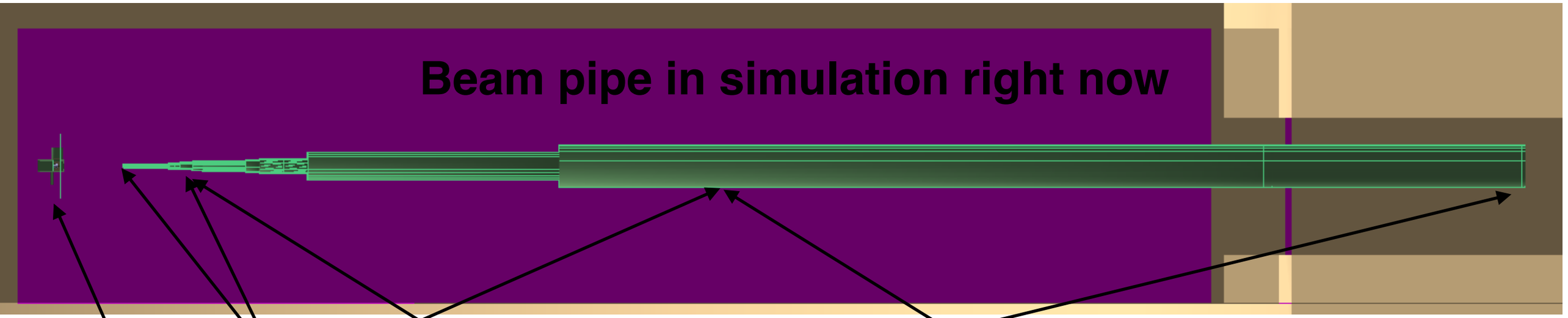
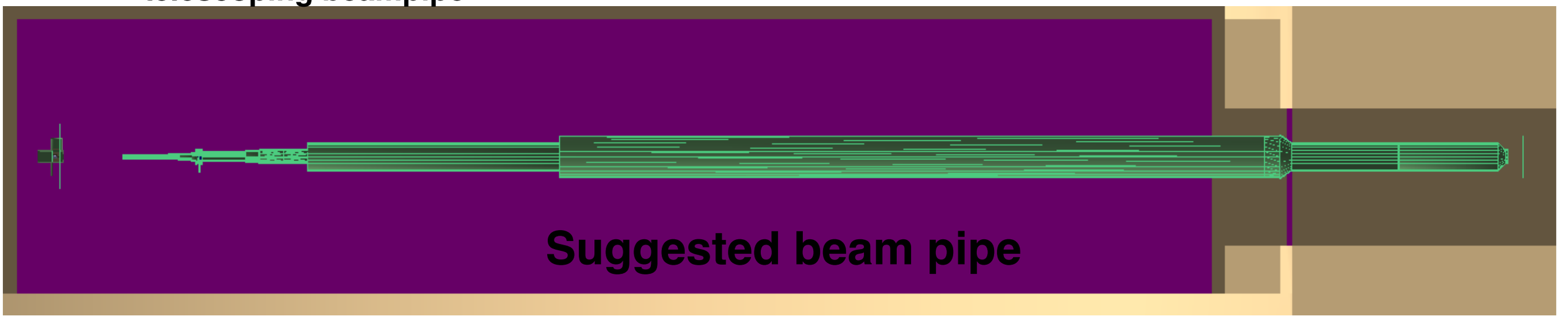
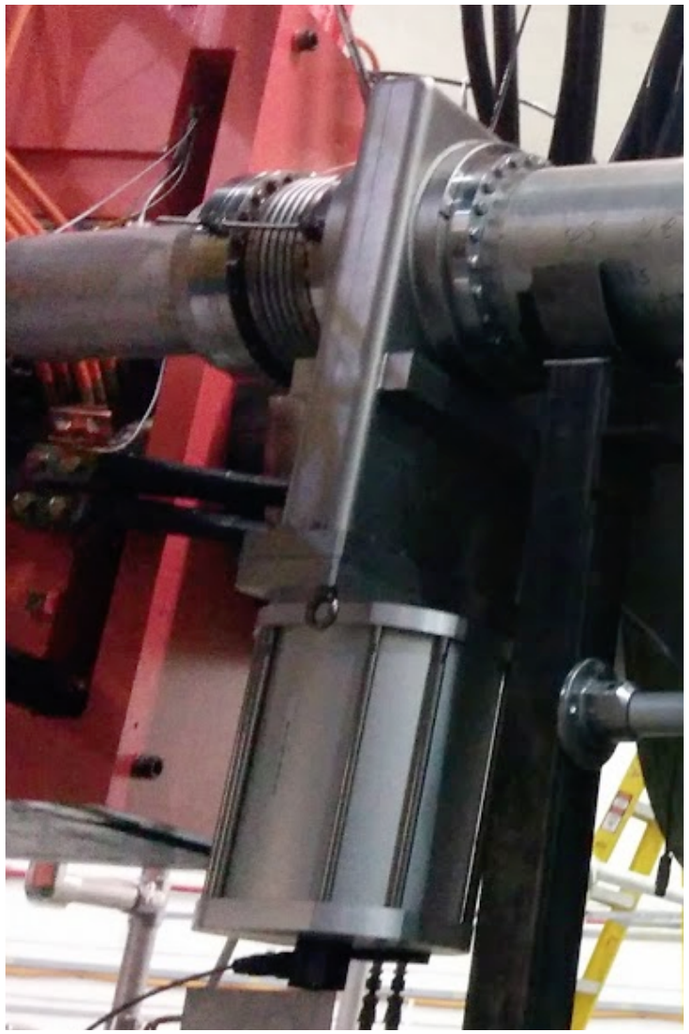
Simulation beamline

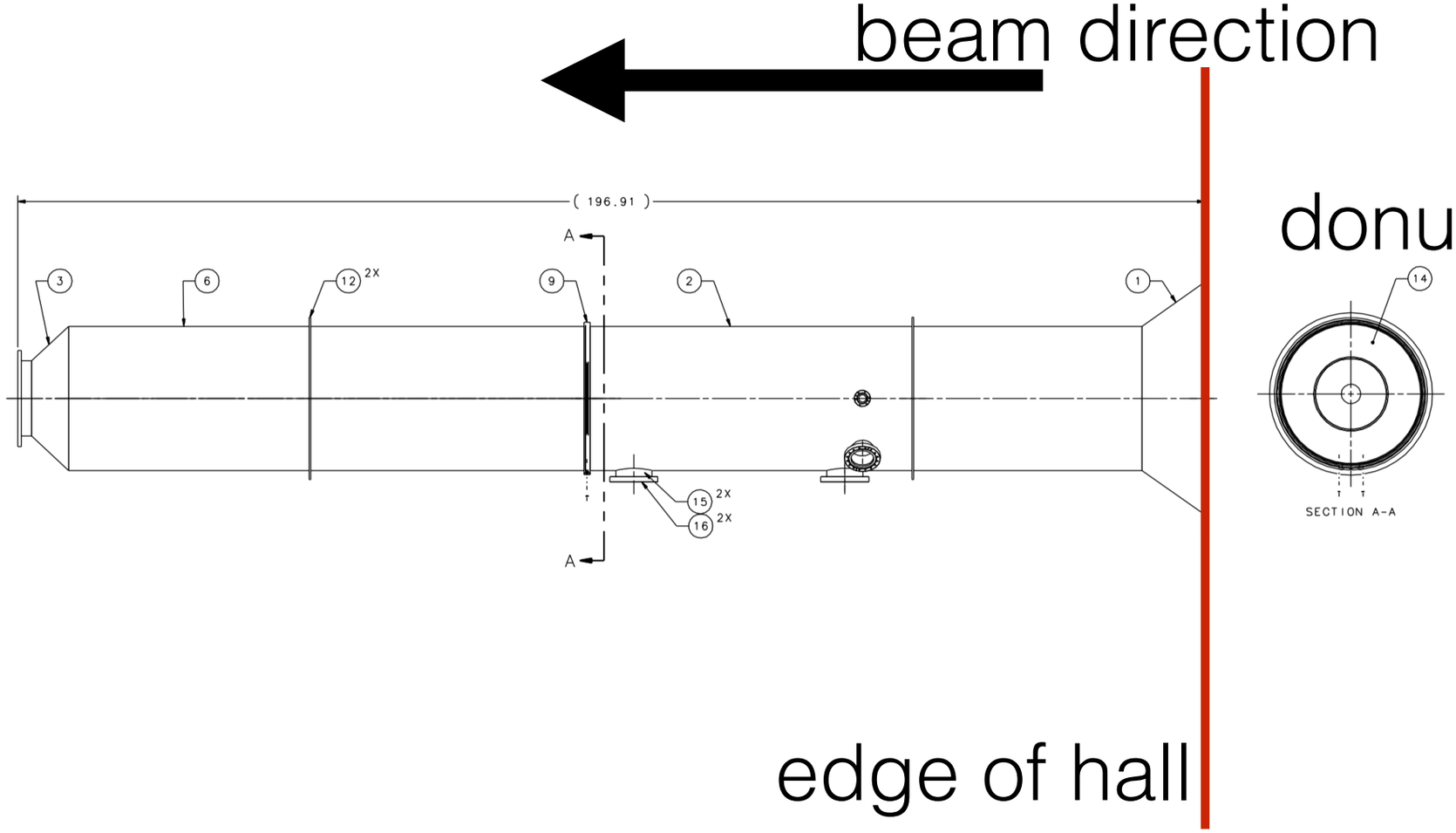




- The original beam pipe has been parametrized by Juliette (https://ace.phys.virginia.edu:80/HAPPEX/2722)
    - She also has a webpage describing the conditions (with pictures) for PREX1 (https://userweb.jlab.org/~crowder/PREx_beamline/)
- I have found the technical drawings from the JLab document repository and created a new configuration

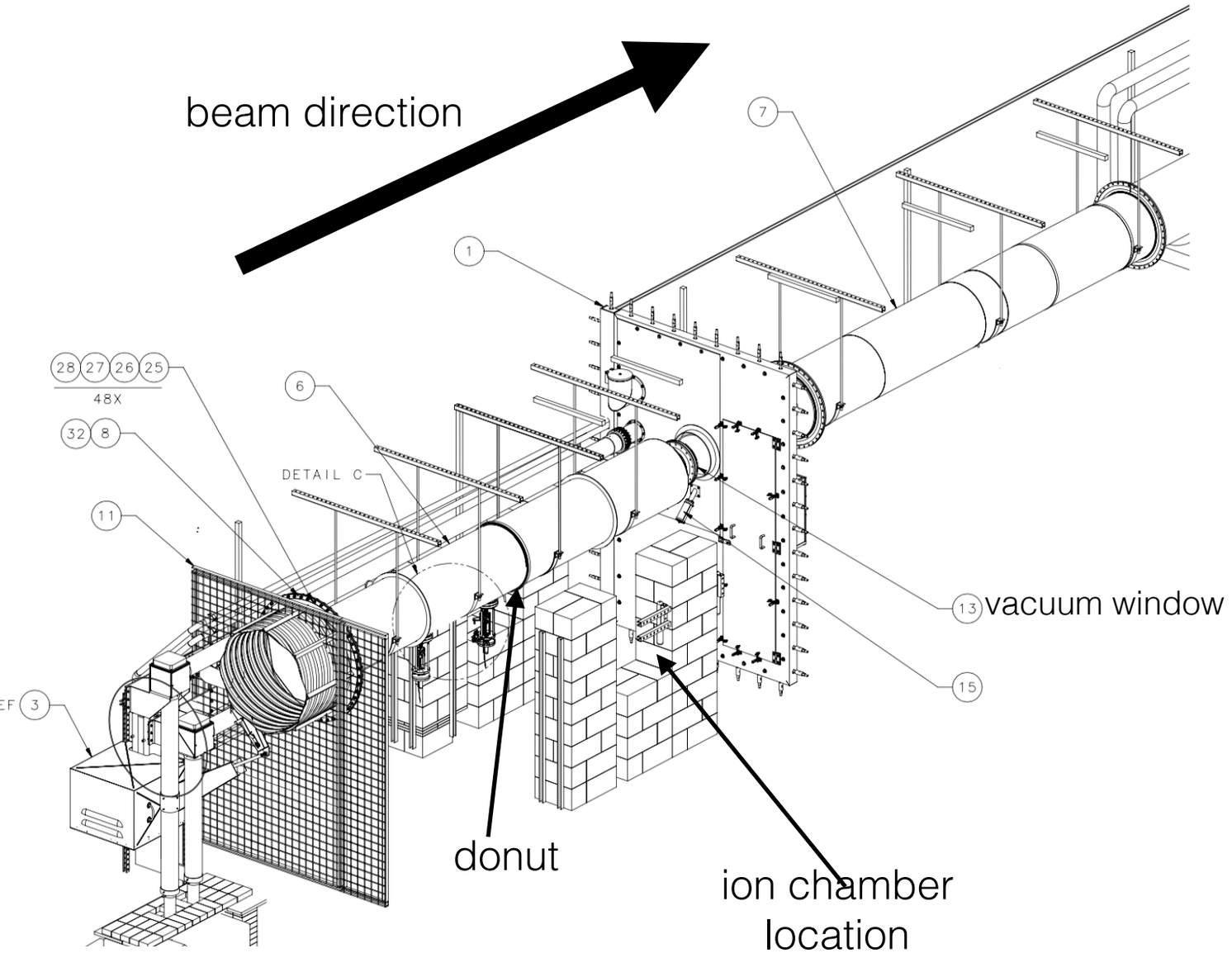
New beam pipe features



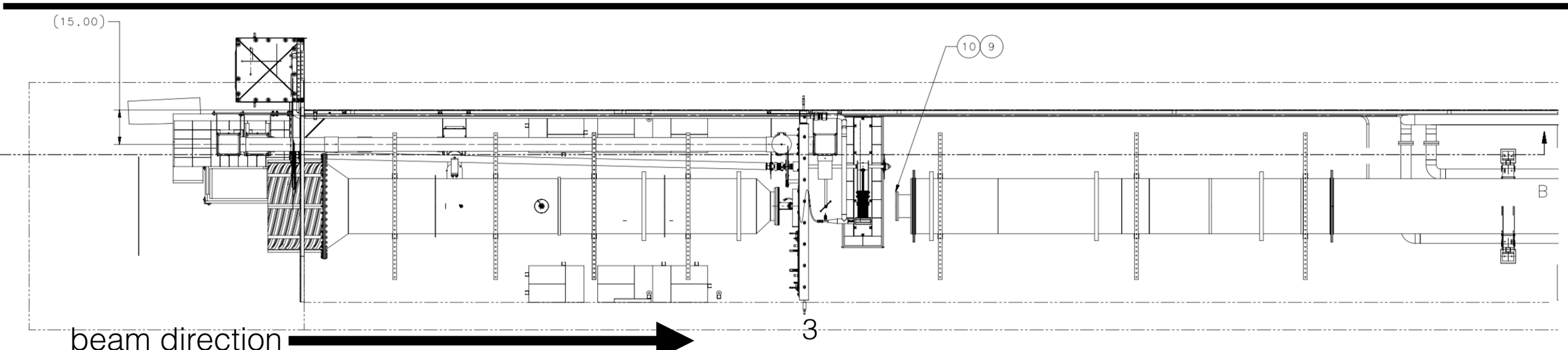


- gate valve: from drawings it seems that it's a 8'' gate valve joining two 8'' pipe sections
- neck down: at the hall wall (before going into the dump tunnel) the beam pipe is reduced in size
- diffuser donut: in order to protect the edge of the diffuser from beam mis-steer an Al donut is placed in front with ion chambers close behind

Dump region

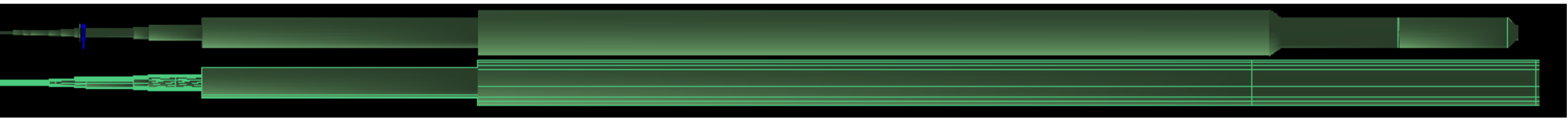


- For PREX2/CREX we will not need to use the diffuser
- The donut is removable in the Hall C design
  - not sure how difficult it would be to remove/ redesign it for Hall A
- I have only implemented the beam pipe until the vacuum window

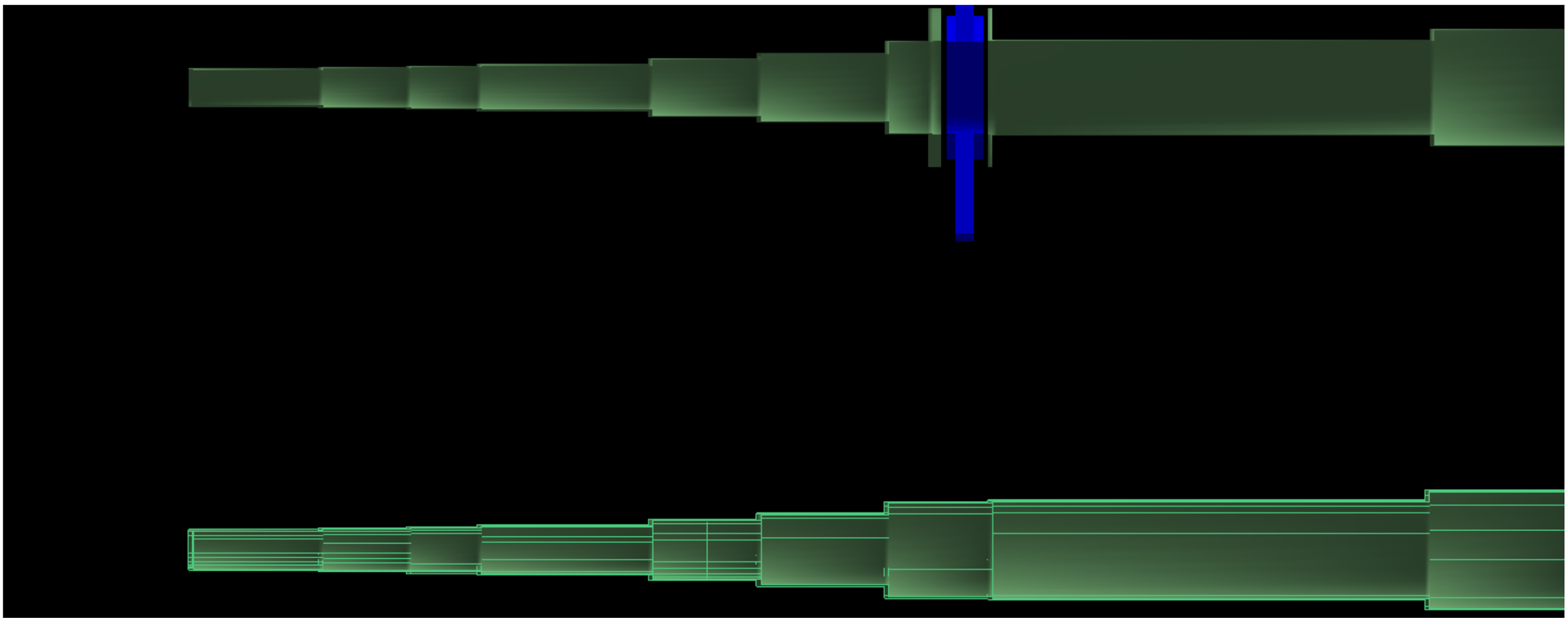


Beam pipe comparison

side by side gdml comparison: whole pipe



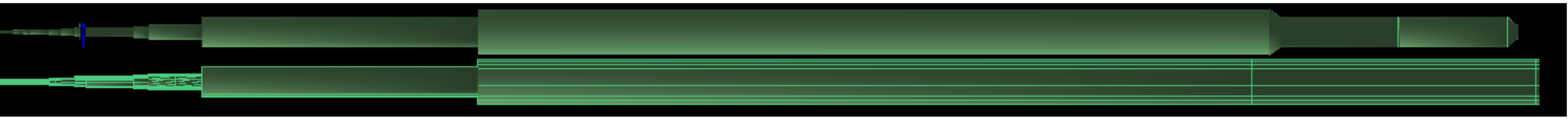
side by side gdml comparison: telescoping beam pipe



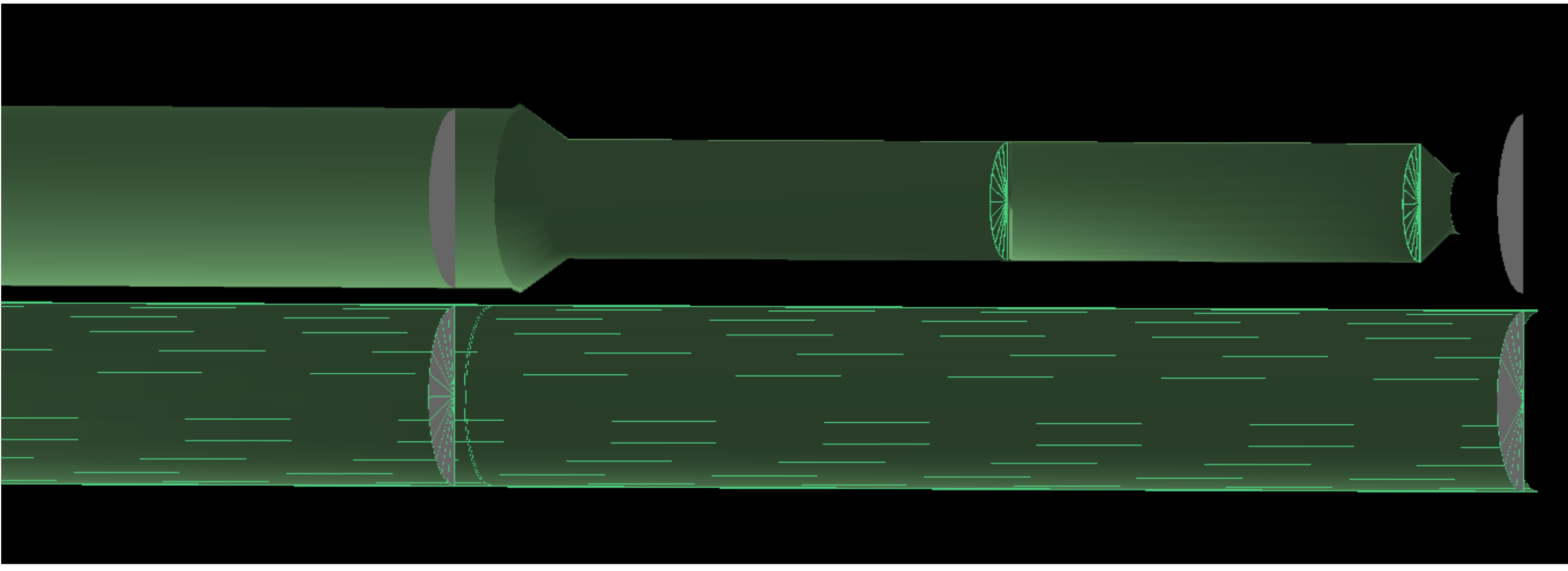
- Now there is a discontinuity in the beam pipe to allow for a stainless steel object as a stand-in for the gate valve
    - Put in Al flanges. The dimensions are from the documents (will need to check thickness of flange and z positioning)

Beam pipe comparison

side by side gdml comparison: whole pipe

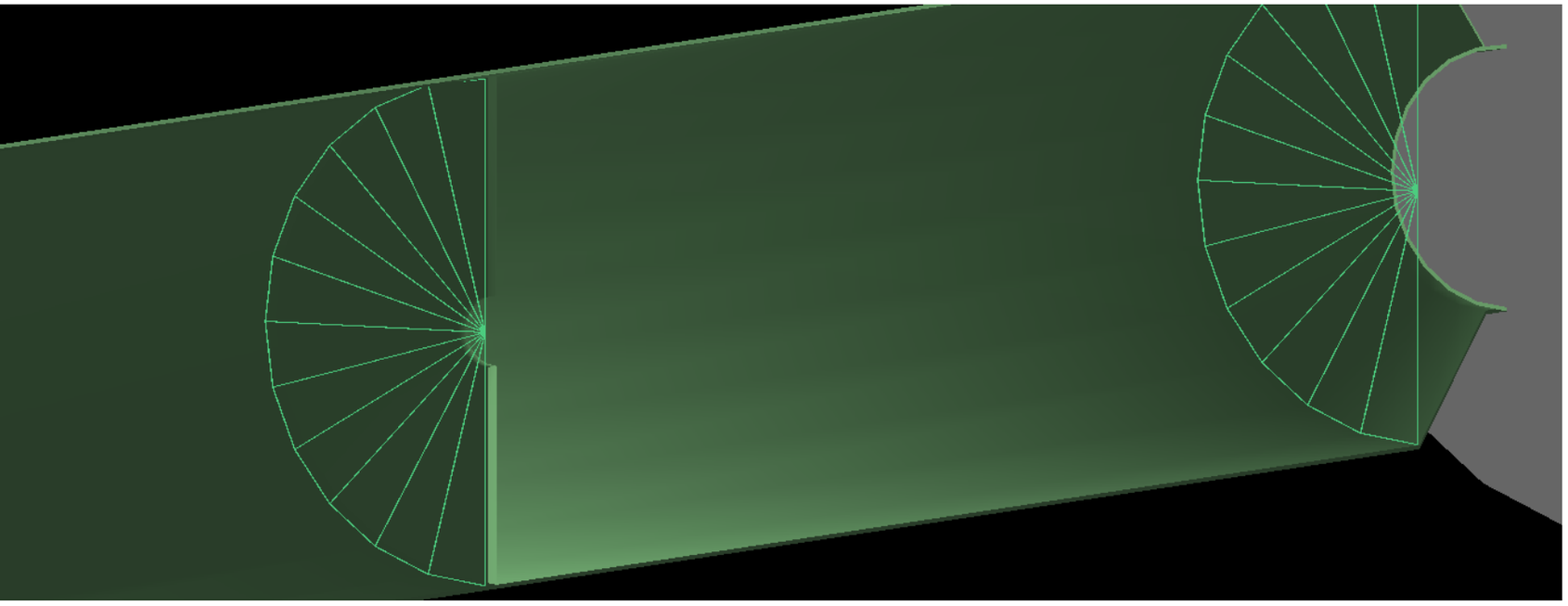


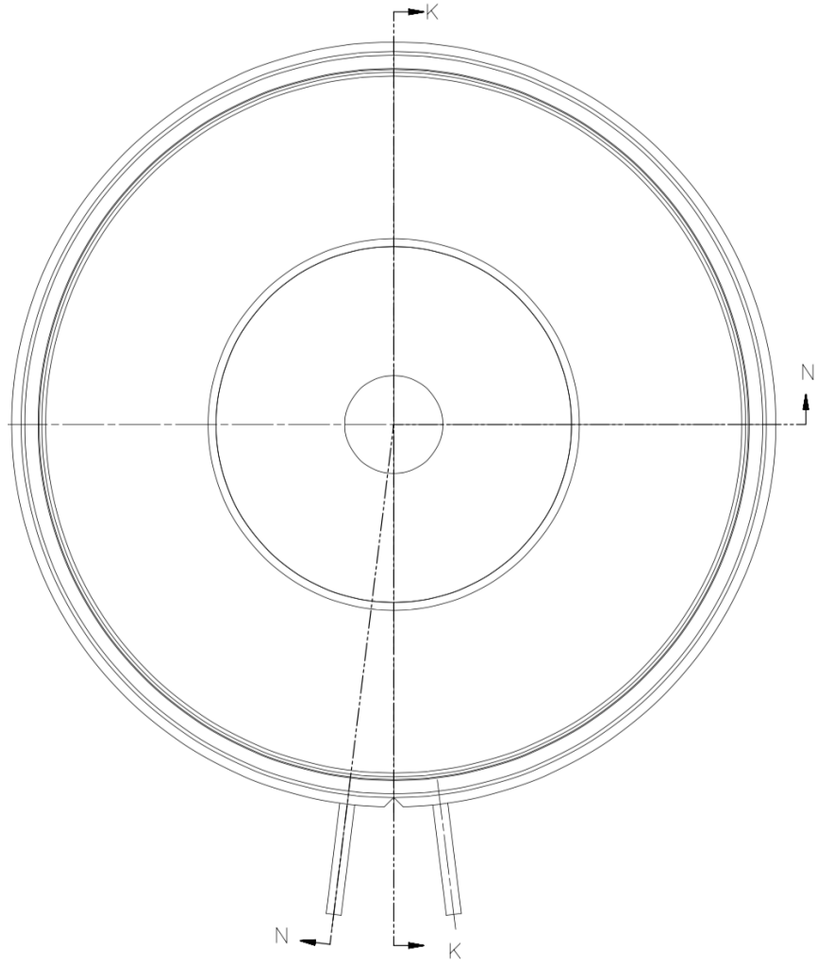
side by side gdml comparison: dump region



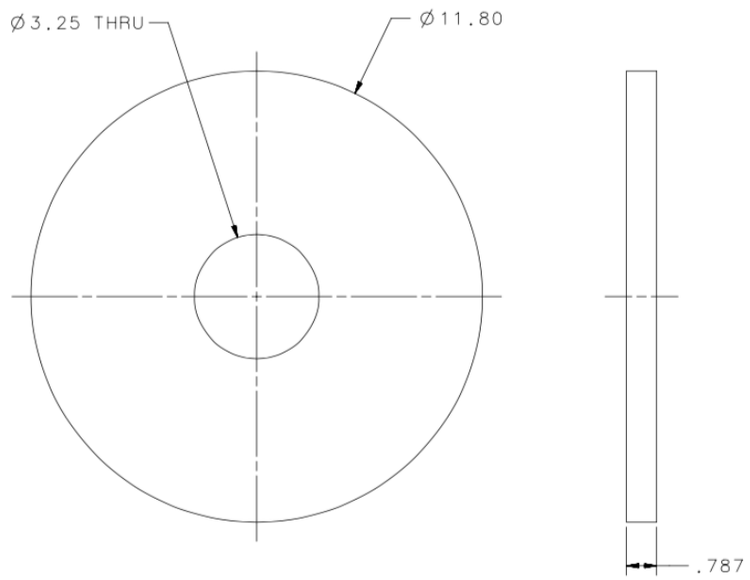
- Again the dimensions are from the drawings
- The grey disks are detectors

Donut - as implemented

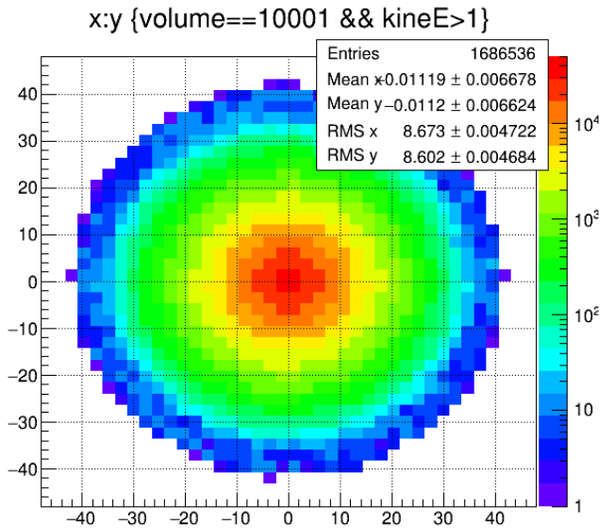


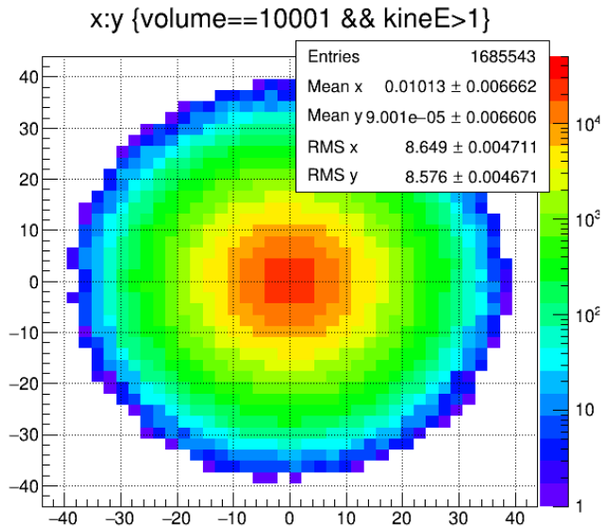


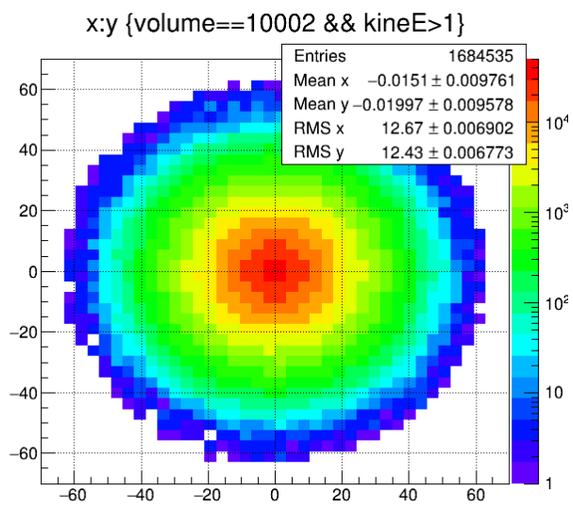
- From what I can tell the donut is 2 cm thick and has an opening of radius 4.13 cm at position ~3021 cm away from the target

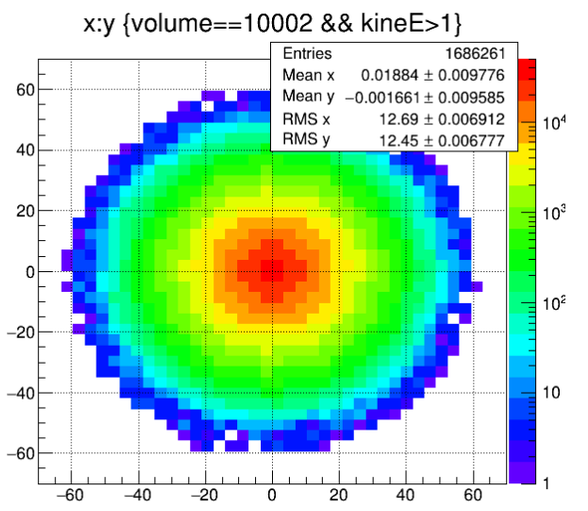


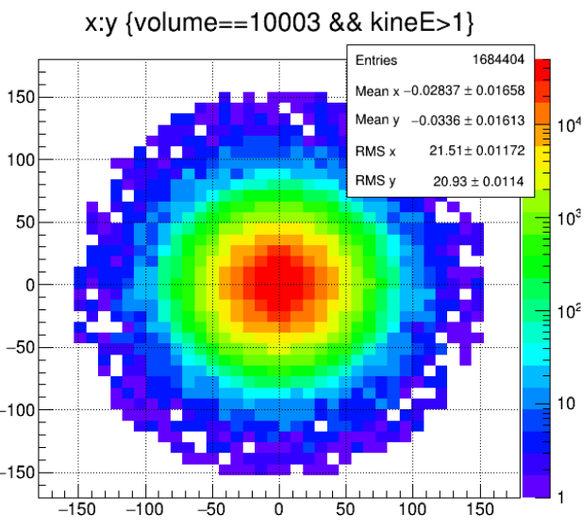
Comparisons by detectors

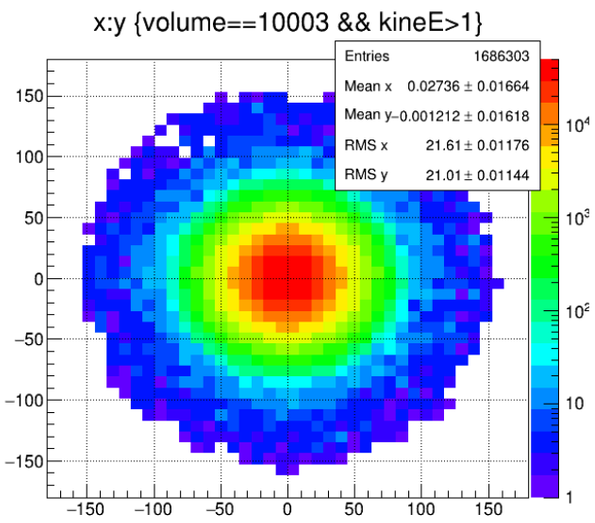


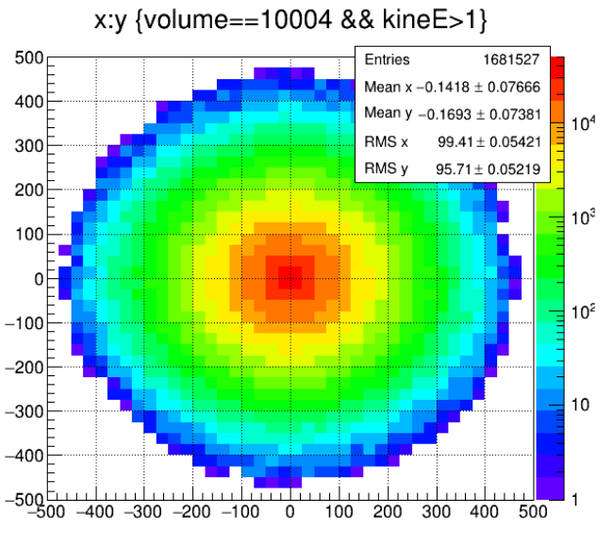


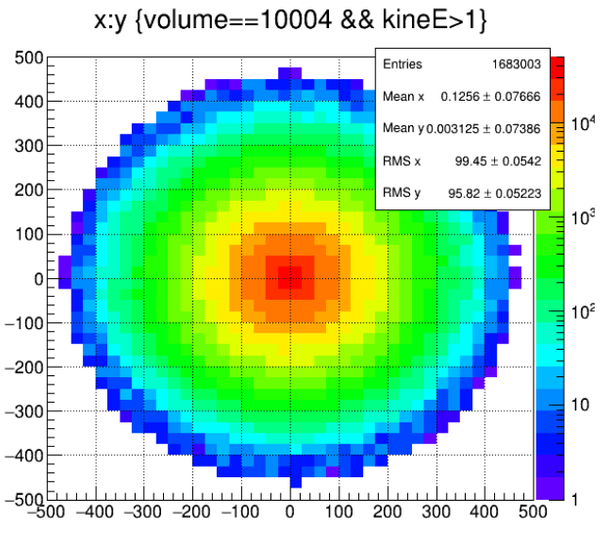




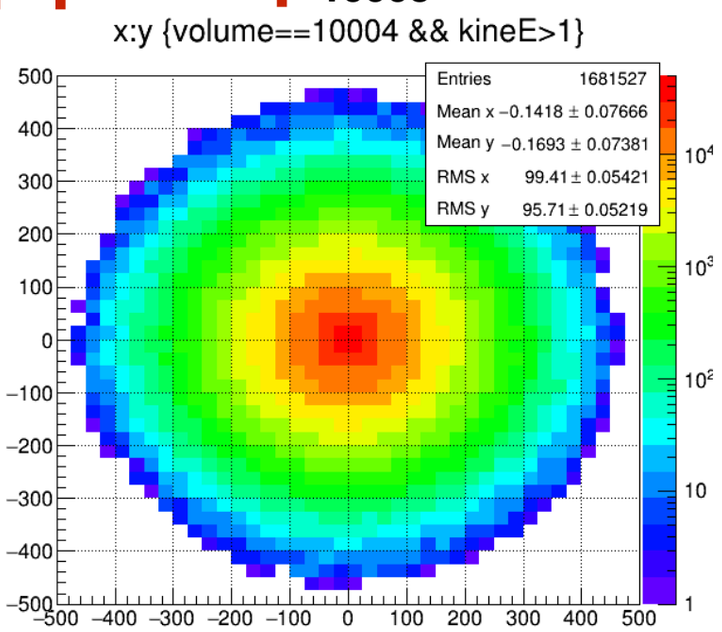


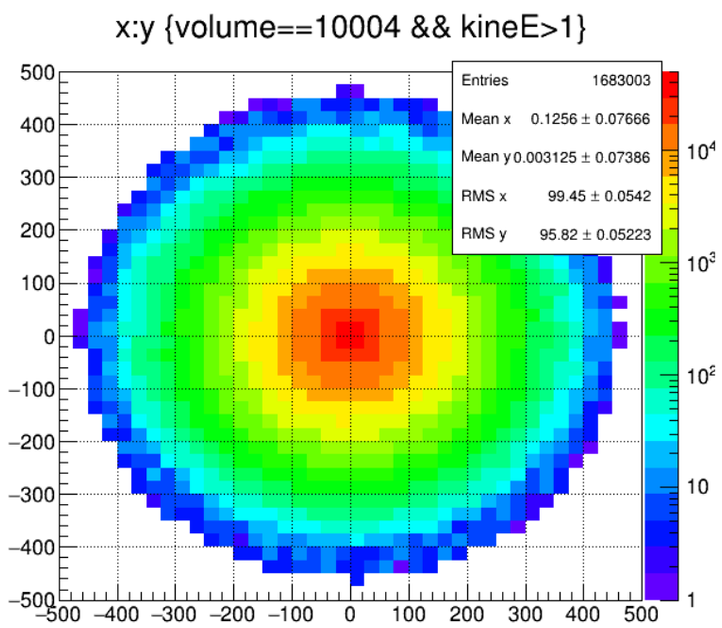


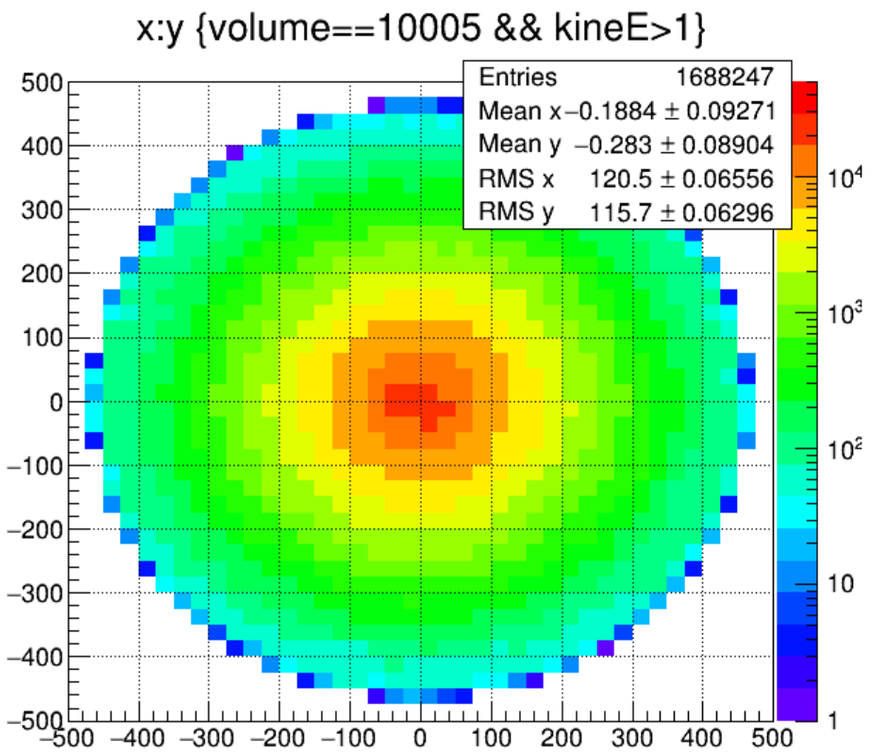


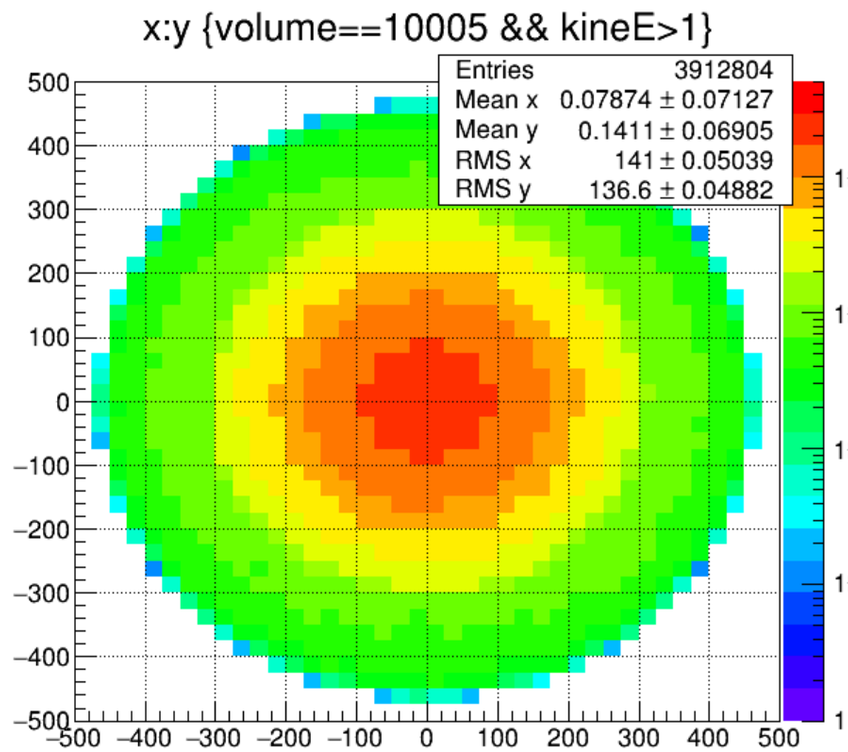


Comparisons by detectors

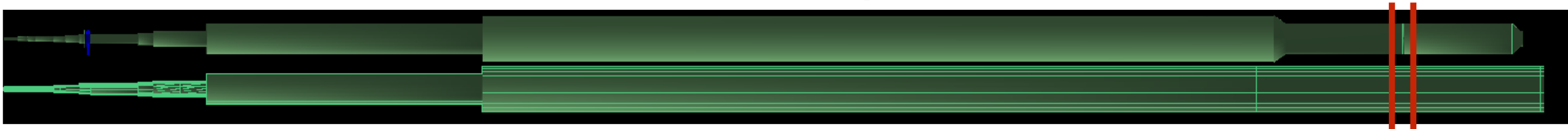


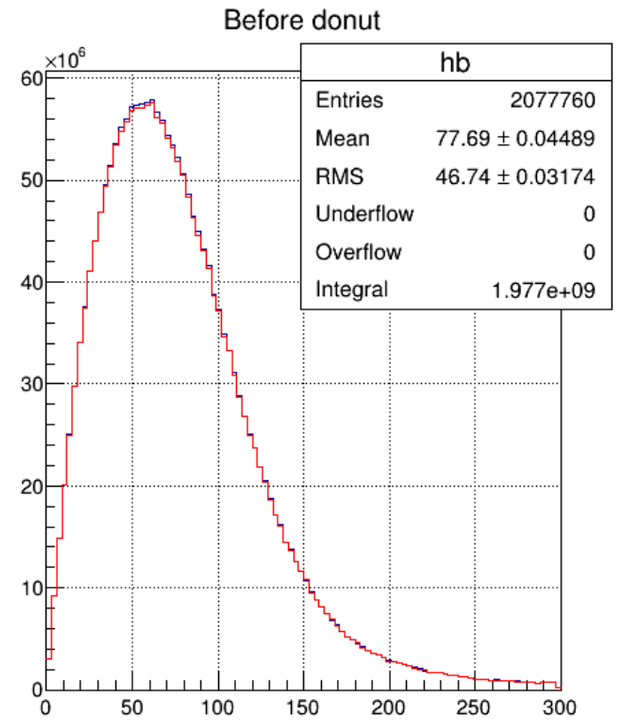


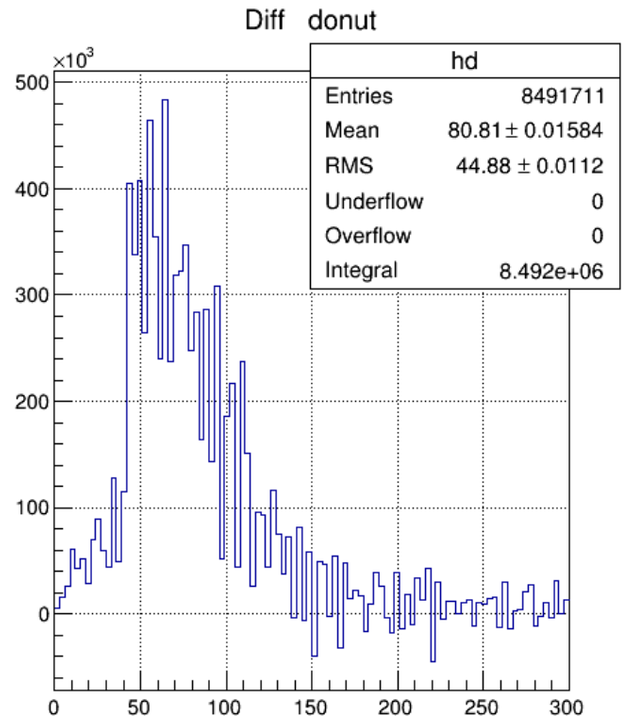


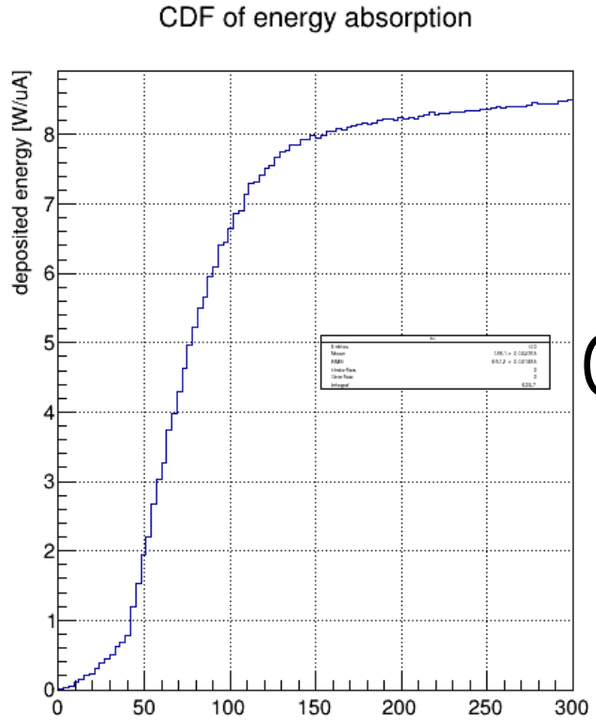


Comparisons by detectors

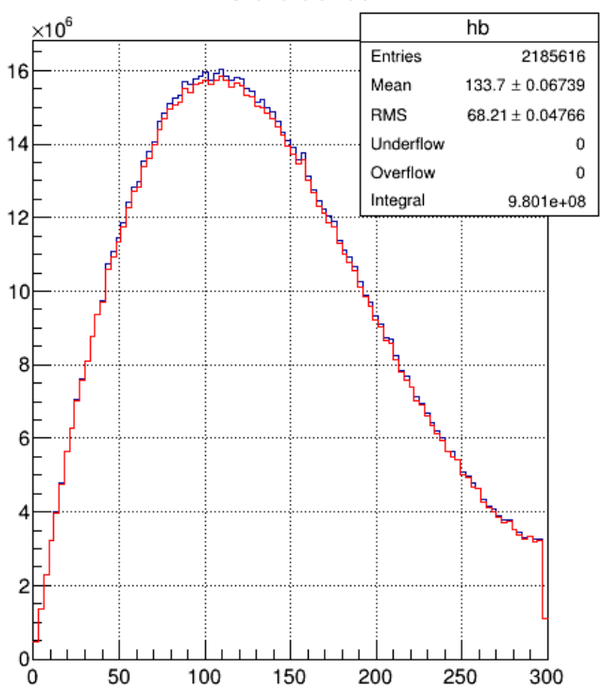


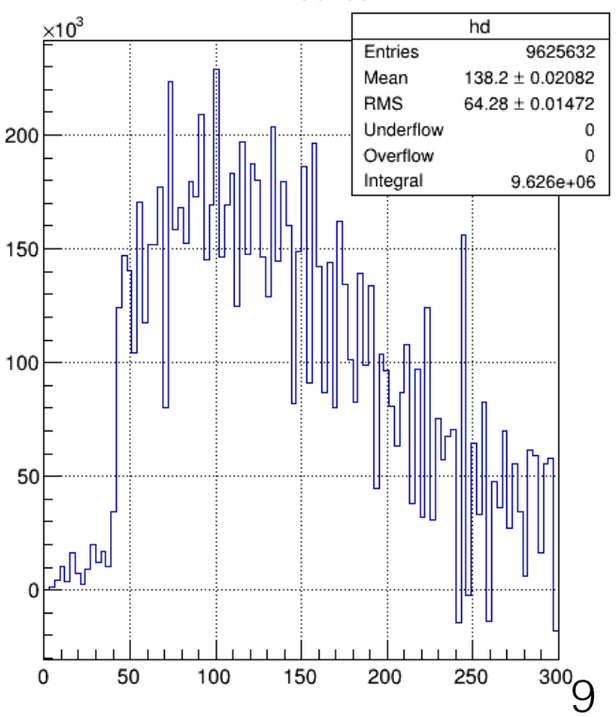


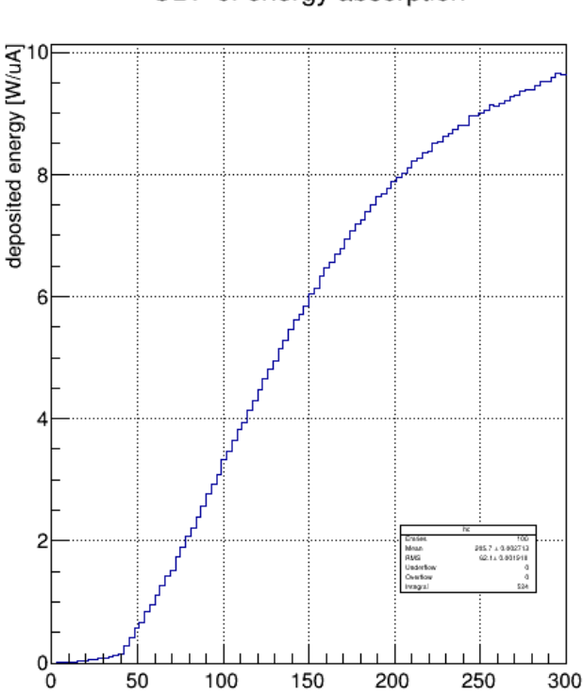




CREX 2 GeV

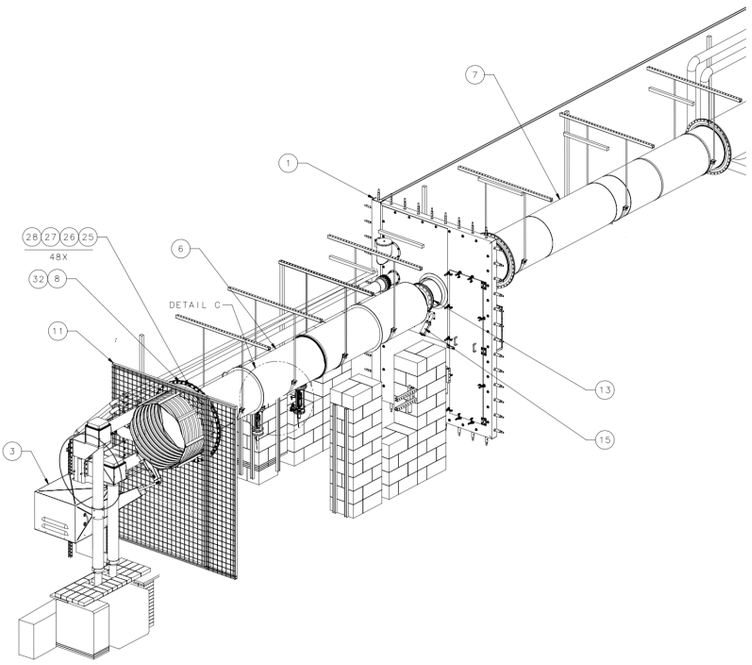


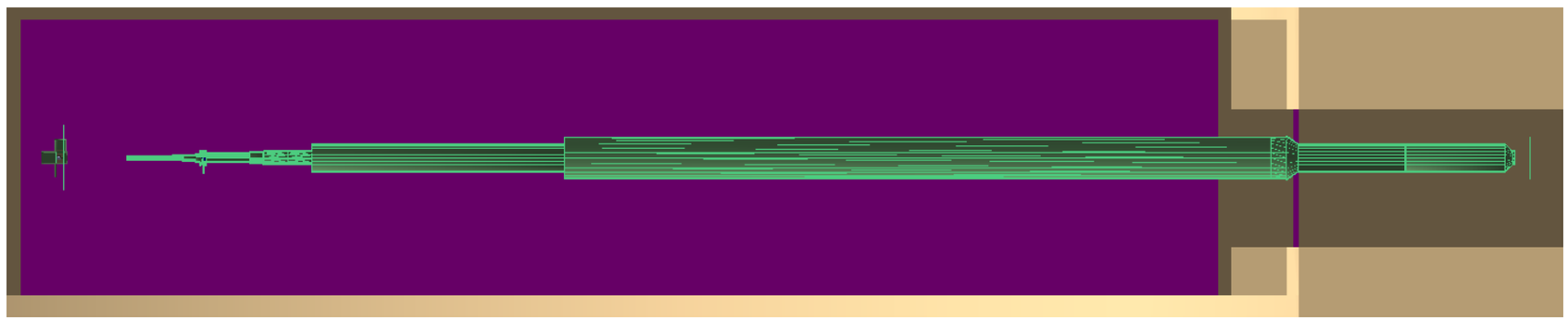




PREX 1 GeV

To do next





- Check the thickness/positioning of the flanges around the gate valve
- Implement the vacuum window at the end of the beam pipe
- move the stainless steel wall to after the vacuum window
- Implement the rest of the dump