CPS Radiation Simulation Update

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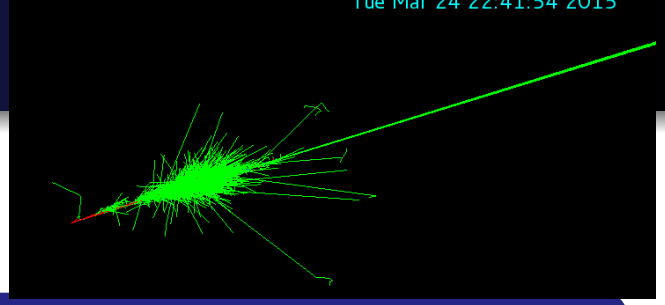
James Madison University

CPS Meeting 05/08/2020

May 8, 2020

From last time...



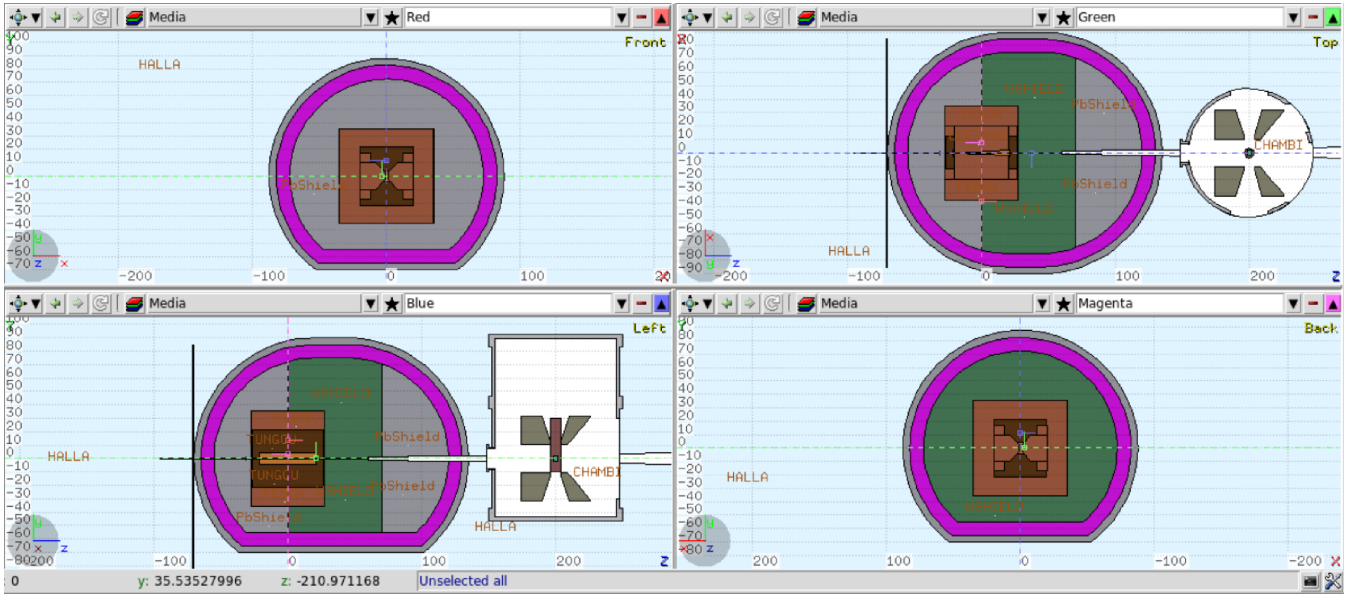
Incremental progress from last time ...

- no radiator, no field simulation
- 2 plastic plates in front of W powder
- beam pipe
- ...
- as in prev. updates will show geometrical configurations
- followed by prompt/activation plots and comparisons.

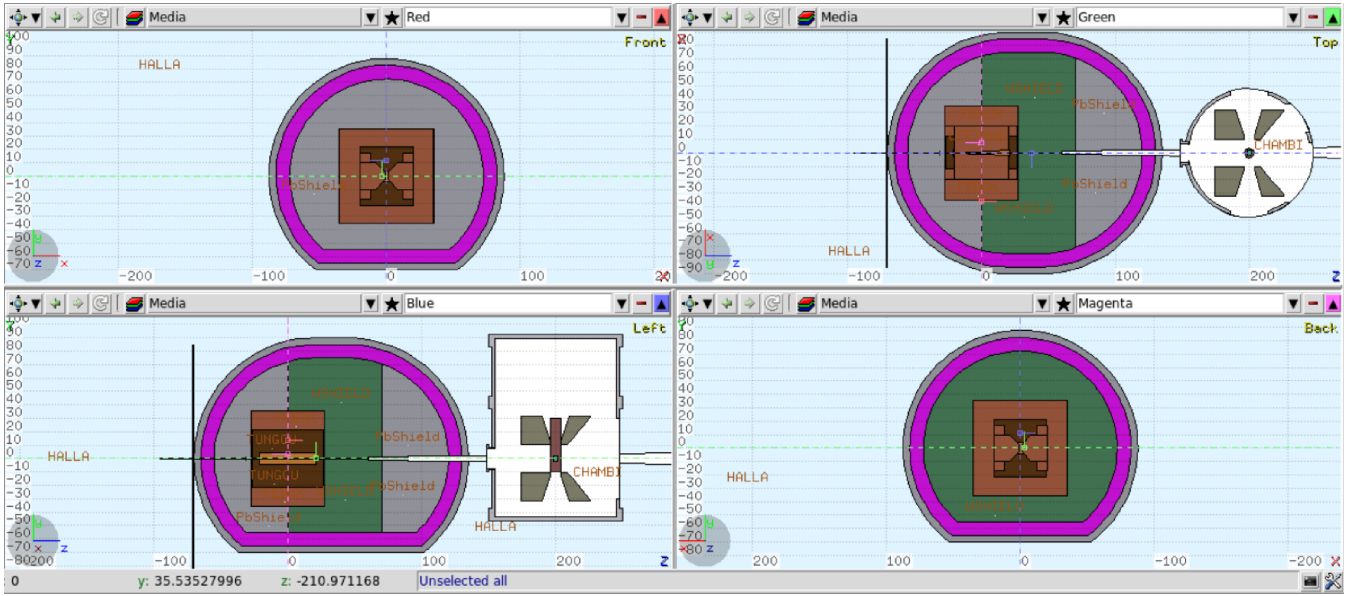
Disclaimer

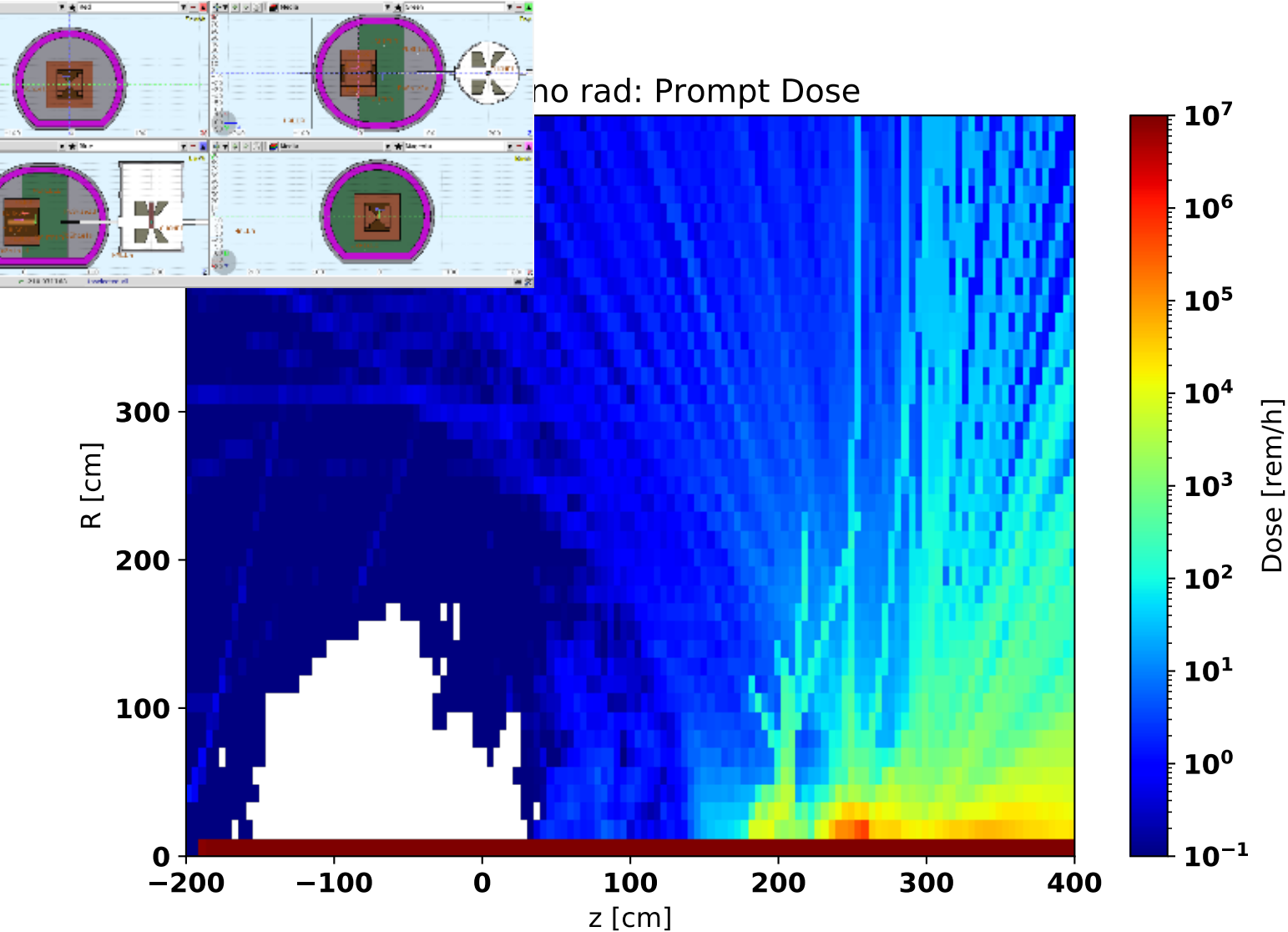
- ...as usual!

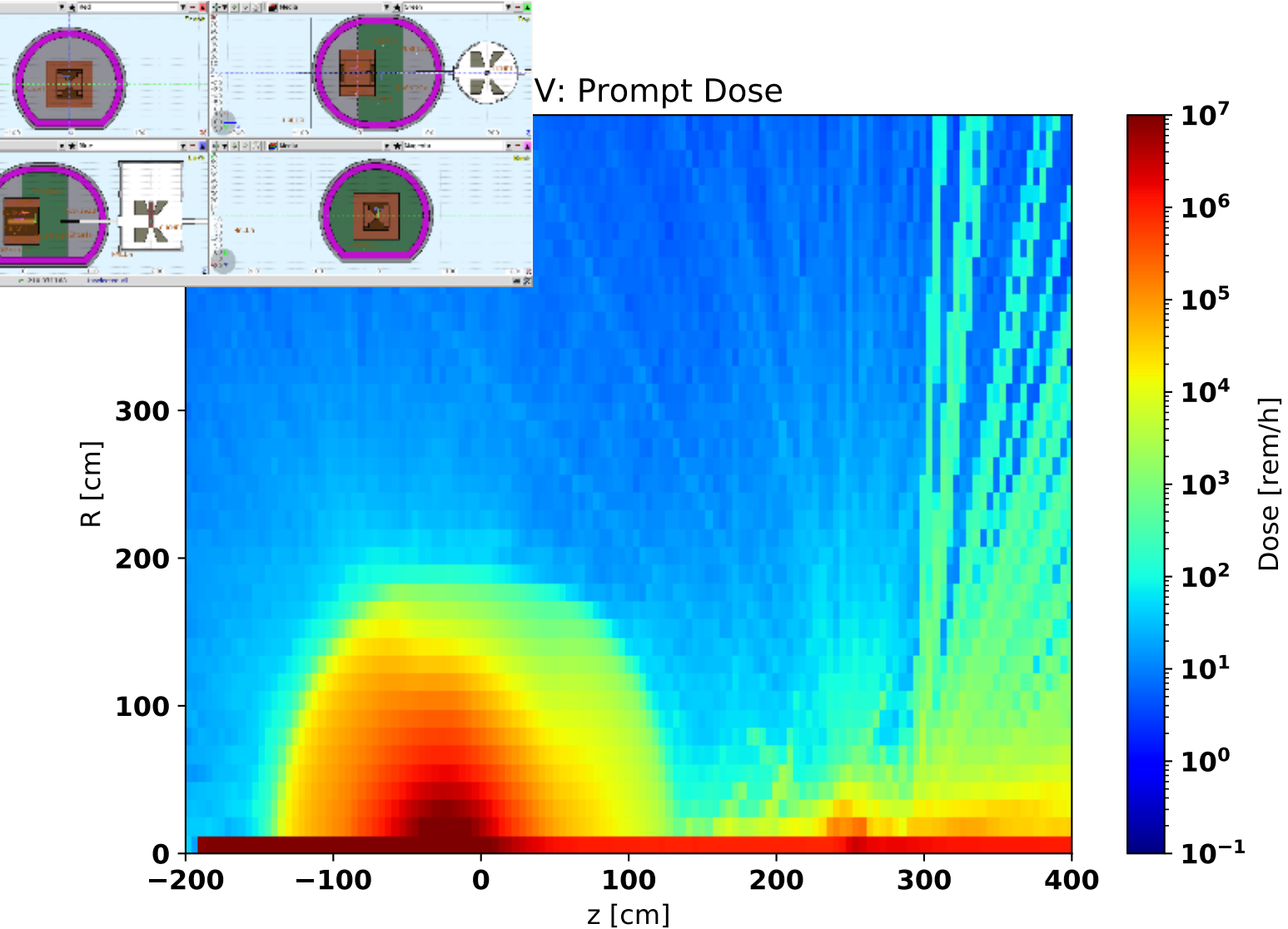
mkV_geometry

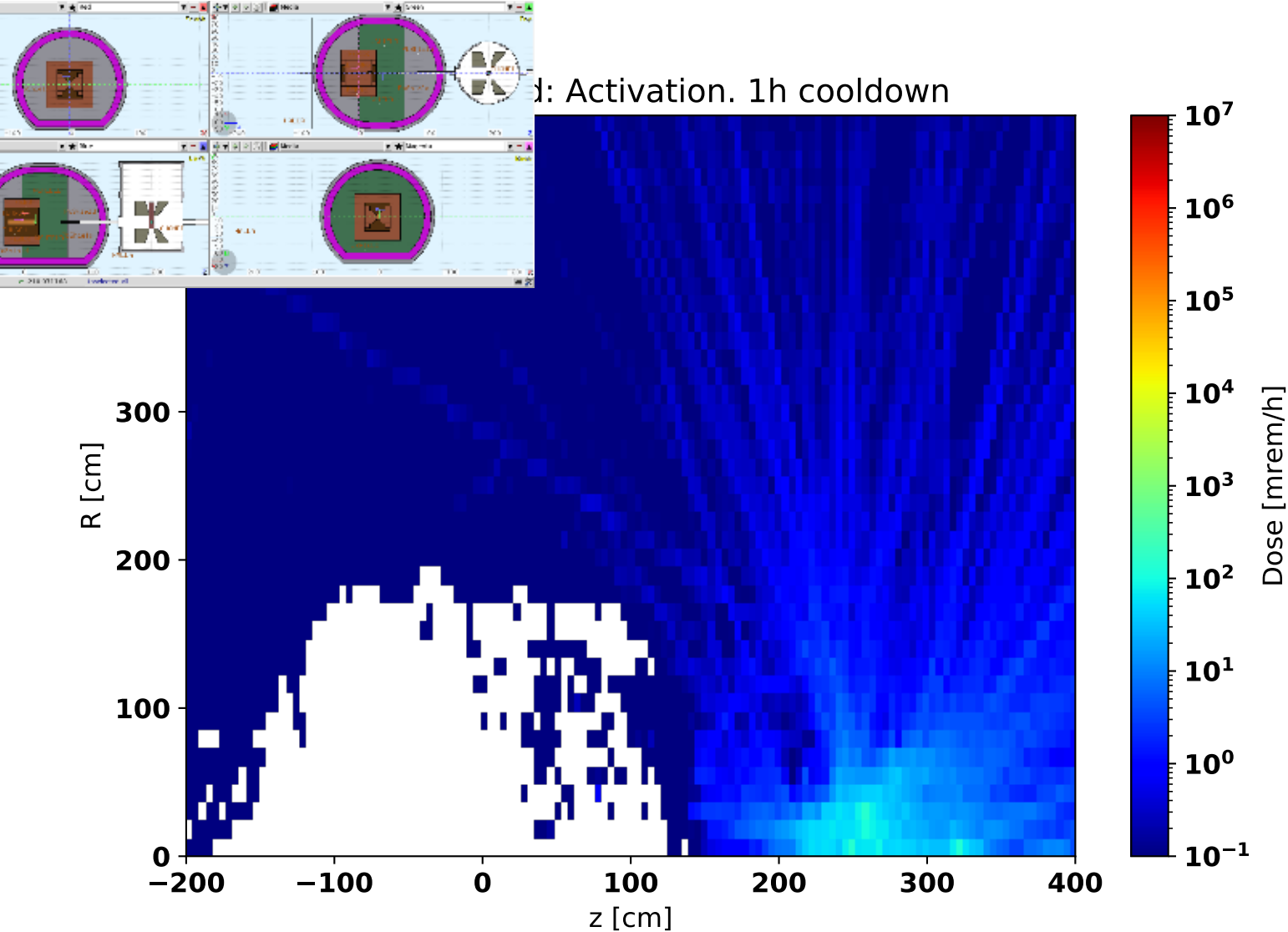


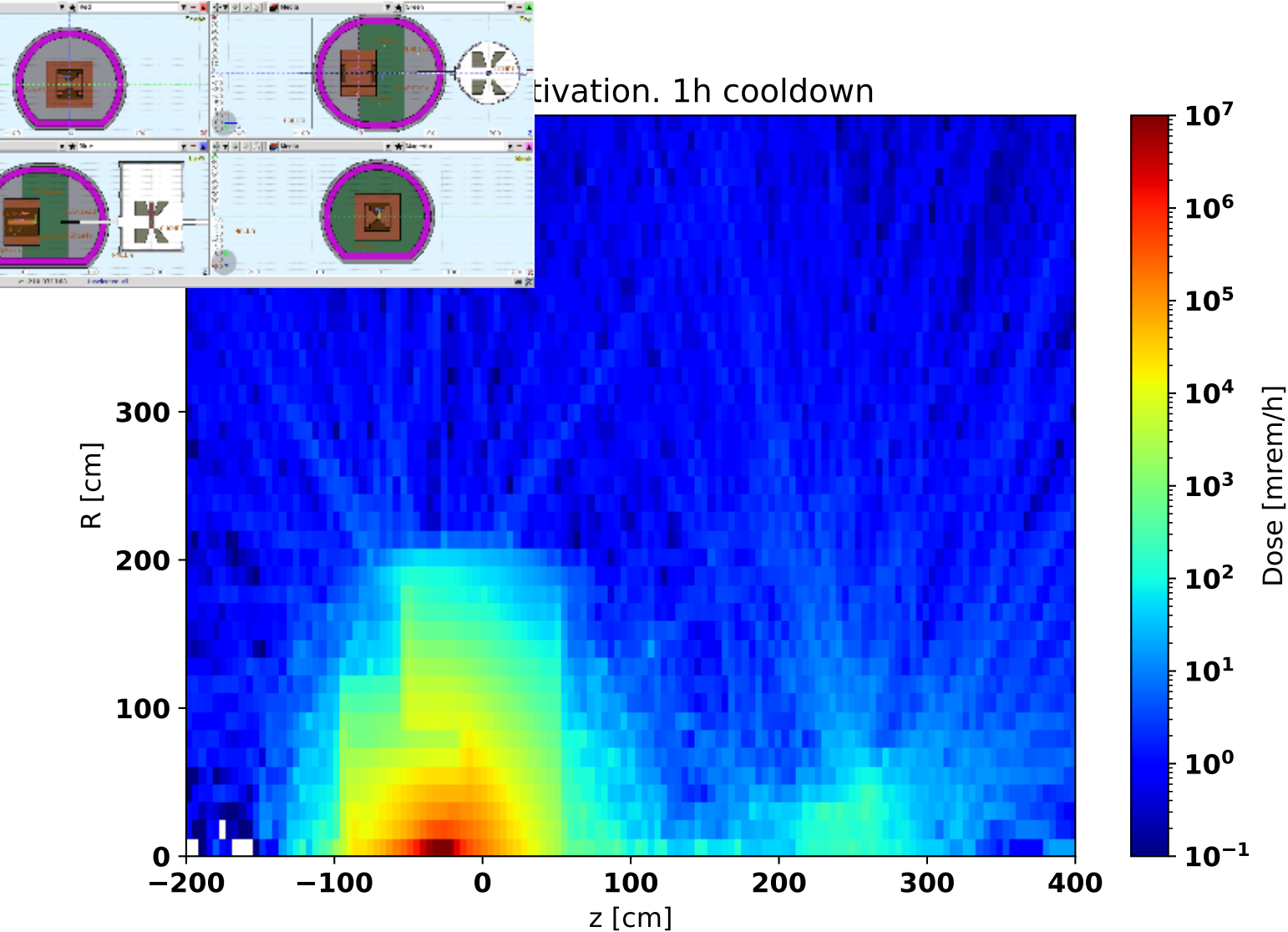
mkV_geometry

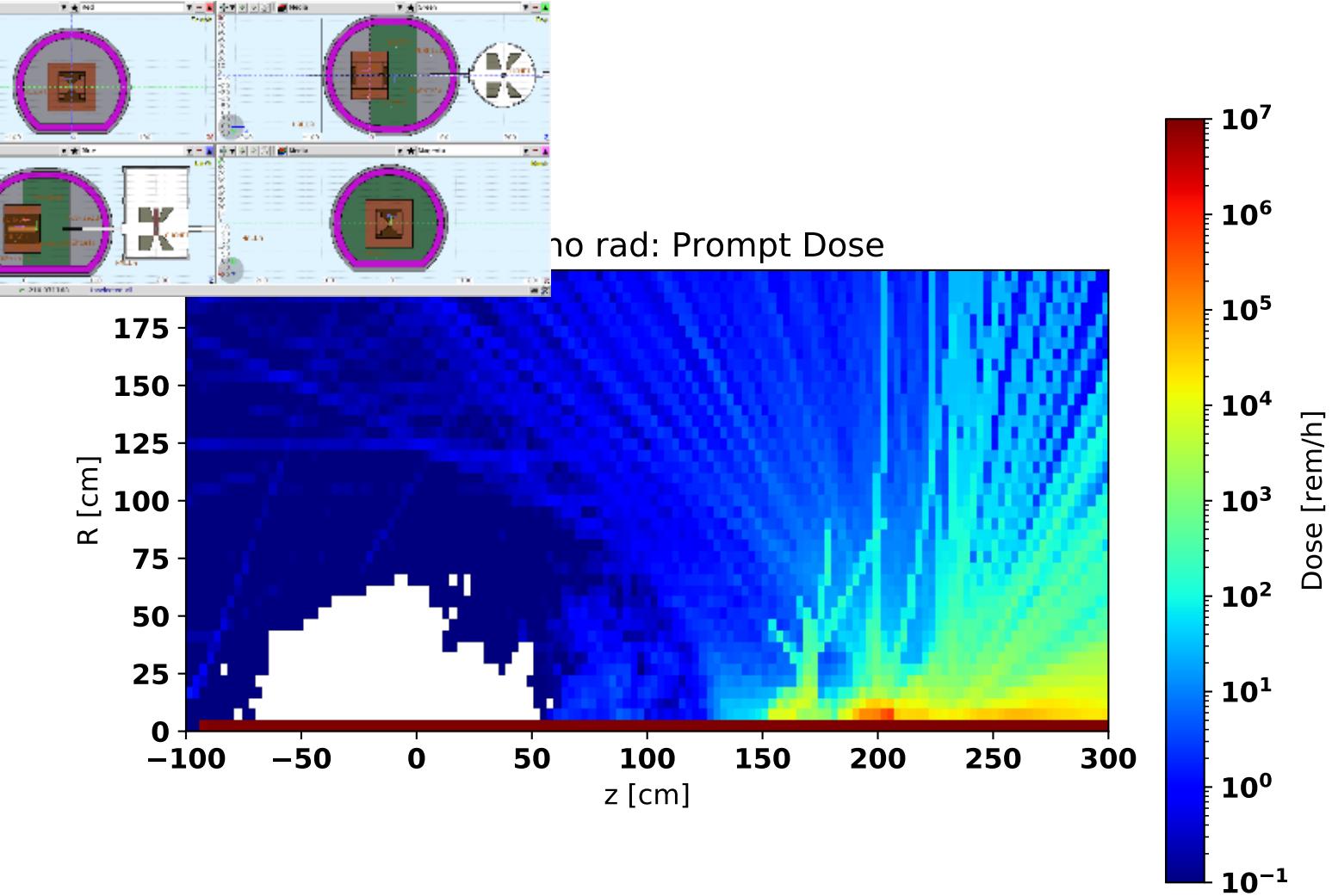


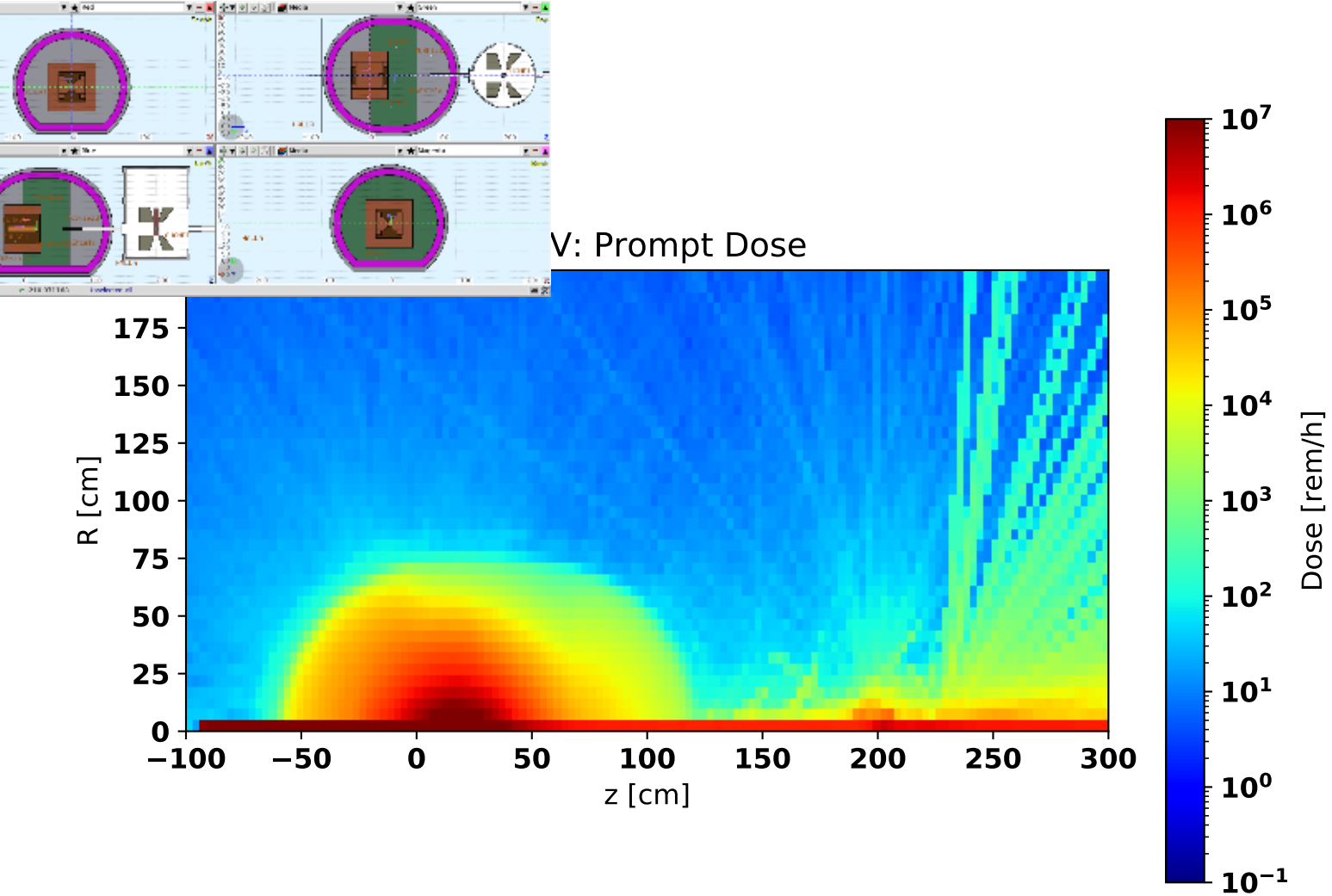

no rad: Prompt Dose
R [cm]
z [cm]
Dose [rem/h]
0
100
200
300
−200
−100
0
100
200
300
400
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
10^{5}
10^{6}
10^{7}

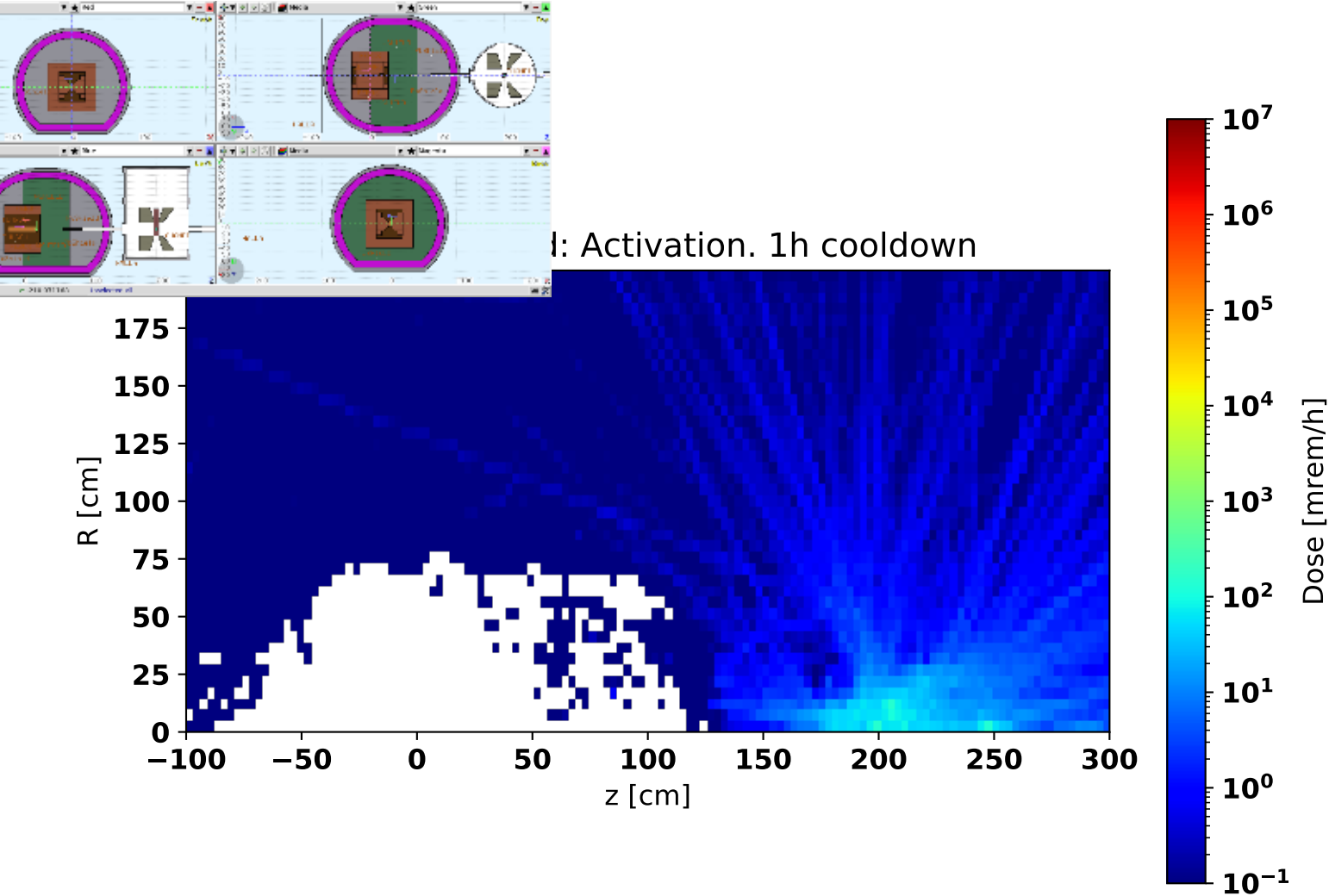

V: Prompt Dose
R [cm]
300
200
100
0
−200
−100
0
100
200
300
400
z [cm]
10^7
10^6
10^5
10^4
10^3
10^2
10^1
10^0
10^{-1}
Dose [rem/h]

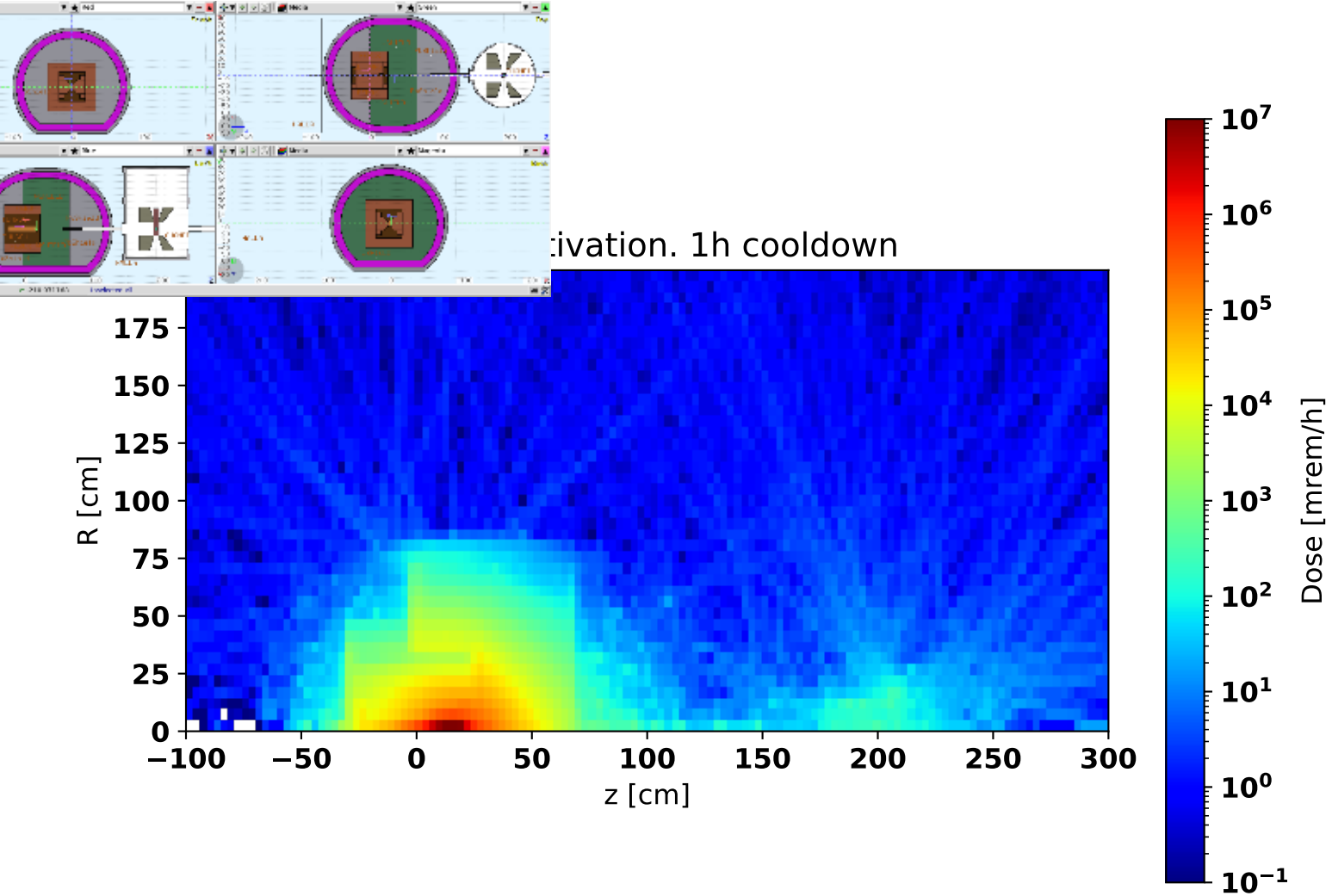

d: Activation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
0
100
200
300
−200
−100
0
100
200
300
400
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

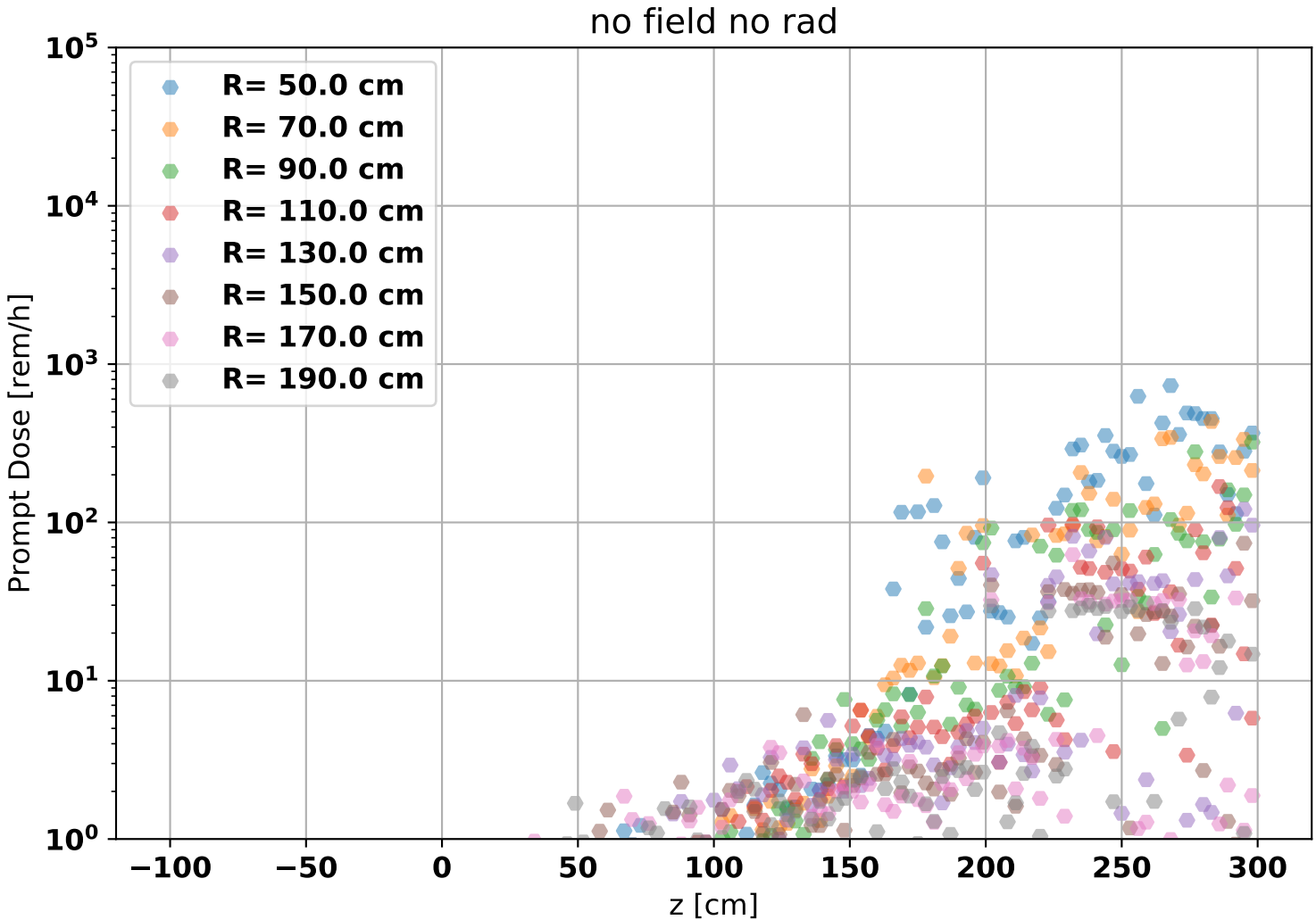

tivation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
0
100
200
300
−200
−100
0
100
200
300
400
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

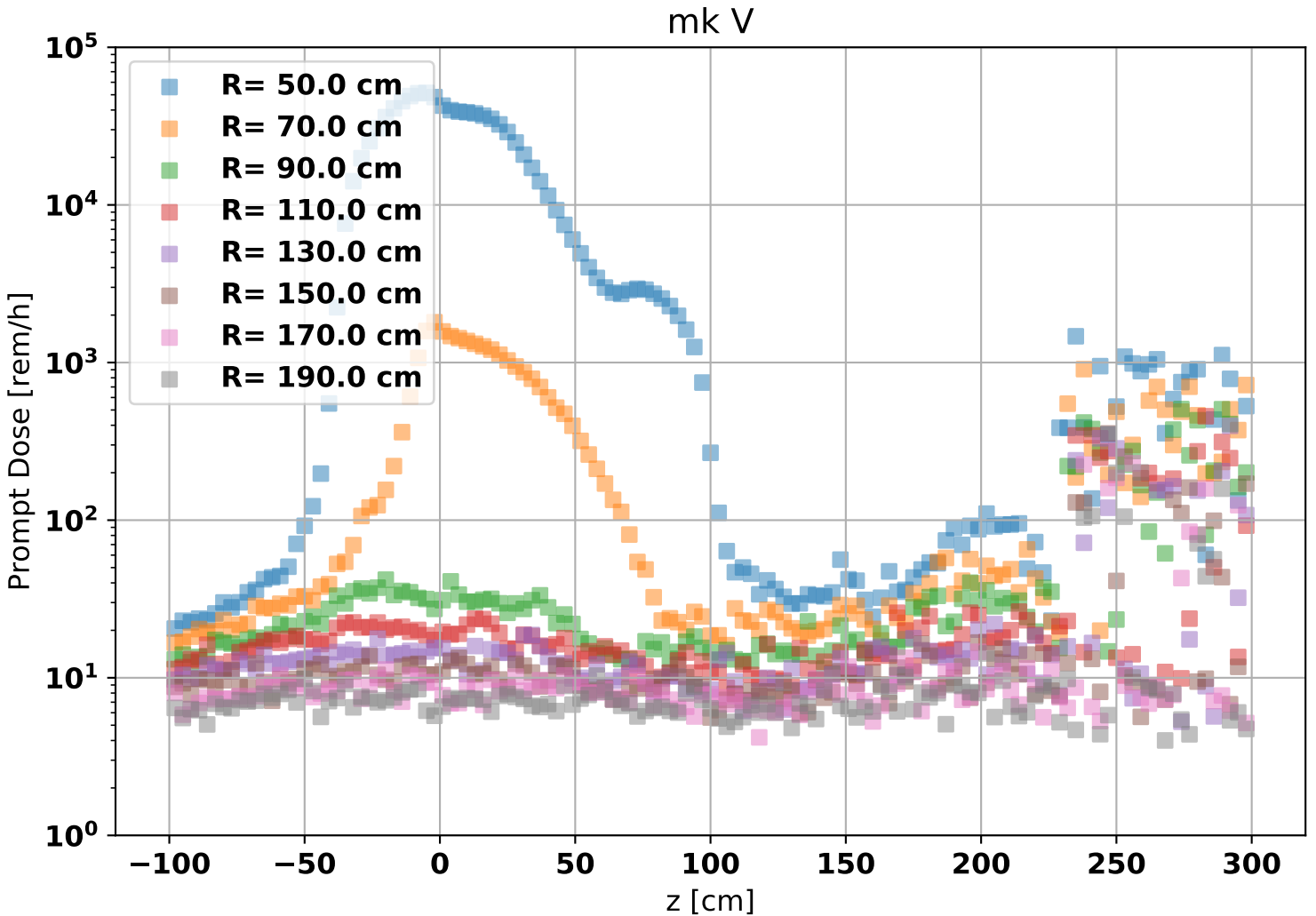

no rad: Prompt Dose
R [cm]
z [cm]
Dose [rem/h]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

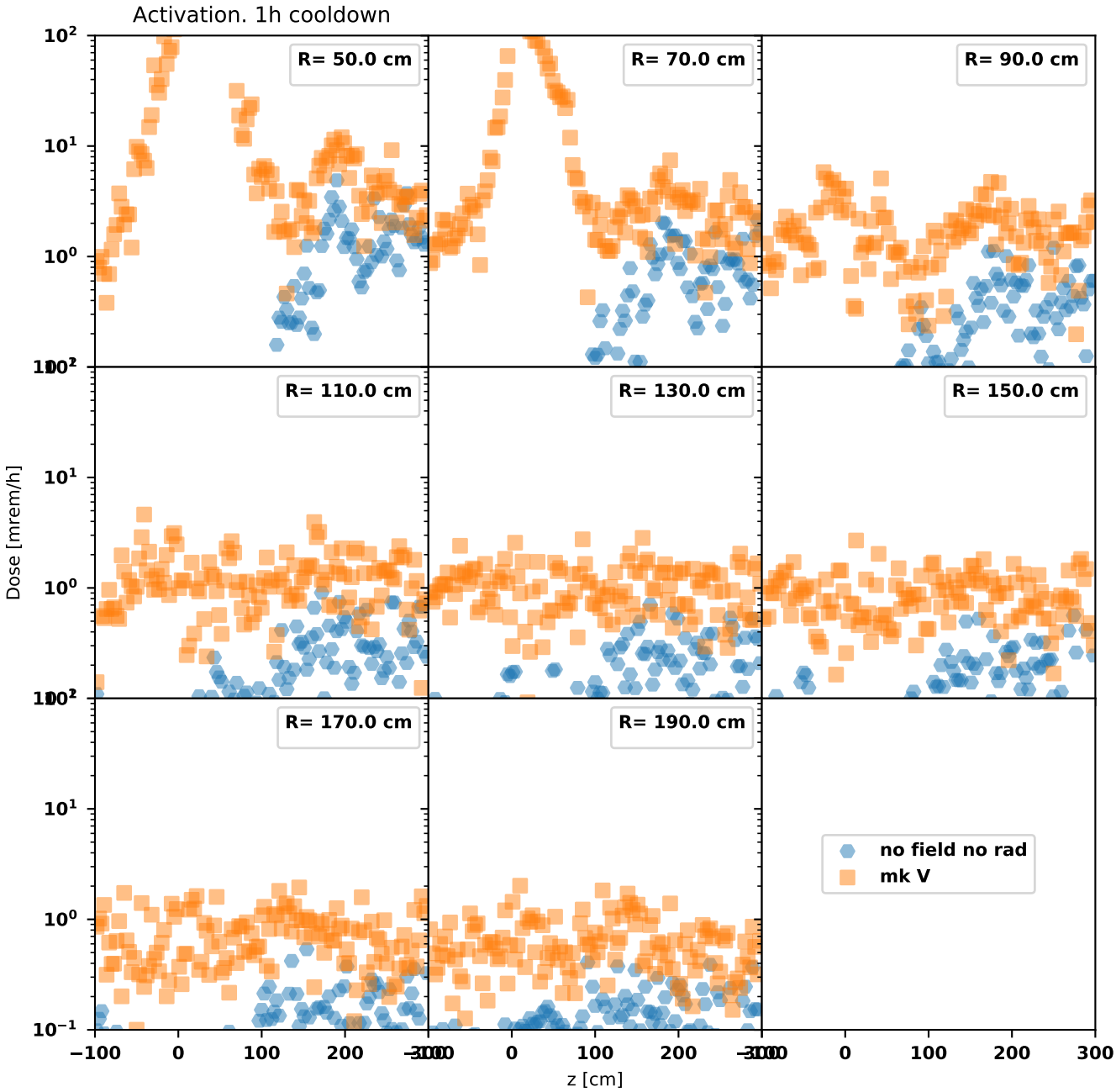

V: Prompt Dose
R [cm]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
z [cm]
Dose [rem/h]
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

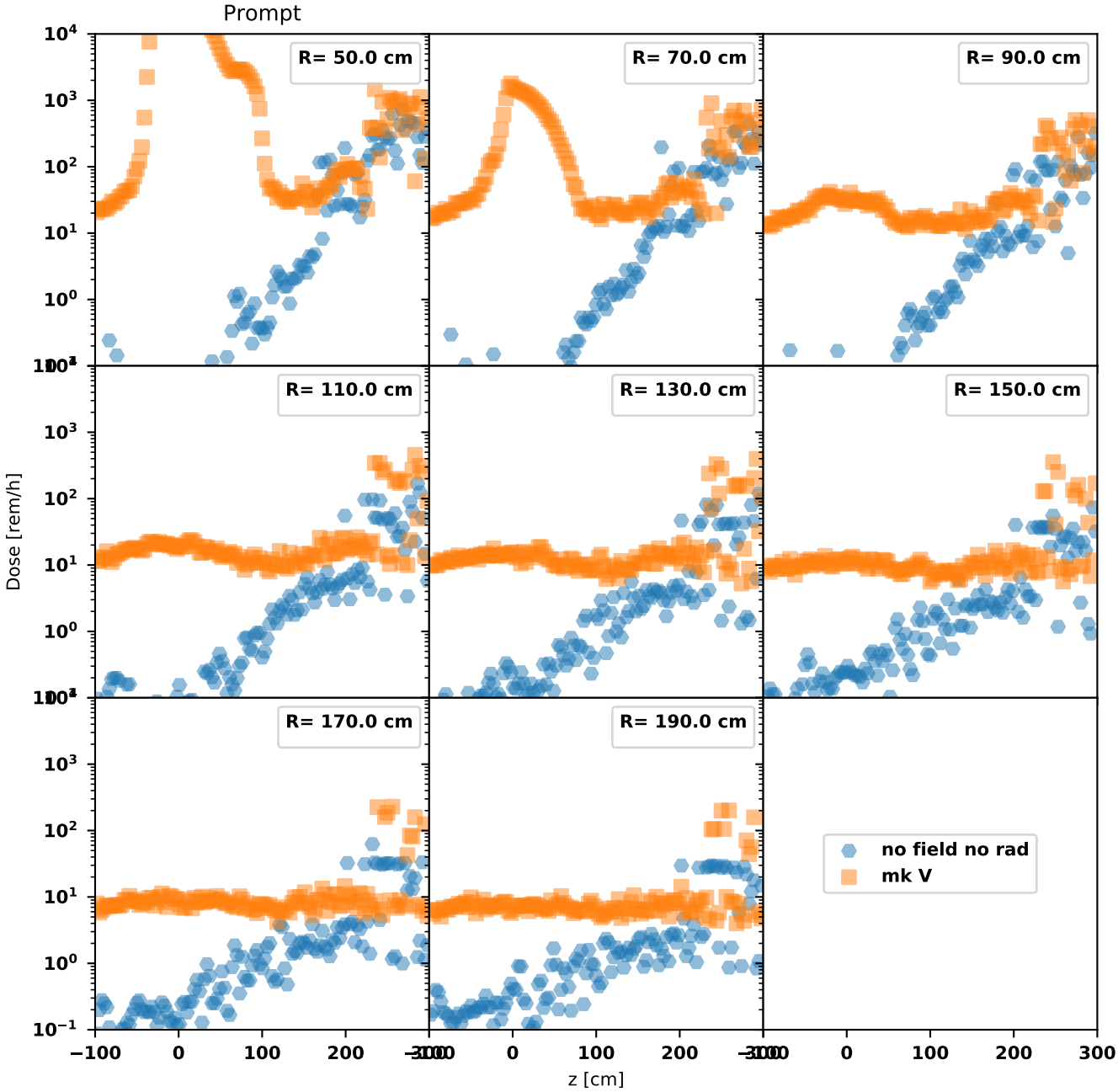

: Activation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


tivation. 1h cooldown
R [cm]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
z [cm]
Dose [mrem/h]
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

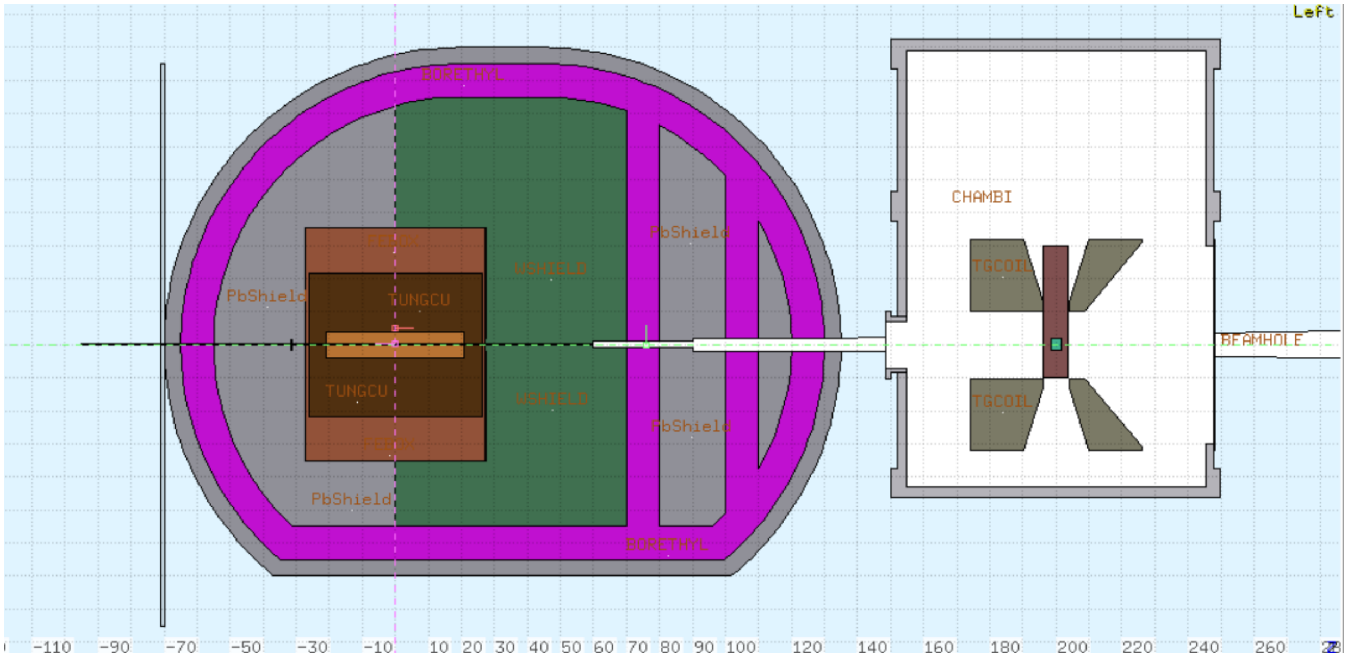

no field no rad
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
Prompt Dose [rem/h]
z [cm]
10^5
10^4
10^3
10^2
10^1
10^0
−100
−50
0
50
100
150
200
250
300


mk V
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
Prompt Dose [rem/h]
z [cm]
10^5
10^4
10^3
10^2
10^1
10^0
−100
−50
0
50
100
150
200
250
300

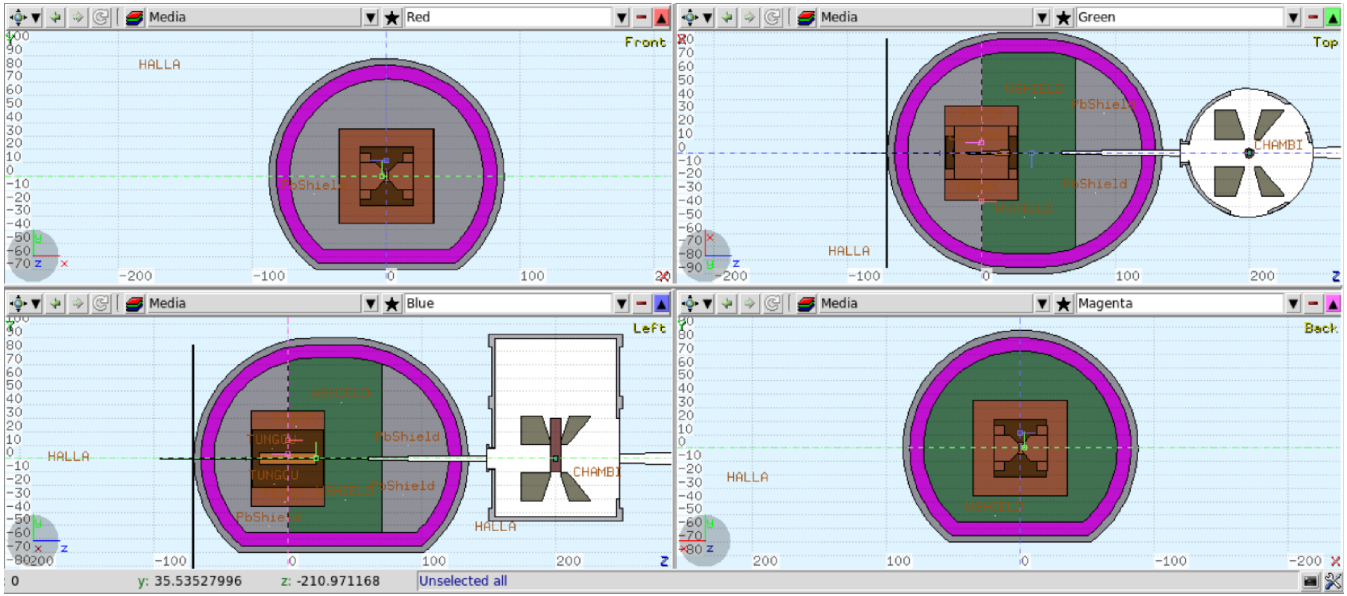

Activation. 1h cooldown
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
no field no rad
mk V
Dose [mrem/h]
z [cm]

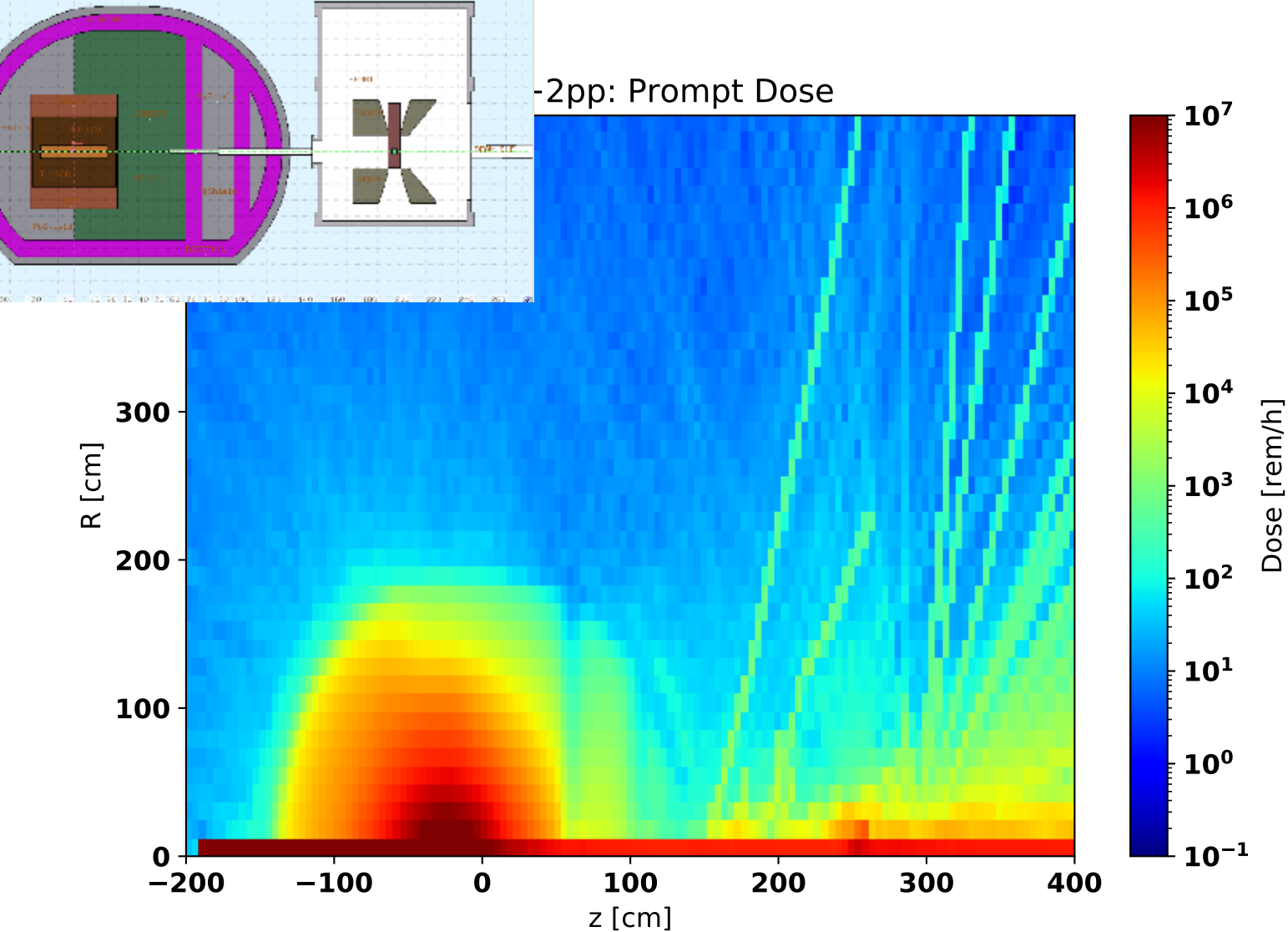

Prompt
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
no field no rad
mk V
Dose [rem/h]
z [cm]

cp21_mkV_2pplates



mkV_geometry




-2pp: Prompt Dose
R [cm]
z [cm]
Dose [rem/h]
0
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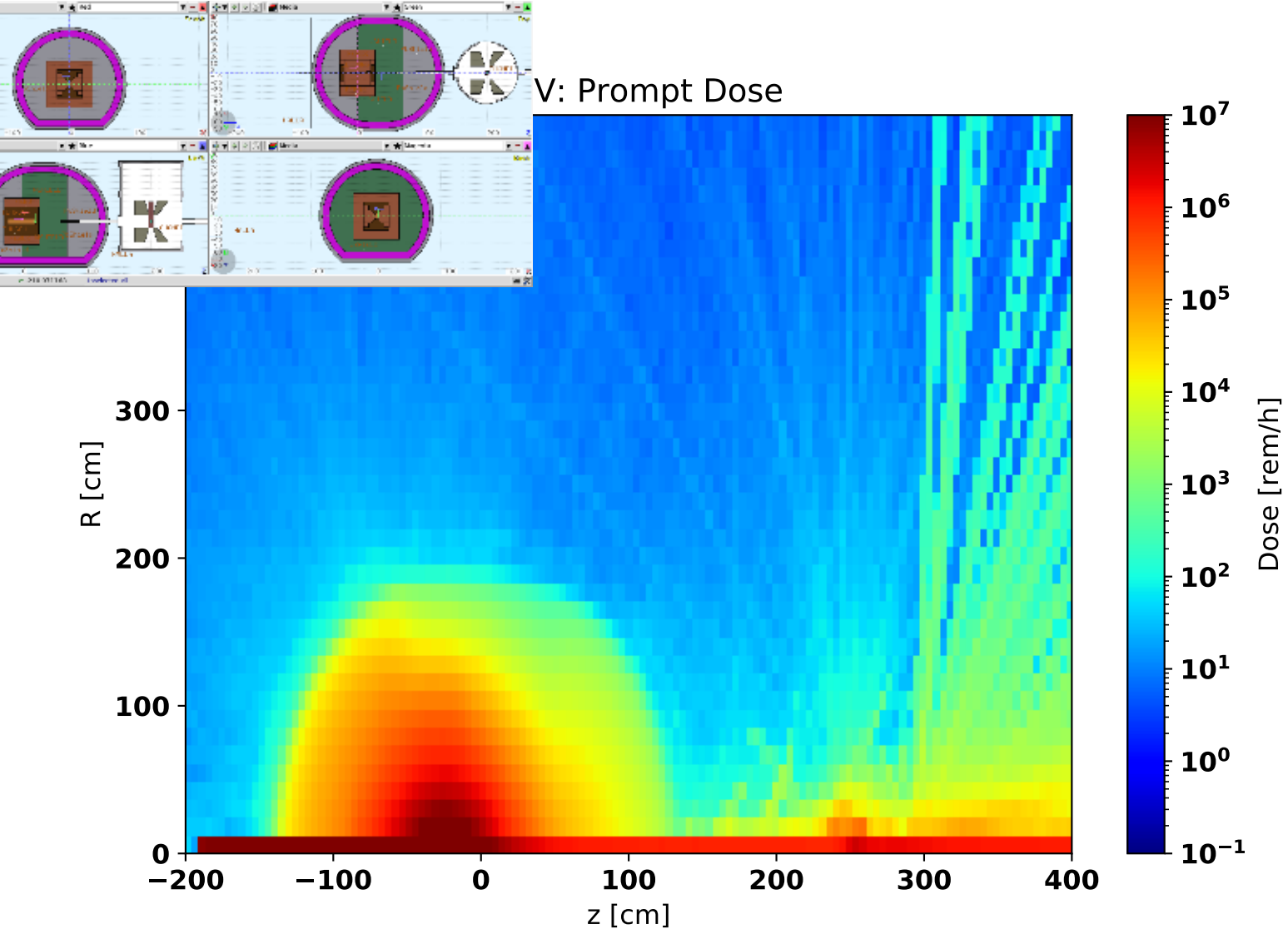
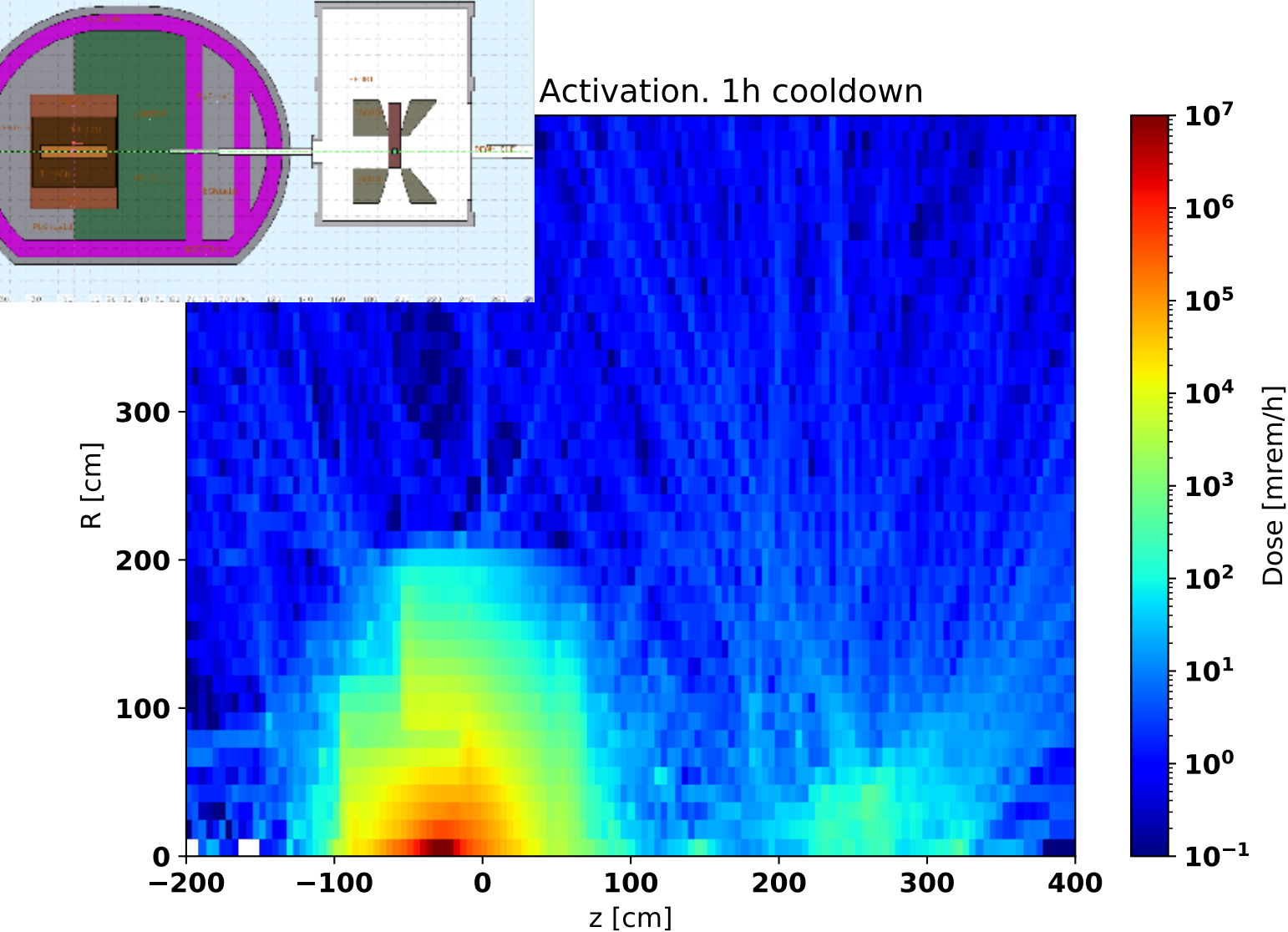
200
300
−200
−100
0
100
200
300
400
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


V: Prompt Dose
R [cm]
300
200
100
0
−200
−100
0
100
200
300
400
z [cm]
10^7
10^6
10^5
10^4
10^3
10^2
10^1
10^0
10^{-1}
Dose [rem/h]


Activation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
0
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200
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−200
−100
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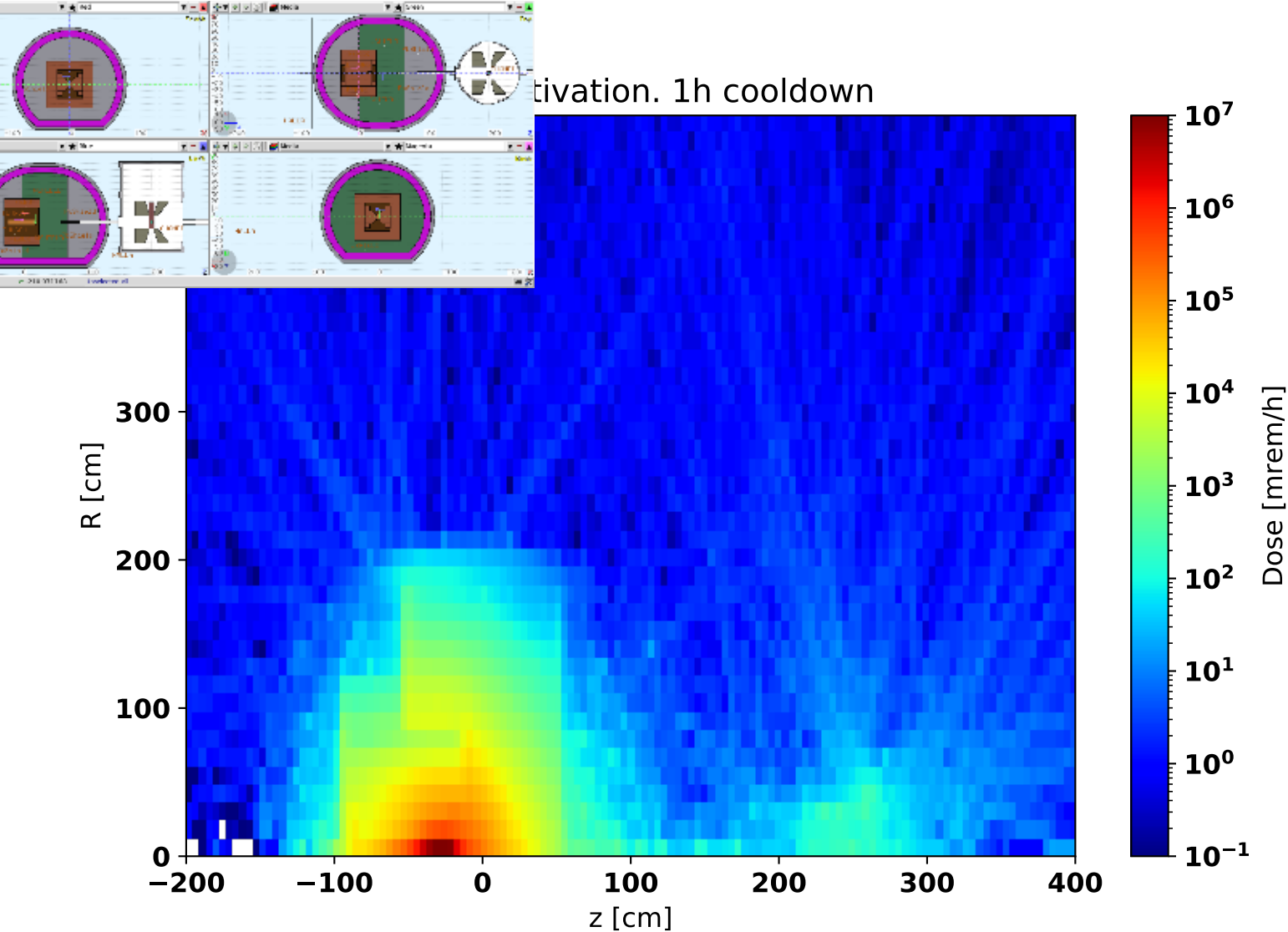
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


tivation. 1h cooldown
R [cm]
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Dose [mrem/h]
0
100
200
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−200
−100
0
100
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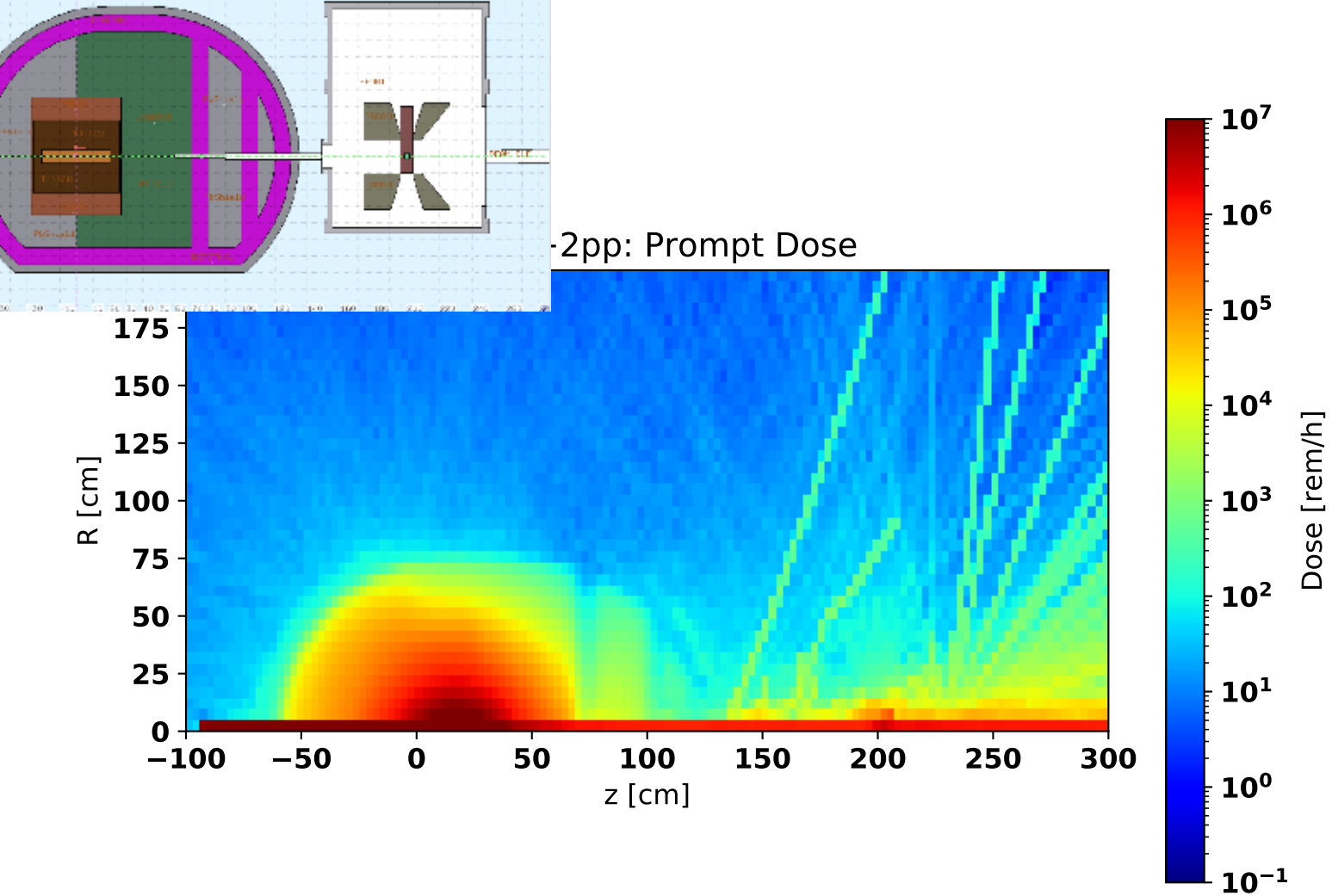
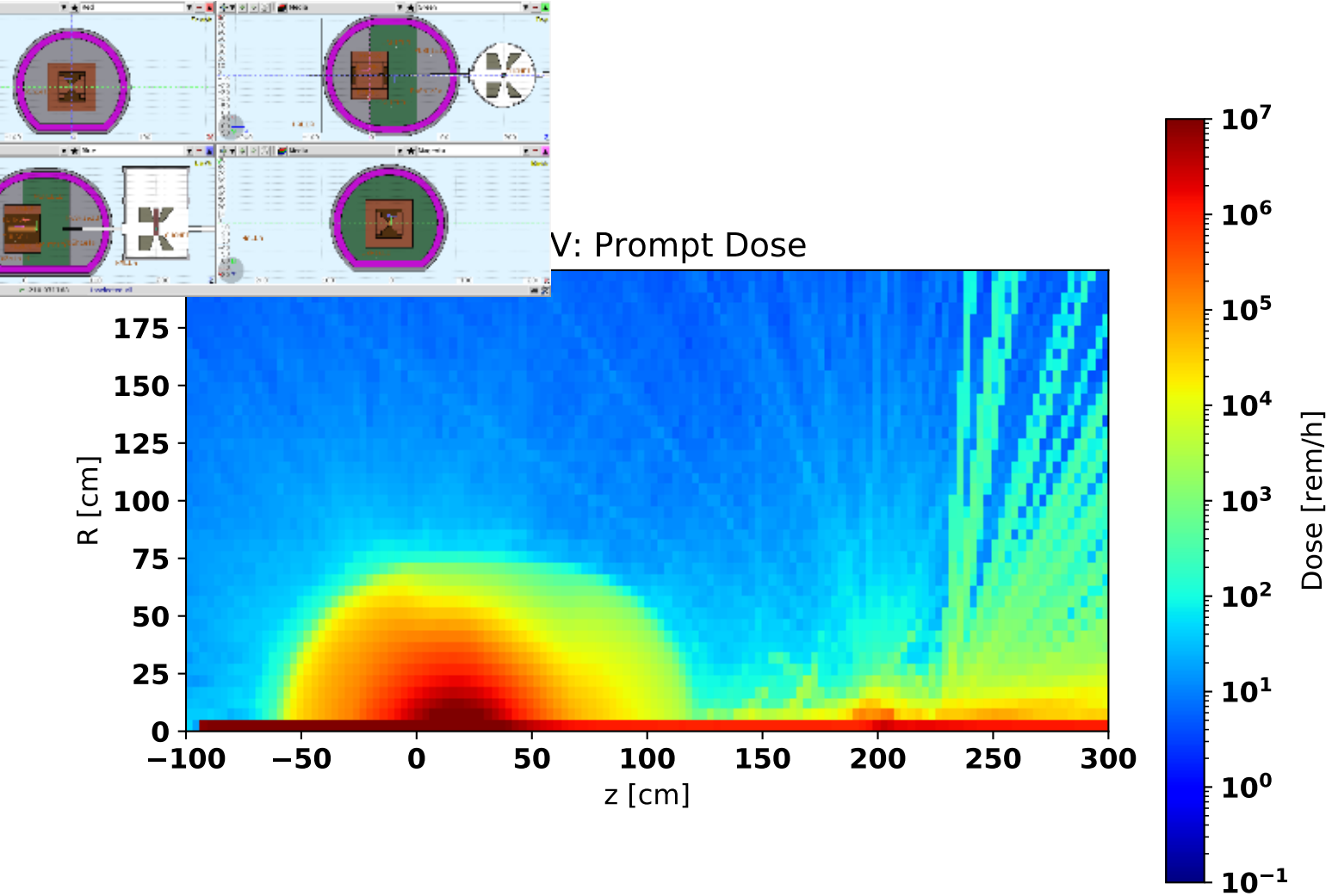
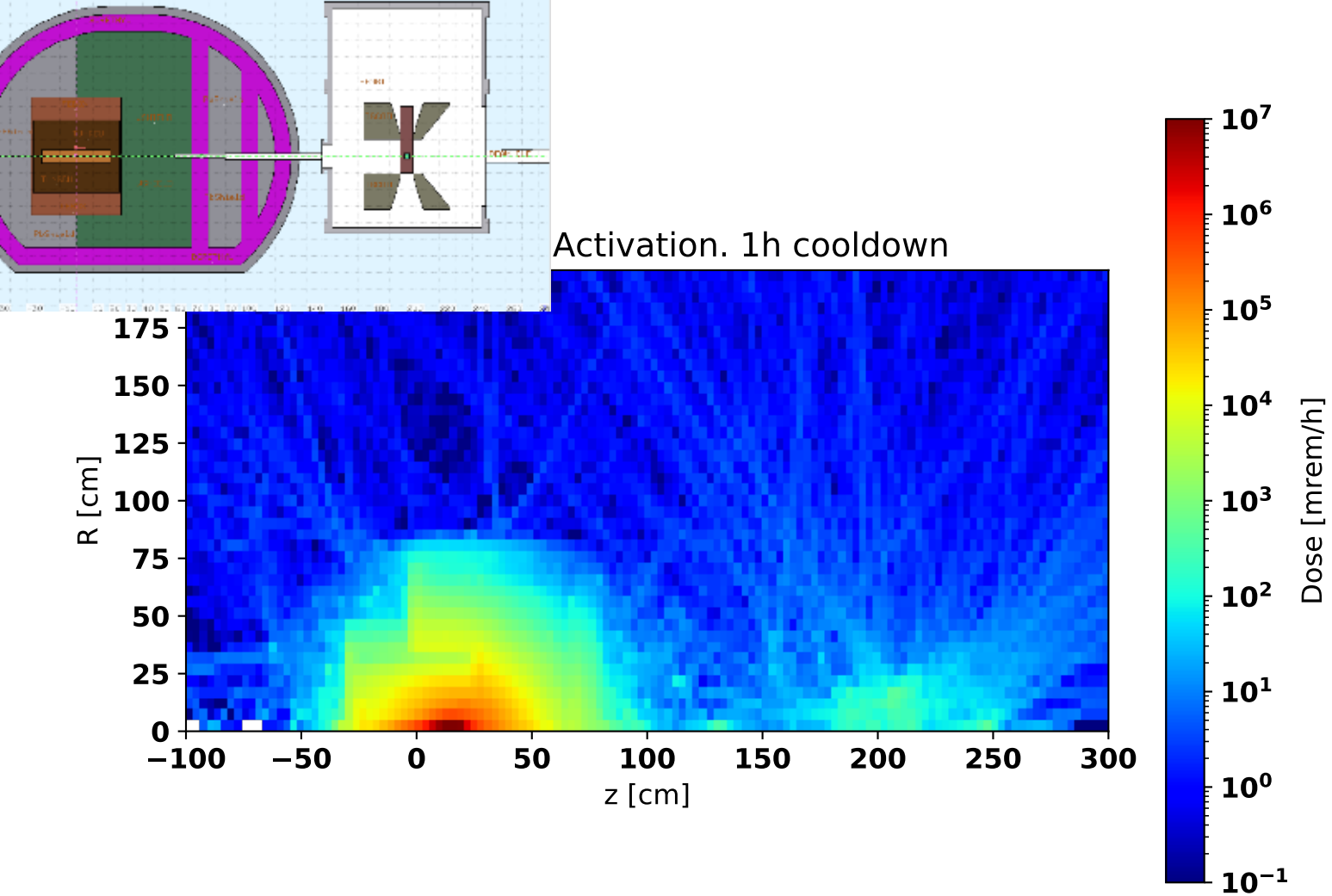
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


-2pp: Prompt Dose
R [cm]
z [cm]
Dose [rem/h]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


V: Prompt Dose
R [cm]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
z [cm]
Dose [rem/h]
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


Activation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
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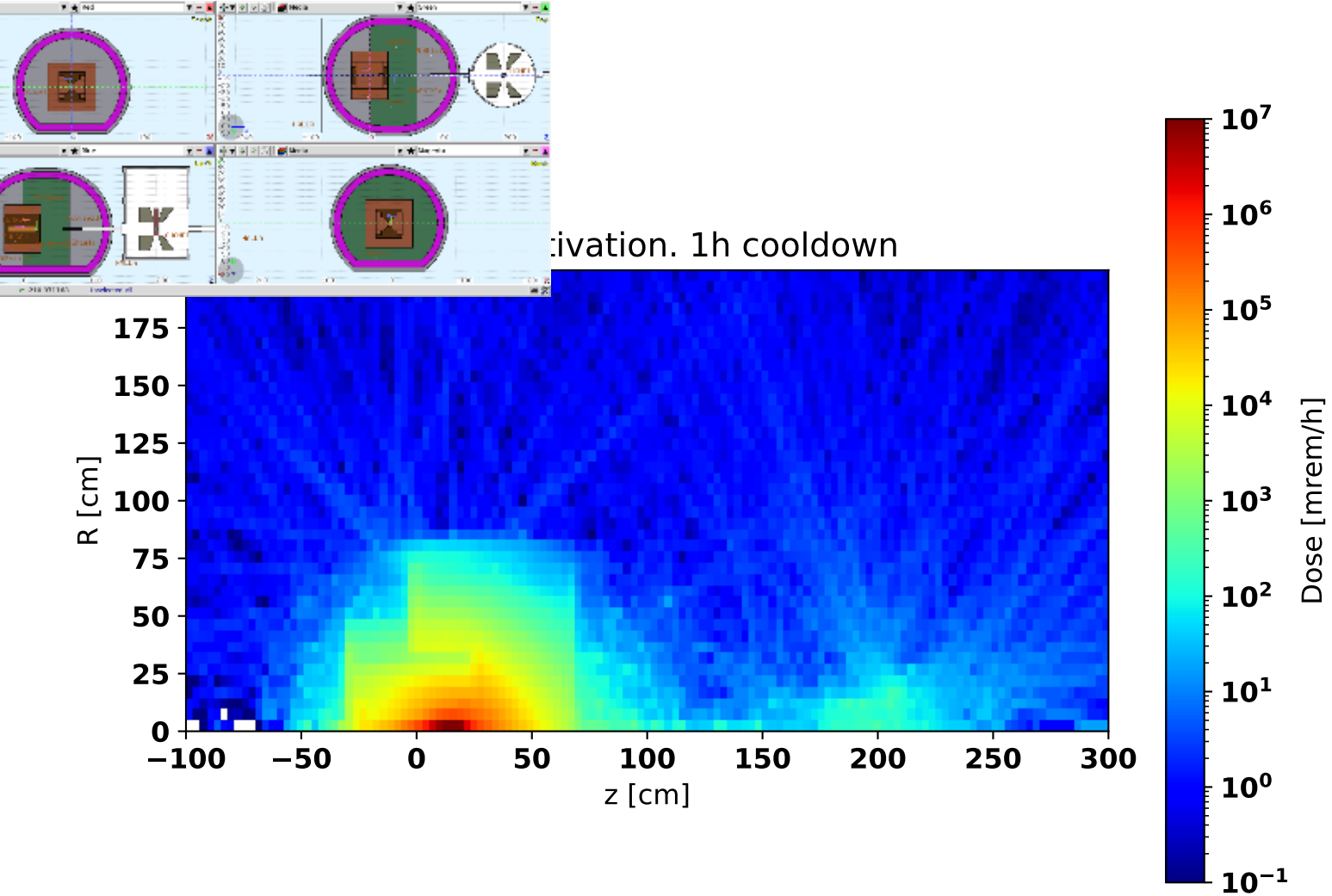
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


tivation. 1h cooldown
R [cm]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
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250
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z [cm]
Dose [mrem/h]
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
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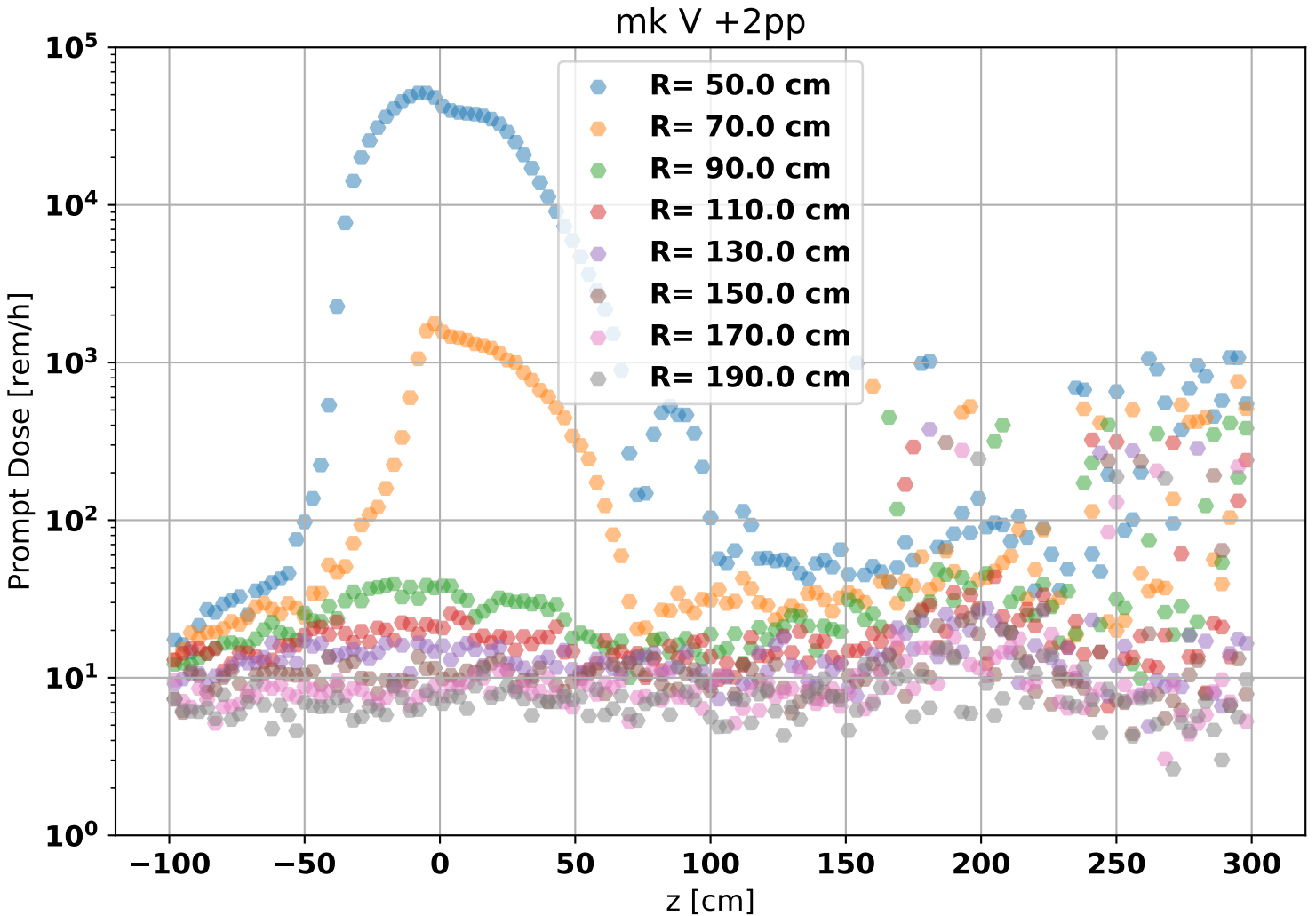
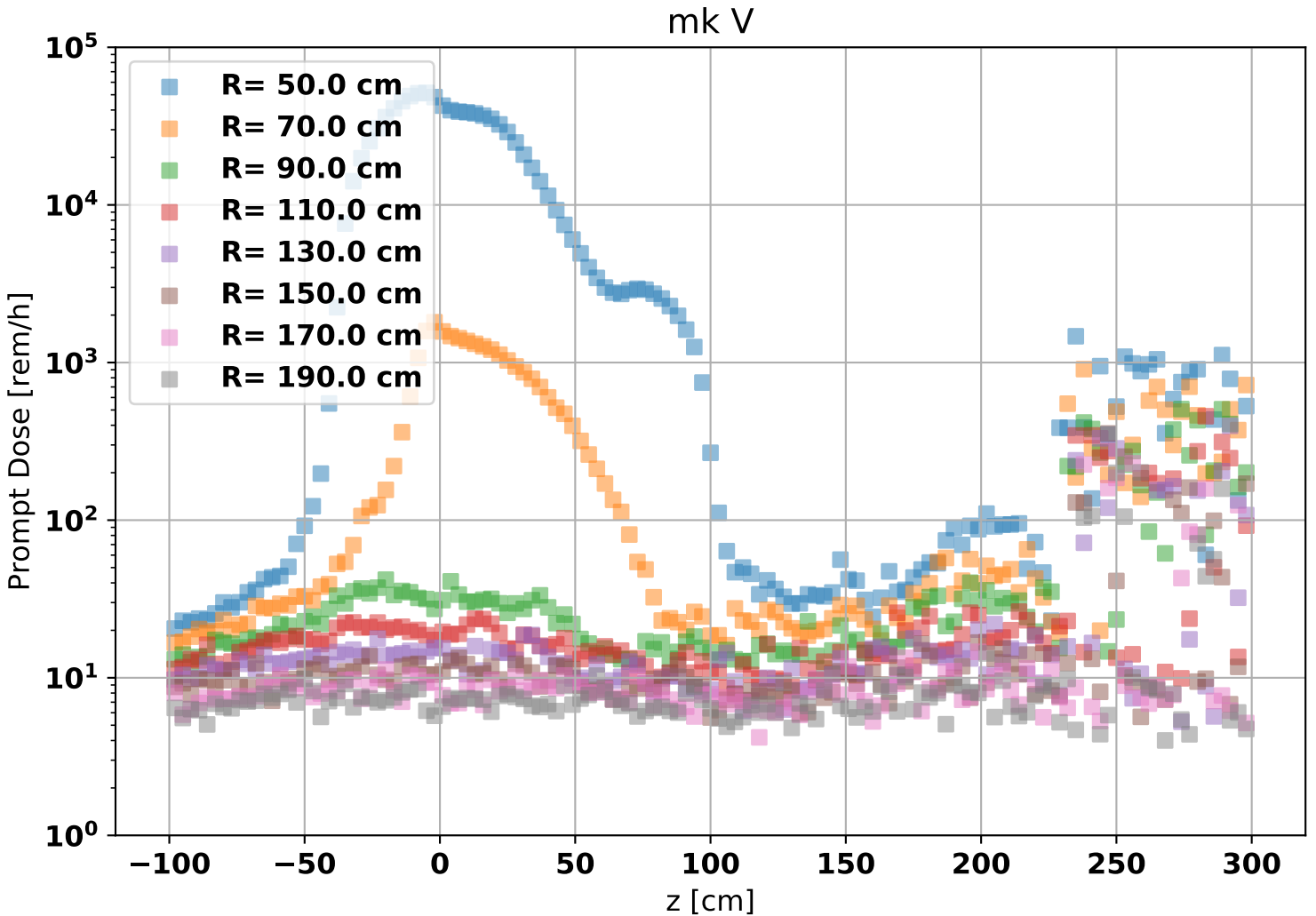
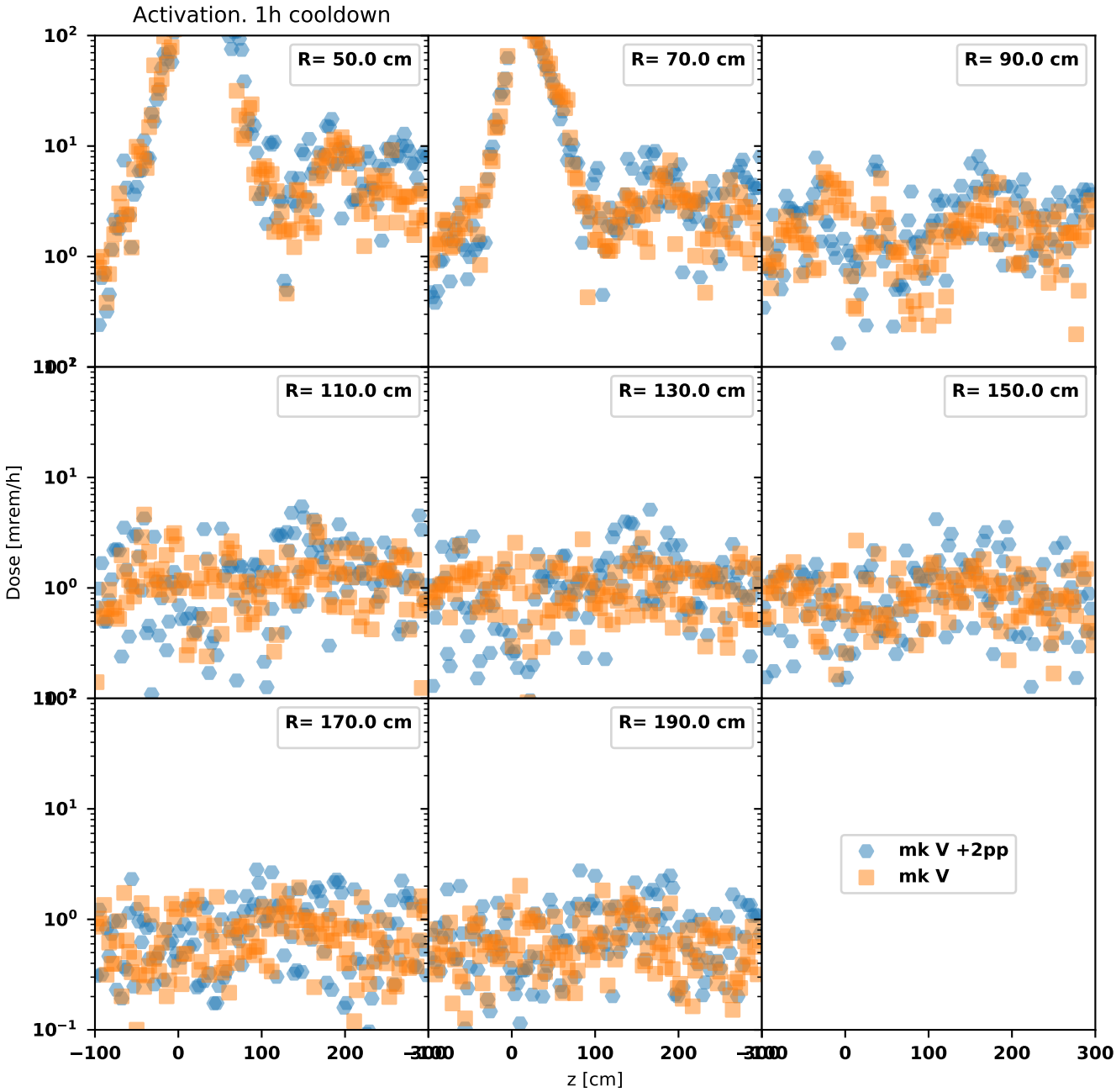
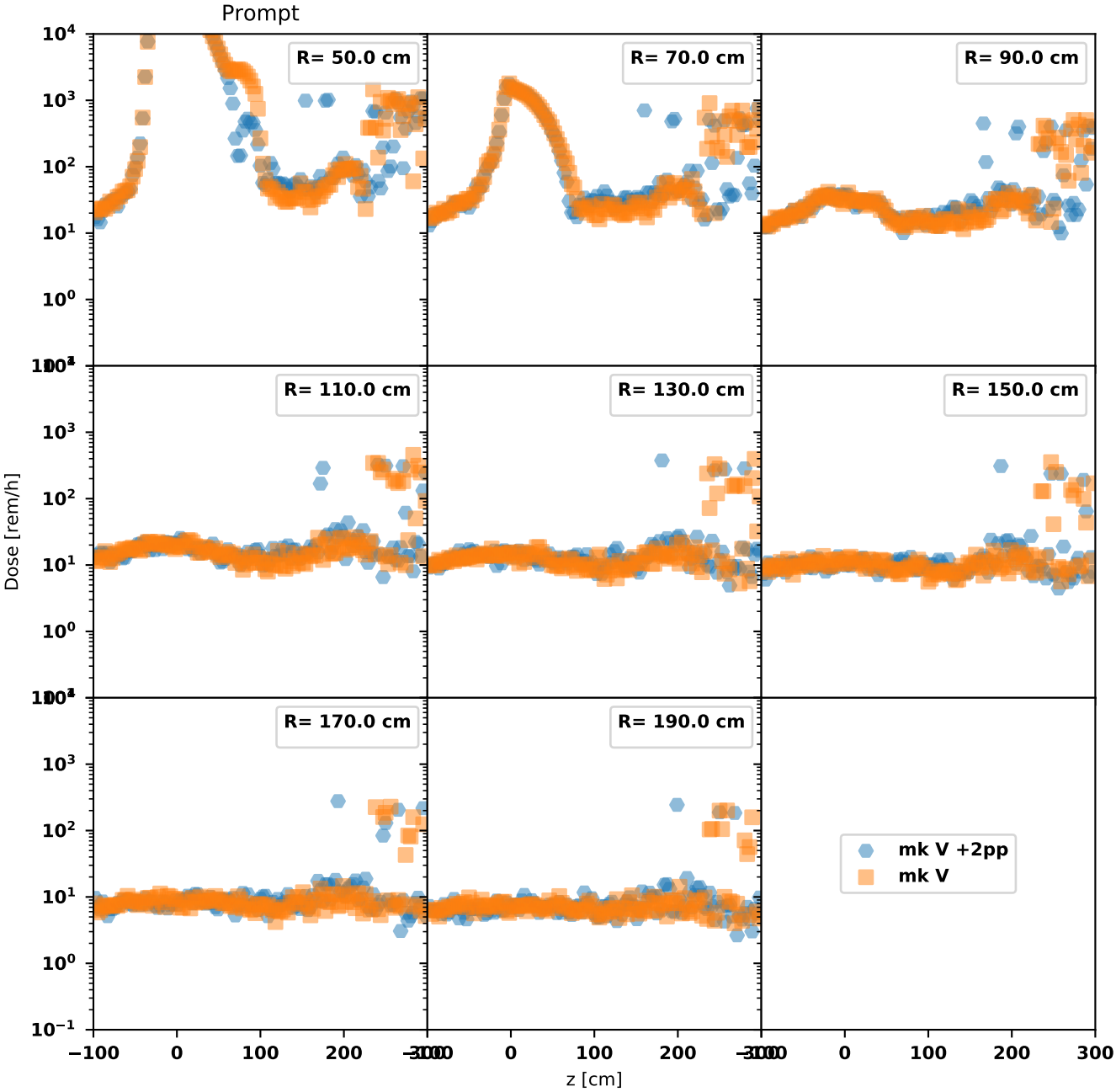
10^{0}
10^{-1}

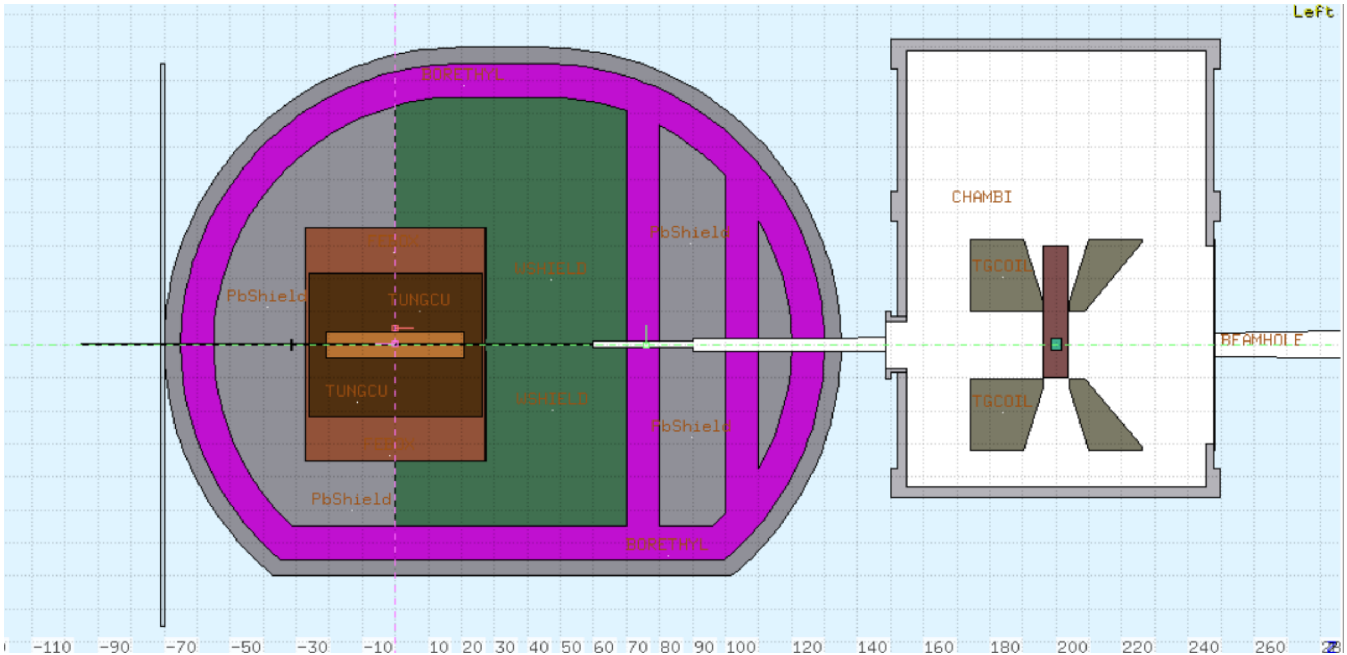

mk V +2pp
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
Prompt Dose [rem/h]
z [cm]
10^5
10^4
10^3
10^2
10^1
10^0
−100
−50
0
50
100
150
200
250
300


mk V
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
Prompt Dose [rem/h]
z [cm]
10^5
10^4
10^3
10^2
10^1
10^0
−100
−50
0
50
100
150
200
250
300

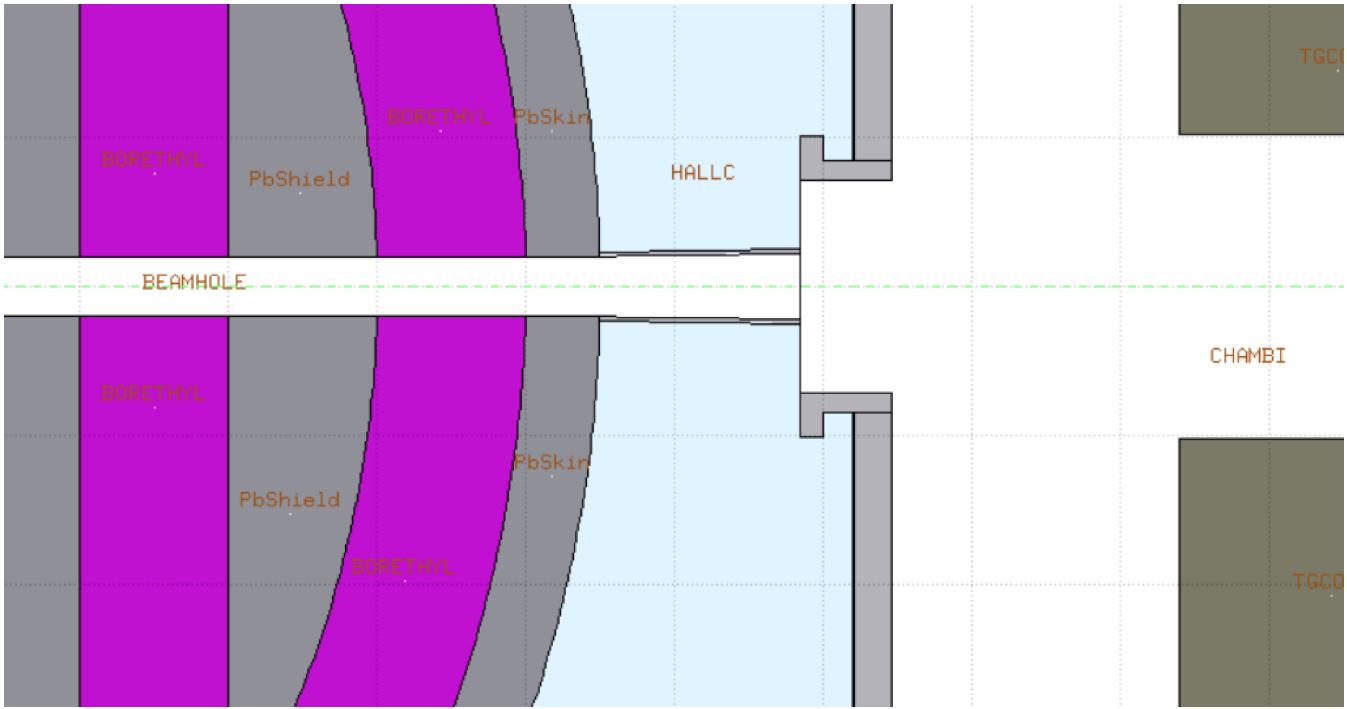

Activation. 1h cooldown
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
mk V +2pp
mk V
Dose [mrem/h]
z [cm]

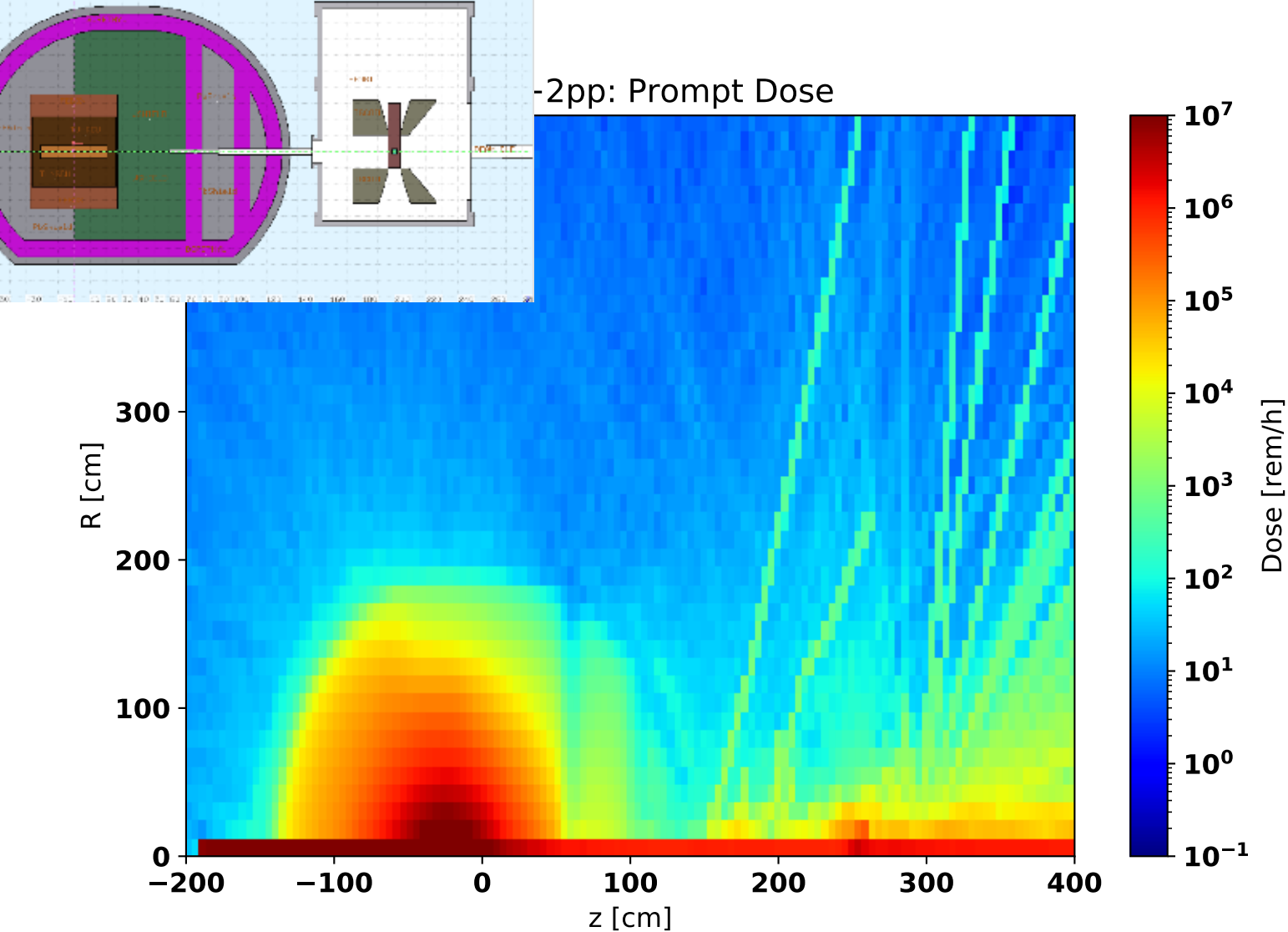

Prompt
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
mk V +2pp
mk V
Dose [rem/h]
z [cm]

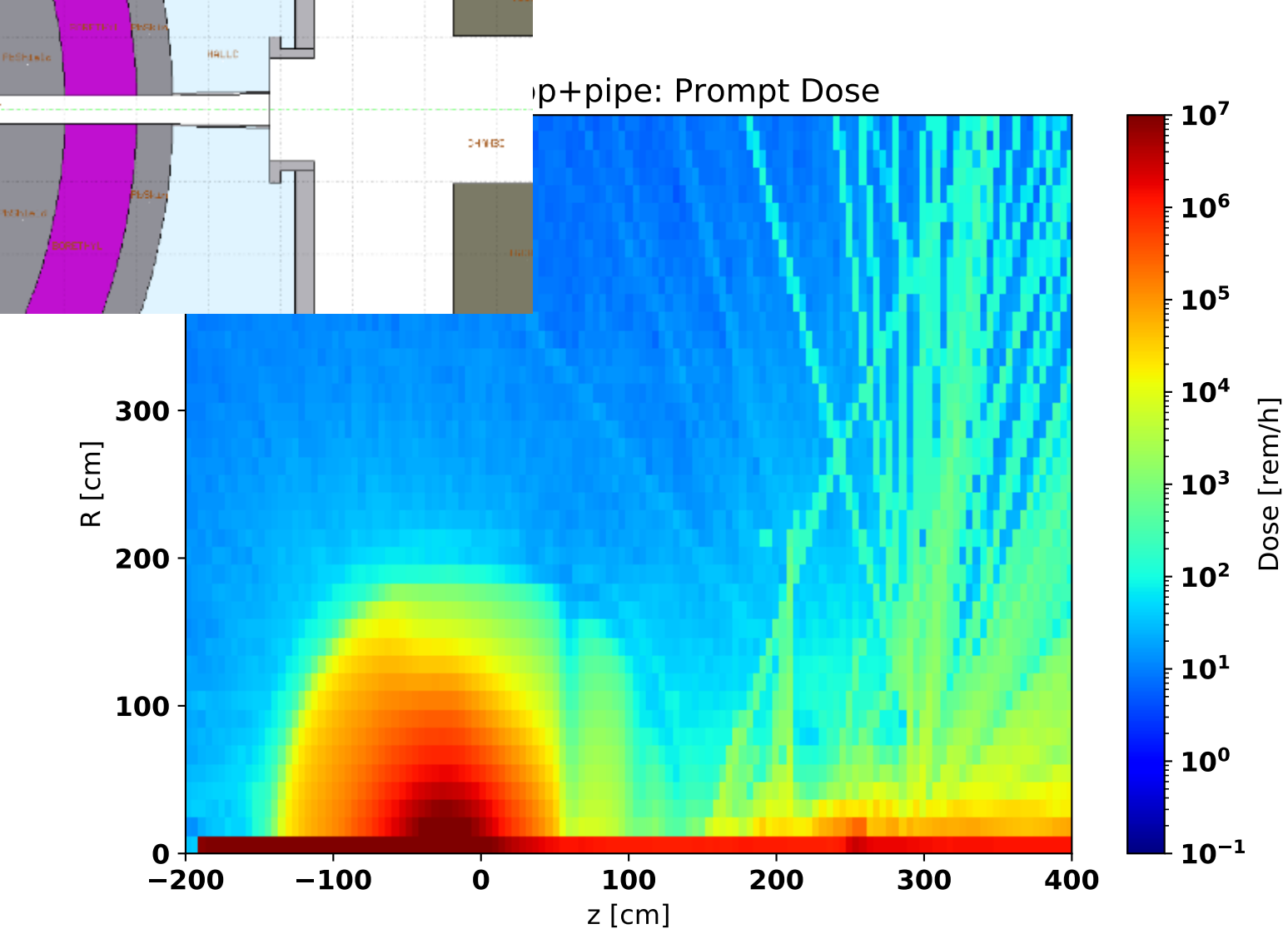
cp21_mkV_2pplates

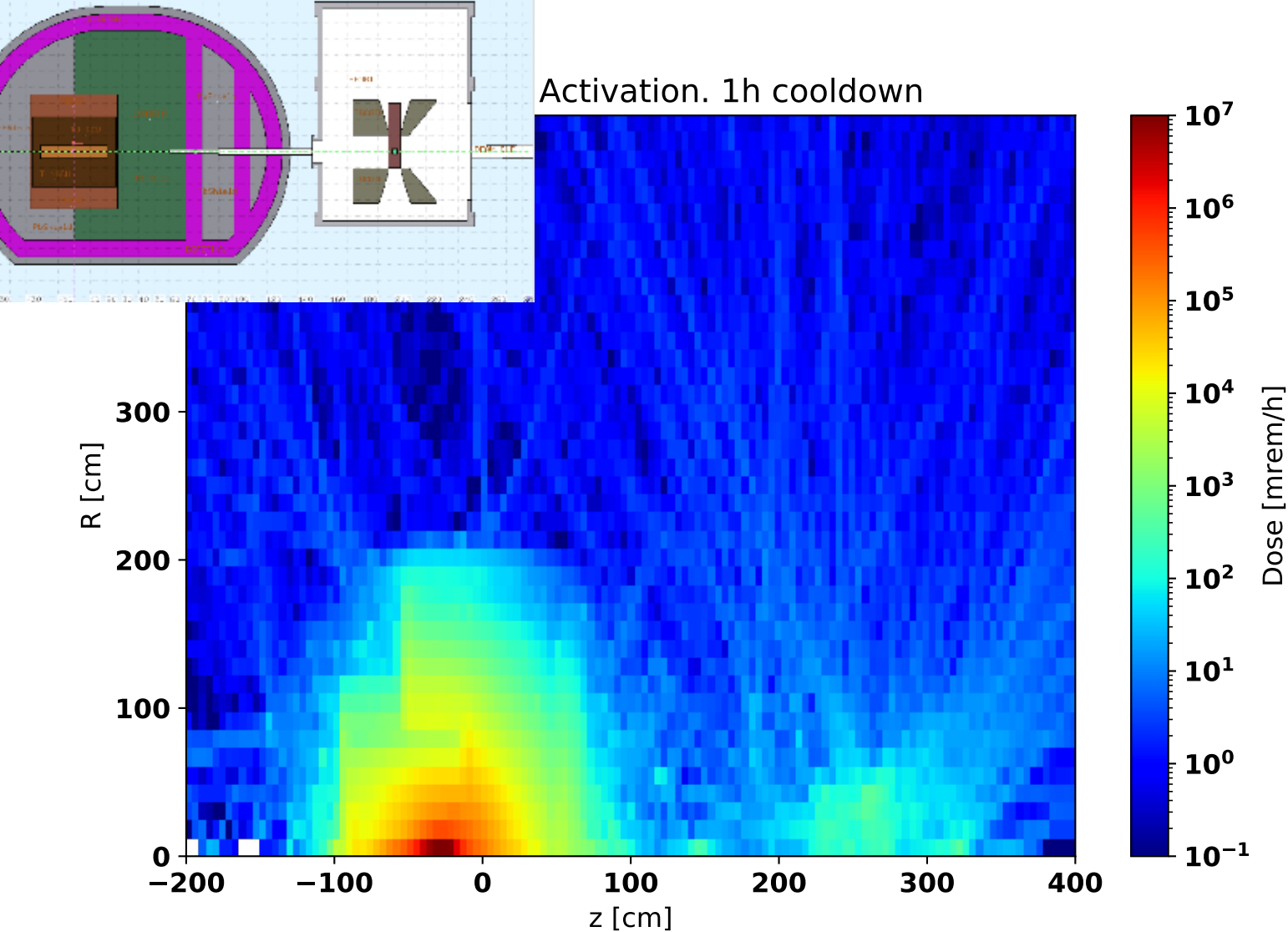


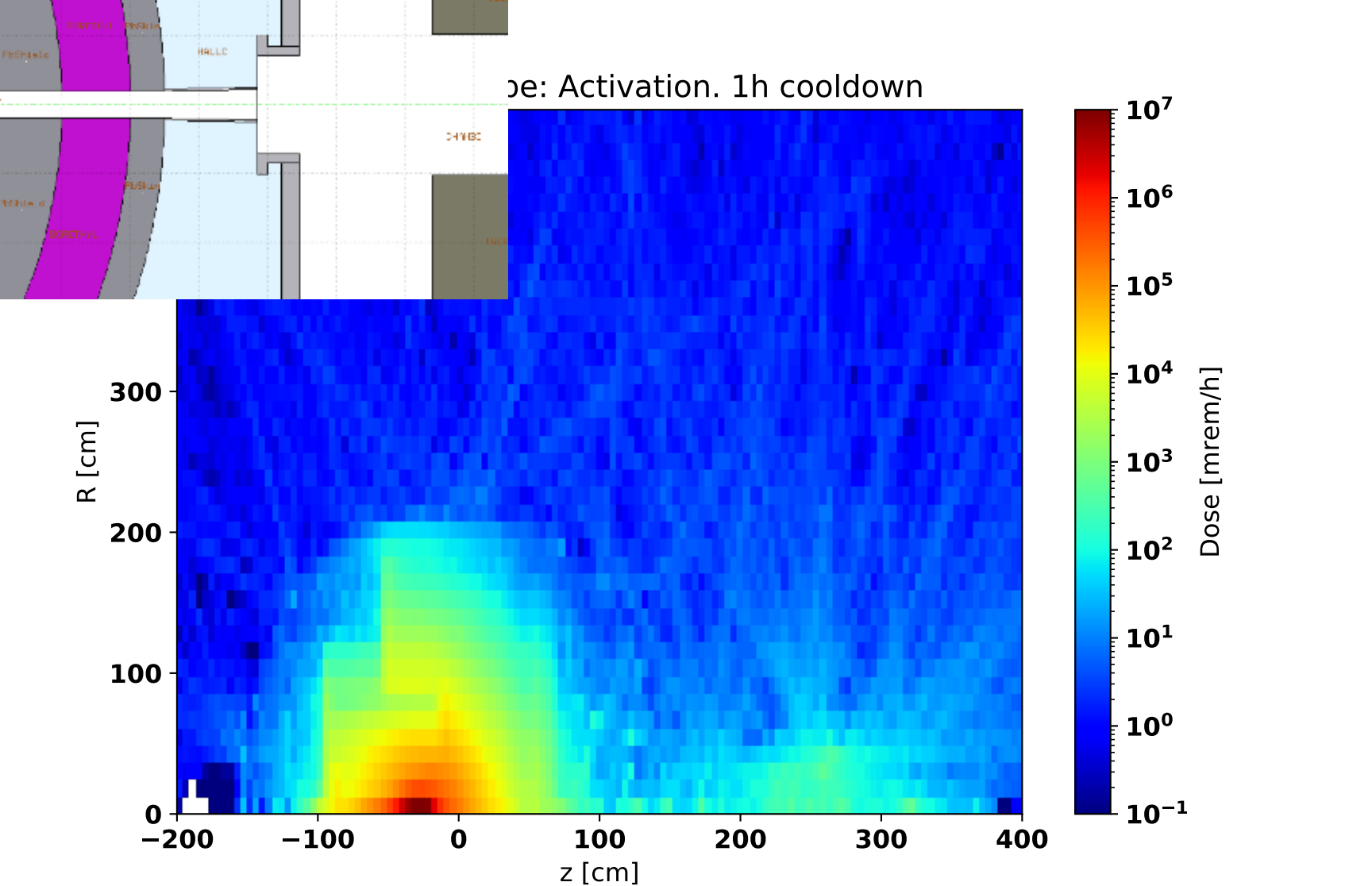
cp21_mkV_2pplates_beampipe

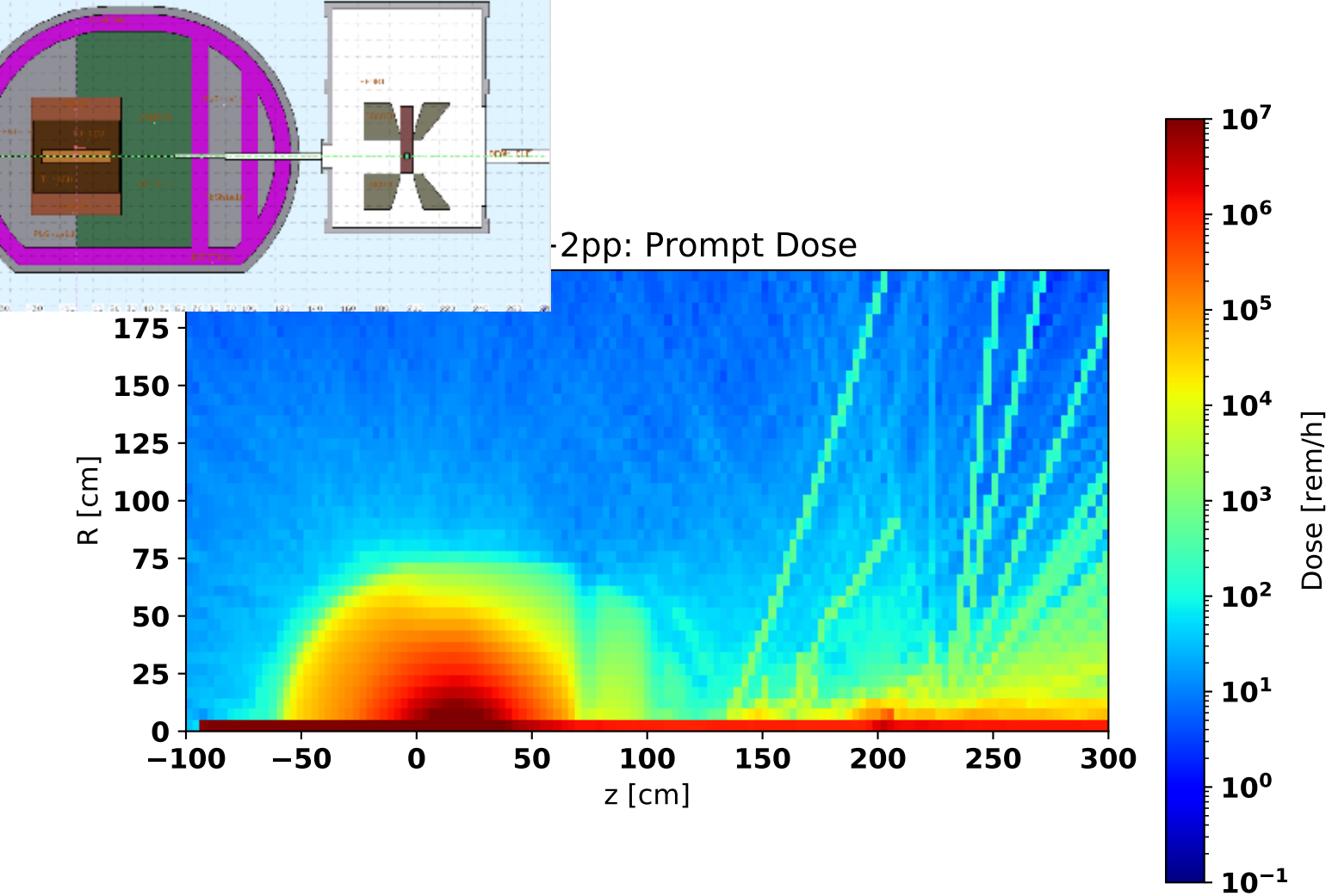


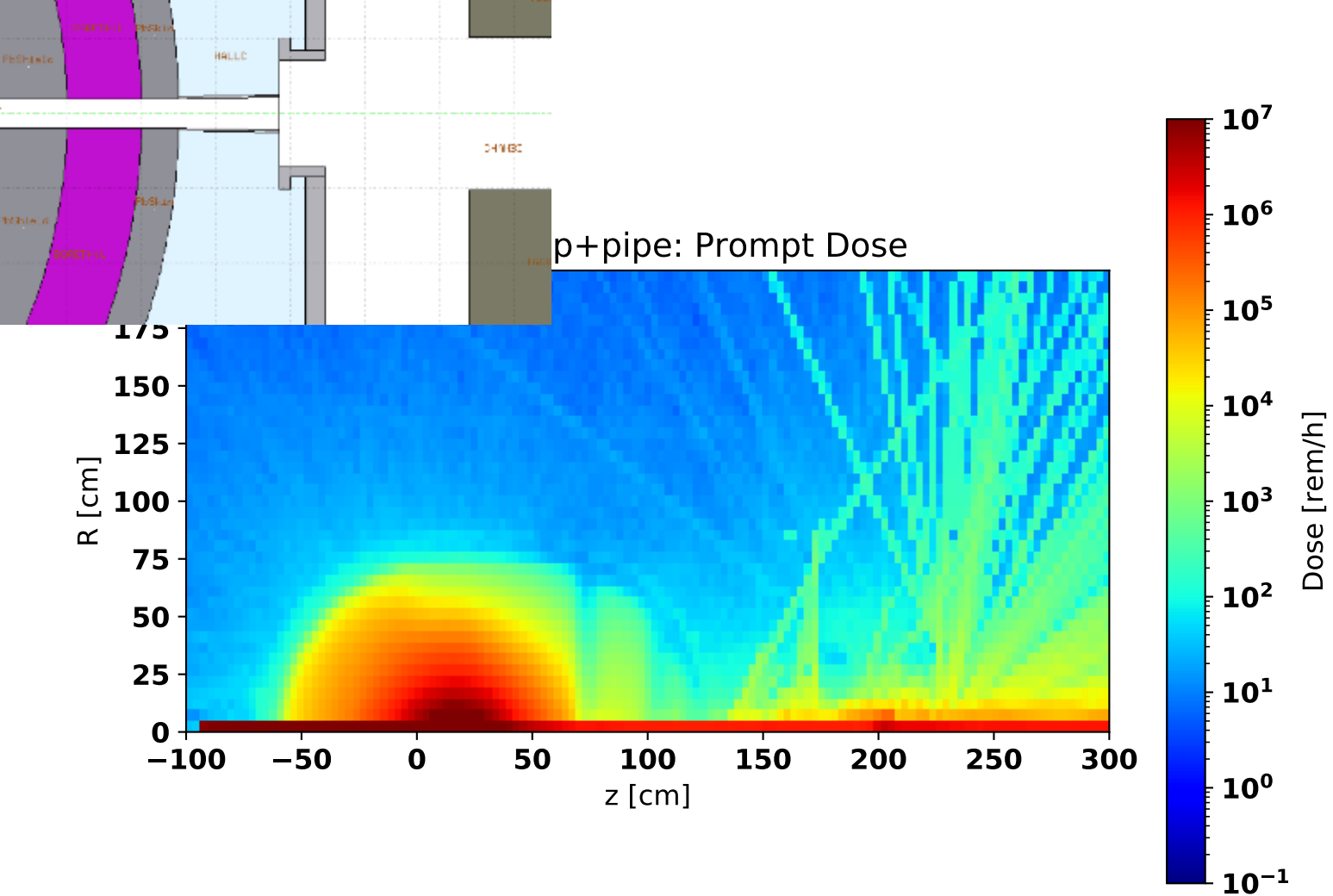

-2pp: Prompt Dose
R [cm]
z [cm]
Dose [rem/h]
0
100
200
300
−200
−100
0
100
200
300
400
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

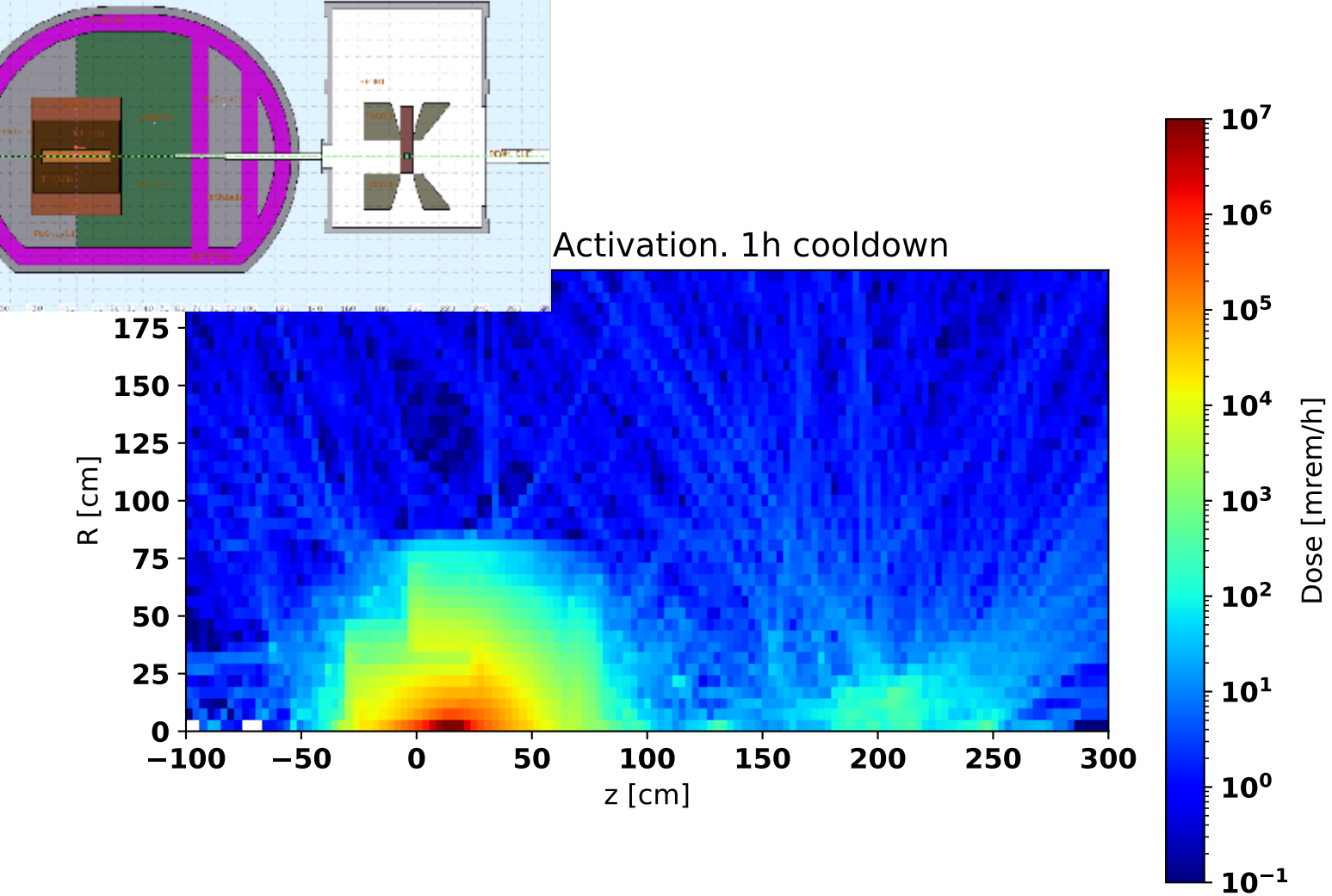

p+pipe: Prompt Dose
R [cm]
z [cm]
Dose [rem/h]
0
100
200
300
−200
−100
0
100
200
300
400
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

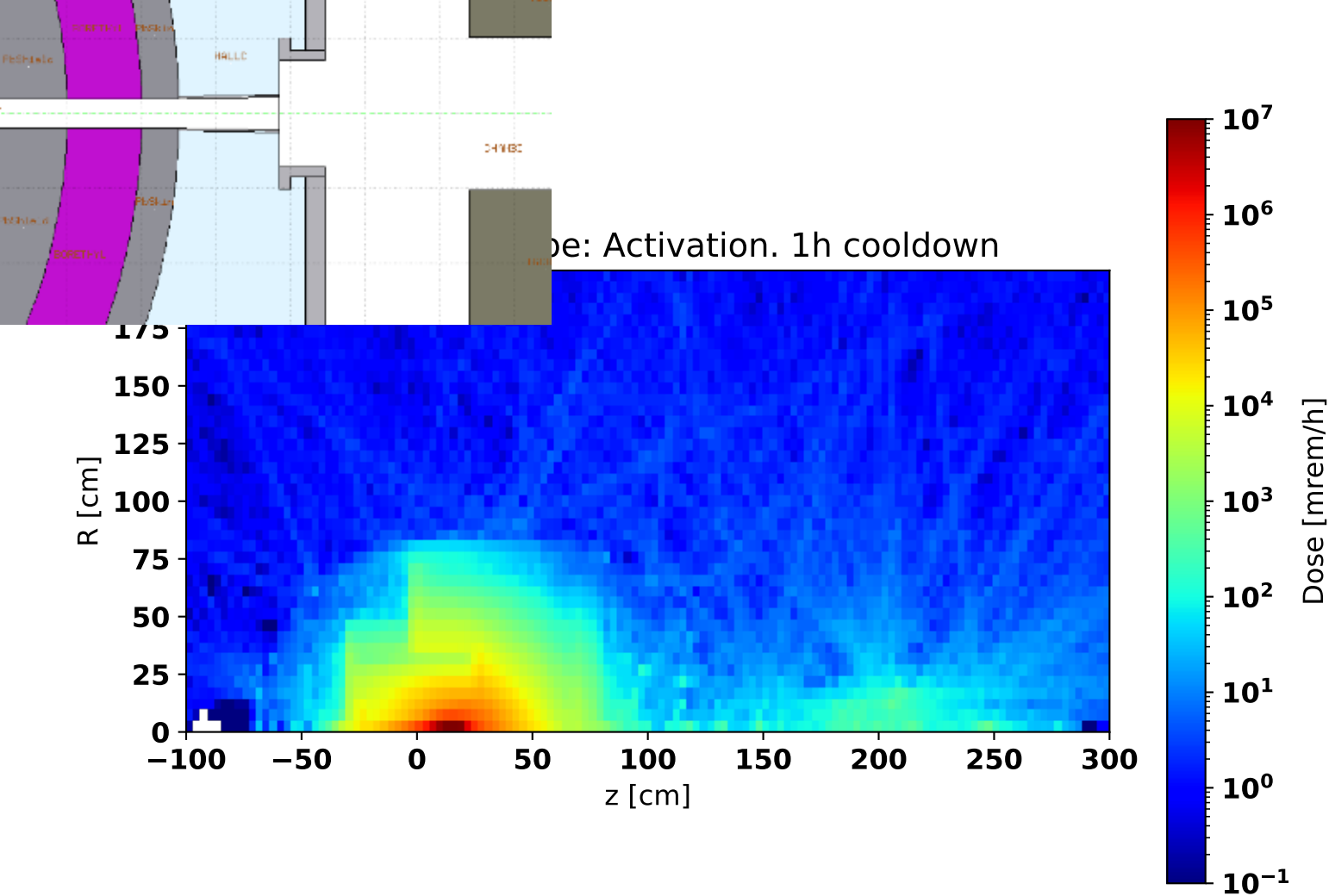

Activation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
0
100
200
300
−200
−100
0
100
200
300
400
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

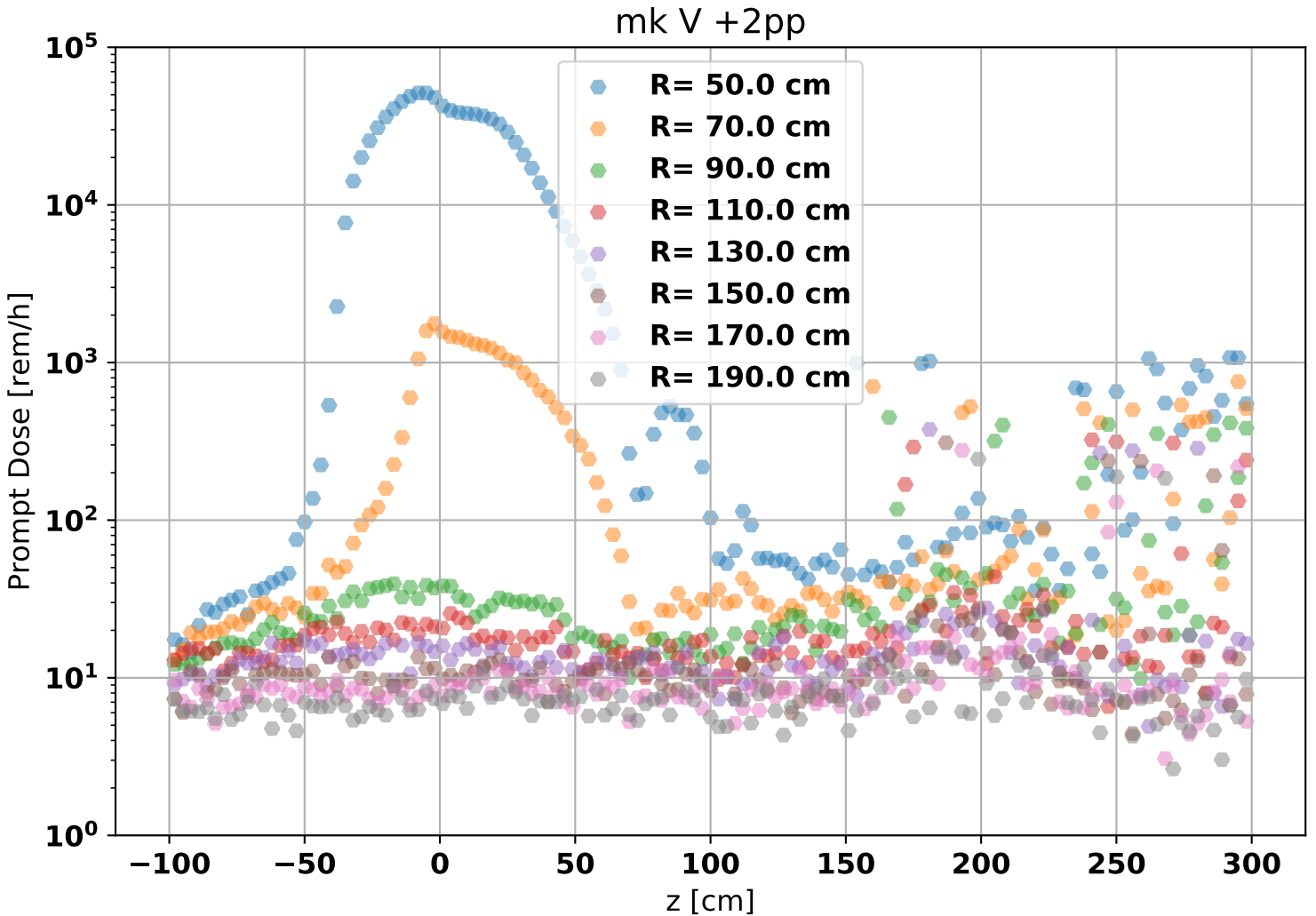

pe: Activation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
0
100
200
300
−200
−100
0
100
200
300
400
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

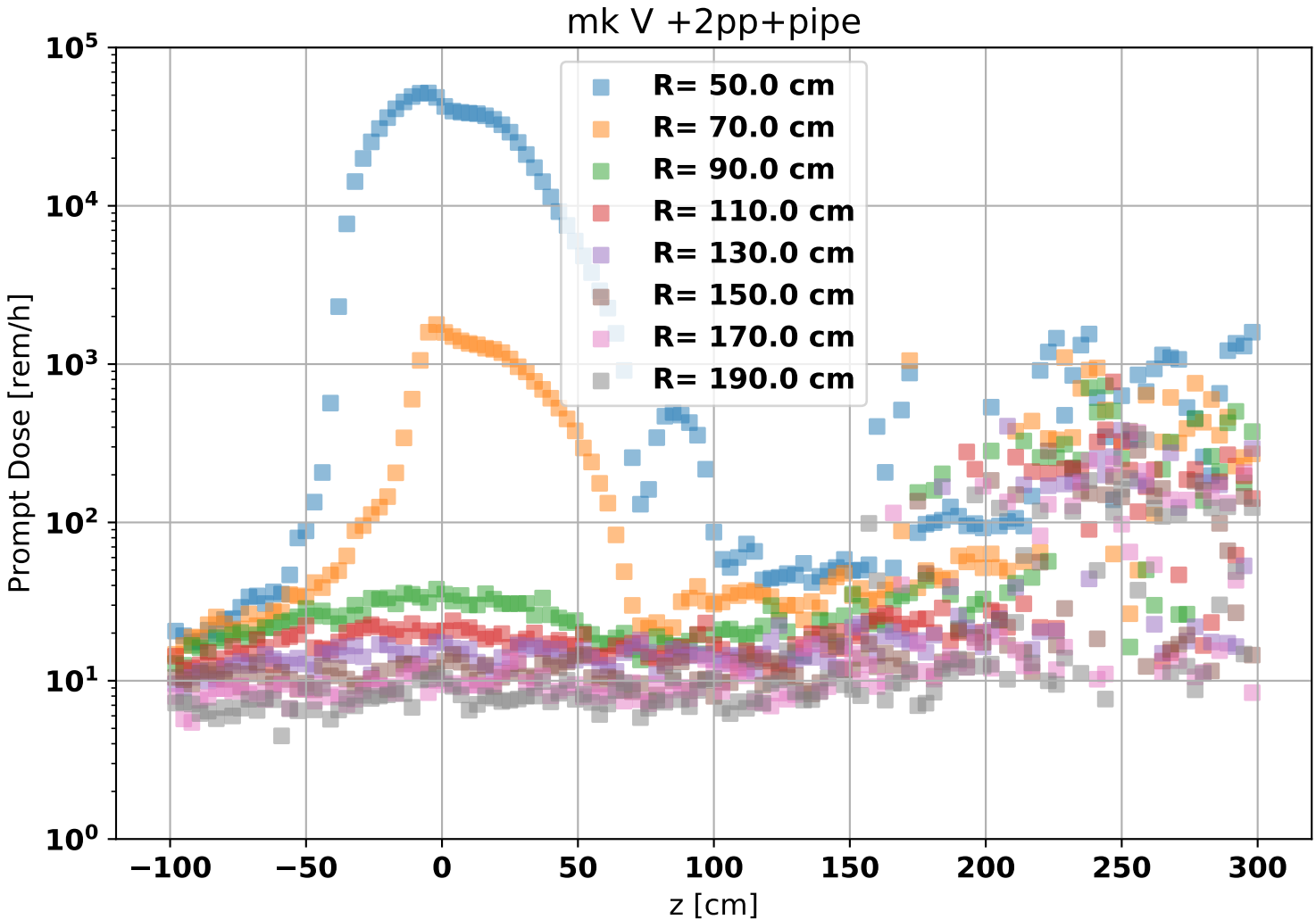

-2pp: Prompt Dose
R [cm]
z [cm]
Dose [rem/h]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

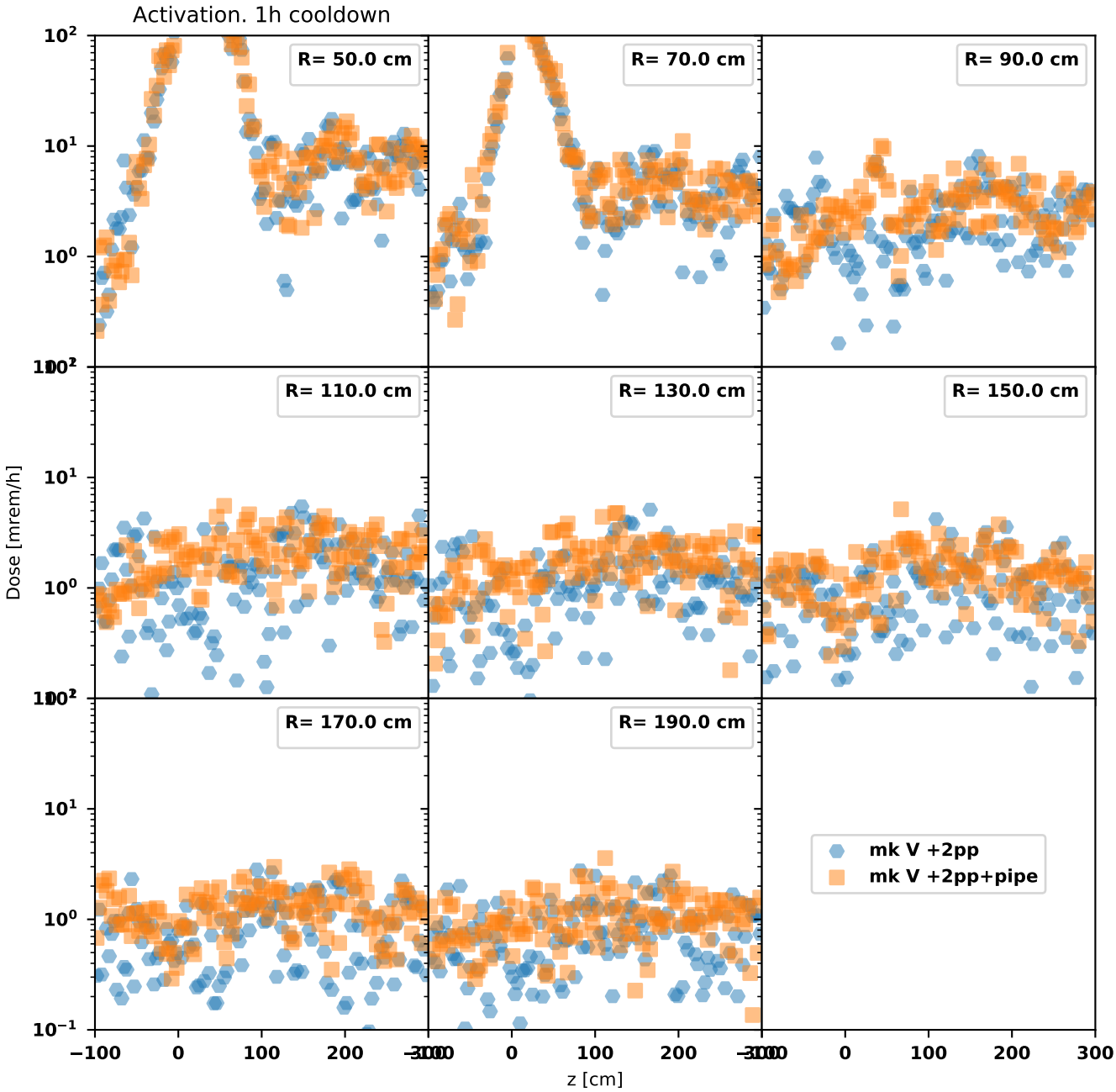

p+pipe: Prompt Dose
R [cm]
z [cm]
Dose [rem/h]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

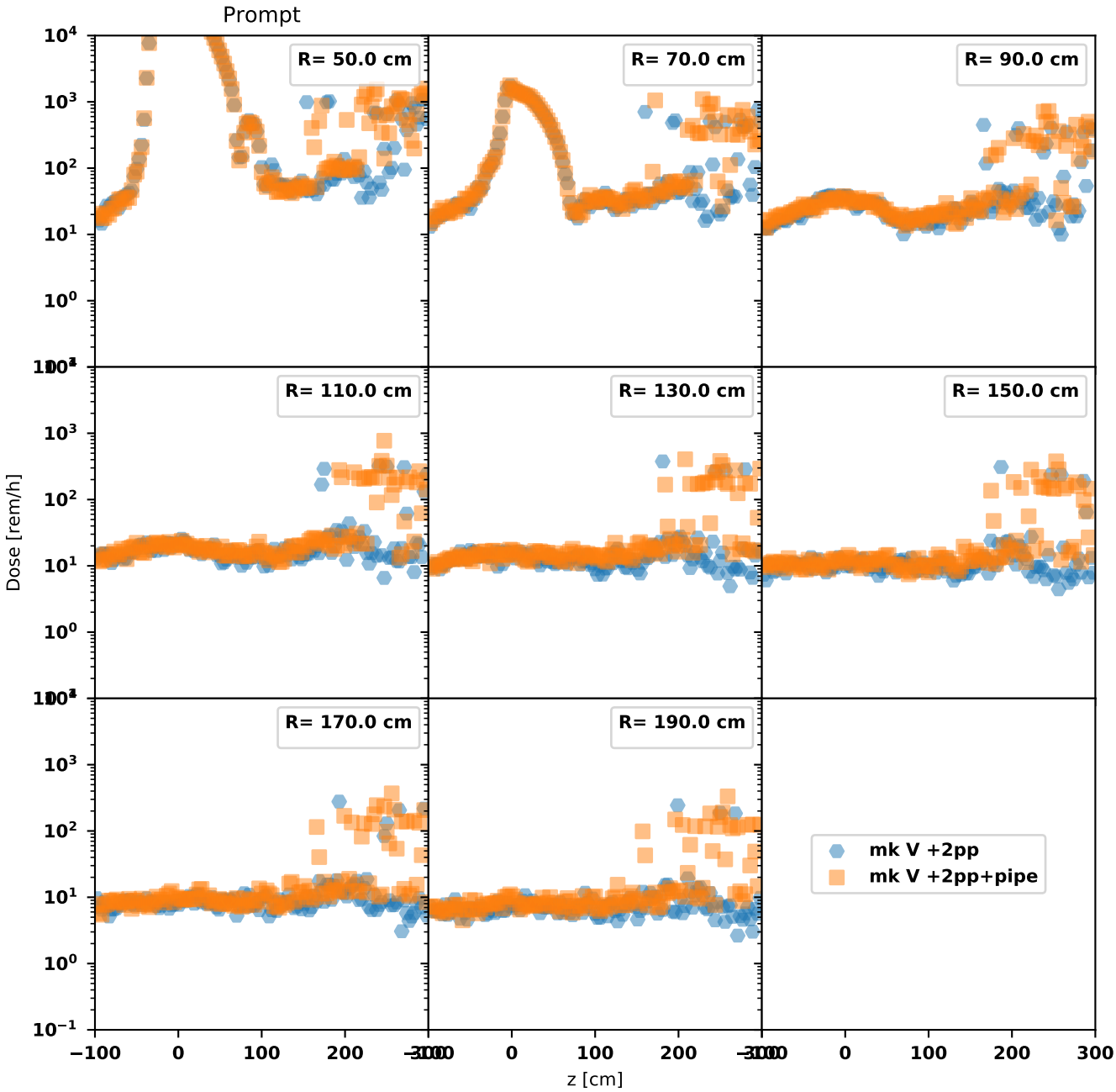

Activation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


pe: Activation. 1h cooldown
R [cm]
z [cm]
Dose [mrem/h]
175
150
125
100
75
50
25
0
−100
−50
0
50
100
150
200
250
300
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}


mk V +2pp
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
Prompt Dose [rem/h]
z [cm]
10^5
10^4
10^3
10^2
10^1
10^0
−100
−50
0
50
100
150
200
250
300


mk V +2pp+pipe
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
Prompt Dose [rem/h]
z [cm]
10^0
10^1
10^2
10^3
10^4
10^5
−100
−50
0
50
100
150
200
250
300


Activation. 1h cooldown
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
mk V +2pp
mk V +2pp+pipe
Dose [mrem/h]
z [cm]


Prompt
R= 50.0 cm
R= 70.0 cm
R= 90.0 cm
R= 110.0 cm
R= 130.0 cm
R= 150.0 cm
R= 170.0 cm
R= 190.0 cm
mk V +2pp
mk V +2pp+pipe
Dose [rem/h]
z [cm]

Summary & Outlook

GN's $0.02 worth...

- IMHO we are "there"
- implementing new geom. in FLUKA - relatively easy/straightforward*
- post-processing software improvements
- Any other suggestions we might think of (Hall D help?)

Thank you!