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Radiation Dose Rates at Remote Handling Room Door and Production Solenoid Drop Hatch

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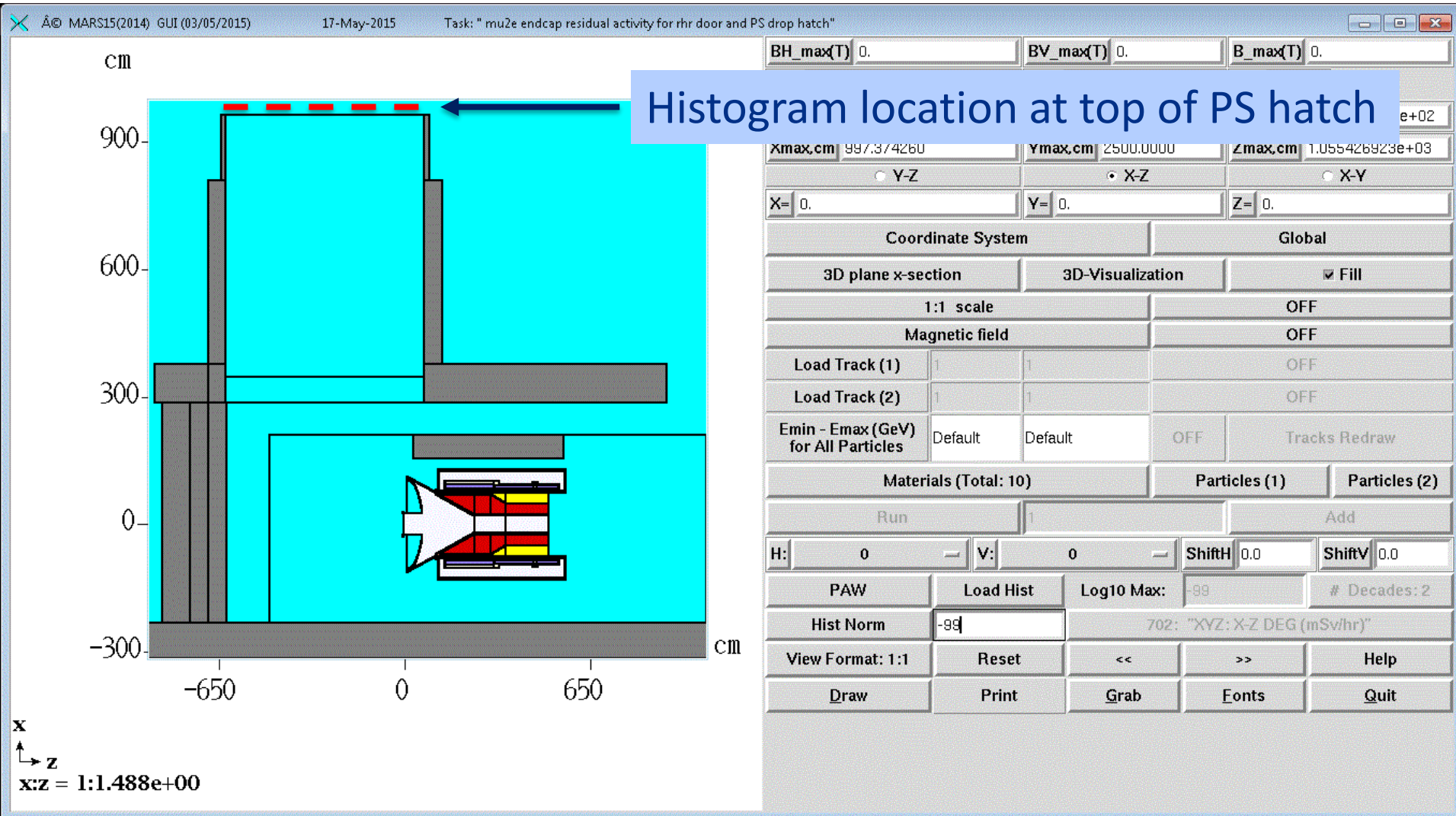
motivation

- What are the radiation dose rates at:
 - Remote handling room door
 - Production Solenoid Room drop hatch when blocks are removed
- The first question is raised while developing the requirements document for the RHR door
- The second question is a long standing one that has arisen numerous times at various design stages

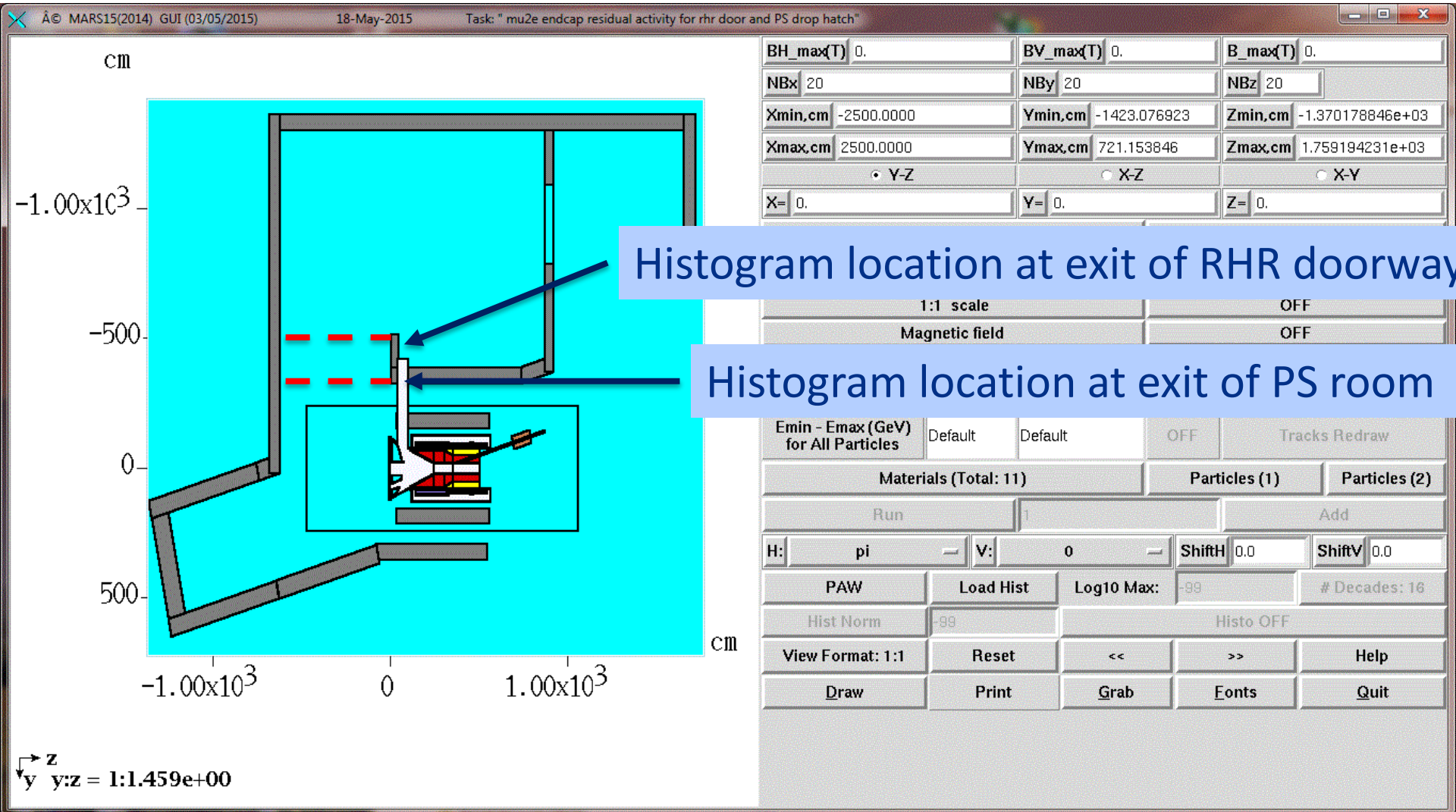
scope

- This work is a natural extension of Production Solenoid Endcap Activation Calculation
 - Started with the production solenoid end cap activation calculation model described at Mu2e-doc-5471, version 4
 - Used the SS316 end cap version
 - 8 kW beam power
 - 365 days irradiation, 7 days cooling time
 - Added a partial model of the production solenoid and remote handling rooms
 - Placed prompt dose rate histograms:
 - Top of PS drop hatch
 - Entrance of RHR doorway
 - Exit of RHR doorway
 - This is a simplified model without earth shielding

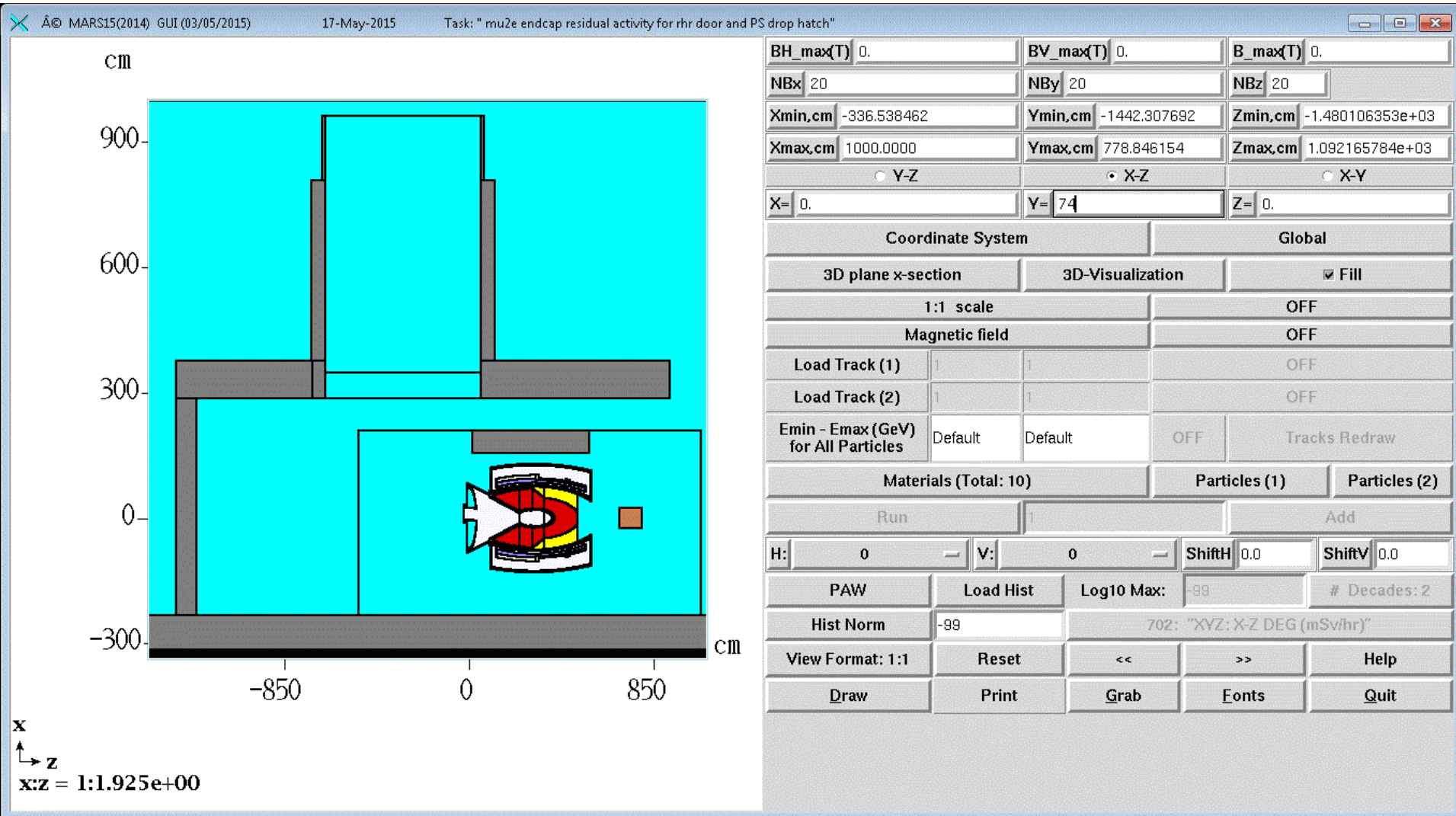
Model details – elevation view through PS center



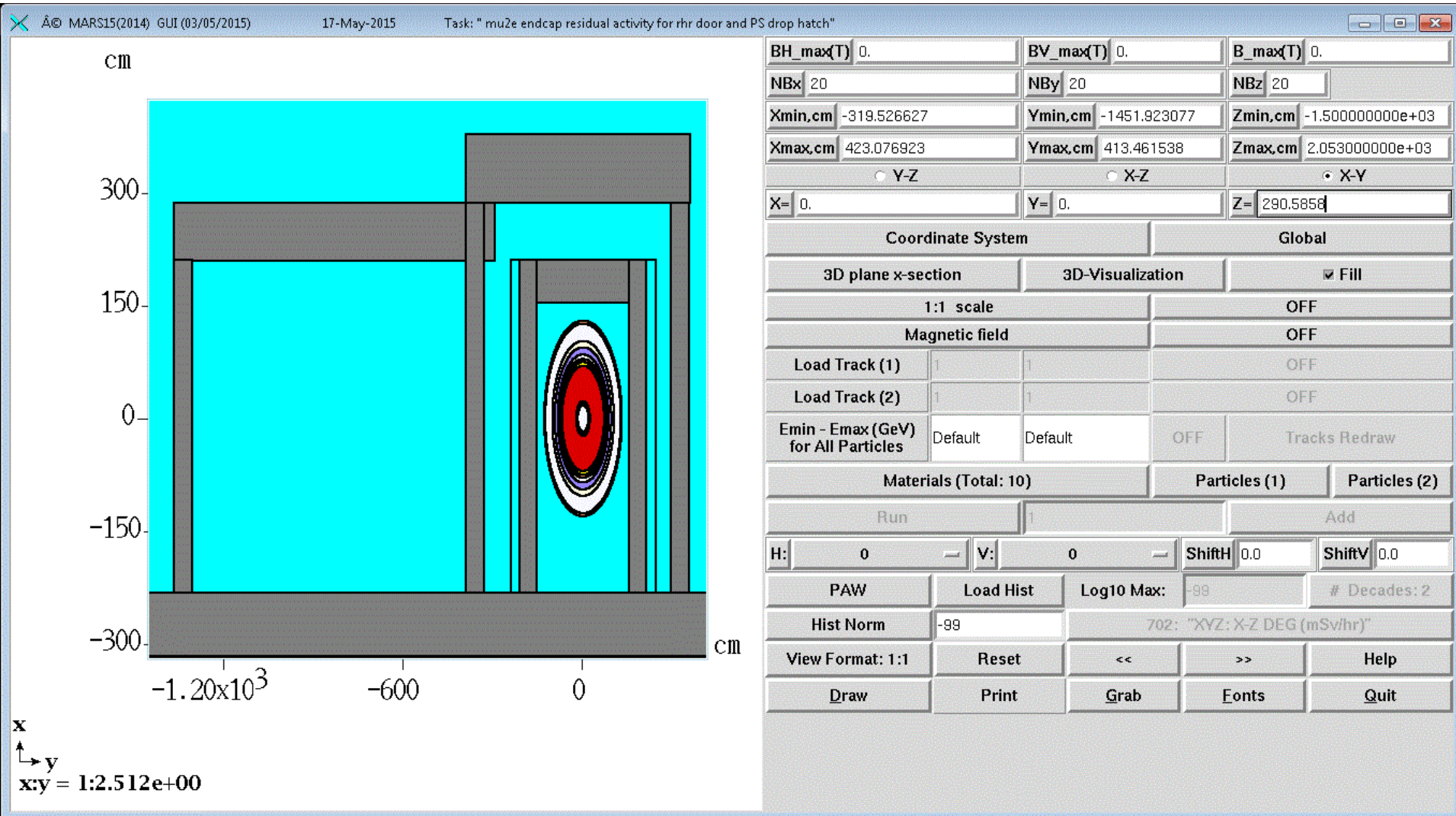
Model details – plan view through PS center, with extended vacuum pipe



Model details – elevation view rotated 14 degrees showing empty dump space

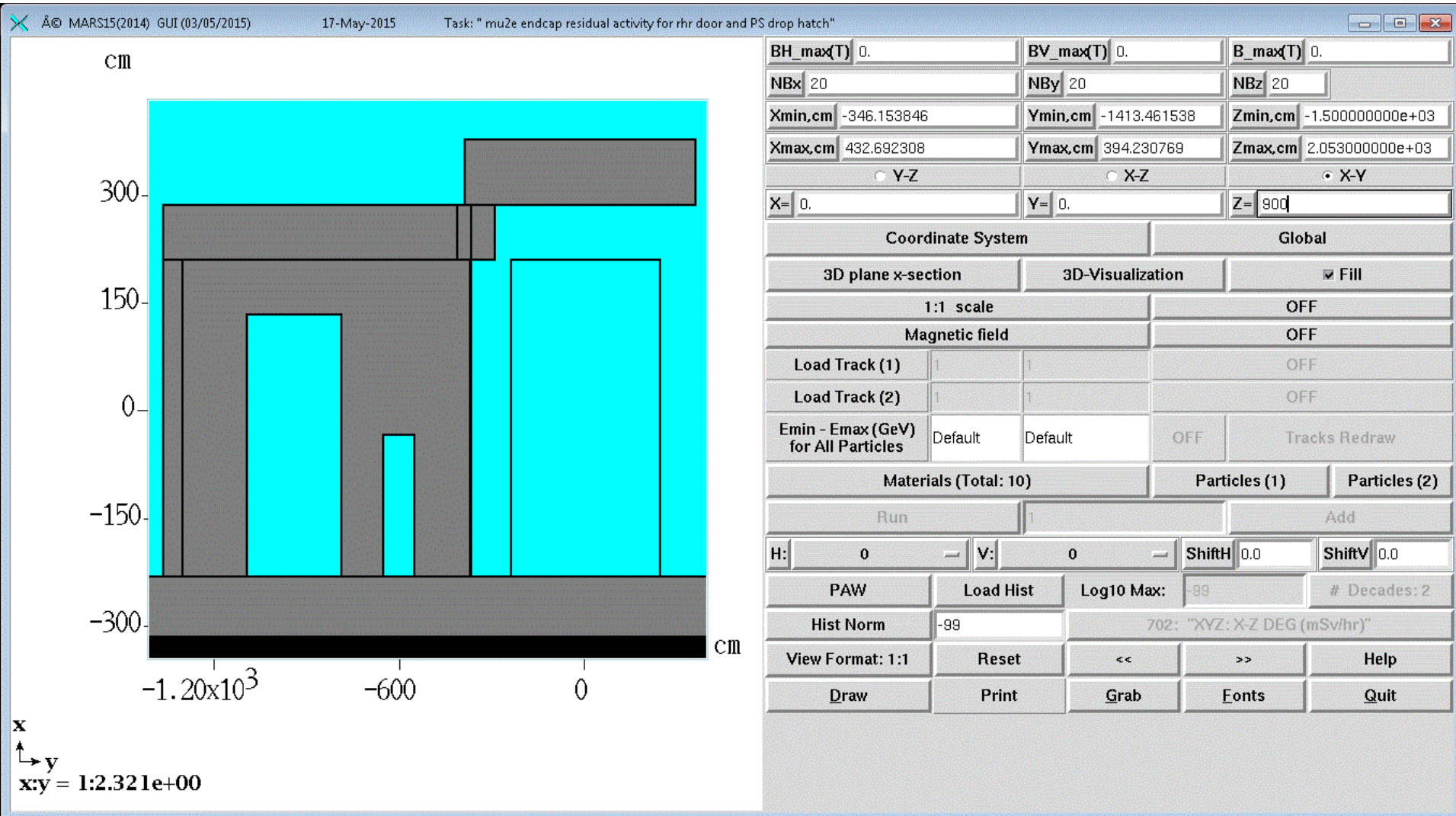


Model details – cross section, elevation view through target center



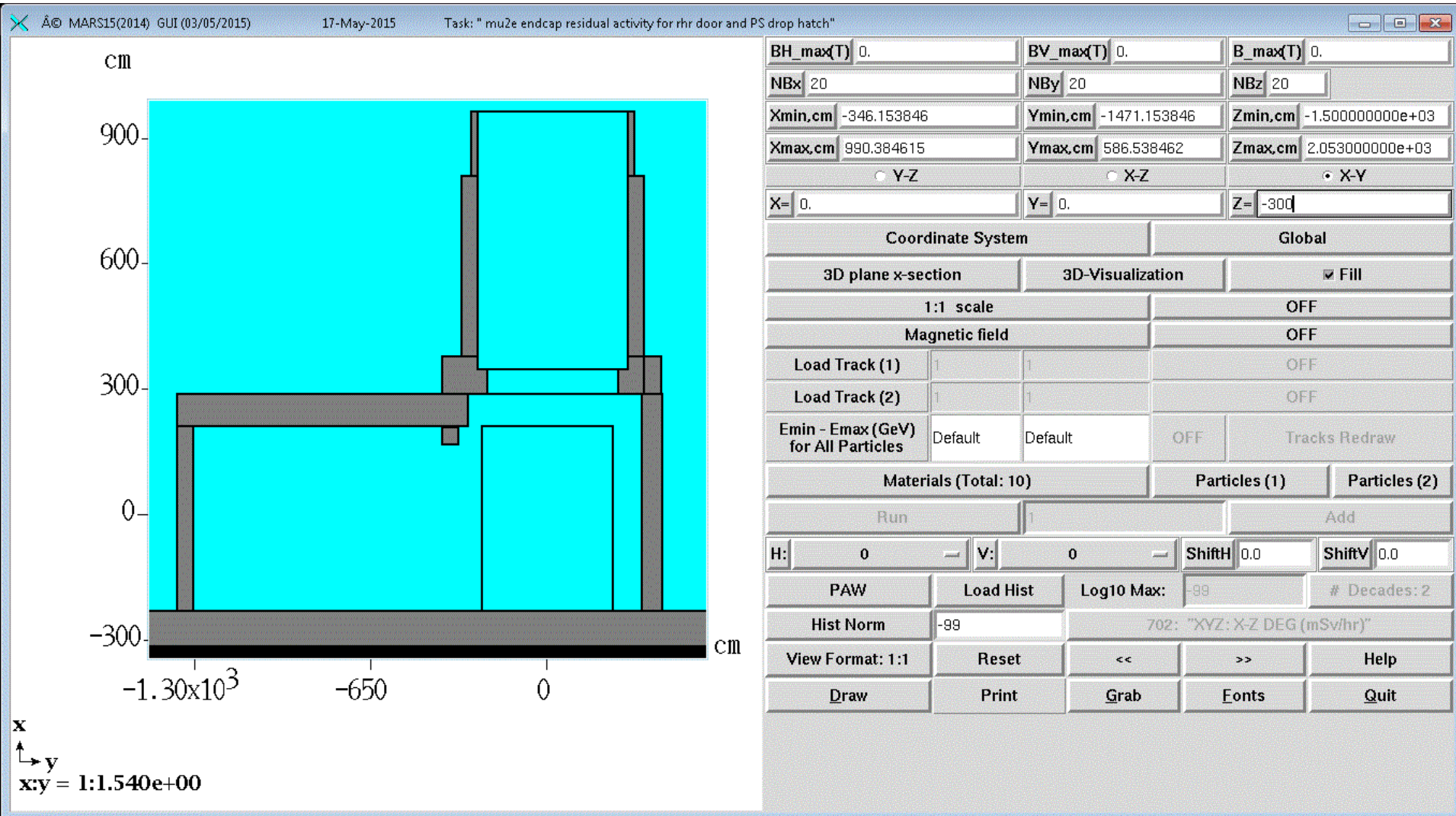
Model details – cross section, elevation view through vacuum pipe

Model details – elevation view, cross section through rollup door wall

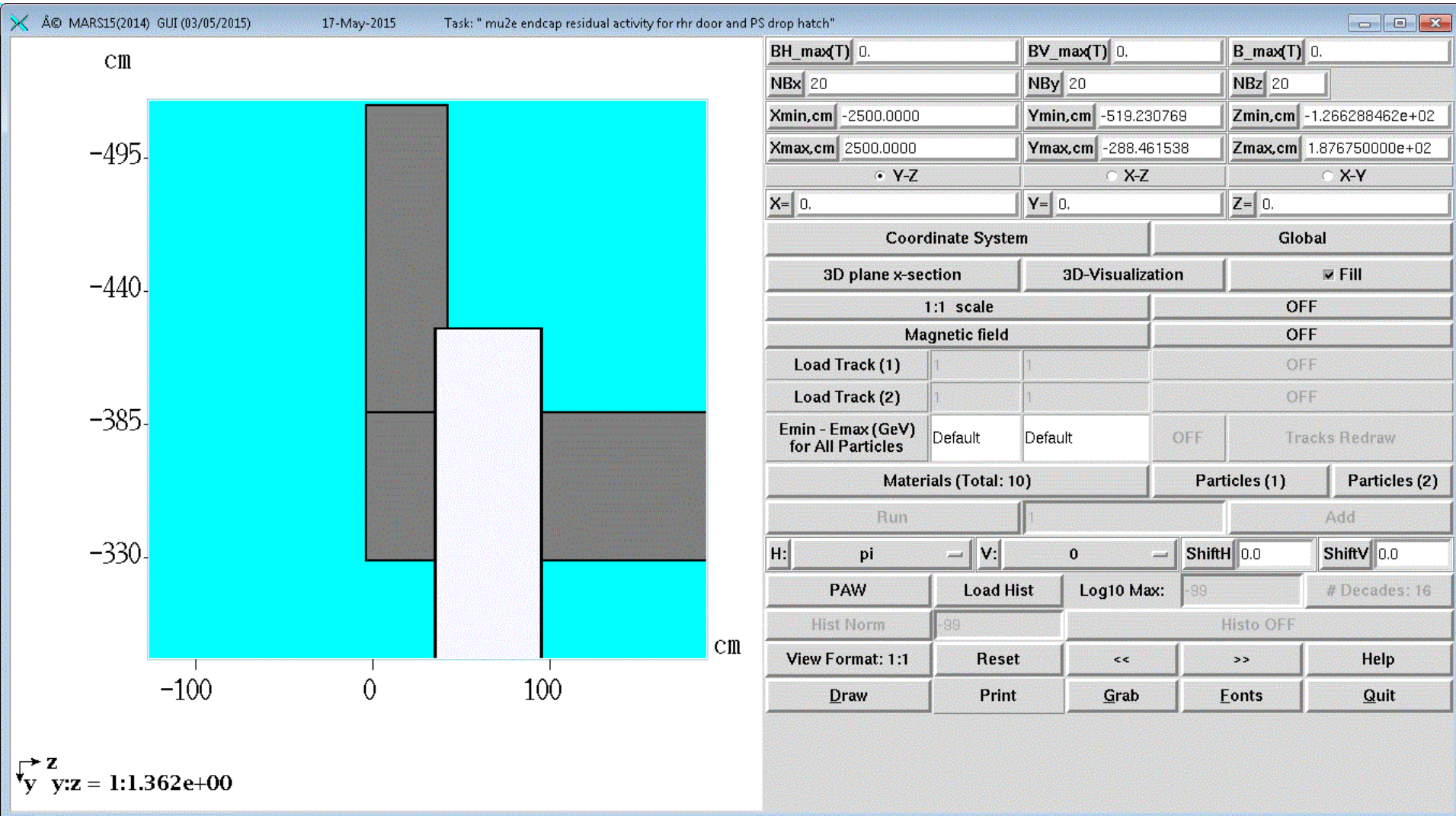


Model details – longitudinal elevation view through RHR wall and doorway

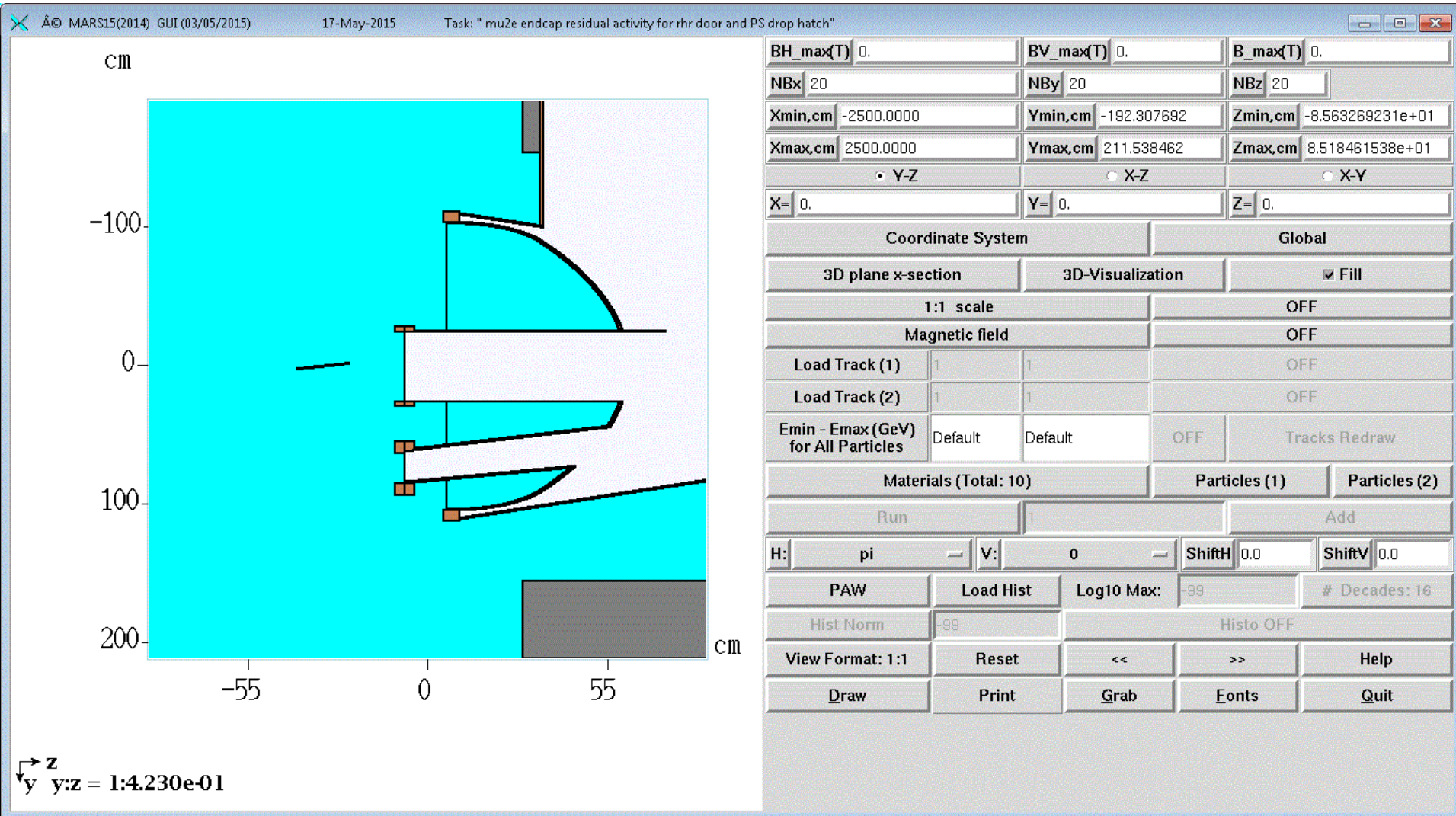
Model details – elevation view, cross section through PS drop hatch



Model details – plan view, vacuum pipe extended in RHR



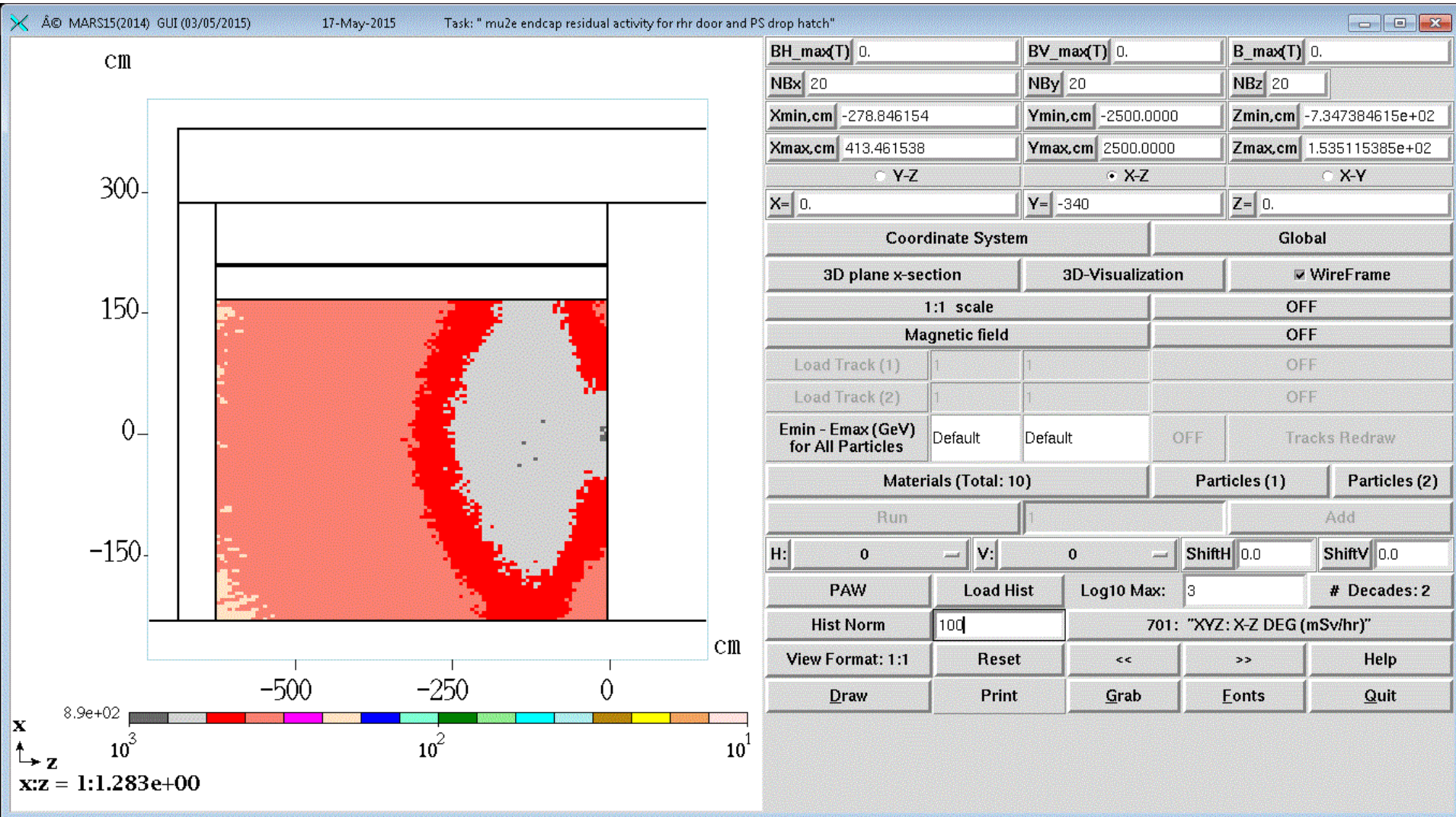
Model details – plan view at end cap with target removed from the PS



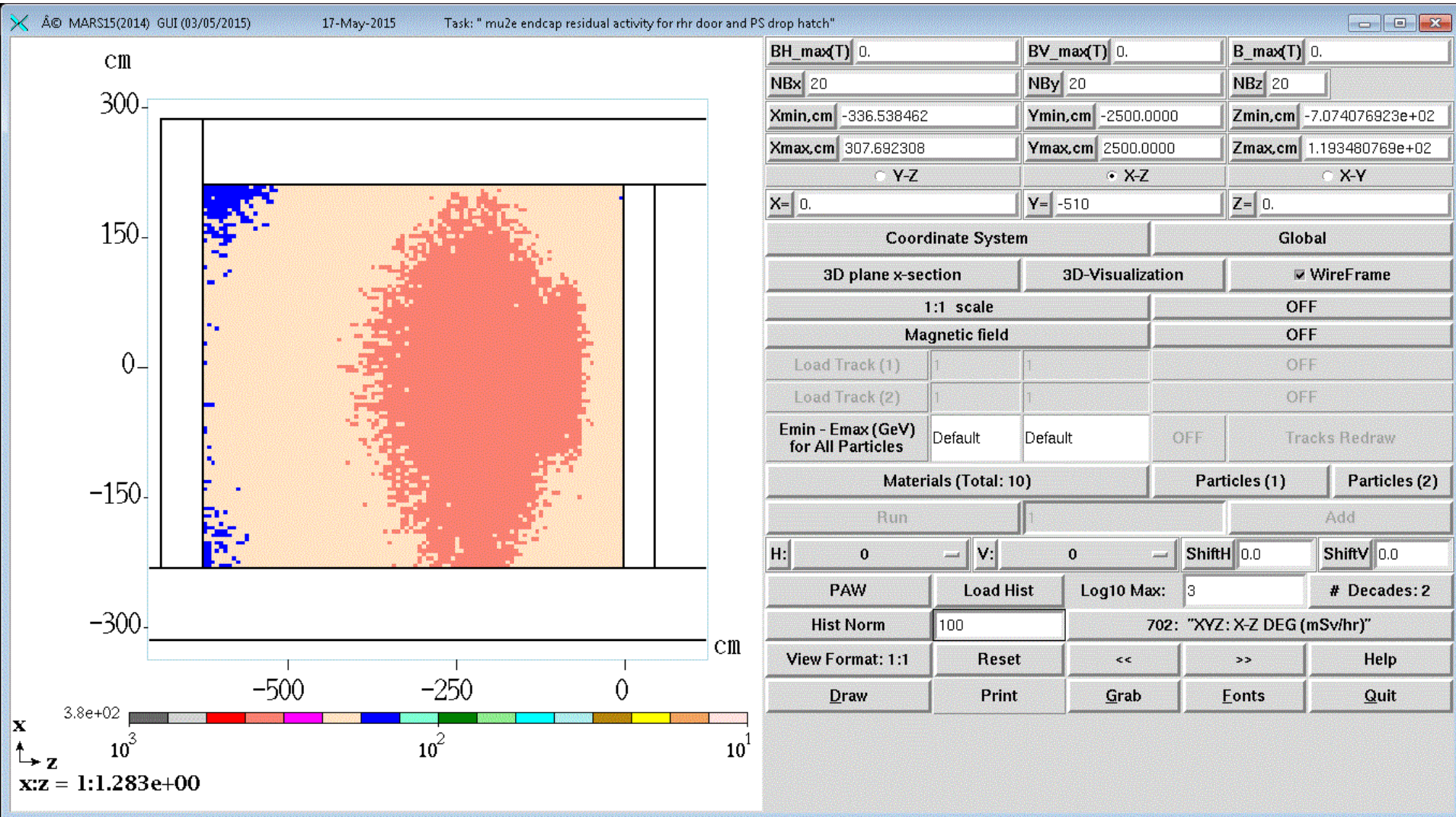
model situation

- It is required that the RHR door be open when moving target change equipment in and out of the room
- The main question is: “Can the doorway be left open during target changes?”
- To answer the question:
 - The model is adjusted to move the target to just outside the PS
 - The target source term is moved to the target
- Assumption:
 - Target will be placed inside coffin near the end of the PS
- This scenario should present the worst case situation at the RHR doorway
- Should also be the worst case for the PS drop hatch if blocks were to be removed

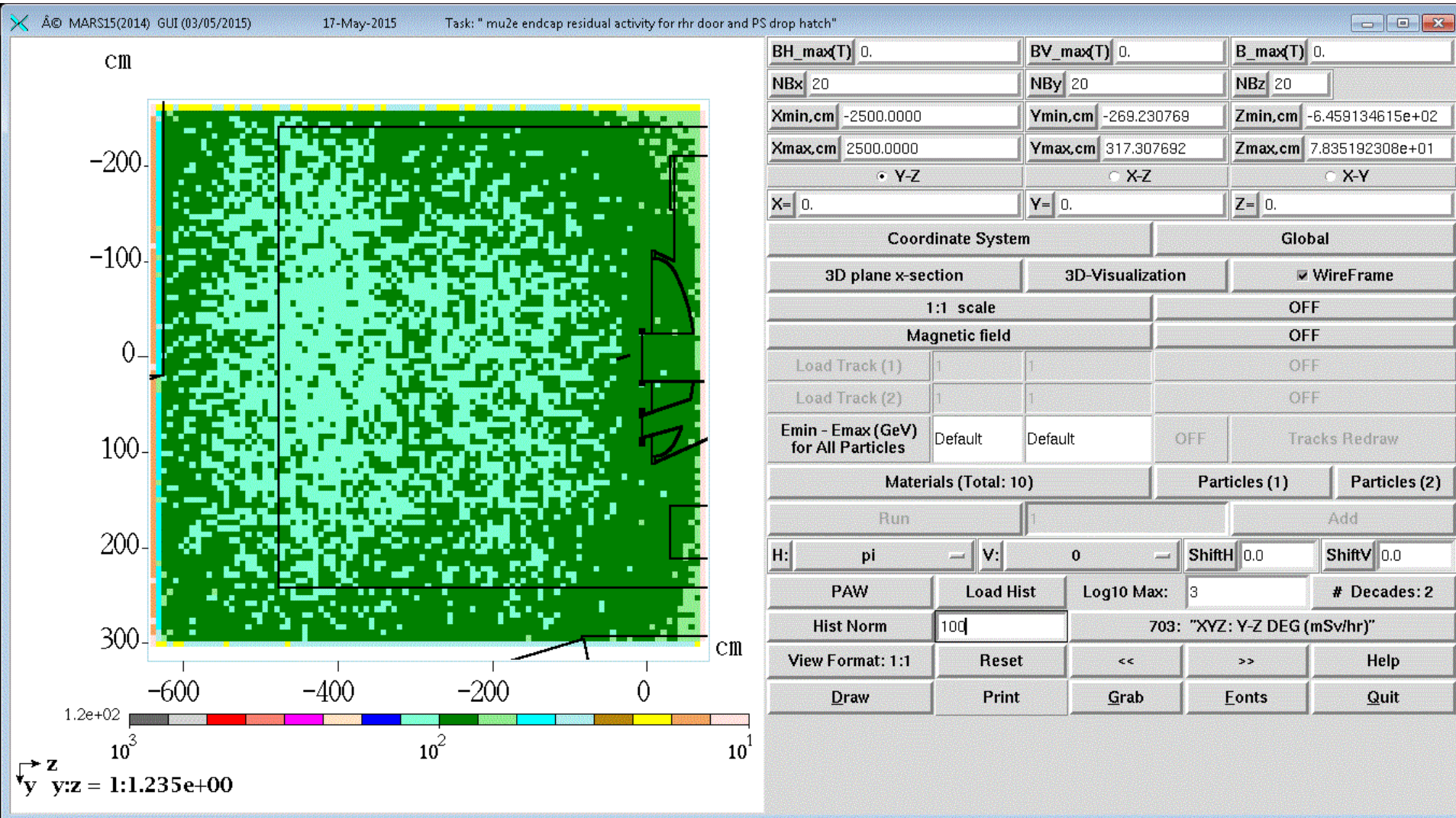
Simulation results – RHR doorway just outside the PS room with peak dose rate at 890 mrem/hr



Simulation results – RHR doorway, just prior to entry into RHR room with peak dose rate of 380 mrem/hr



Simulation results – exit of PS drop hat with peak dose rate of 120 mrem/hr



conclusion

- The dose rates at the locations are significant but manageable
- Worker access at target facilities is controlled by Radiation Safety Personnel
- If access controls to the RHR doorway are implemented, the RHR doorway could remain open during target changes