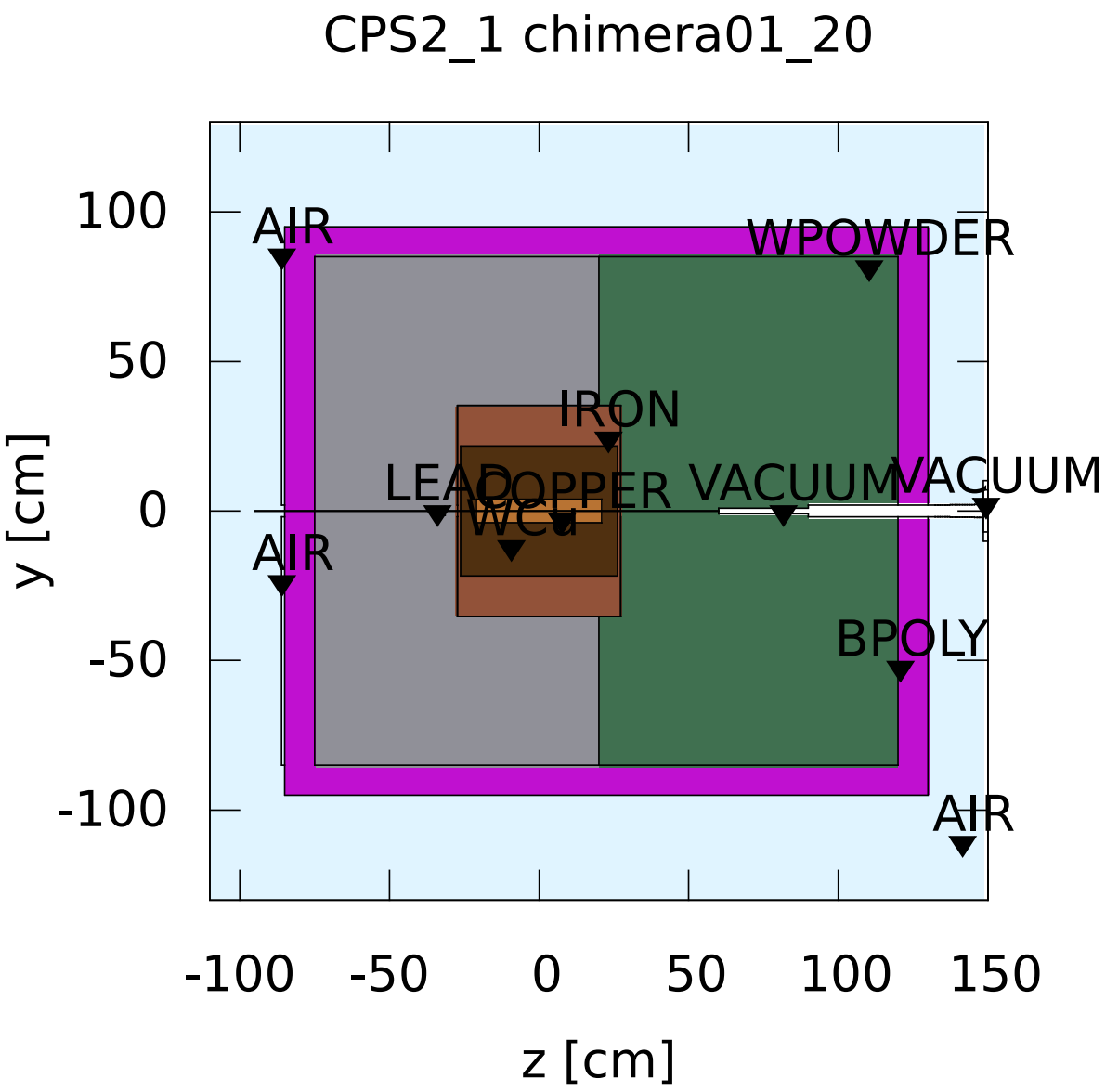


Geometries and Mats. (IV)

CPS21 chimera01 10 Geometry

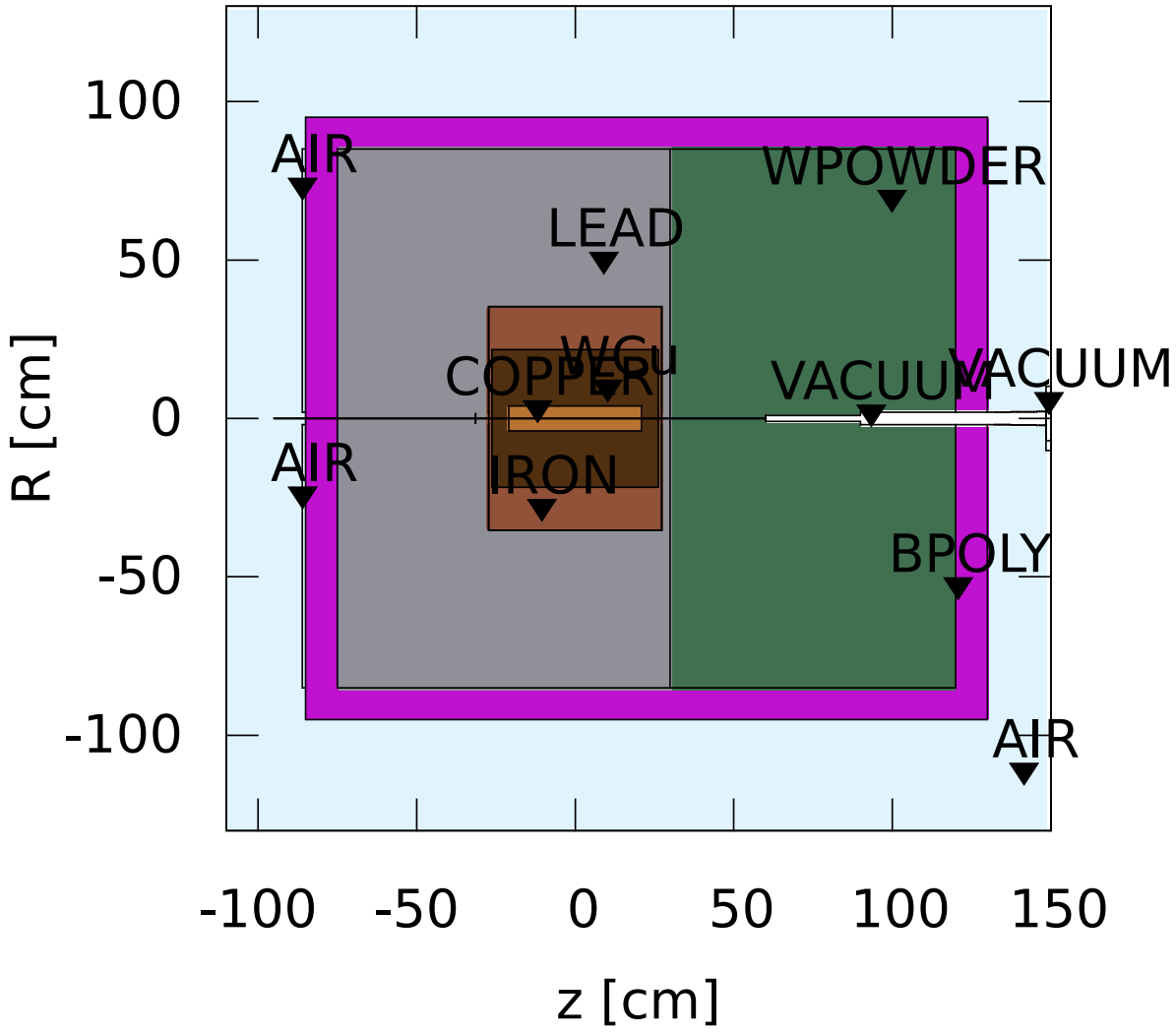


Geometries and Mats. (V)



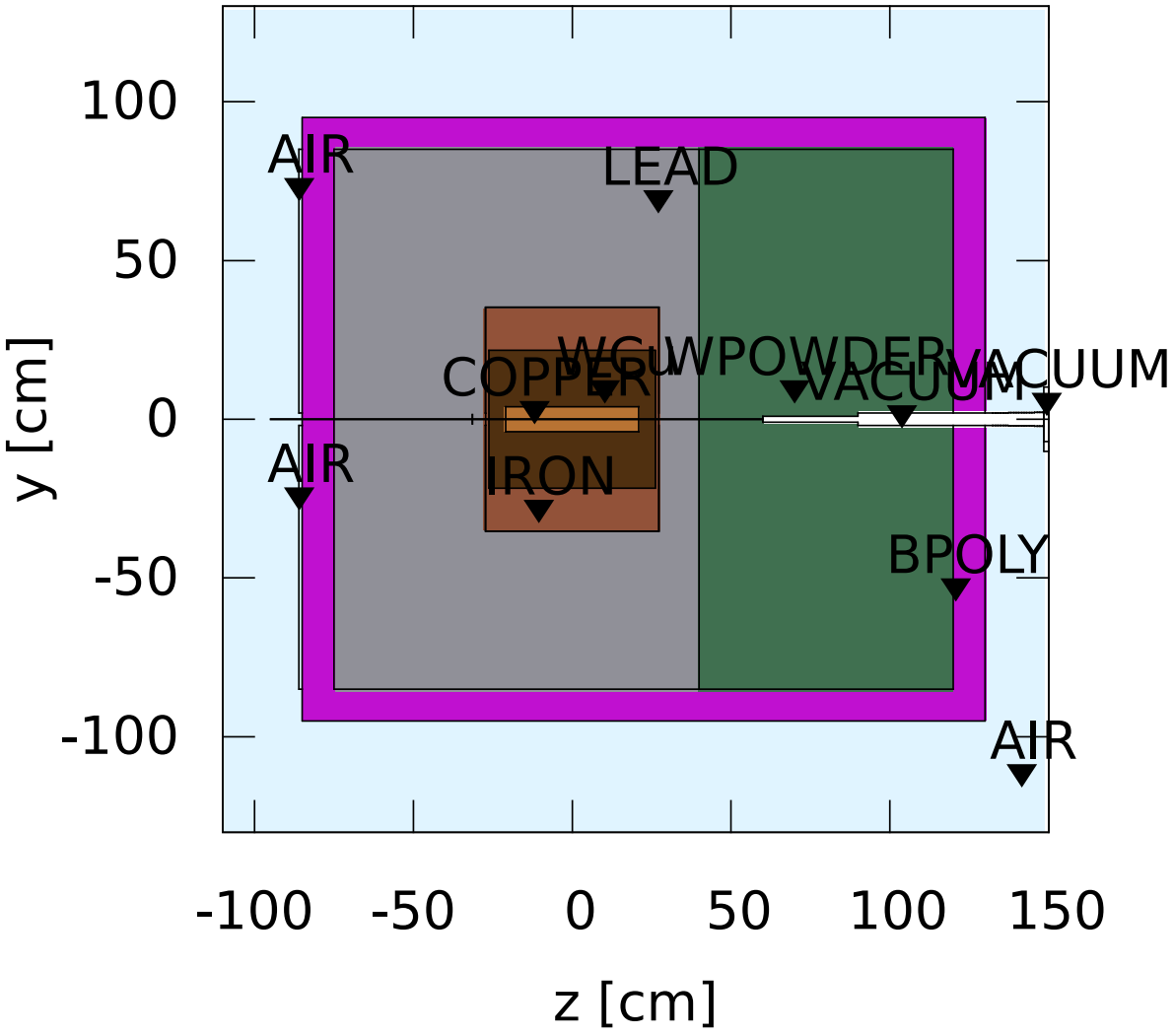
Geometries and Mats. (VI)

CPS21 chimera01 30 Geometry



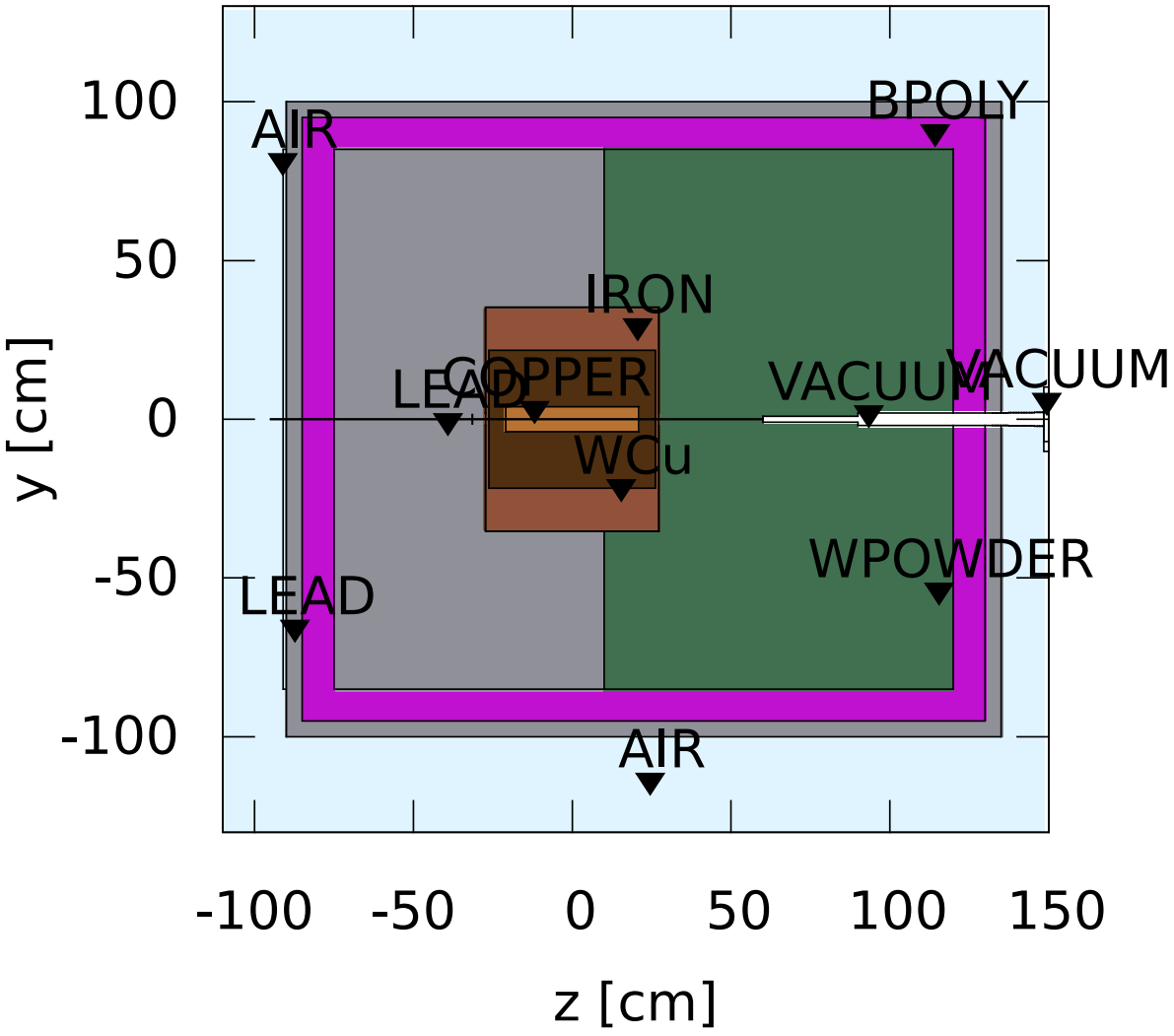
Geometries and Mats. (VII)

CPS2 1 chimera01 40 Geometry



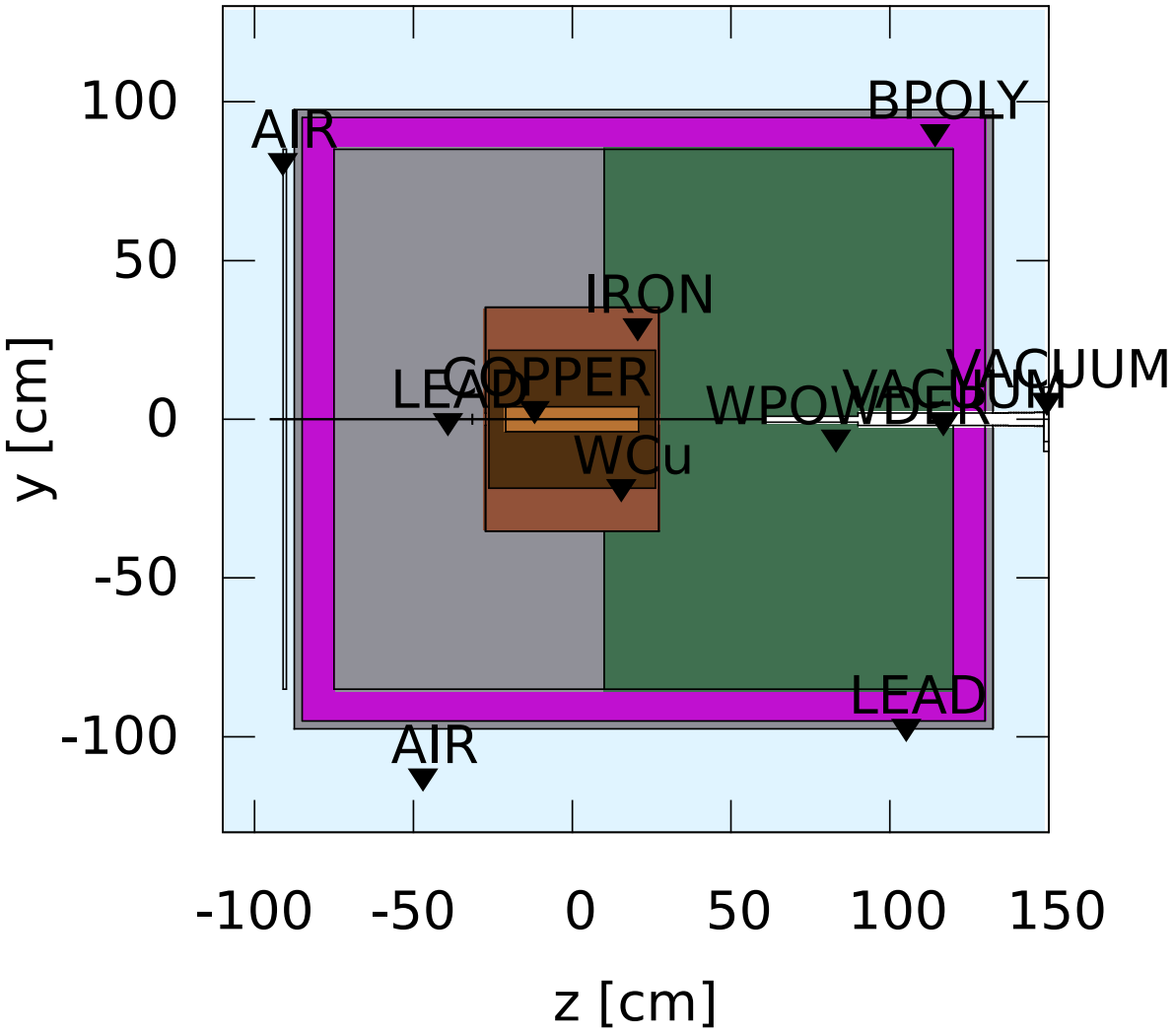
Geometries and Mats. (VIII)

CPS21 chimera01 10 5skin Geometry



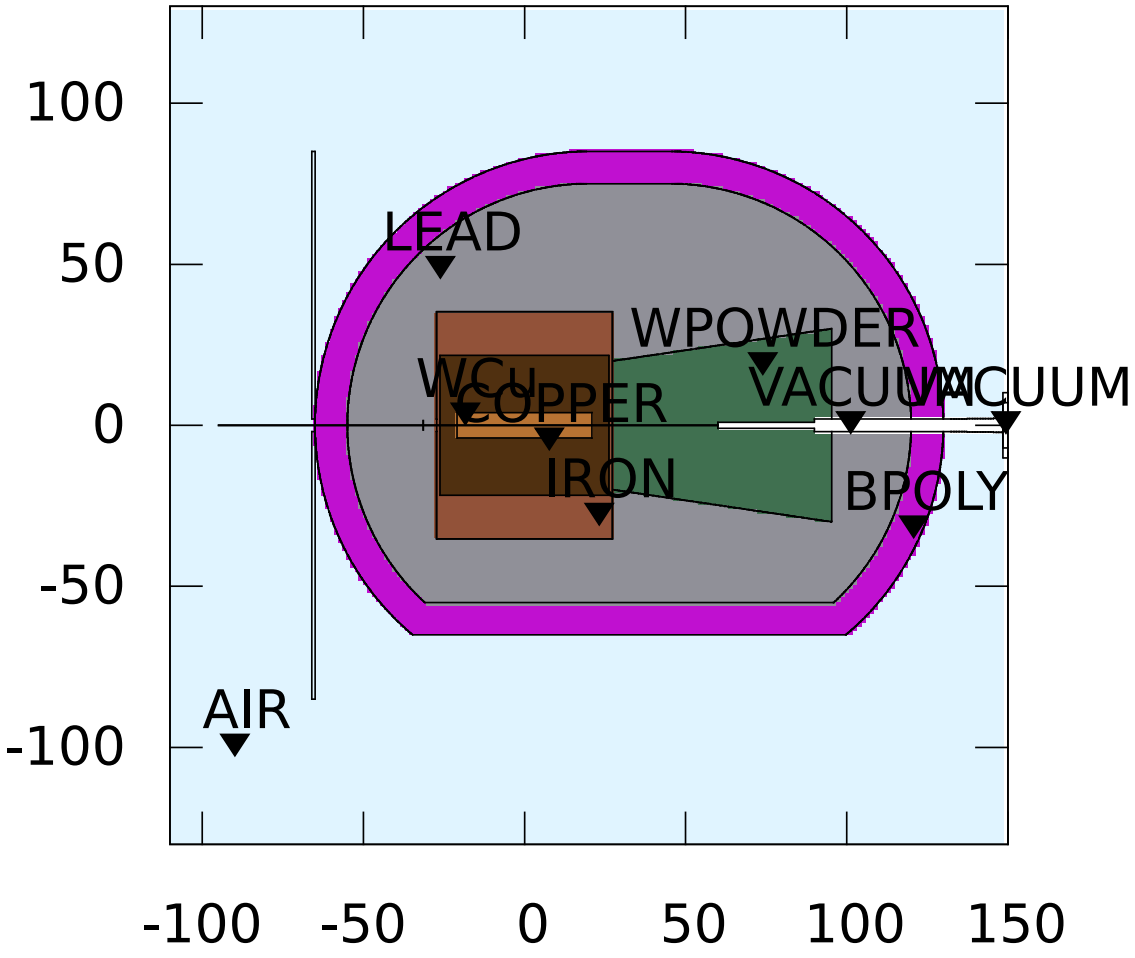
Geometries and Mats. (IX)

CPS21 chimera01 10 2.5skin Geometry



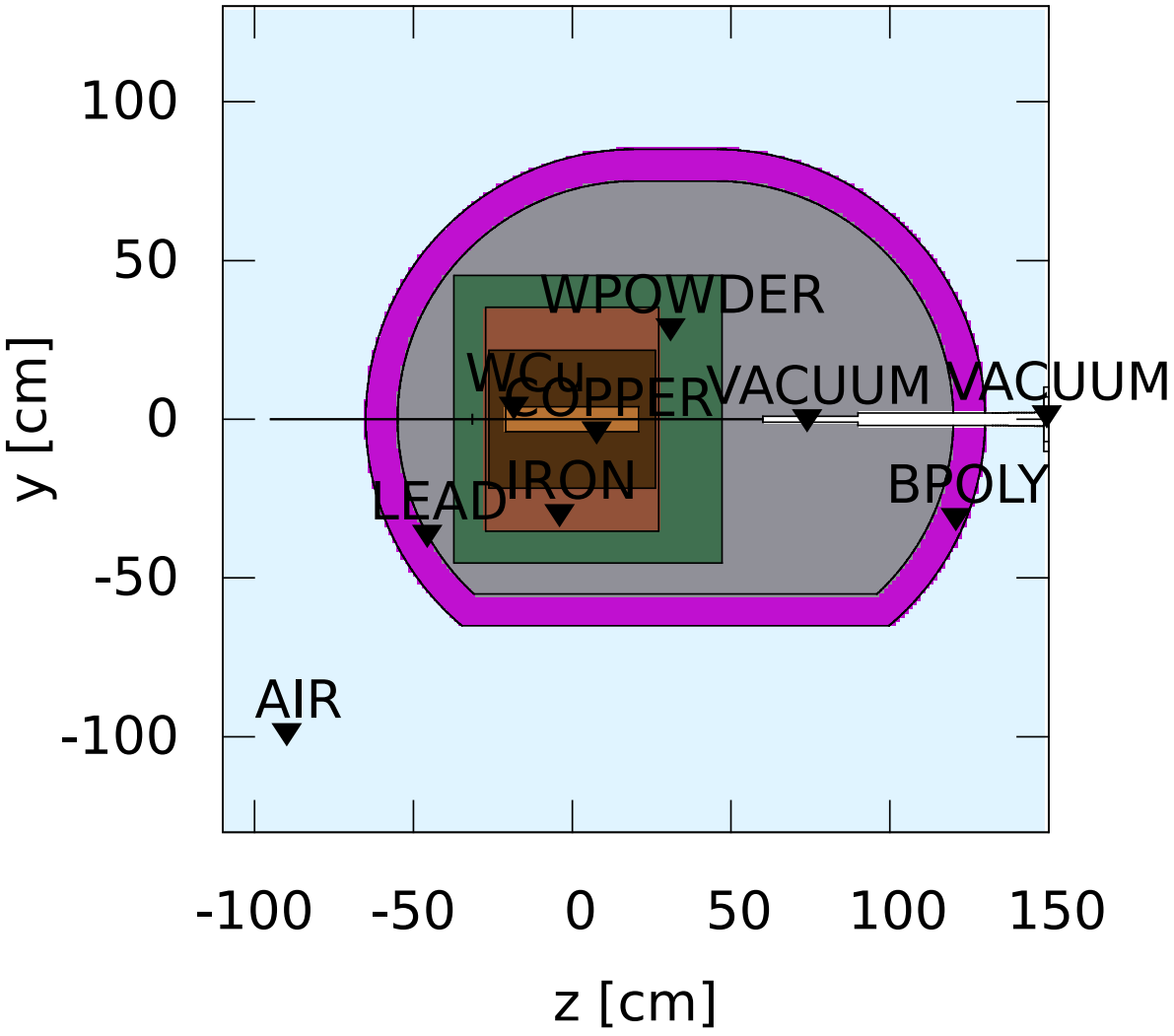
Geometries and Mats. (X)

CPS2 1 004 Cyl (actually Cone) Geometry



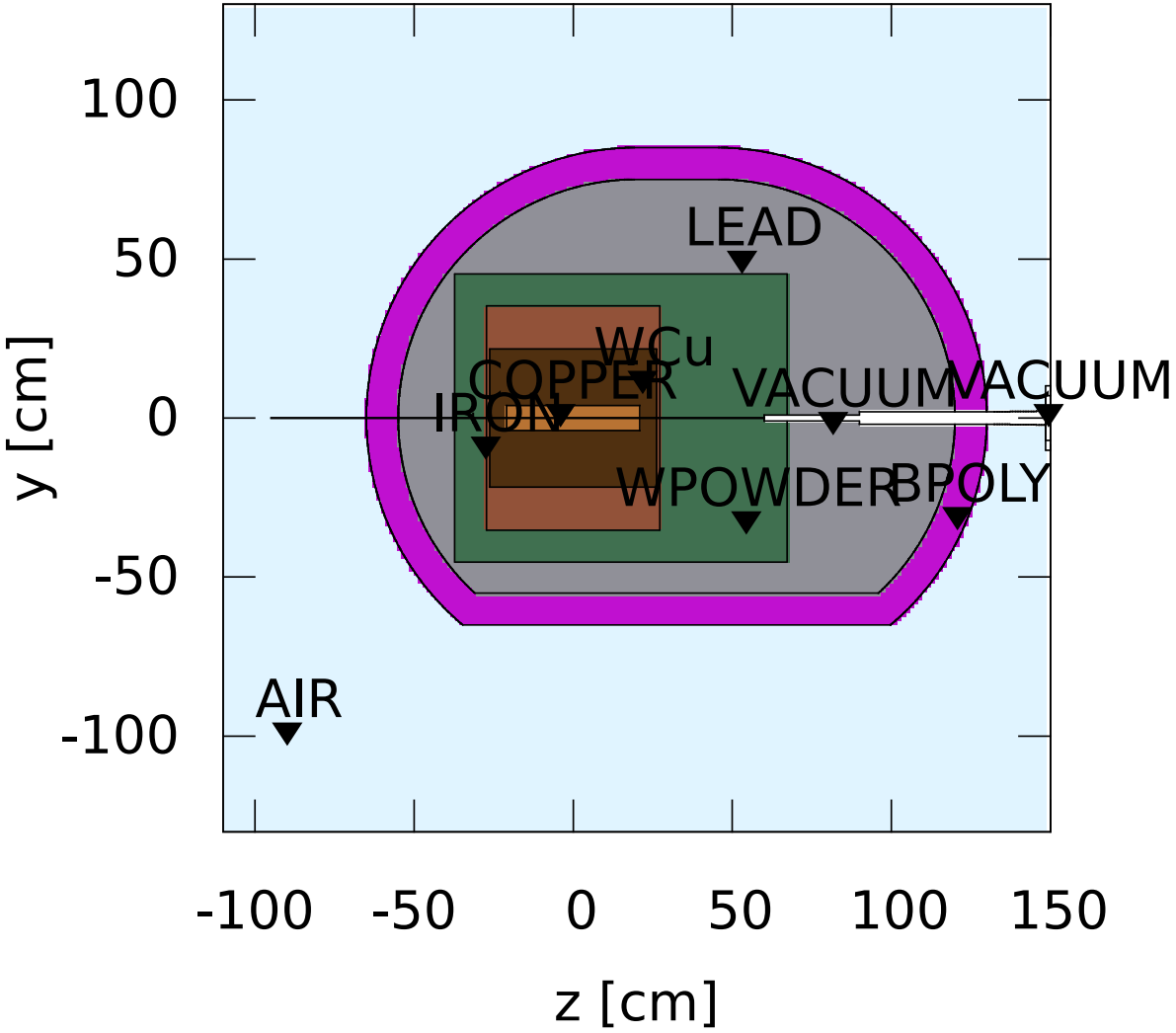
Geometries and Mats. (XI)

CPS21 matryoshka 10 20 Geometry



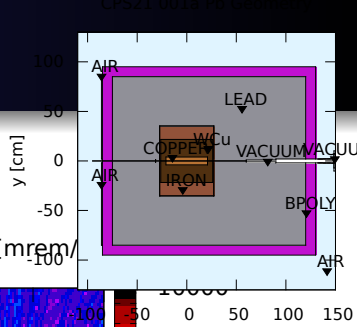
Geometries and Mats. (XII)

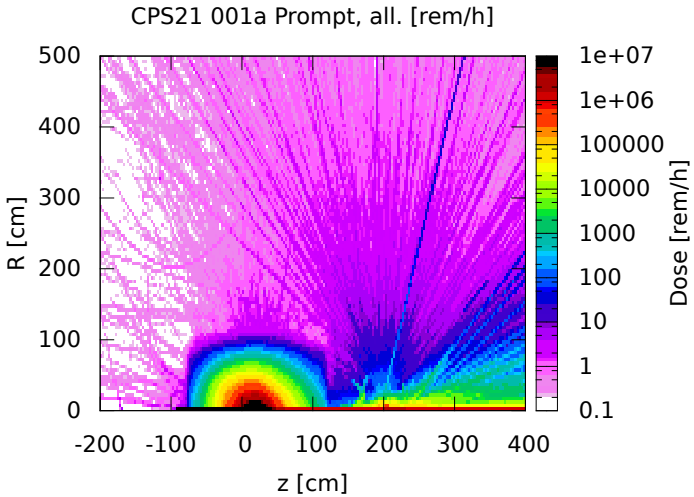
CPS21 matryoshka 10 40 Geometry

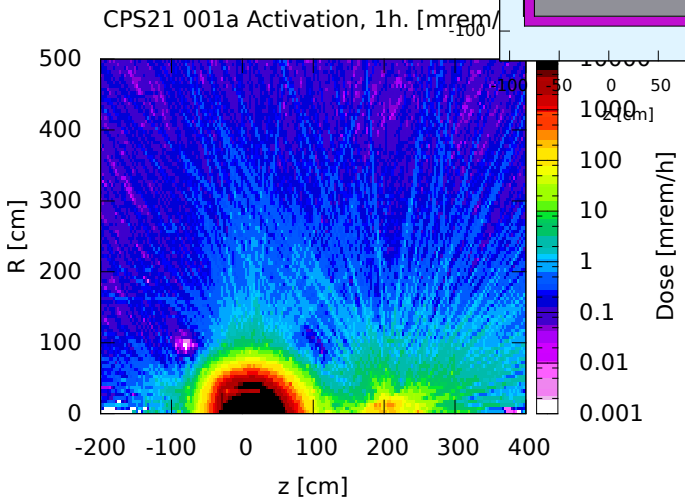


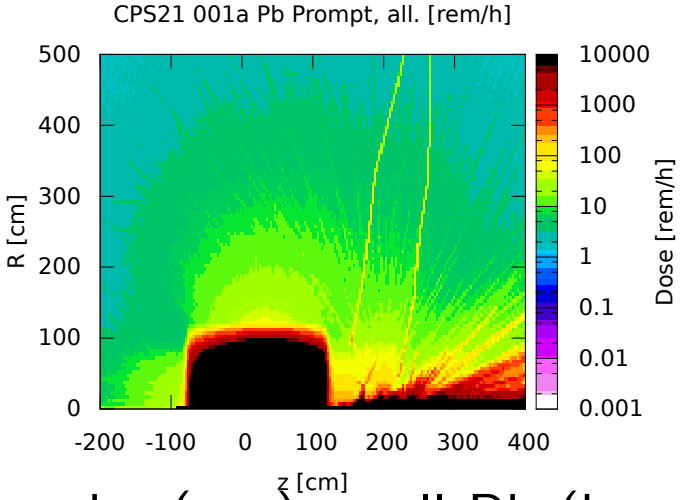
...and a few more variations like these.

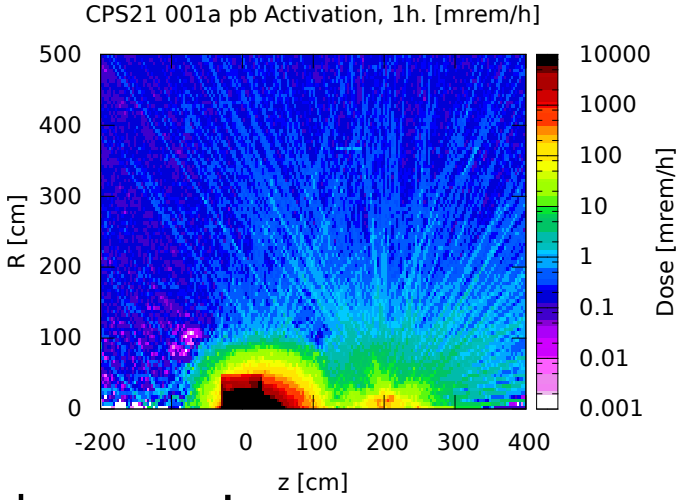
Comparisons (I)





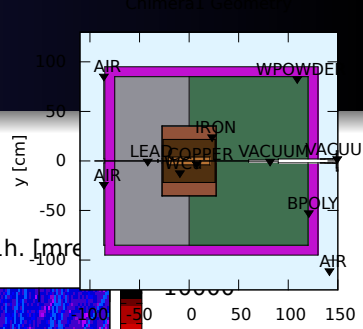


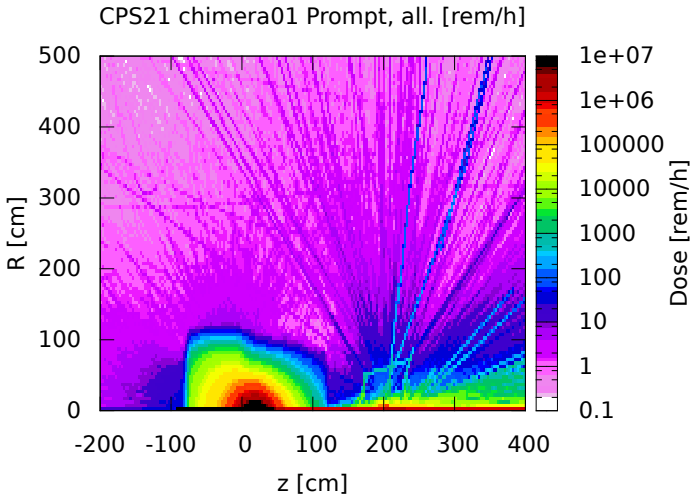


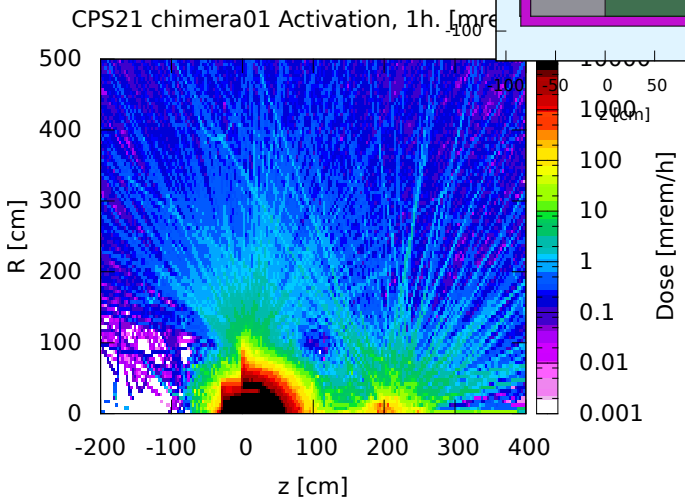


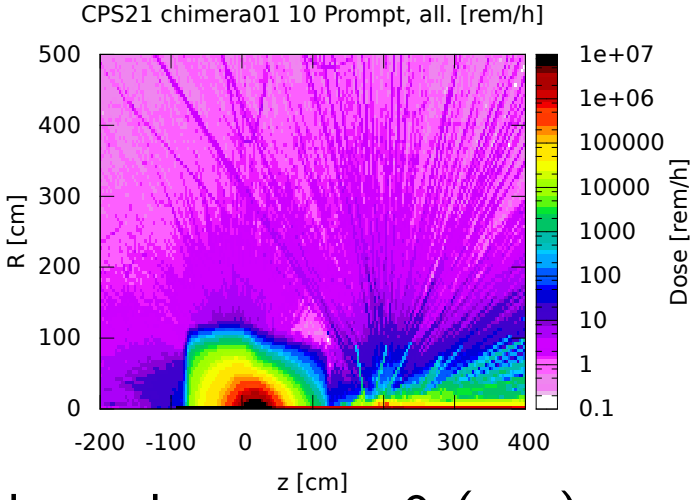
all WPowder (top) vs all Pb (bottom). Large box version.

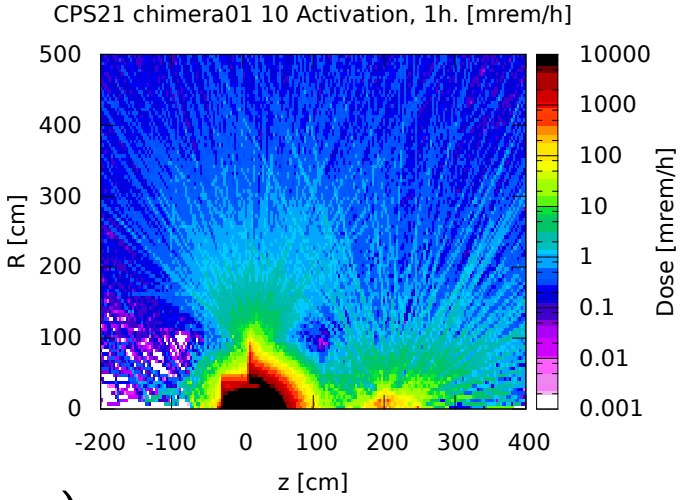
Comparisons (II)





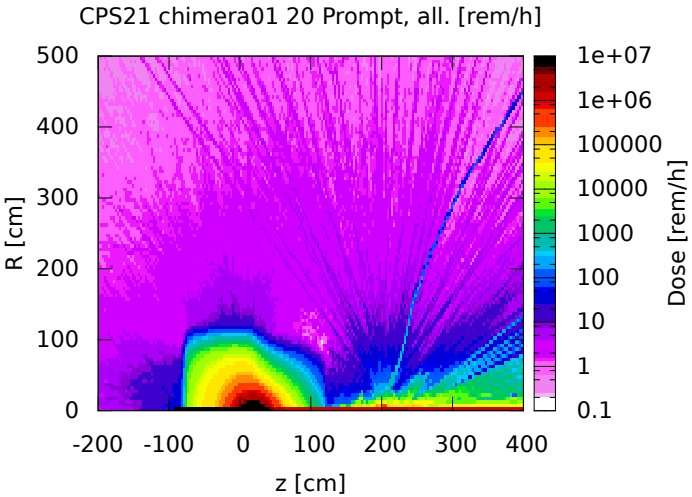


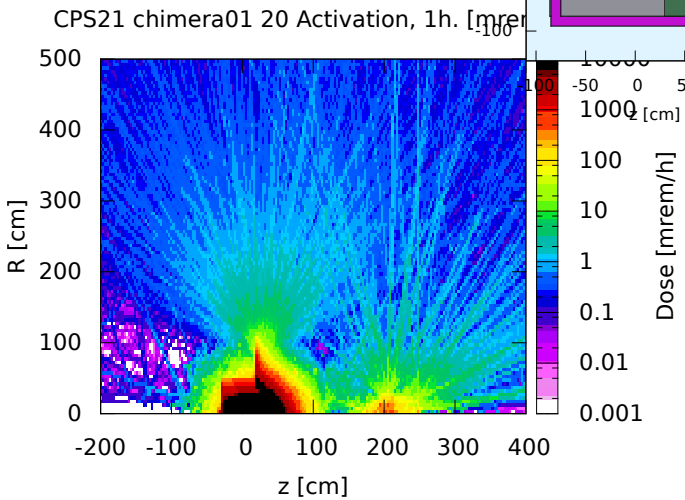


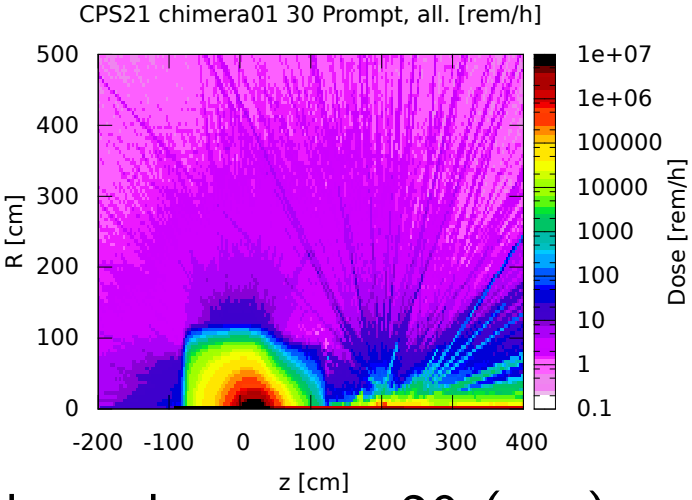


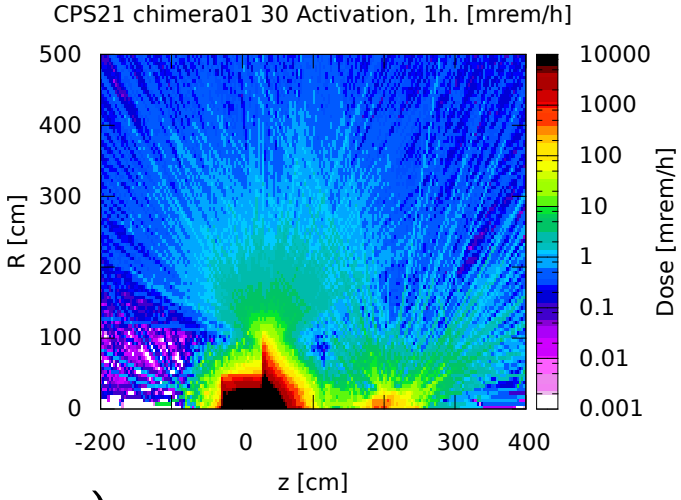
W/Pb boundary at z=0 (top) vs z=10 (bottom)

Comparisons (III)



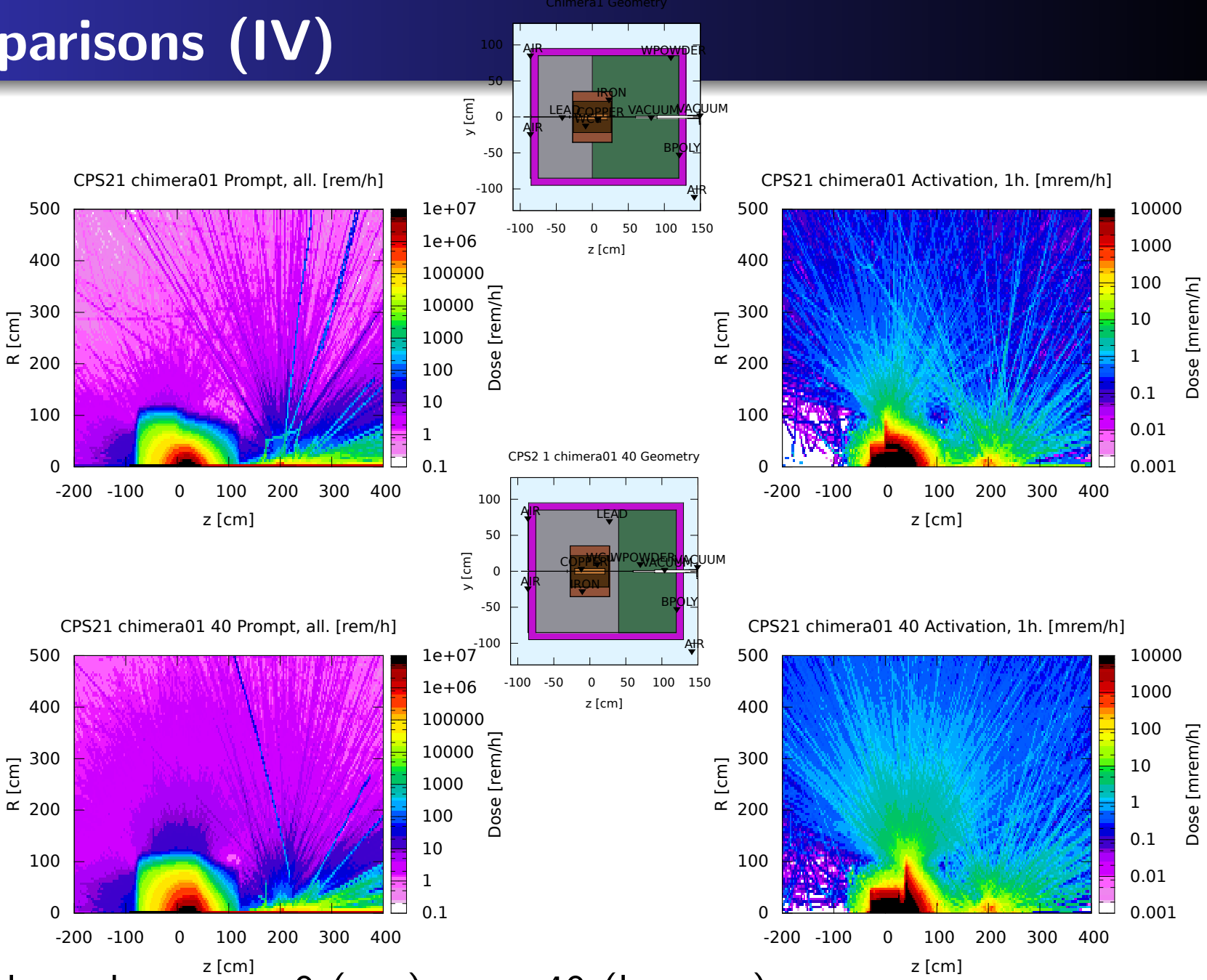






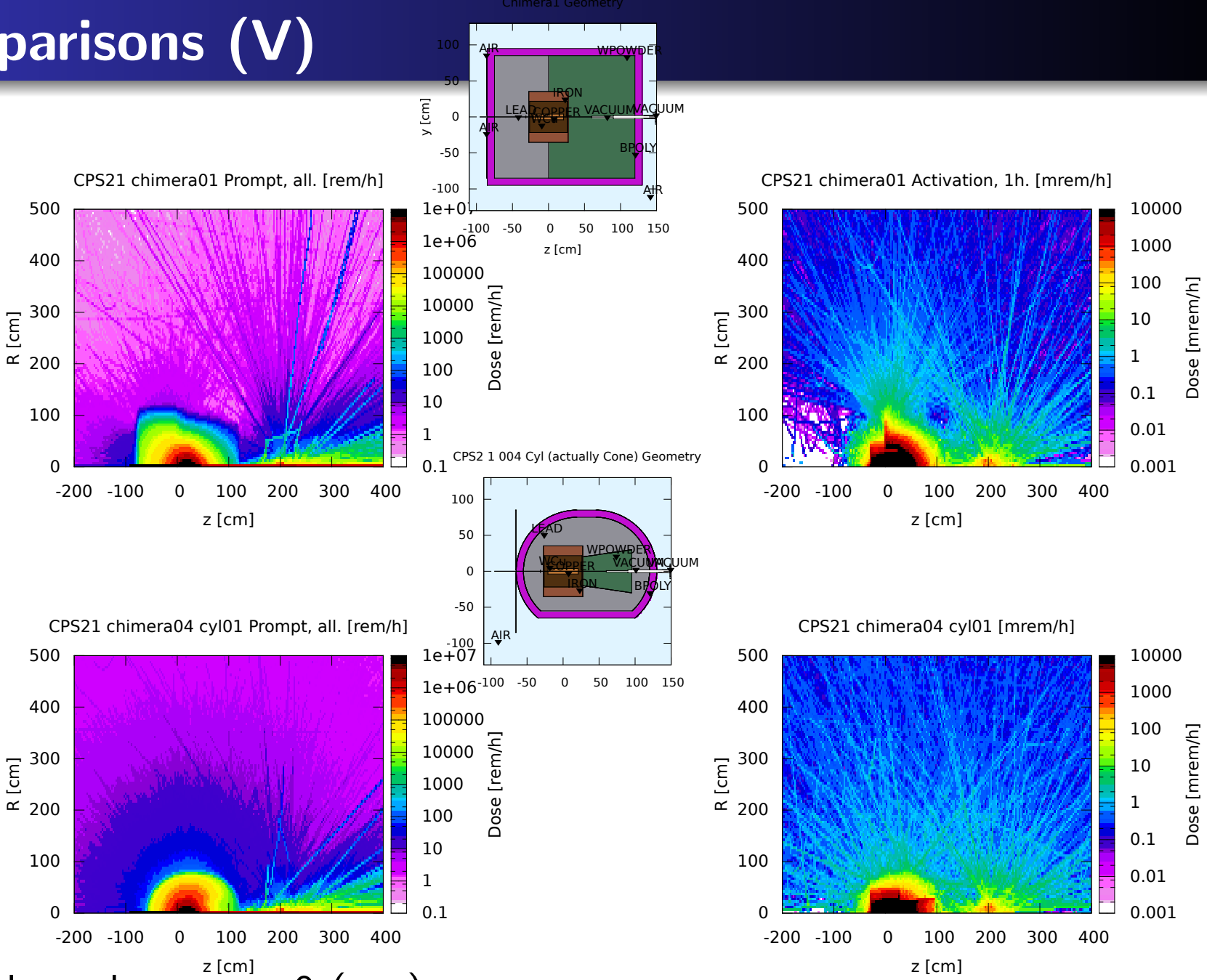
W/Pb boundary at z=20 (top) vs z=30 (bottom)

Comparisons (IV)



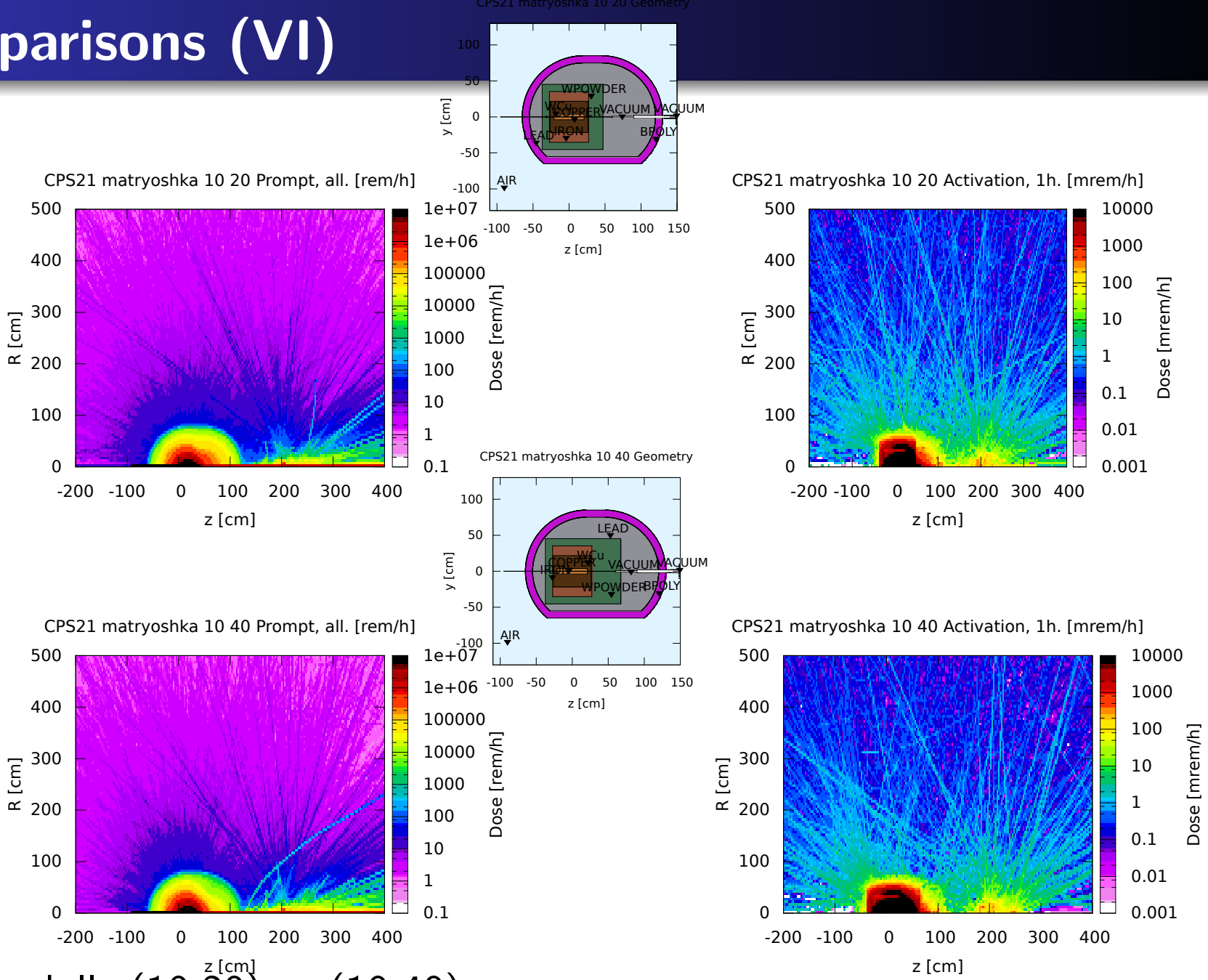
W/Pb boundary at z=0 (top) vs z=40 (bottom)

Comparisons (V)



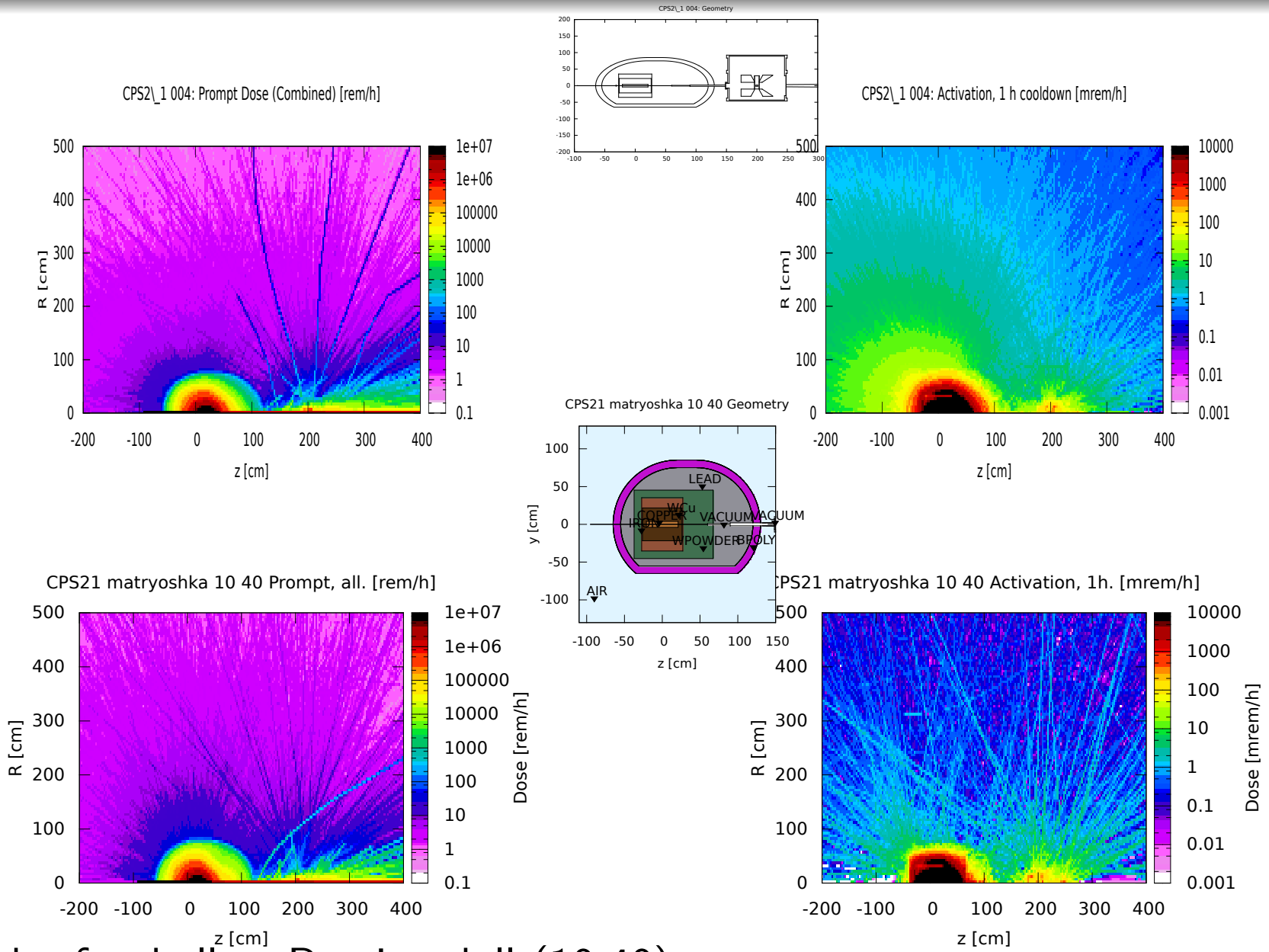
W/Pb boundary at z=0 (top) vs nose cone

Comparisons (VI)



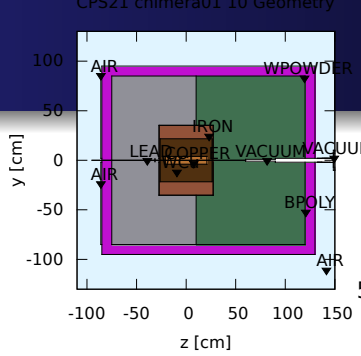
Russian dolls (10,20) vs (10,40)

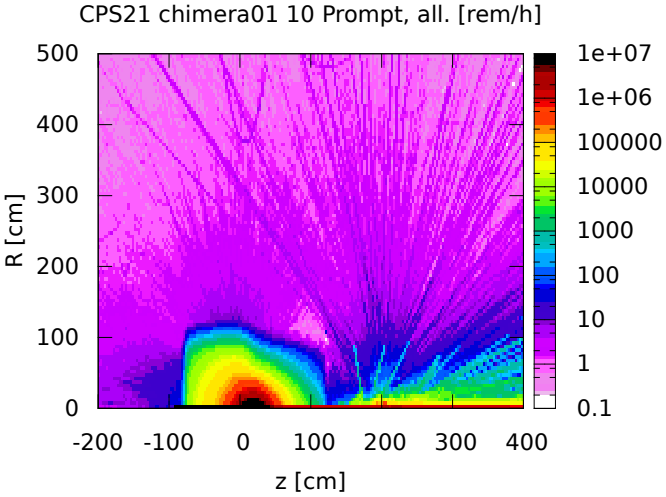
Comparisons (VII)

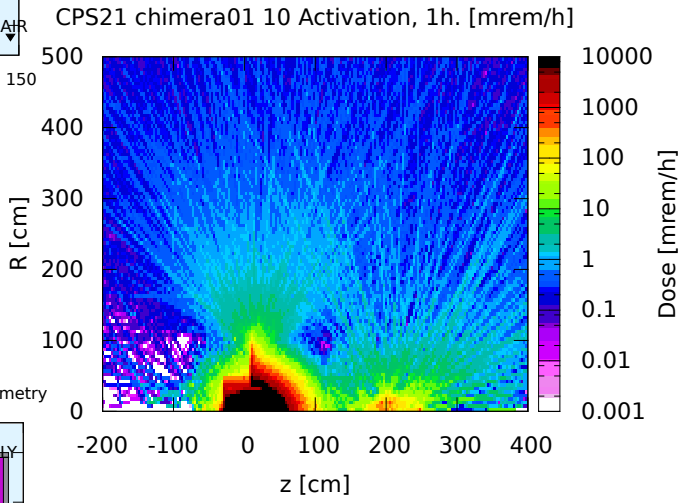


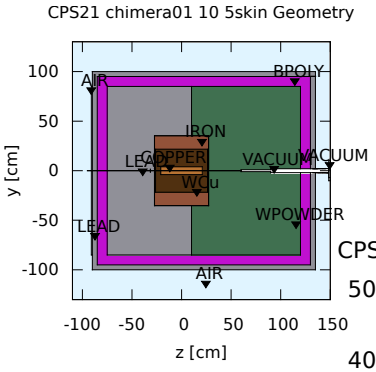
WPowder football vs Russian doll (10,40).

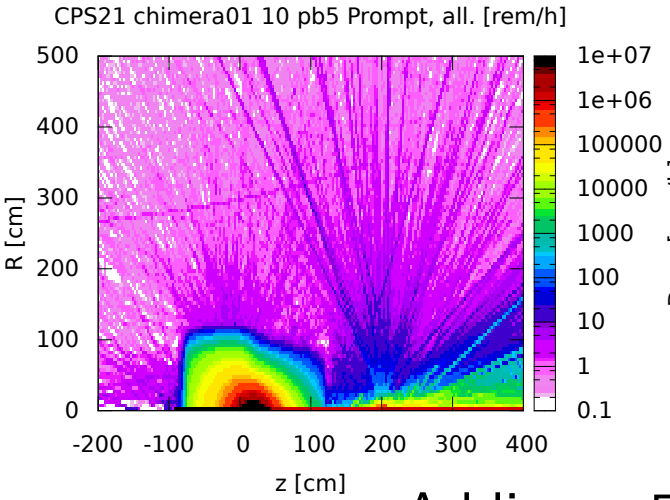
Comparisons (VIII)

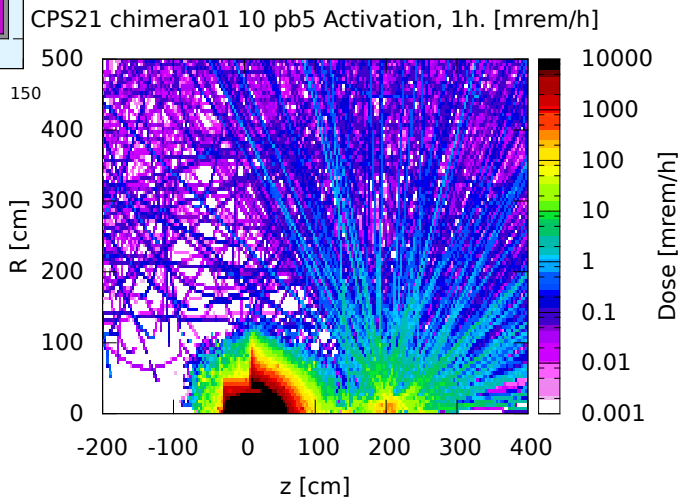






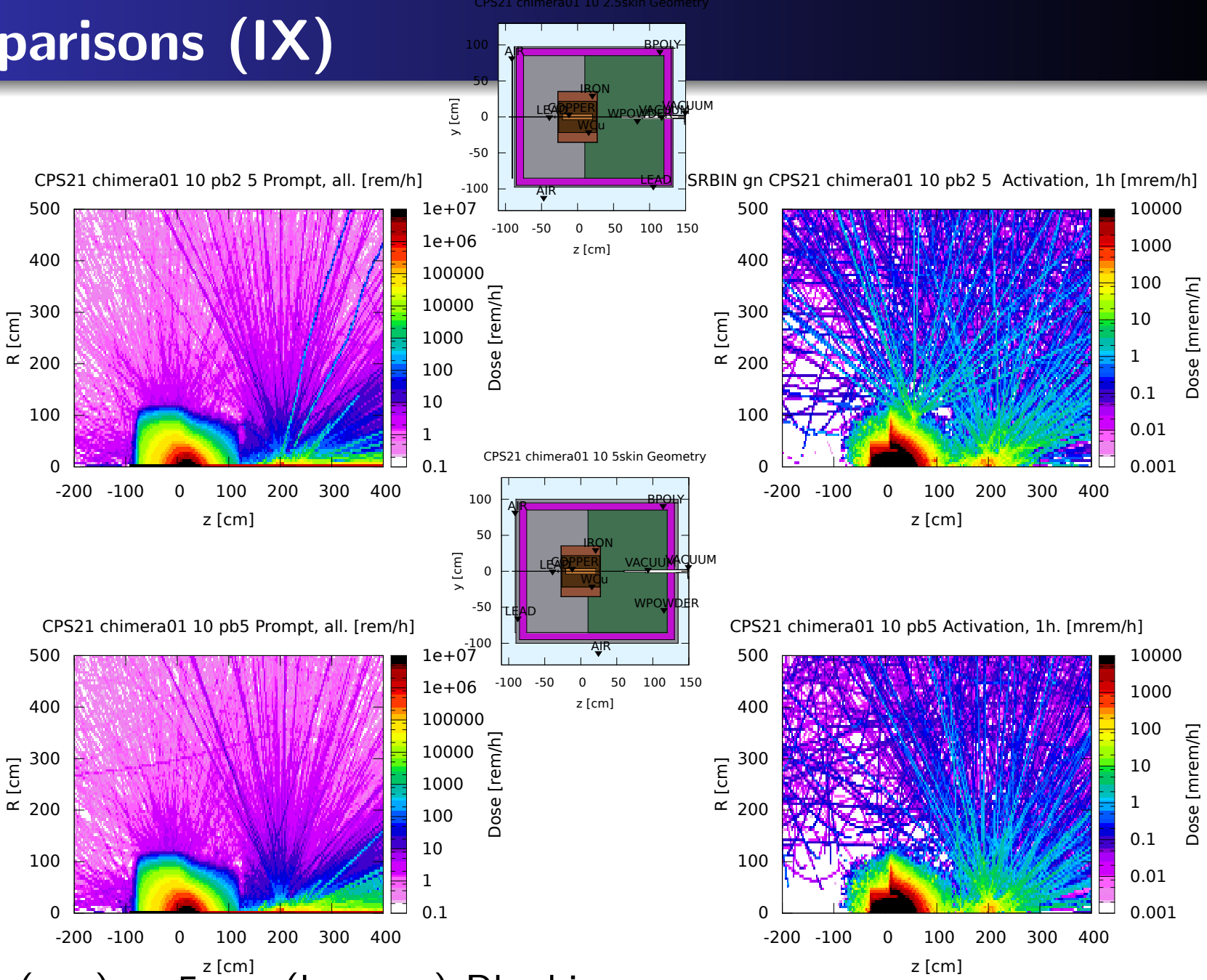






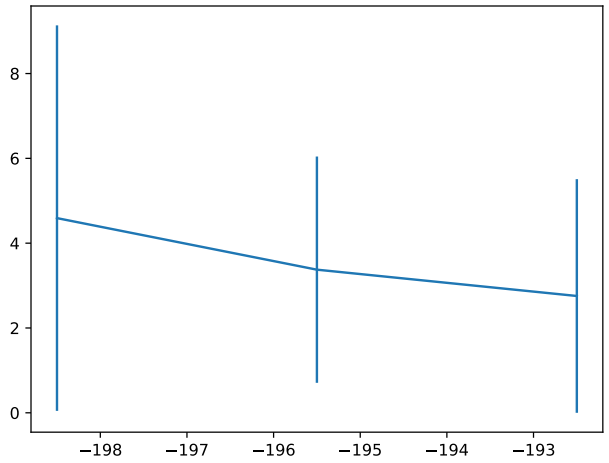
Back to square geom. Adding a 5 cm Pb skin.

Comparisons (IX)



2.5 cm (top) vs 5 cm (bottom) Pb skin.

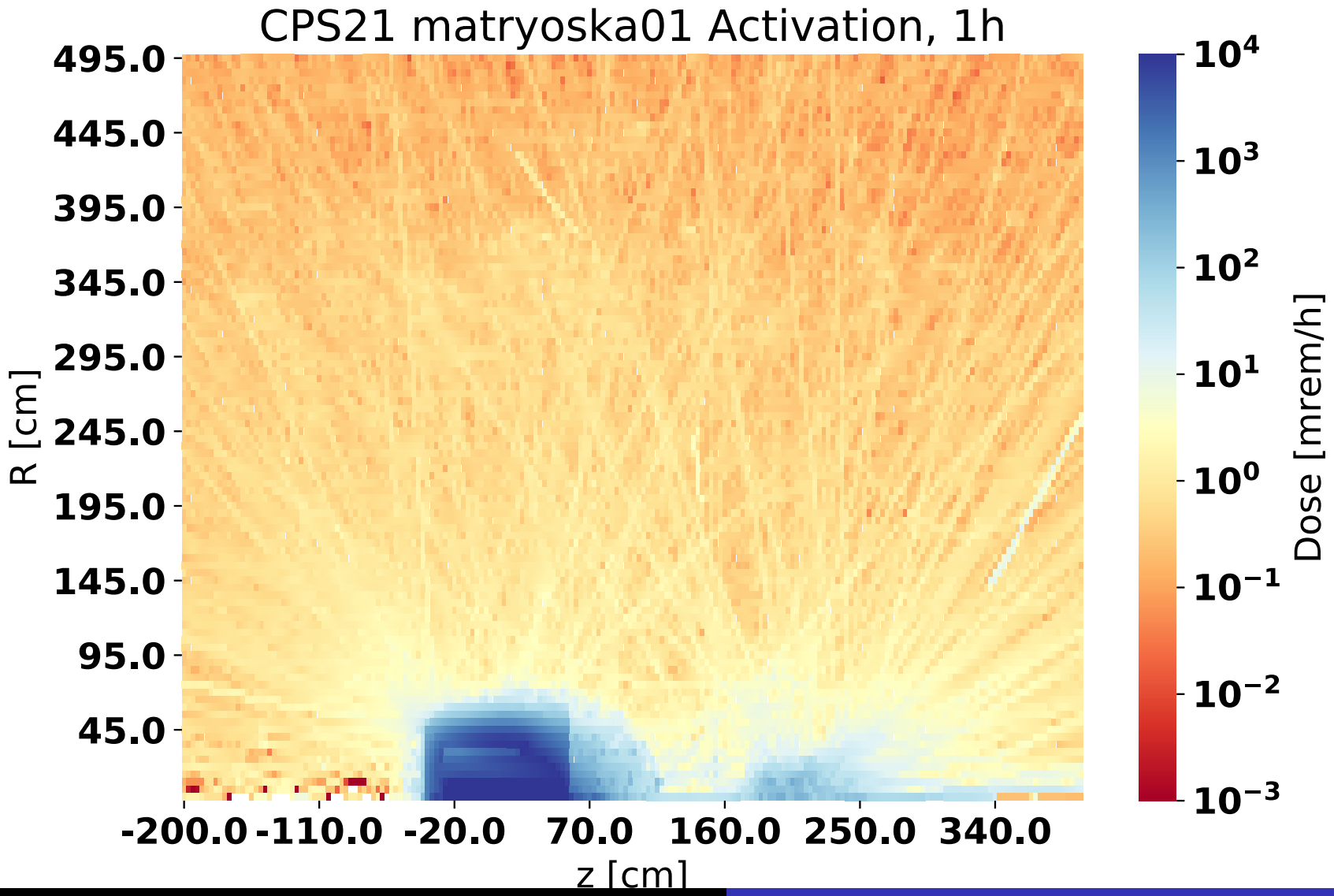
Meanwhile...



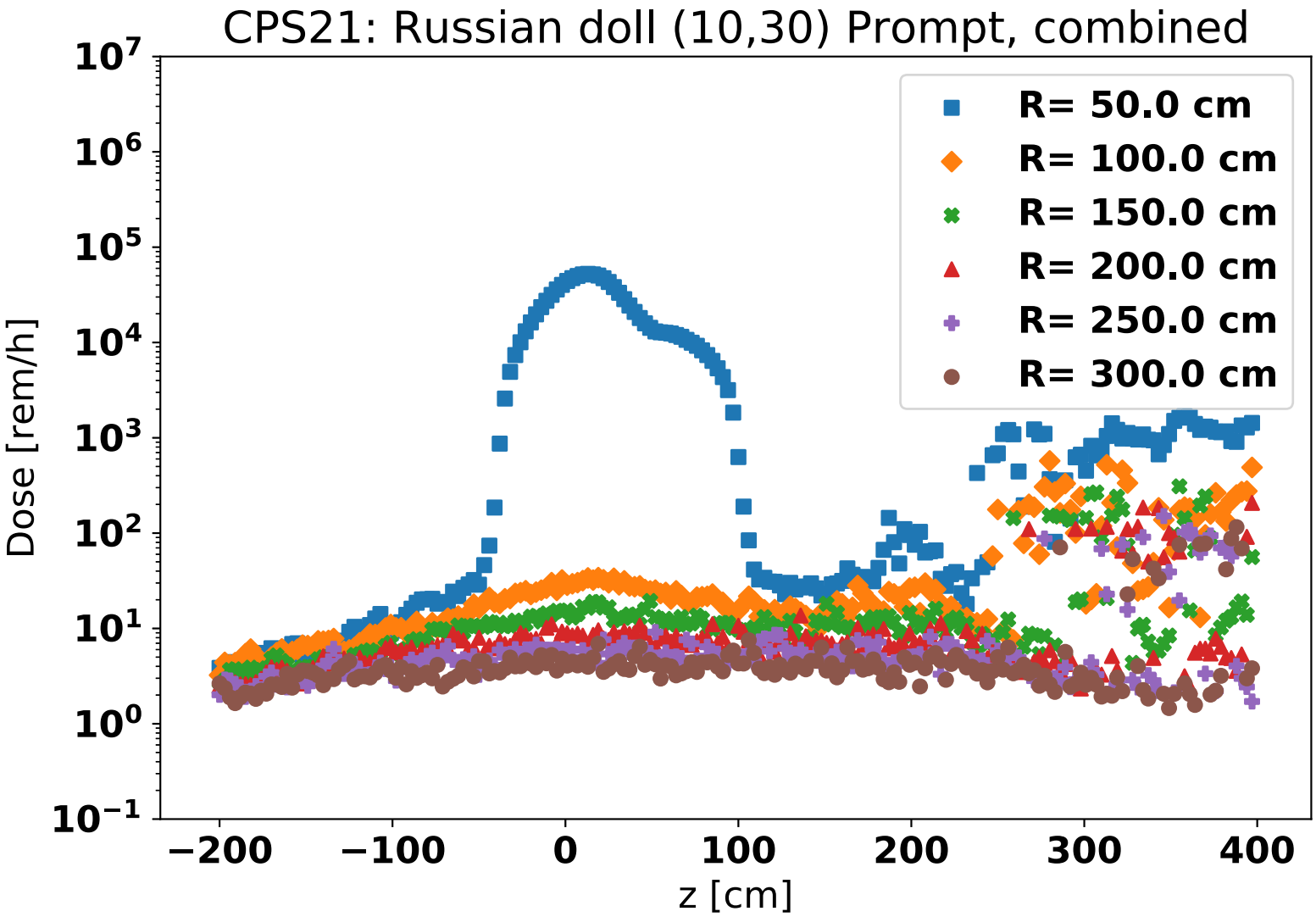
...

- while waiting for these simulations to finish...
- worked on moving away from the Fluka **gnuplot** drawing interface
- lots of typing and clicking there (which I don't mind)
- ... but increases the chance of boo-boos
- managed to get **python** to read .bnn (Fluka 3D output) files
- so a **F77** $\rightarrow$ **python** kind of thing
- took a little while but got done!

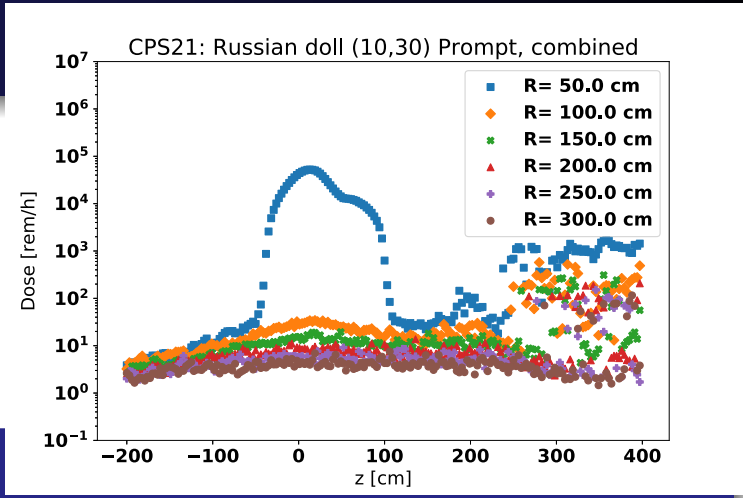
Activation, 1h cooldown



Prompt dose at various R



Summary & Outlook



GN's $0.02 worth...

- Well on the way of exploring several "hybrid" configurations...
- ... some more promising than others.
- migrating plotting tasks from **f77** to **python**.
- some goal numbers would certainly help!

Thank you!