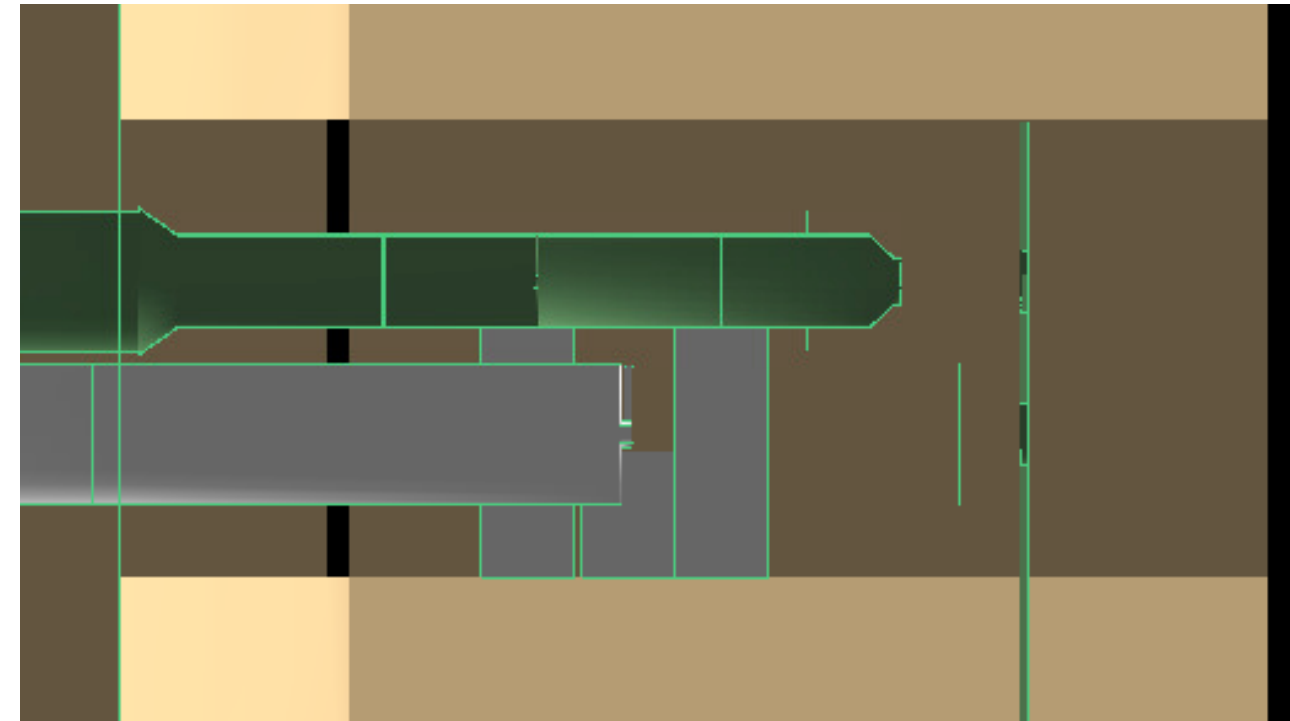
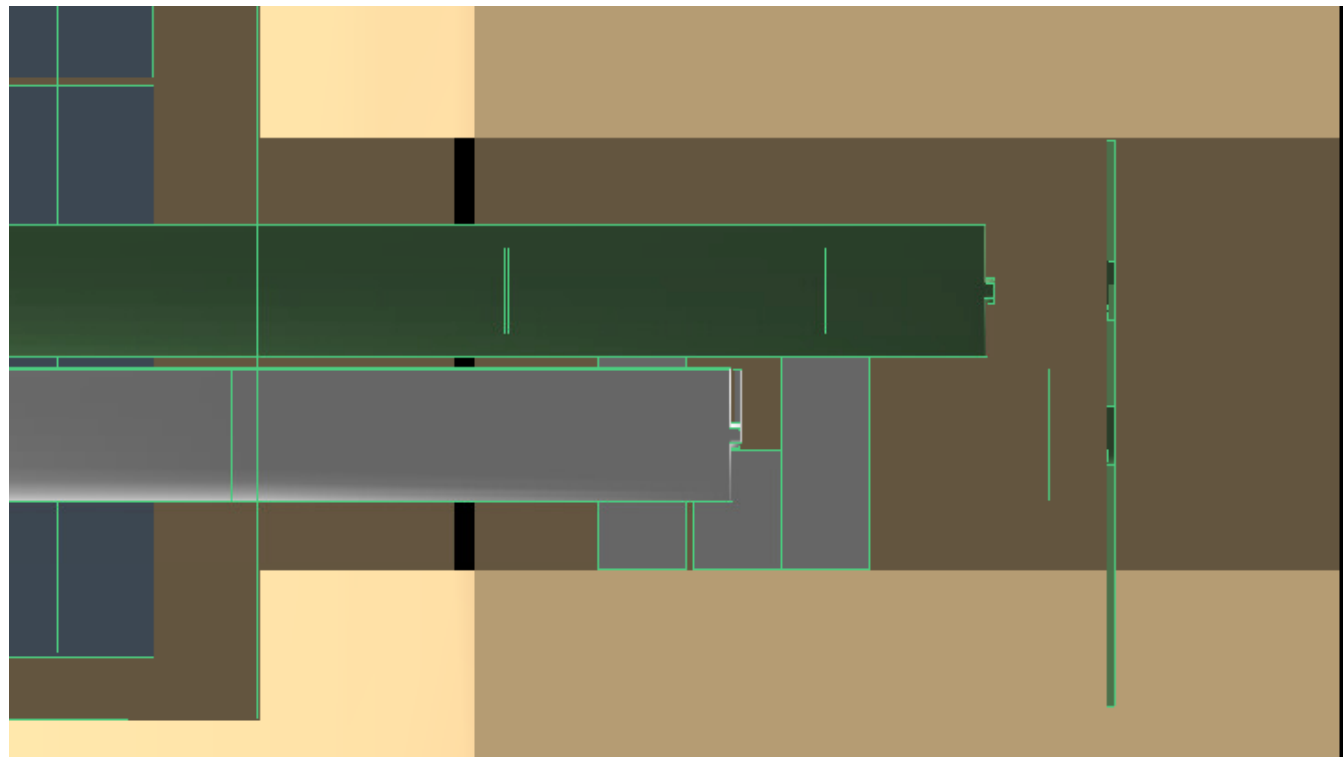


PREX Dump configuration

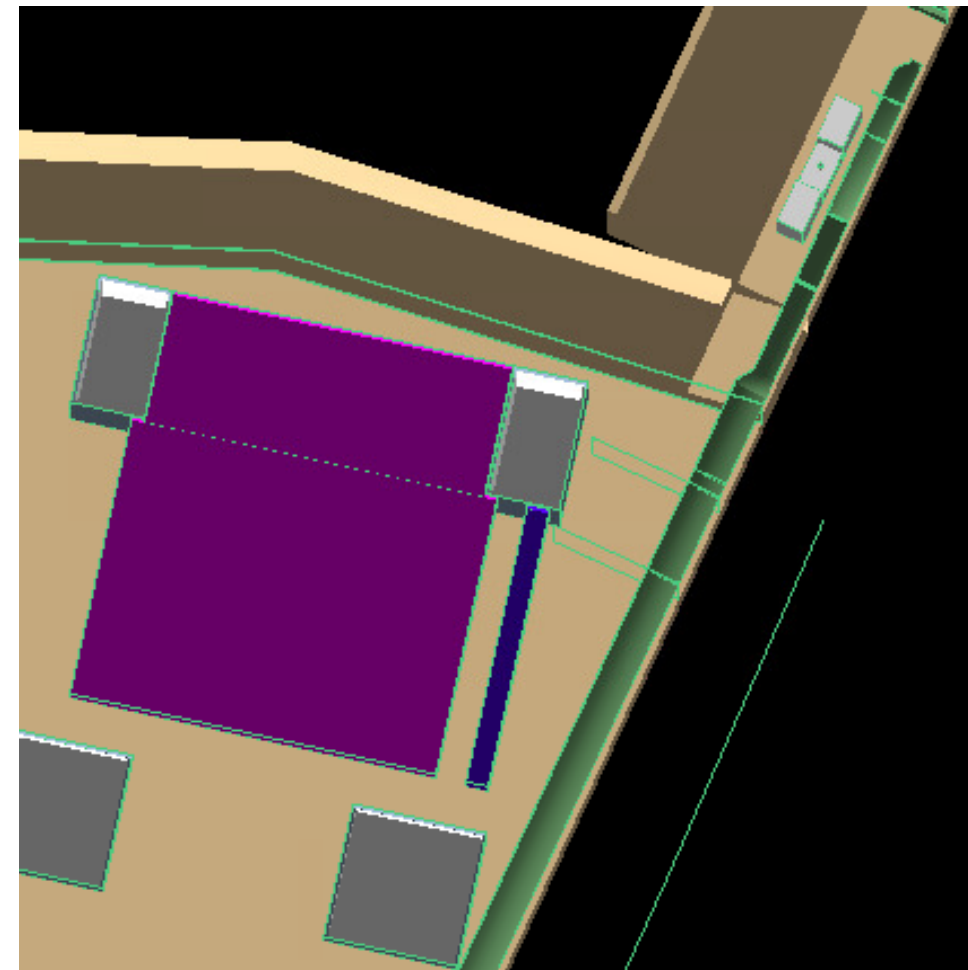
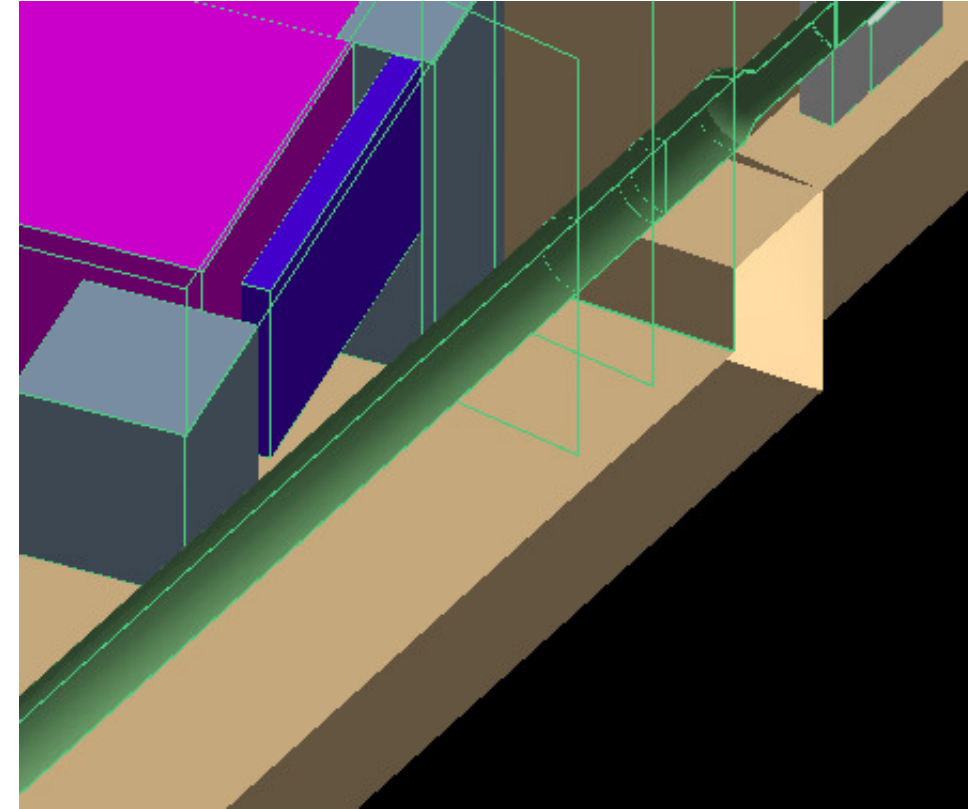
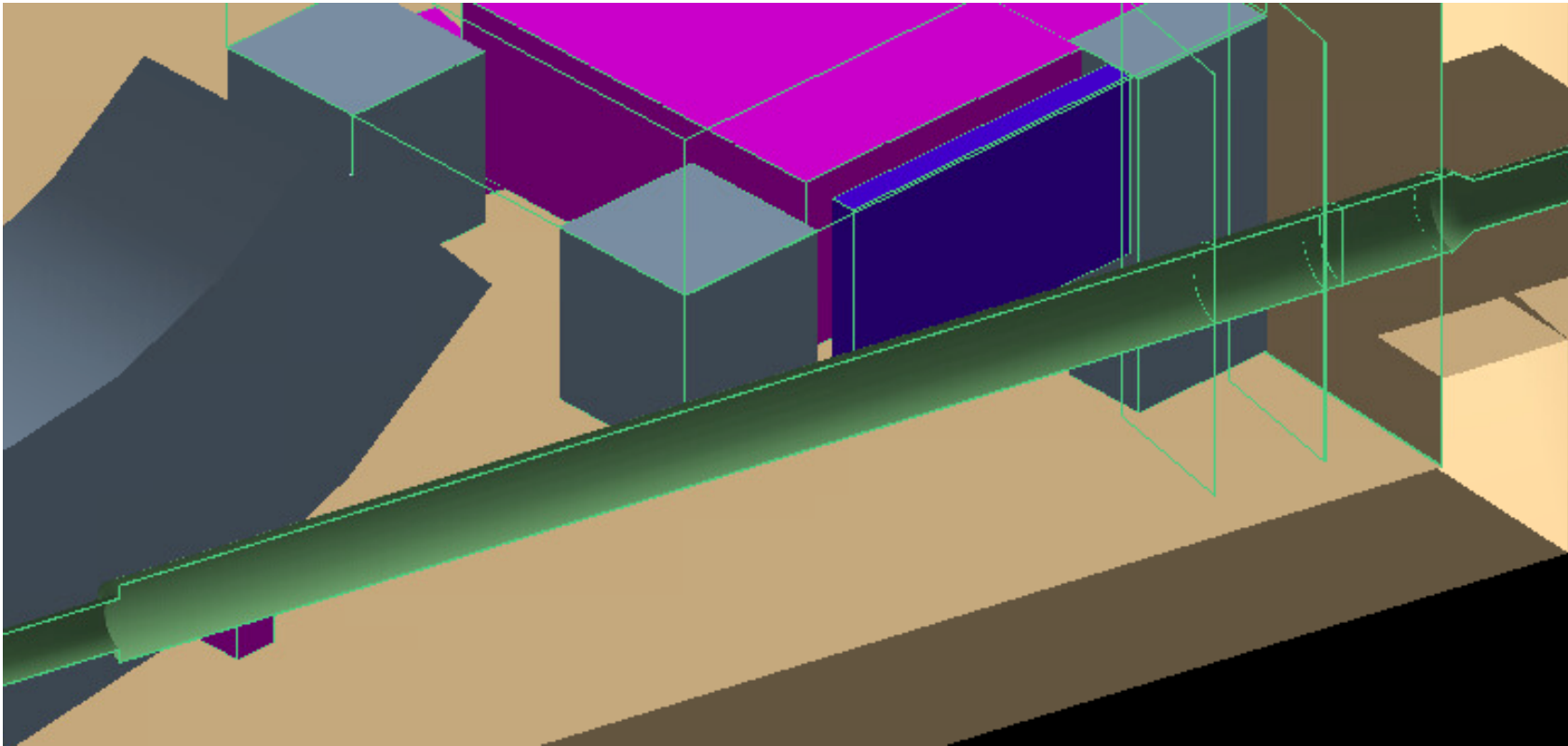
Ciprian Gal
UVa

Fat pipe (PREX1 style)

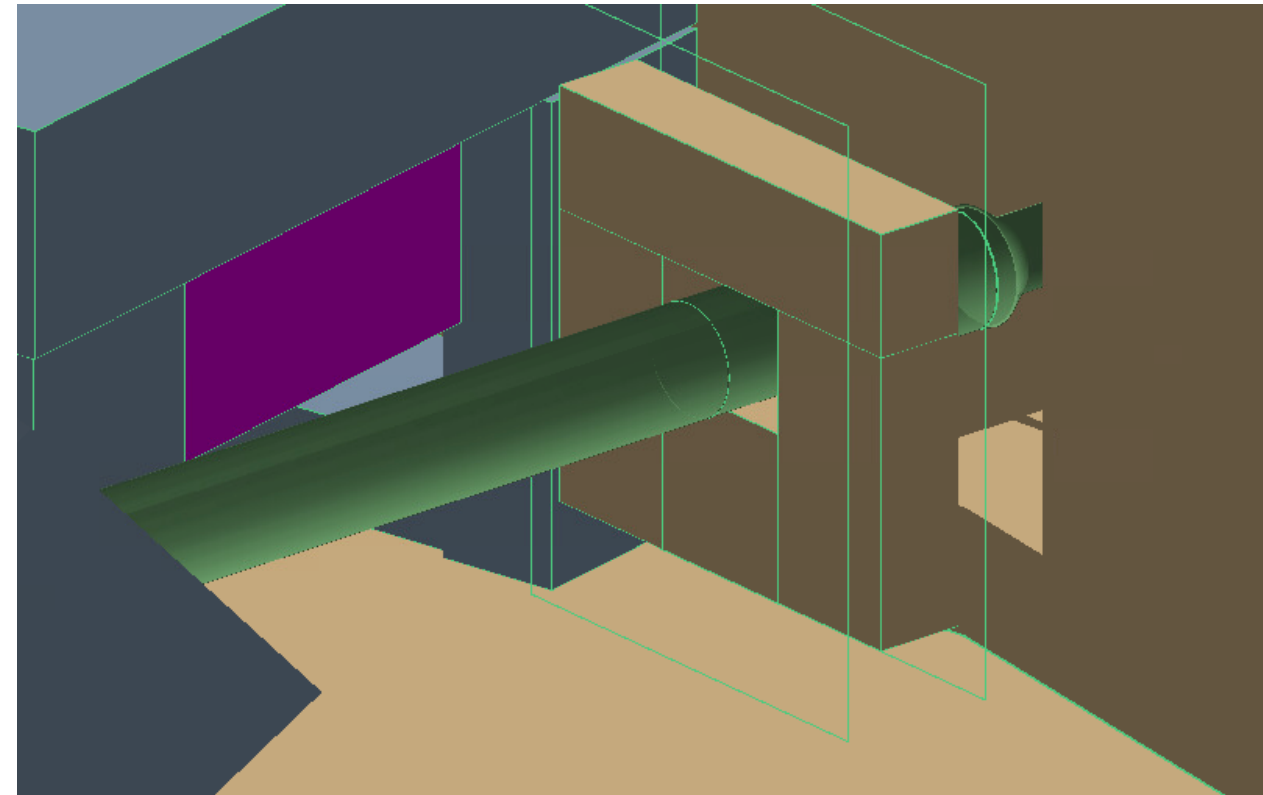
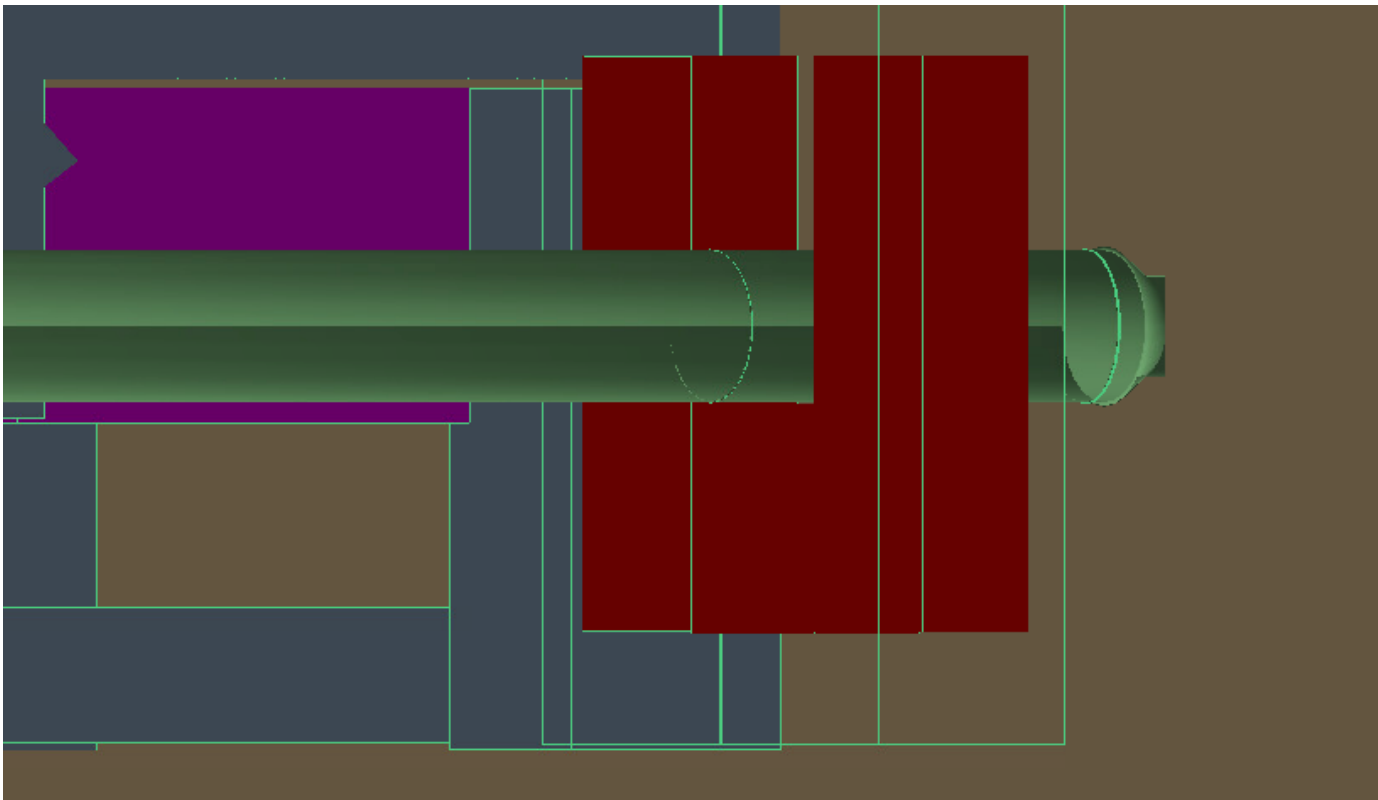


- Left: fatPipe (green) and PREX1 (white)
- Right: current Pipe (green) and PREX1 (white)

Side shield



Extended Dump shield



- Left: extended side shielding by 1 meter vertically to go over the height of the HRS platform opening
- Right: covered the area above the beam pipe

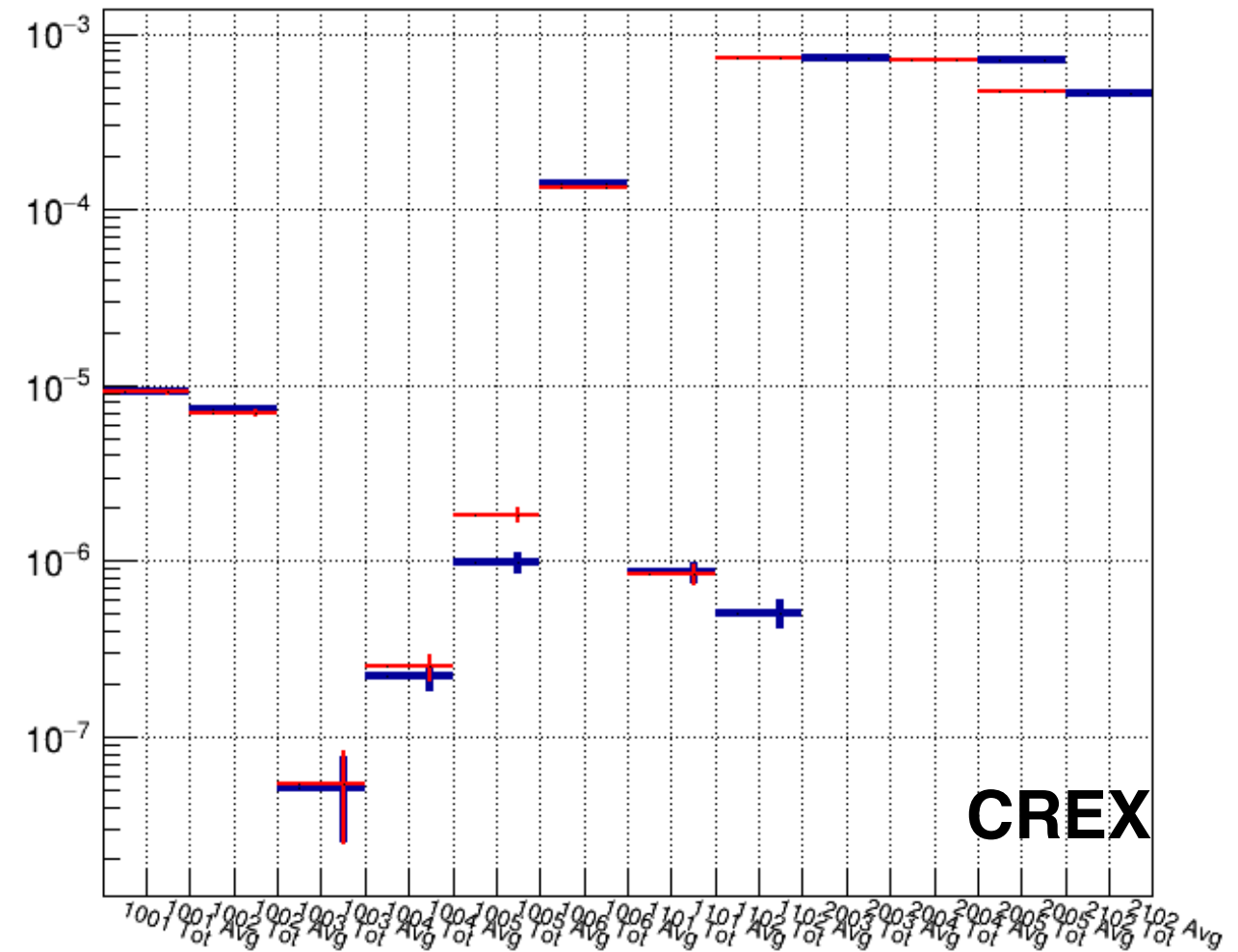
Summary table

| | | HRS detector | | | | Under detector | | | |
|--------|--|----------------|----------|-------------|--------|----------------|----------|-------------|--------|
| | | Total NEIL/cm2 | uncert | Ratio to P1 | uncert | Total NEIL/cm2 | uncert | Ratio to P1 | uncert |
| | PREX1 (ERR dump) | 4.60E+10 | 1.79E+09 | 1.00 | 0.06 | 7.43E+10 | 4.92E+09 | 1.00 | 0.09 |
| PREX 2 | current (farm) | 5.23E+10 | 1.11E+09 | 1.14 | 0.05 | 8.03E+10 | 3.77E+09 | 1.08 | 0.09 |
| | no donut | 3.90E+10 | 1.31E+09 | 0.85 | 0.04 | 5.04E+10 | 3.74E+09 | 0.68 | 0.07 |
| | NewHRSDet+2ft Conc | 1.55E+10 | 5.00E+08 | 0.34 | 0.02 | 2.23E+10 | 2.29E+09 | 0.30 | 0.04 |
| | newHRSDet+fat Pipe | 1.07E+10 | 4.10E+08 | 0.23 | 0.01 | 3.23E+10 | 3.18E+09 | 0.43 | 0.05 |
| | newHRSDet+sideShield (1ftConc) | 9.81E+09 | 4.33E+08 | 0.21 | 0.01 | 6.66E+10 | 4.75E+09 | 0.90 | 0.09 |
| | newHRS+sideShield(1ftConc) + 4inDonut | 9.72E+09 | 4.36E+08 | 0.21 | 0.01 | 5.90E+10 | 4.49E+09 | 0.79 | 0.08 |
| | newHRS+DStopCover(2ftConc)+4inDonut | 1.03E+10 | 3.80E+08 | 0.22 | 0.01 | 1.88E+10 | 2.13E+09 | 0.25 | 0.03 |
| | newHRS+DSlargeU(2ftConc)+4inDonut | 1.11E+10 | 4.14E+08 | 0.24 | 0.01 | 2.20E+10 | 2.42E+09 | 0.30 | 0.04 |
| | newHRS+sideShield(1ftConc) + 4inDonut == Hall Only | 5.12E+09 | 3.03E+08 | 0.11 | 0.01 | 1.39E+10 | 1.58E+09 | 0.19 | 0.02 |
| | newHRS+DStopCover(2ftConc)+4inDonut == Hall only | 7.20E+09 | 2.96E+08 | 0.16 | 0.01 | 1.46E+10 | 1.71E+09 | 0.20 | 0.03 |
| | newHRS+DSlargeU(2ftConc)+4inDonut == Hall only | 7.30E+09 | 3.10E+08 | 0.16 | 0.01 | 1.33E+10 | 1.39E+09 | 0.18 | 0.02 |
| CREX 5 | current (farm) | 4.47E+10 | 1.84E+09 | 0.97 | 0.06 | 5.78E+10 | 5.41E+09 | 0.78 | 0.09 |
| | no donut | 1.37E+10 | 1.20E+09 | 0.30 | 0.03 | 2.29E+10 | 4.73E+09 | 0.31 | 0.07 |
| | NewHRSDet+2ft Conc | 1.15E+10 | 7.72E+08 | 0.25 | 0.02 | 1.17E+10 | 3.24E+09 | 0.16 | 0.04 |
| | newHRSDet+fat Pipe | 2.70E+10 | 1.26E+09 | 0.59 | 0.04 | 9.70E+10 | 1.08E+10 | 1.31 | 0.17 |
| | newHRSDet+sideShield (1ftConc) | 6.96E+09 | 6.19E+08 | 0.15 | 0.01 | 4.39E+10 | 6.83E+09 | 0.59 | 0.10 |
| | newHRS+sideShield(1ftConc) + 4inDonut | 3.15E+09 | 3.56E+08 | 0.07 | 0.01 | 3.10E+10 | 5.44E+09 | 0.42 | 0.08 |
| | newHRS+DStopCover(2ftConc)+4inDonut | 5.51E+09 | 4.62E+08 | 0.12 | 0.01 | 1.20E+10 | 2.28E+09 | 0.16 | 0.03 |
| | newHRS+DSlargeU(2ftConc)+4inDonut | 6.04E+09 | 4.72E+08 | 0.13 | 0.01 | 1.07E+10 | 2.18E+09 | 0.14 | 0.03 |
| | newHRS+sideShield(1ftConc) + 4inDonut == Hall Only | 2.13E+09 | 2.65E+08 | 0.05 | 0.01 | 1.10E+10 | 2.43E+09 | 0.15 | 0.03 |
| | newHRS+DStopCover(2ftConc)+4inDonut == Hall only | 3.85E+09 | 3.18E+08 | 0.08 | 0.01 | 1.17E+10 | 2.28E+09 | 0.16 | 0.03 |
| | newHRS+DSlargeU(2ftConc)+4inDonut == Hall only | 4.57E+09 | 3.82E+08 | 0.10 | 0.01 | 1.05E+10 | 2.18E+09 | 0.14 | 0.03 |

Todos

- Update repository to integrate latest updates (vacuum for the beampipe, larger hall) into the current configurations
- Summary slides and talk to Thia

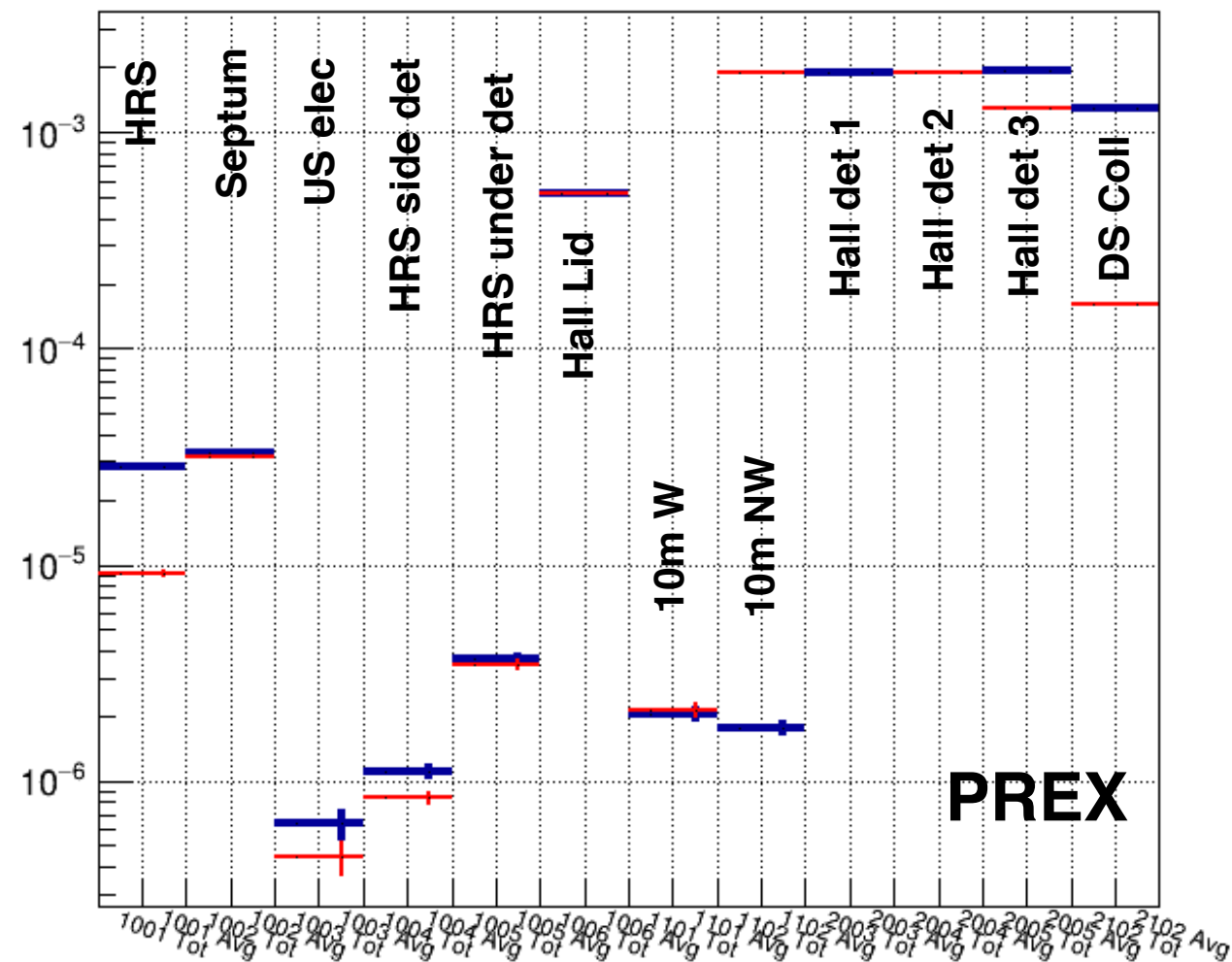
summary histogram pe electron on target| neilLogX



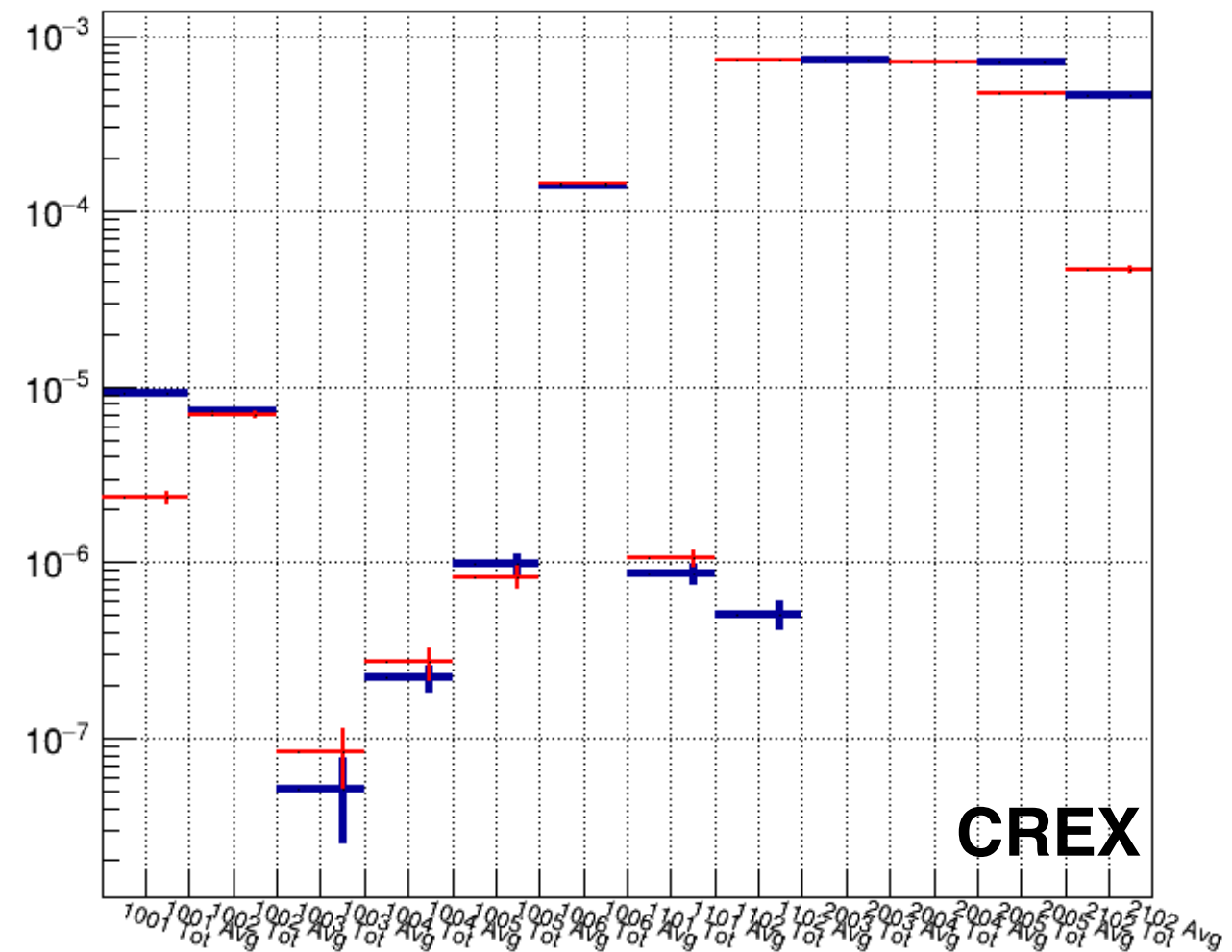
- 7

Side shield

summary histogram per electron on target| neilLogX

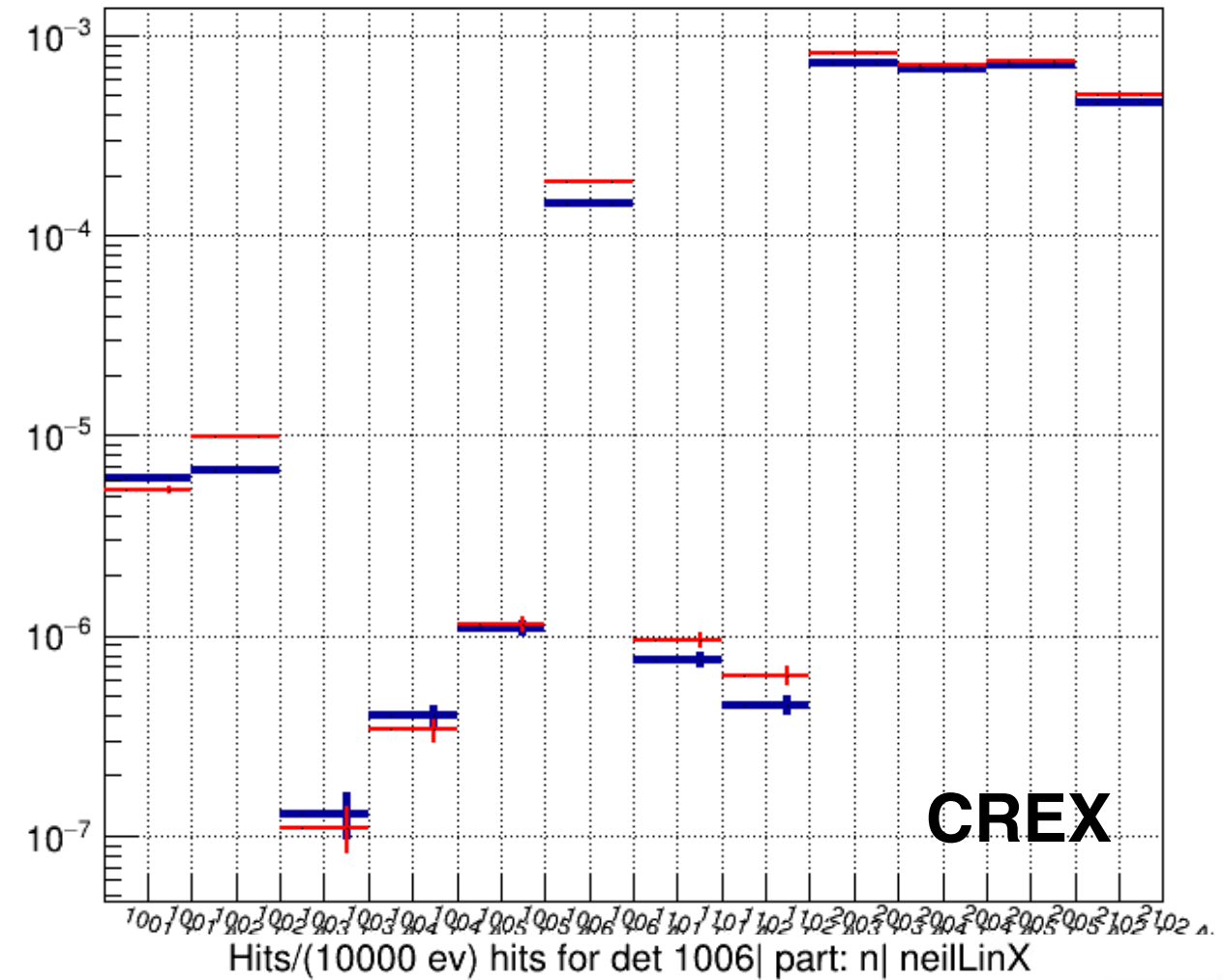
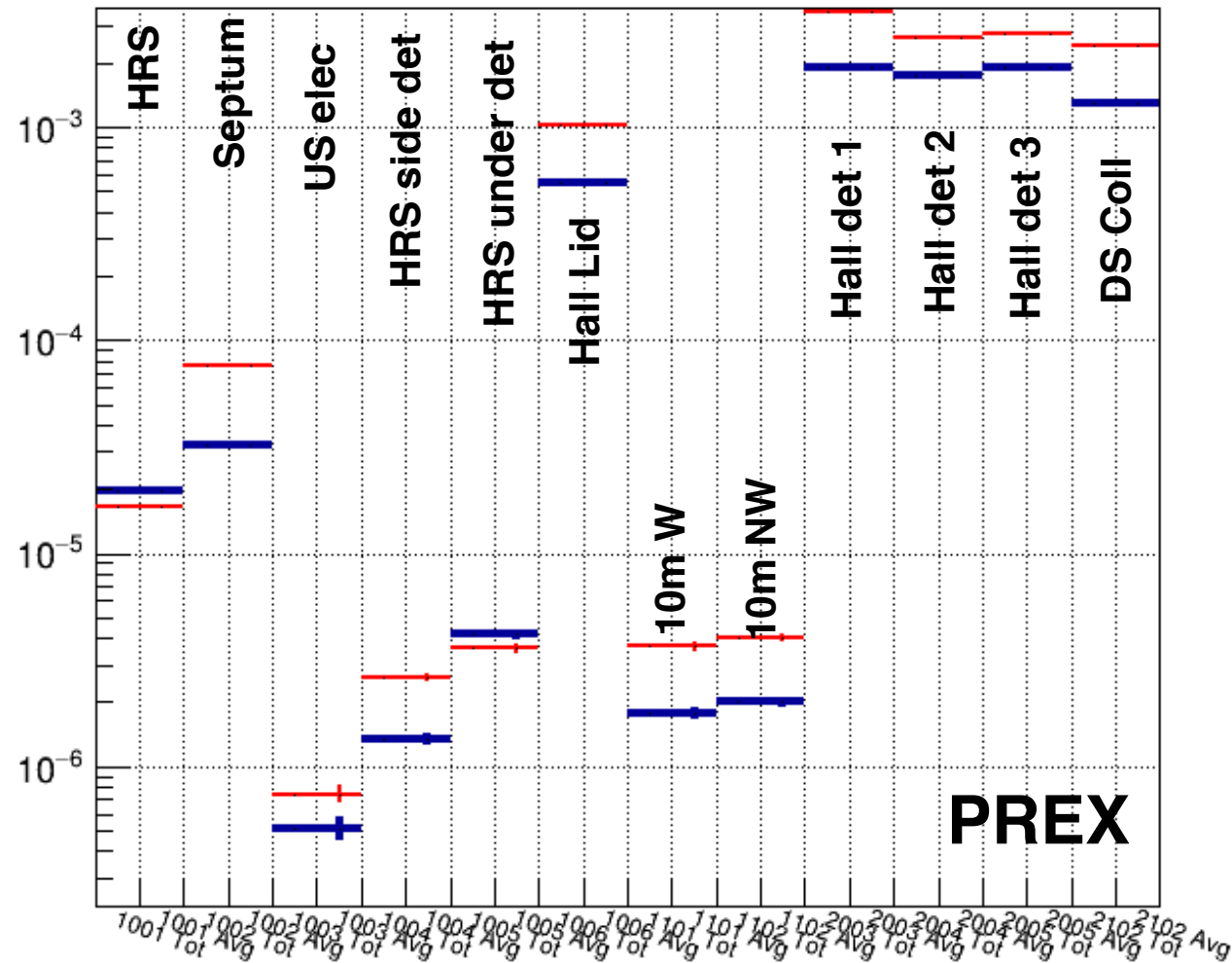


summary histogram per electron on target| neilLogX

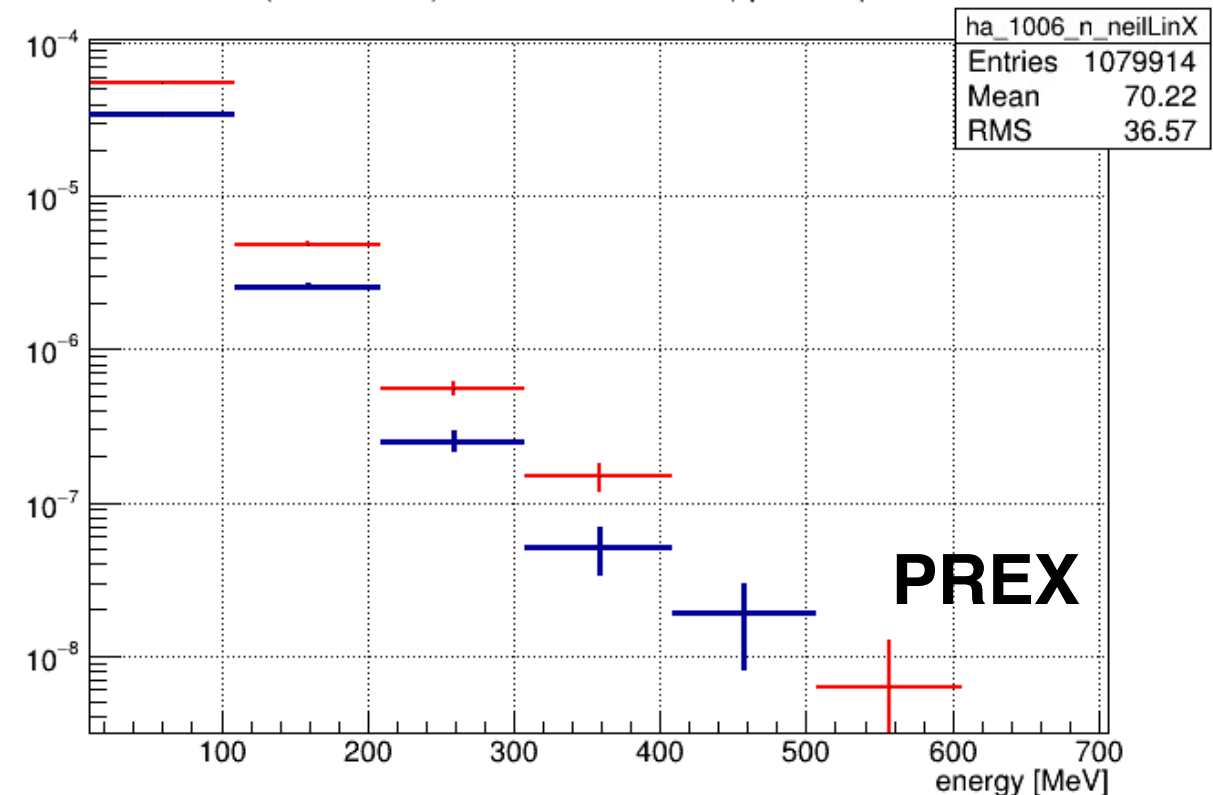


- blue: newHRS+newDet
- 1102 detector shows odd behavior wit the latest calculation (will investigate)

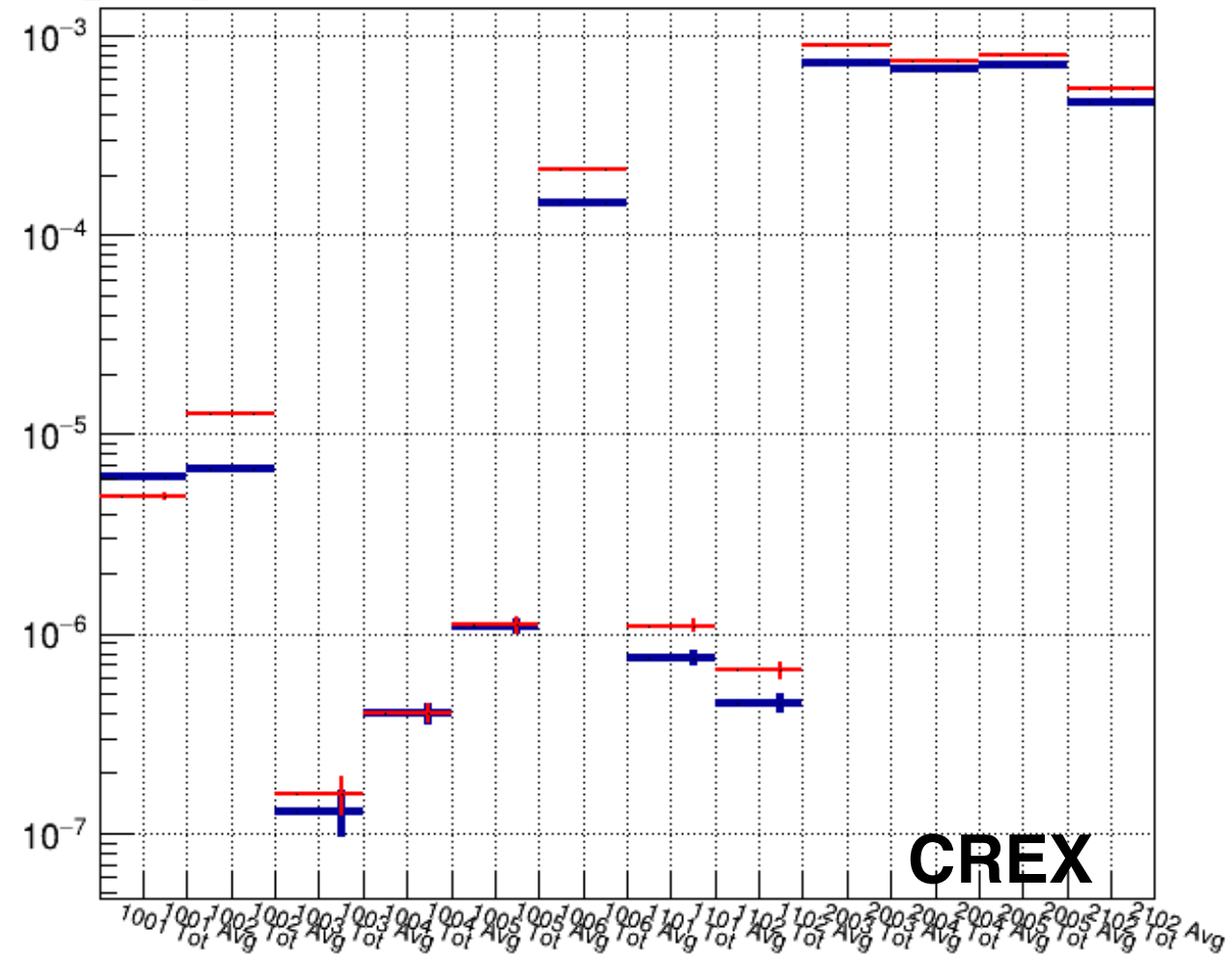
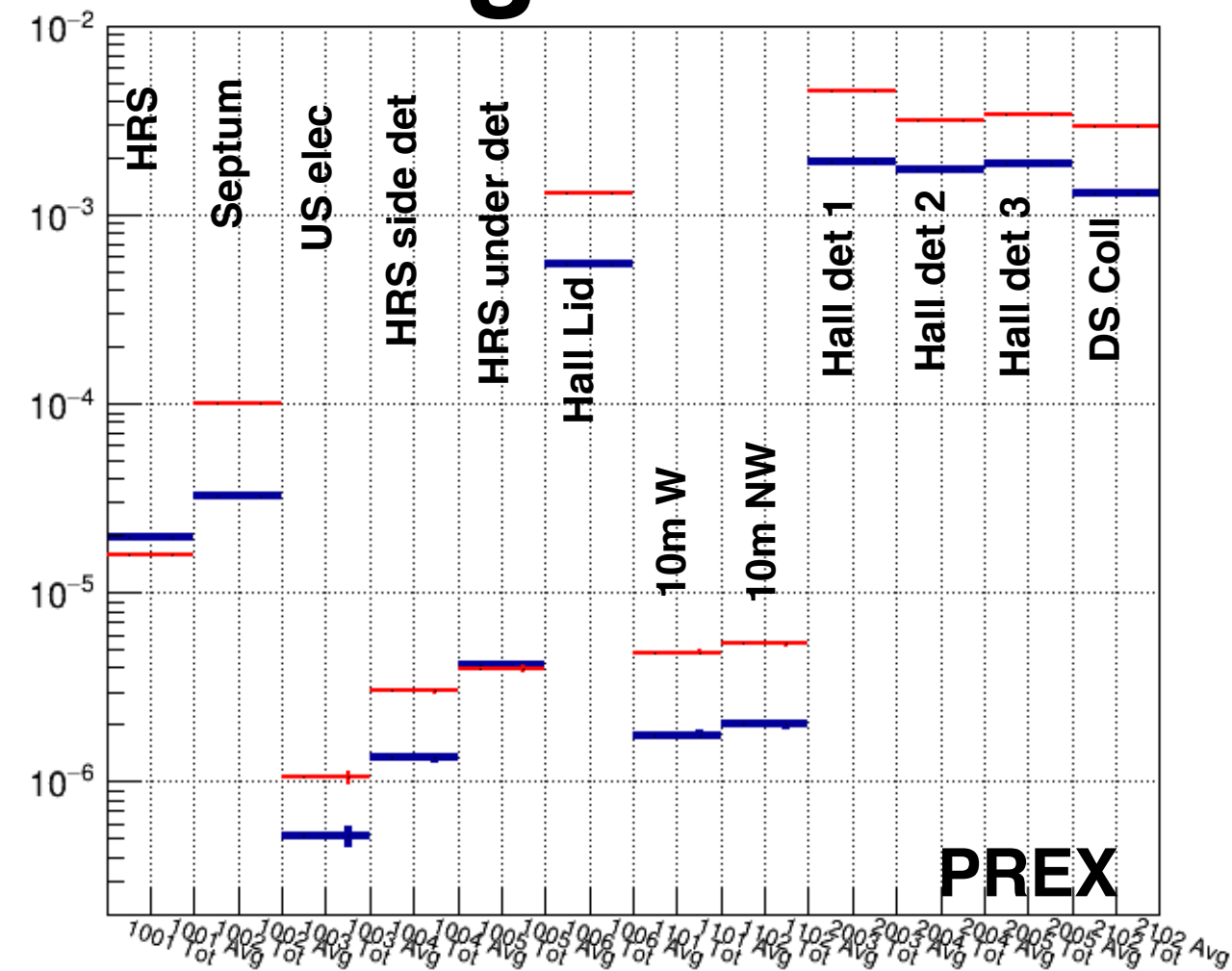
Tighter collimator (neck Down)



- Current in blue, comparison in red
- Tighter collimator to hide neck down (0.78 deg -> 0.61 deg; US radius: 1.133-> 0.891; DS radius: 1.345->1.058)
- There is a small decrease in the radiation at the HRS platform but the radiation at the hall lid nearly doubles for PREX
- CREX(PREX) sees a 20(65)% increase in number of HE neutrons at the hall lid

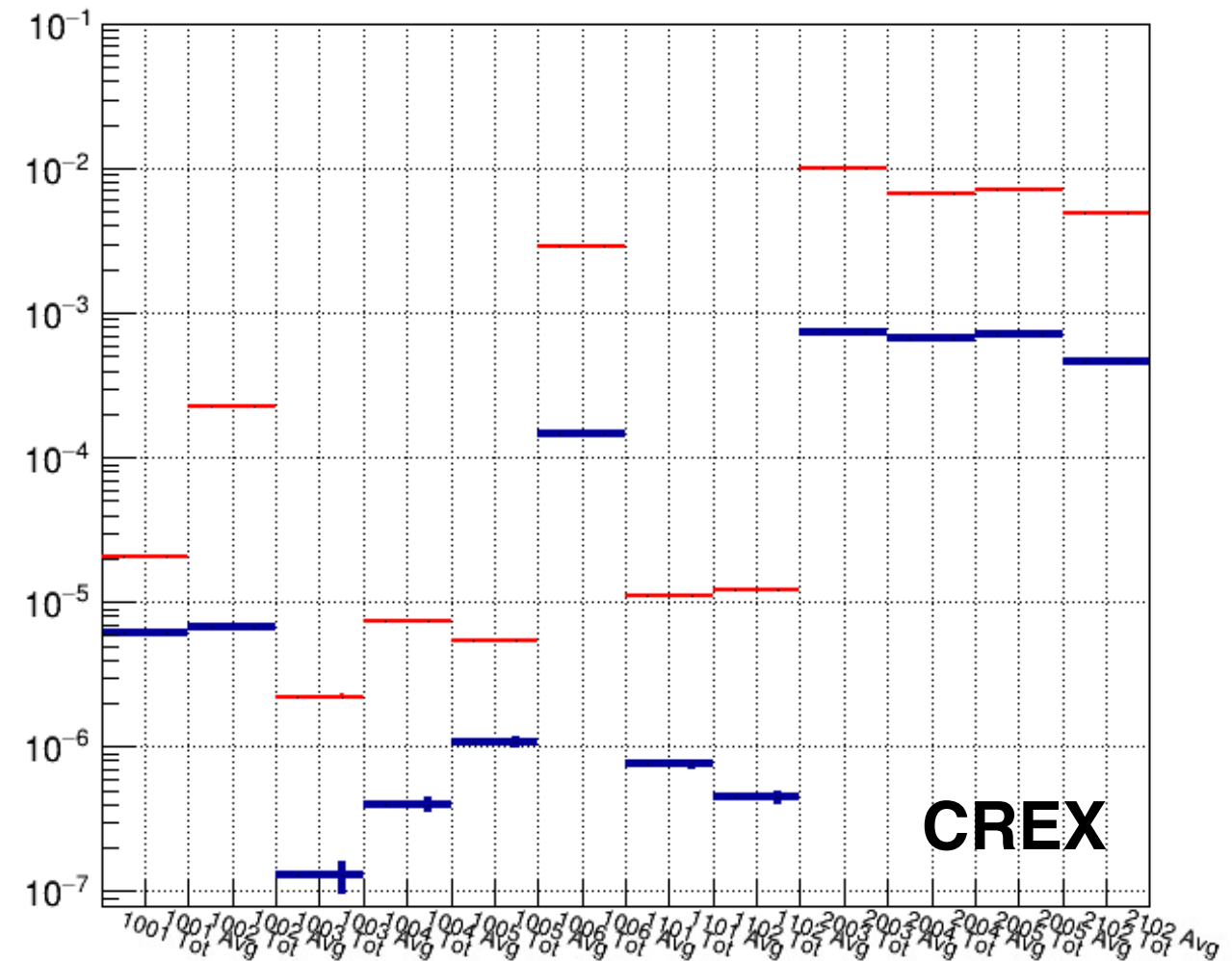
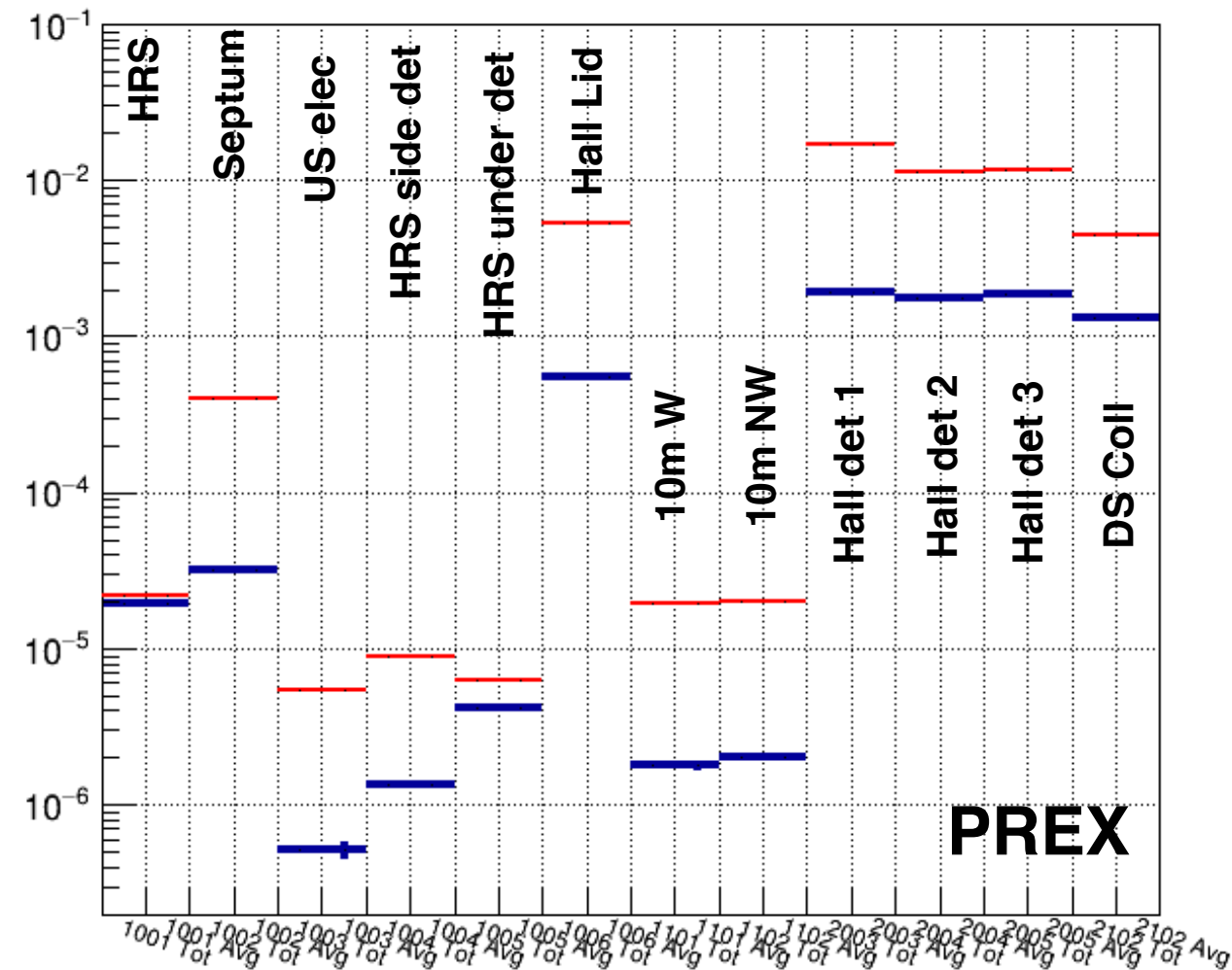


Tighter collimator (pipe to Donut)



- Current in blue, comparison in red
- Tighter collimator to hide half of donut; covers beam pipe until the donut @2929cm
 - (0.78 deg \rightarrow 0.57 deg; US radius: 1.133 \rightarrow 0.822; DS radius: 1.345 \rightarrow 0.976)
- This is even worse although the HRS seems unaffected (the big dipole iron must be blocking everything)
- CREX(PREX) sees a 30(95)% increase in number of HE neutrons at the hall lid

Tighter collimator (middle of Donut)



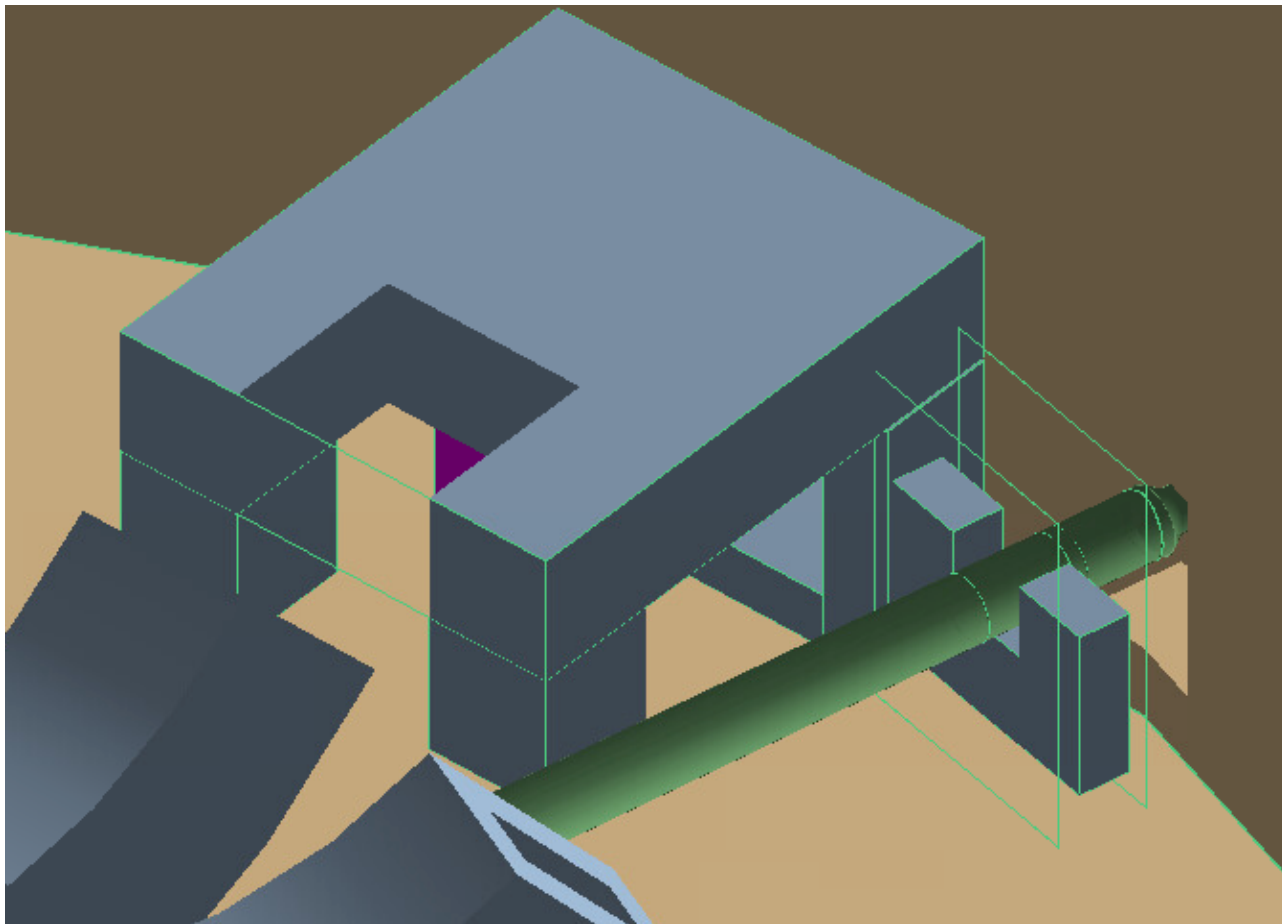
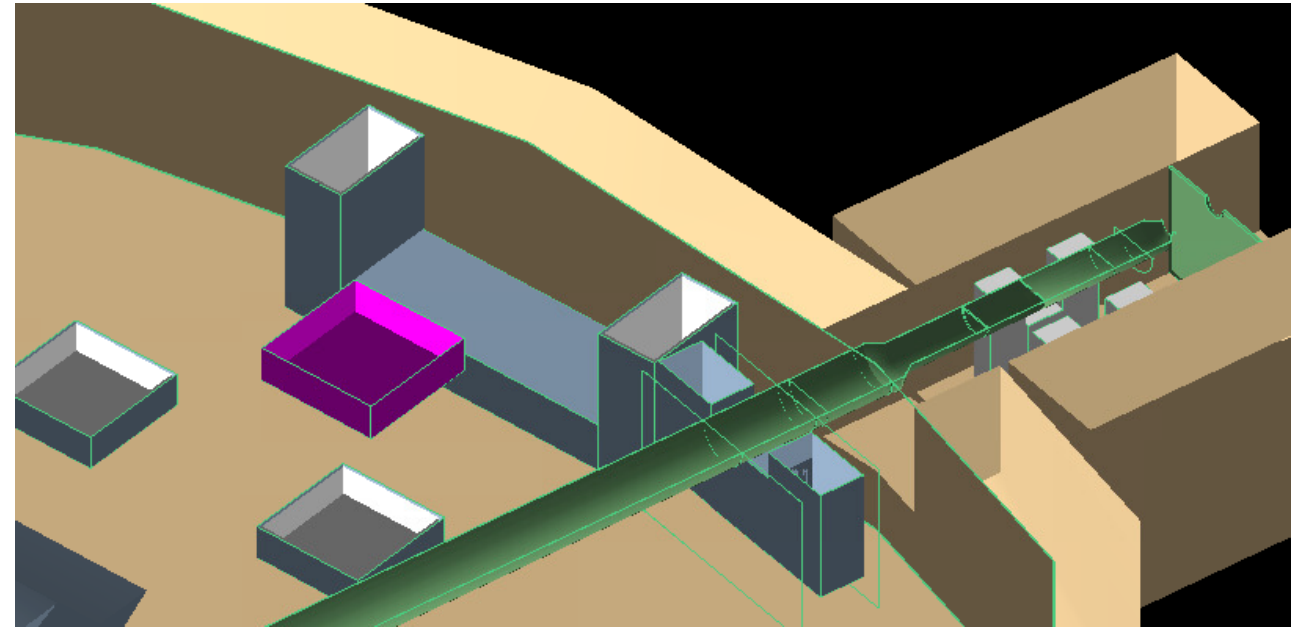
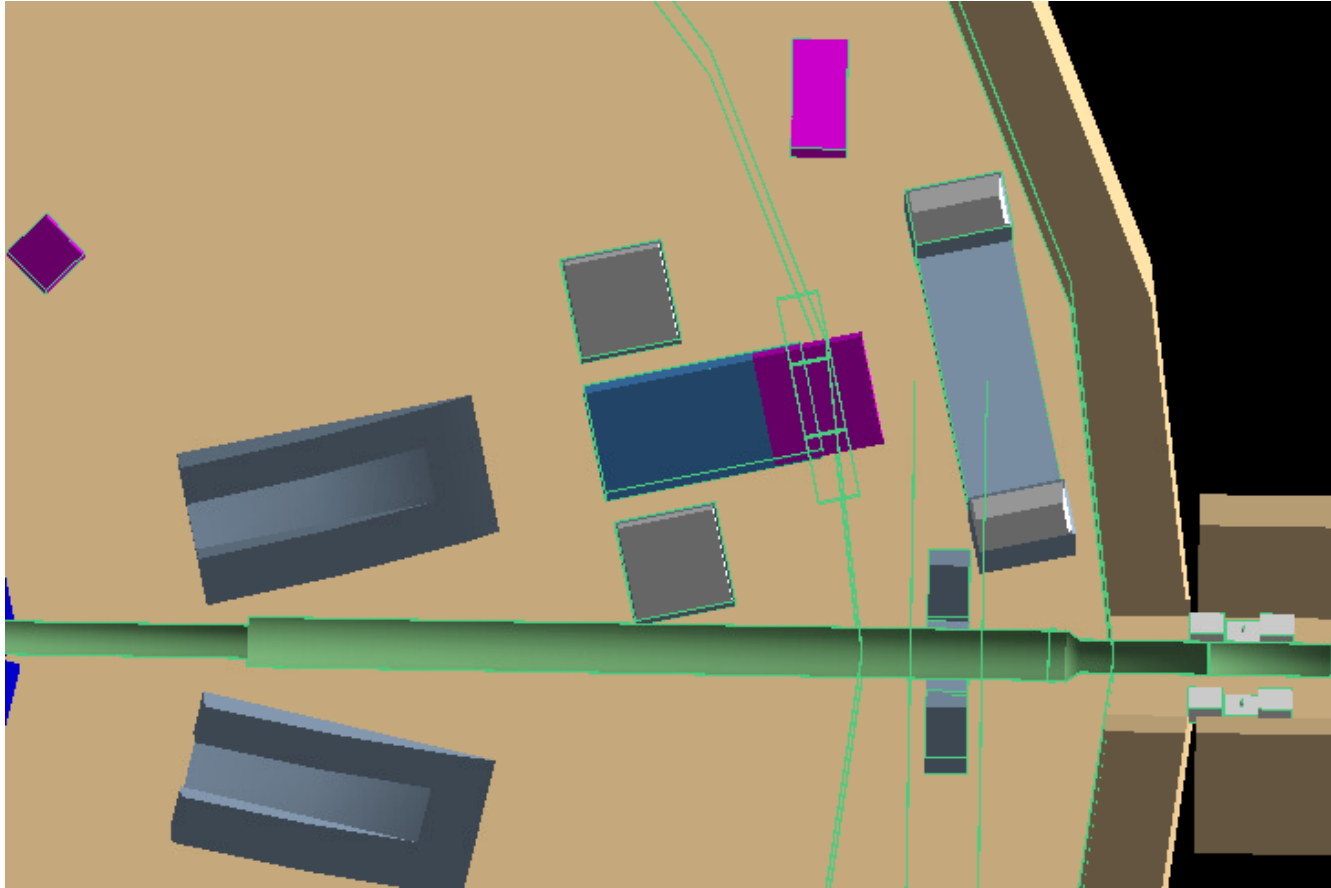
- Current in blue, comparison in red
- Tighter collimator to hide half of donut; to $R=15\text{cm}$ @ 2929 cm
 - (0.78 deg \rightarrow 0.28 deg; US radius: 1.133 \rightarrow 0.412; DS radius: 1.345 \rightarrow 0.489)
- CREX(PREX) sees a 1070(816)% increase in number of HE neutrons at the hall lid

Tighter collimators

| | W/uA | | | |
|-------------------------|------|------|---------------|----------------|
| | PREX | CREX | PREX@70uA [W] | CREX@150uA [W] |
| current | 32 | 6 | 2264 | 833 |
| smaller Coll Neck | 74 | 10 | 5193 | 1451 |
| smaller Coll Pipe2Donut | 99 | 12 | 6965 | 1805 |
| smaller Coll MidDonut | 509 | 197 | 35601 | 29478 |

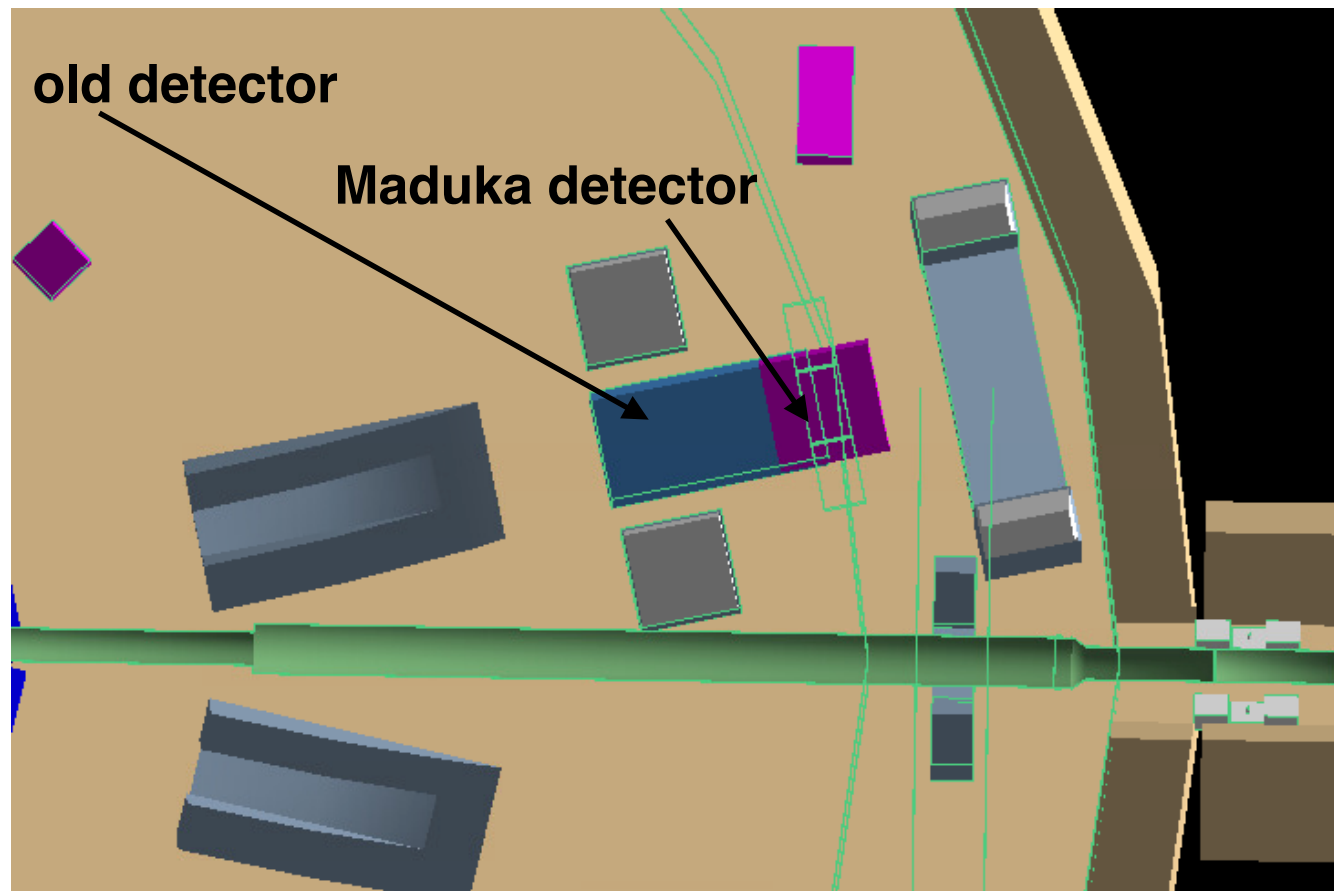
- The power deposited in the collimator more than doubles when we cover the neck down

New HRS

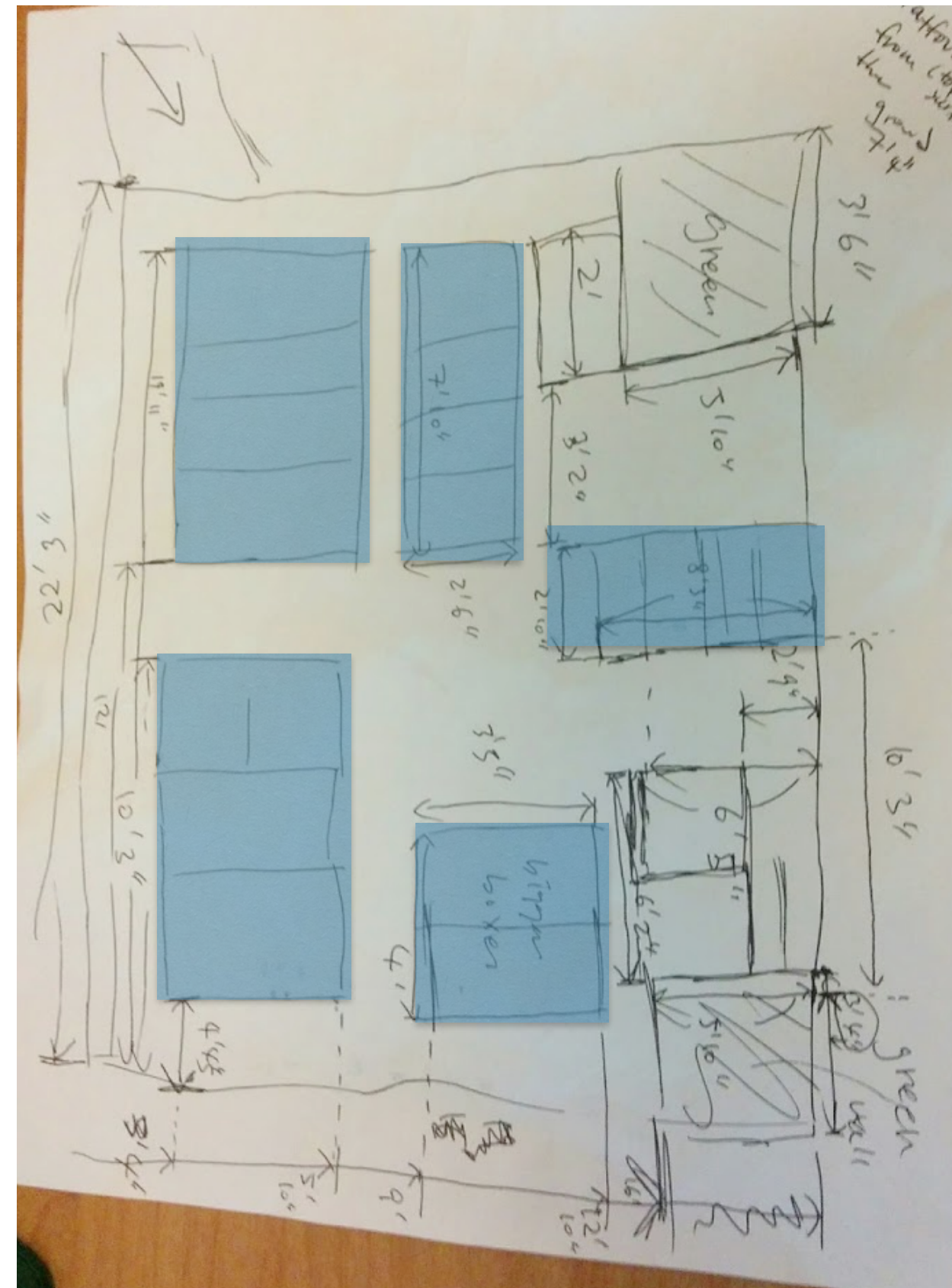


- The detector as implemented by Maduka (pink) sits right at the center of the HRS platform
 - it is significantly smaller than what we had (overlap in blue) and what is on the platform in reality
- plan to increase the size and extend it downstream and to size to make it more accurate
- The support structure is ~5cm thick iron with Air inside

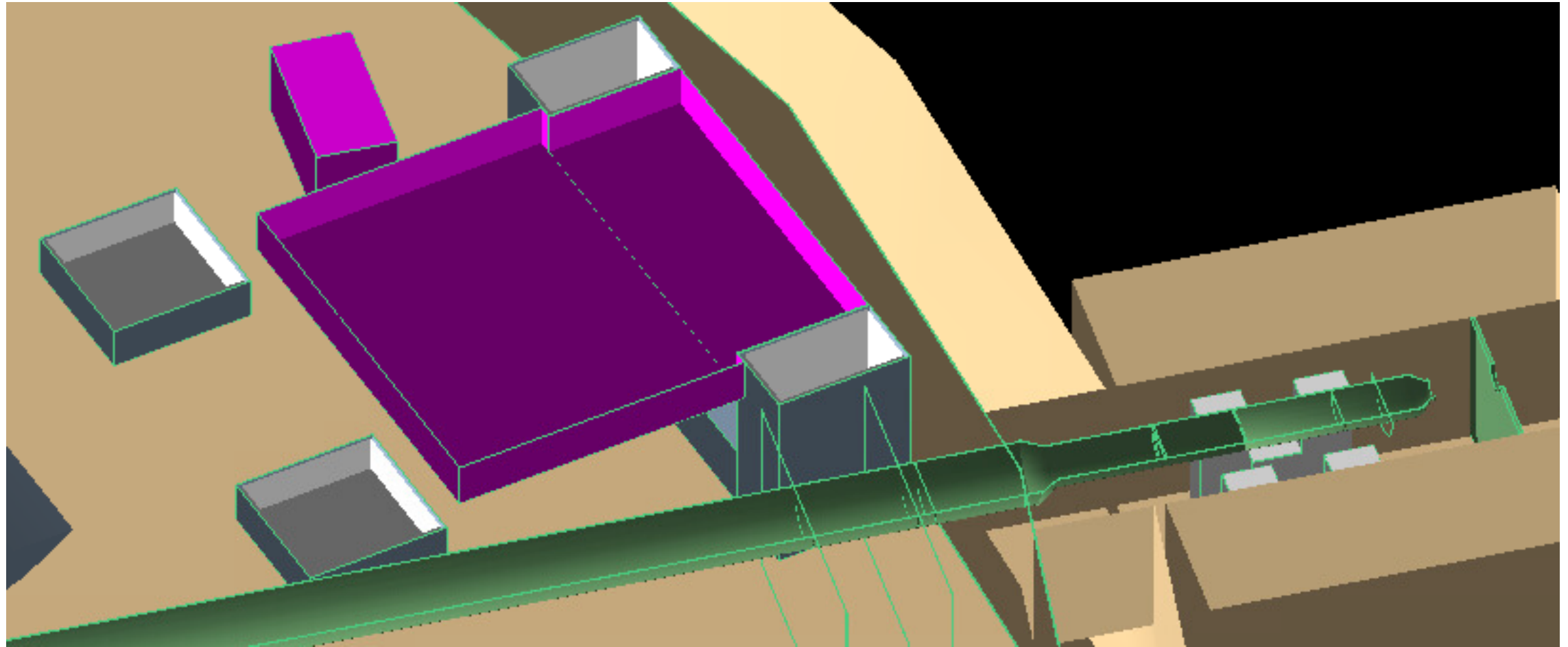
New HRS



- Will need to look at some drawings for the HRS platform dimensions (not urgent)
- The dimensions that Maduka had for the pillars and the total size of the platform is consistent with what Sanghwa and I measured in the hall
- Electronics boxes are spread out over a larger area (highlighted regions on the right drawing) — drawing not to scale

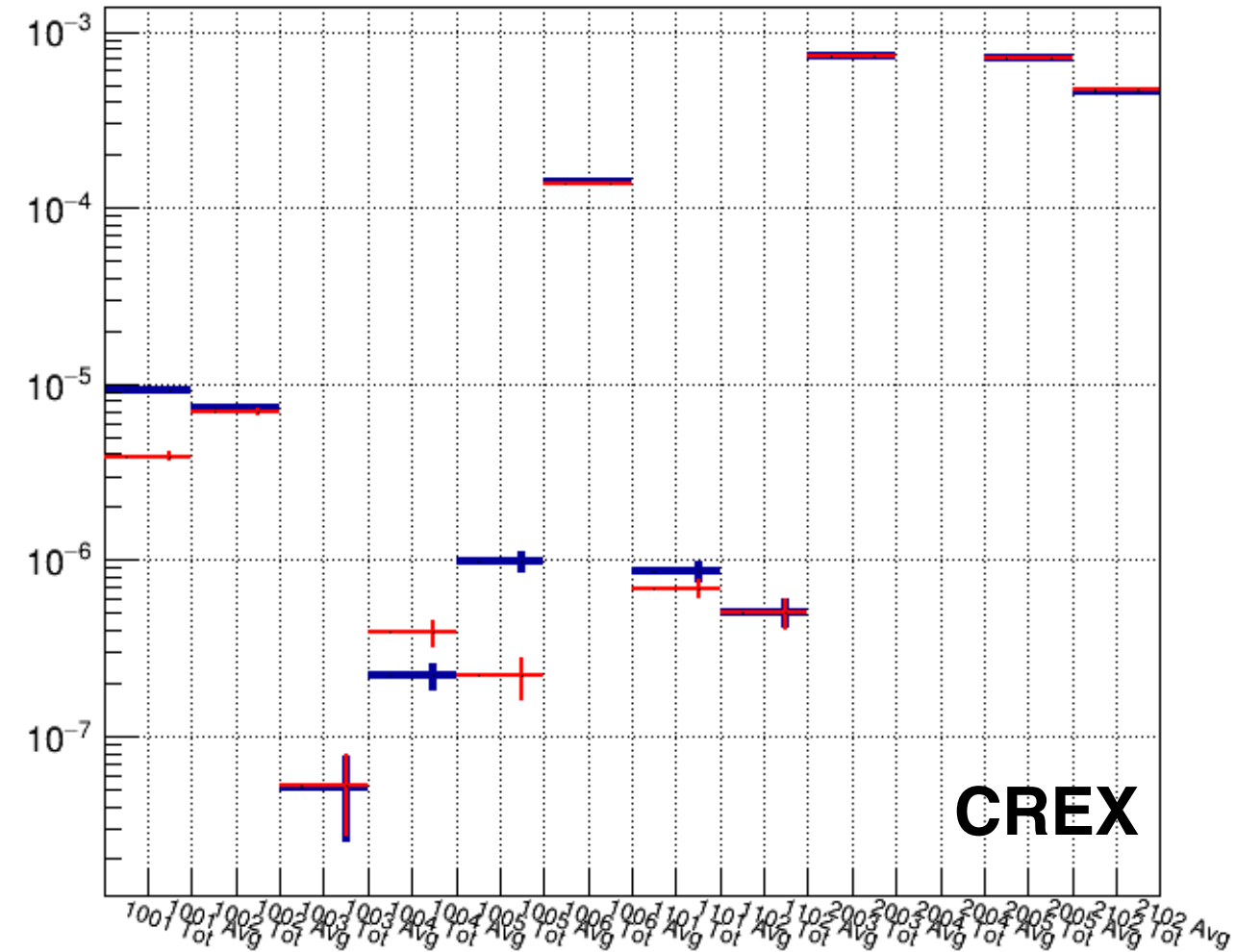
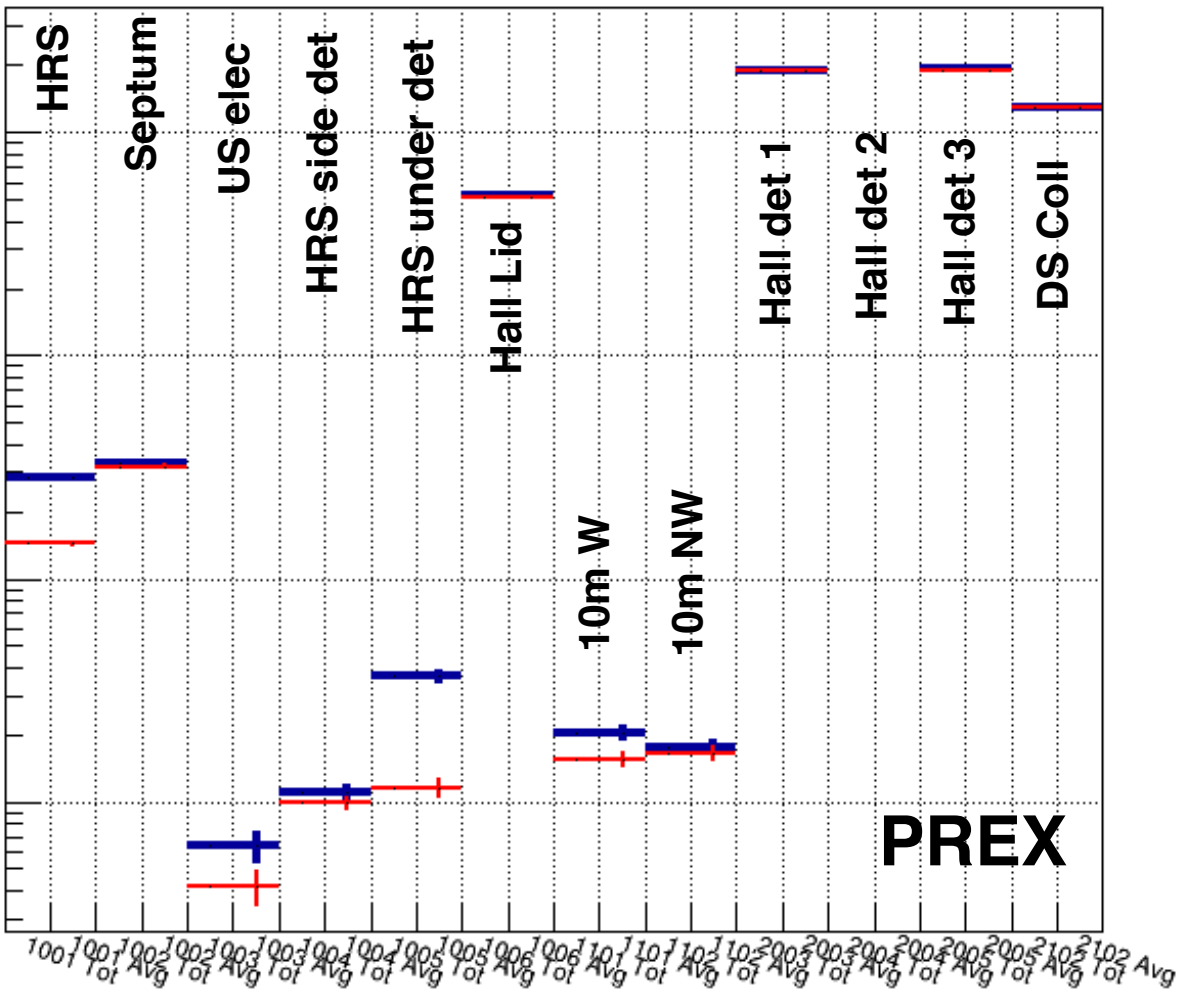


New HRS + new Det



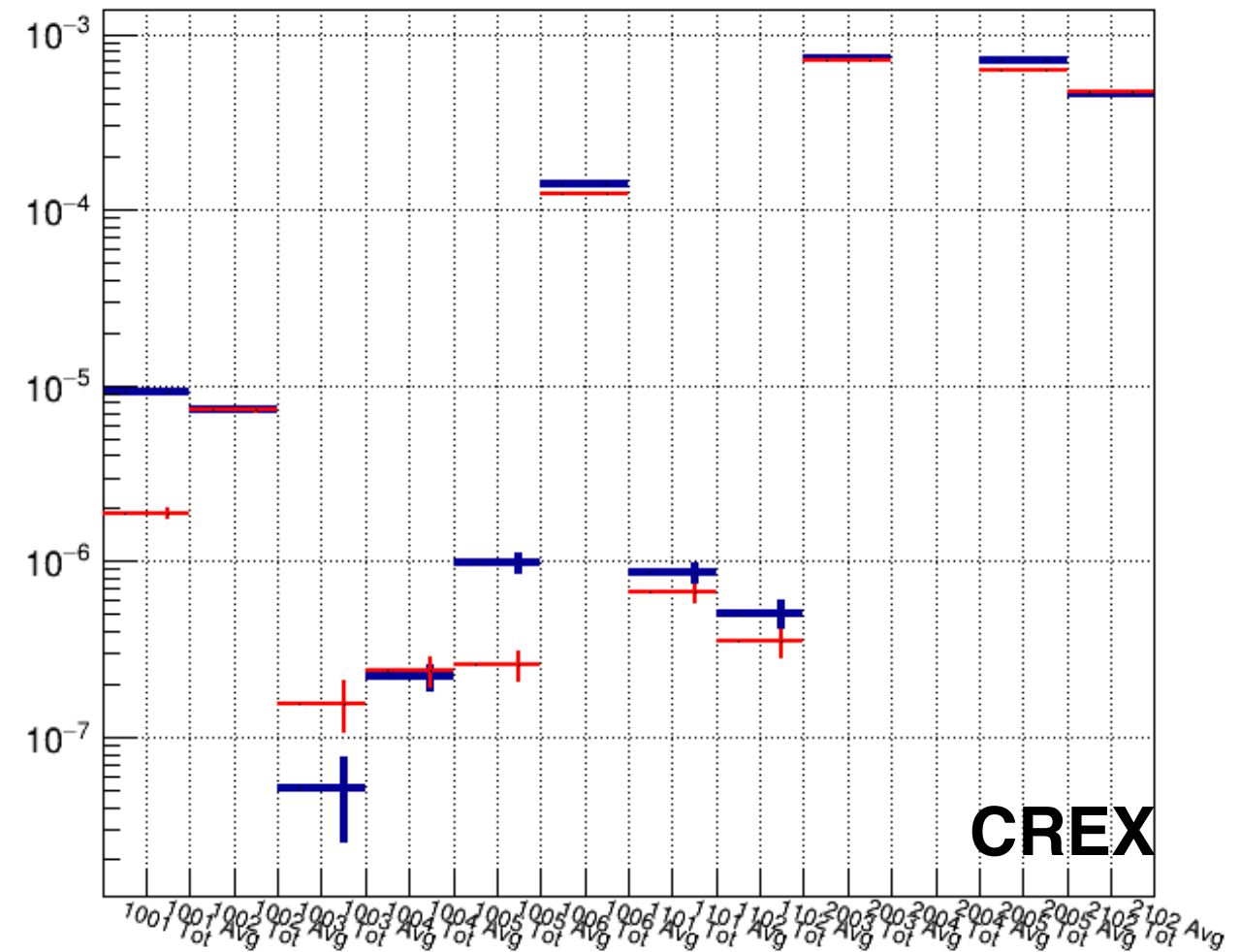
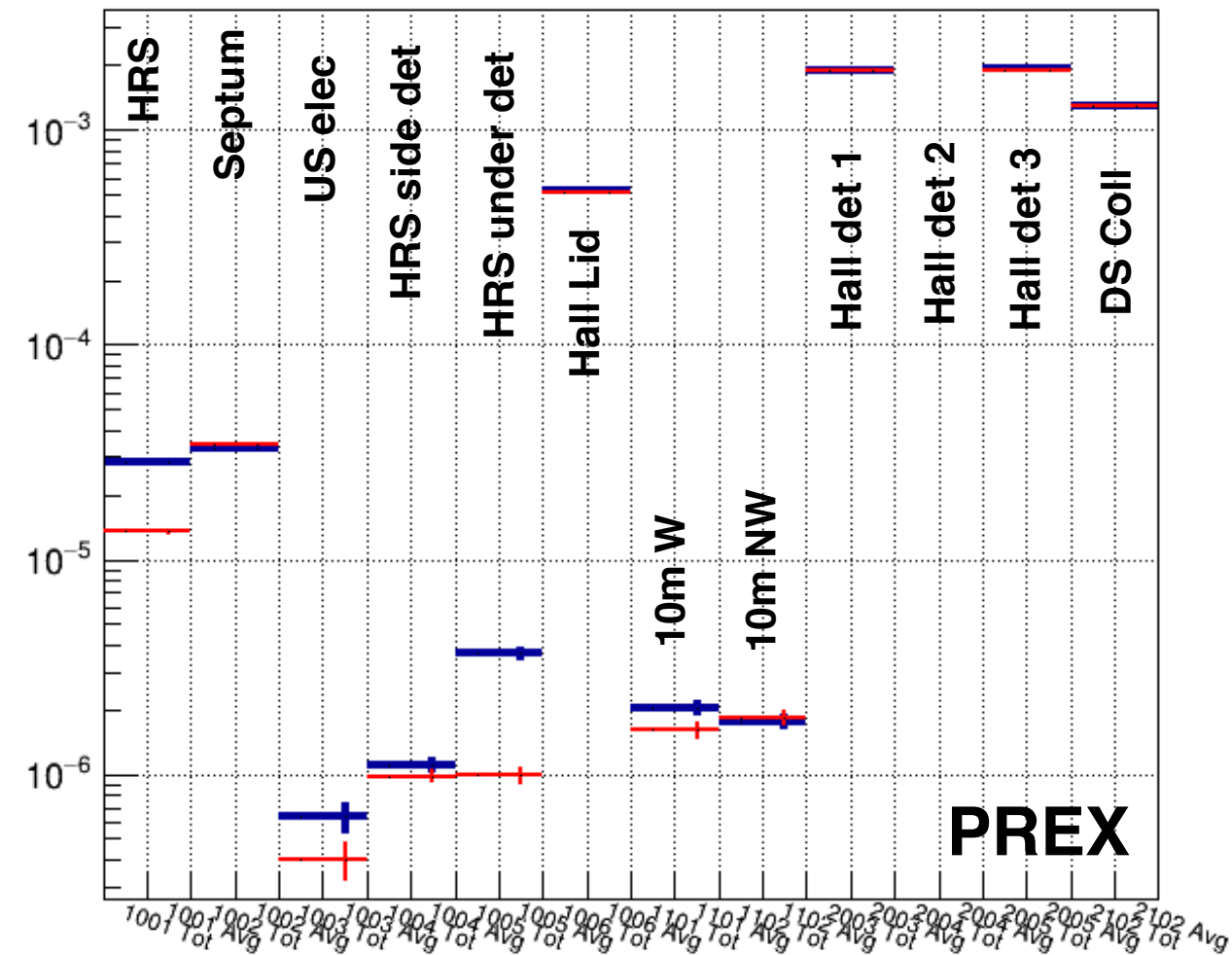
- Increased size of detector to cover any area where electronics could be placed
- This will produce an increase in the radiation per electron since the surface area is increased (400k cm² to ~987k cm²)

2ft Concrete



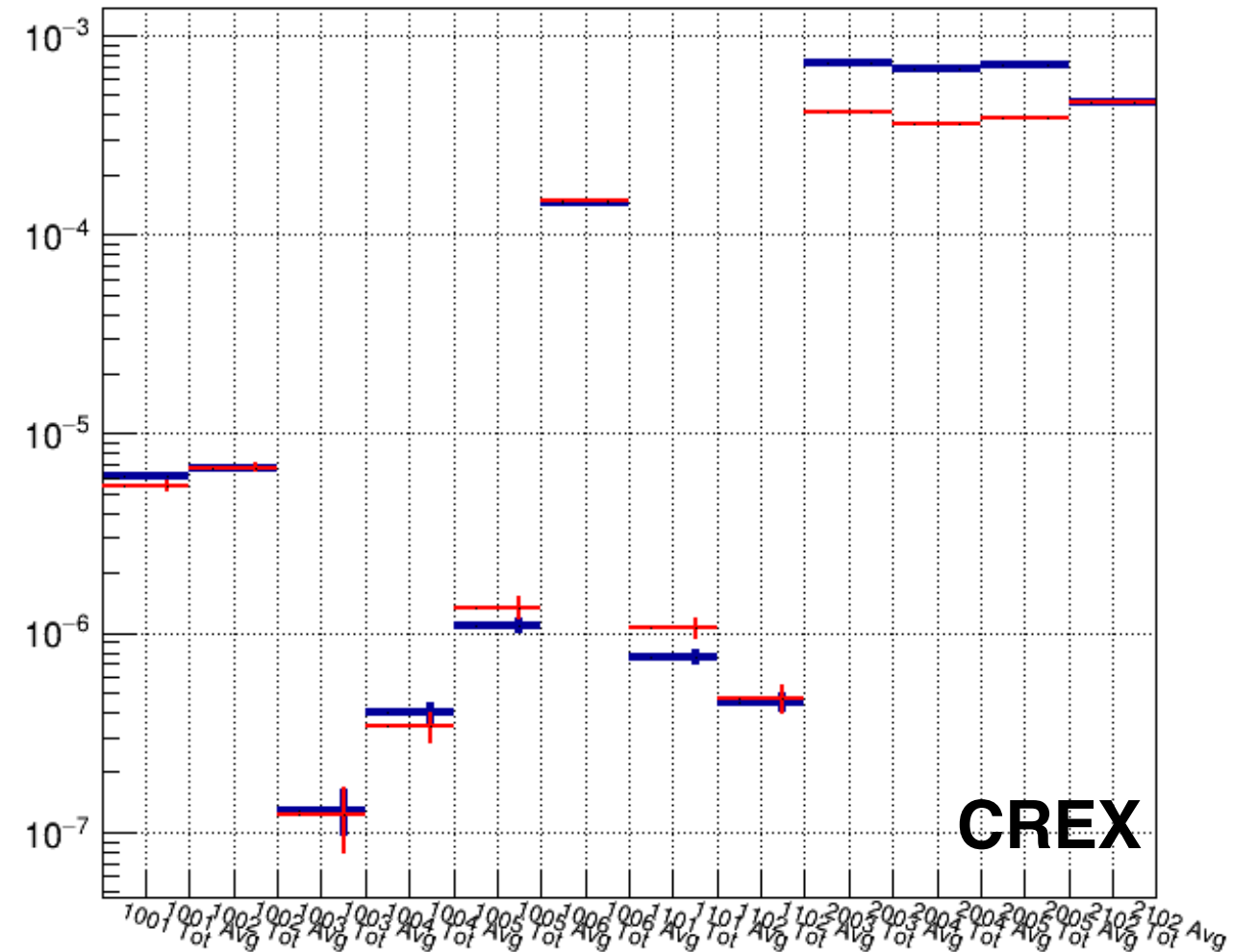
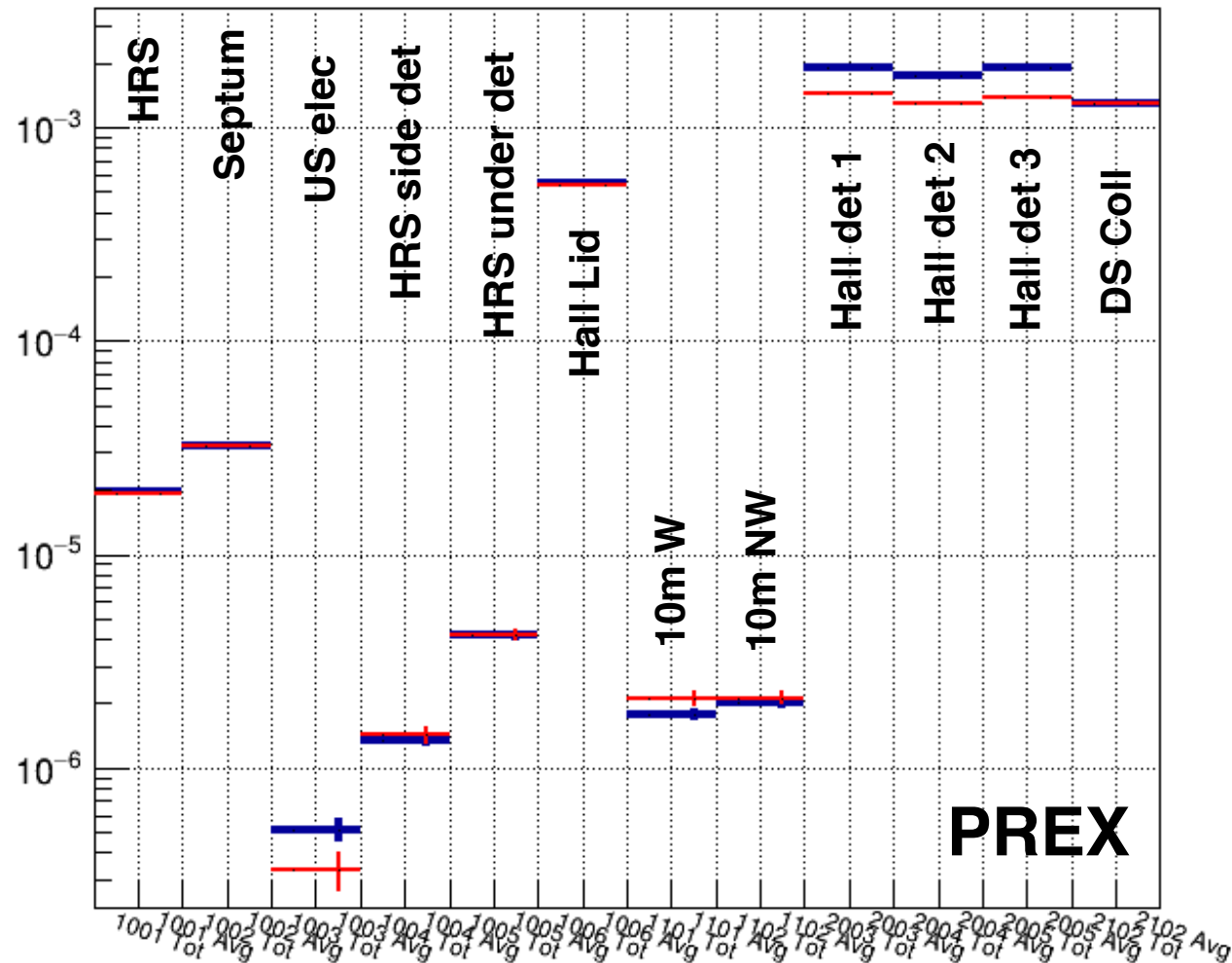
- Blue: is newHRS+newDet; Red is +2ft Concrete dump shield
- Concrete still shows better results compared to iron

1ft concrete+1ft iron+4 in Donut



- Blue: is newHRS+newDet; Red is + 1ft Iron+1ft concrete dump shield + 4in donut
- This is our “maximal shielding” configuration

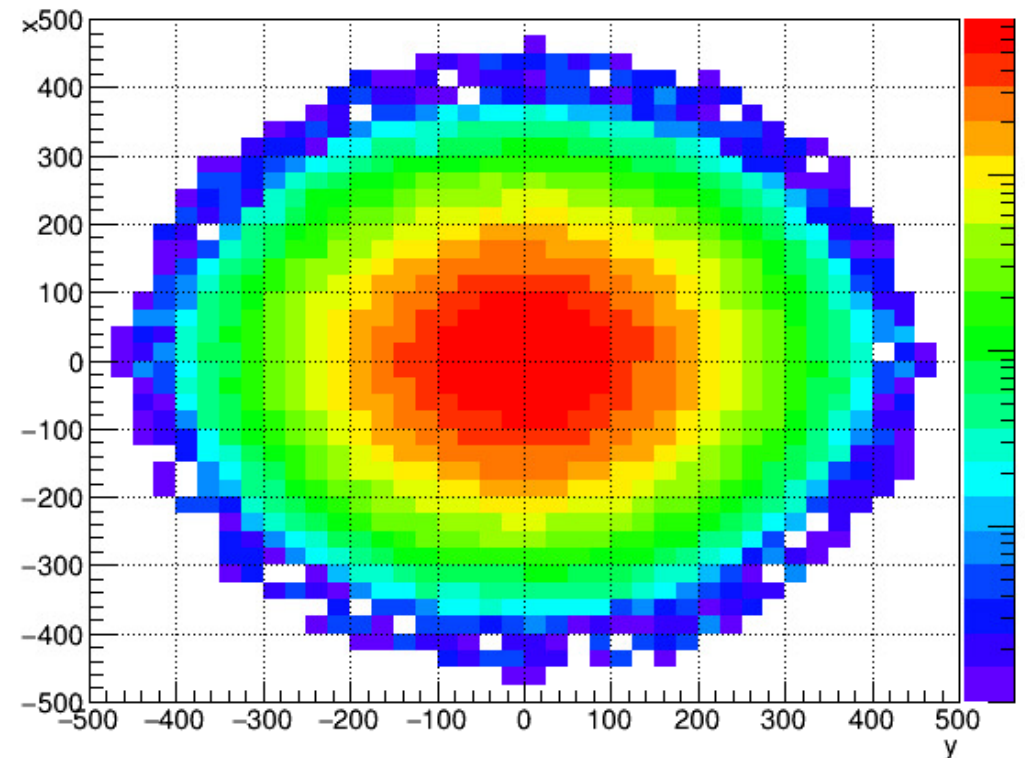
Vacuum in beampipe



- Current in blue, comparison in red
- When implementing the beam pipe I included only the volumes containing materials
 - since the hall was filled with air otherwise, the hole inside the pipe was effectively air
- There are some small difference in the radiation at different points inside the hall, except for the Hall detectors

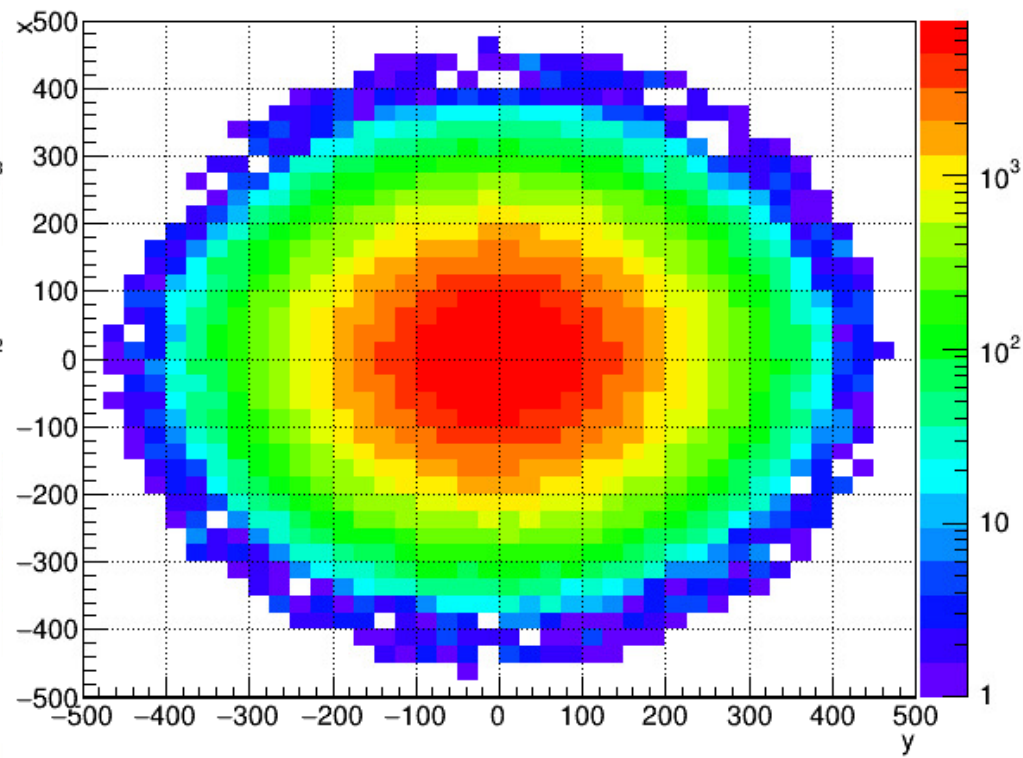
Vacuum in beampipe

x:y {volume==2204 && PDGid==11}



PREX Current

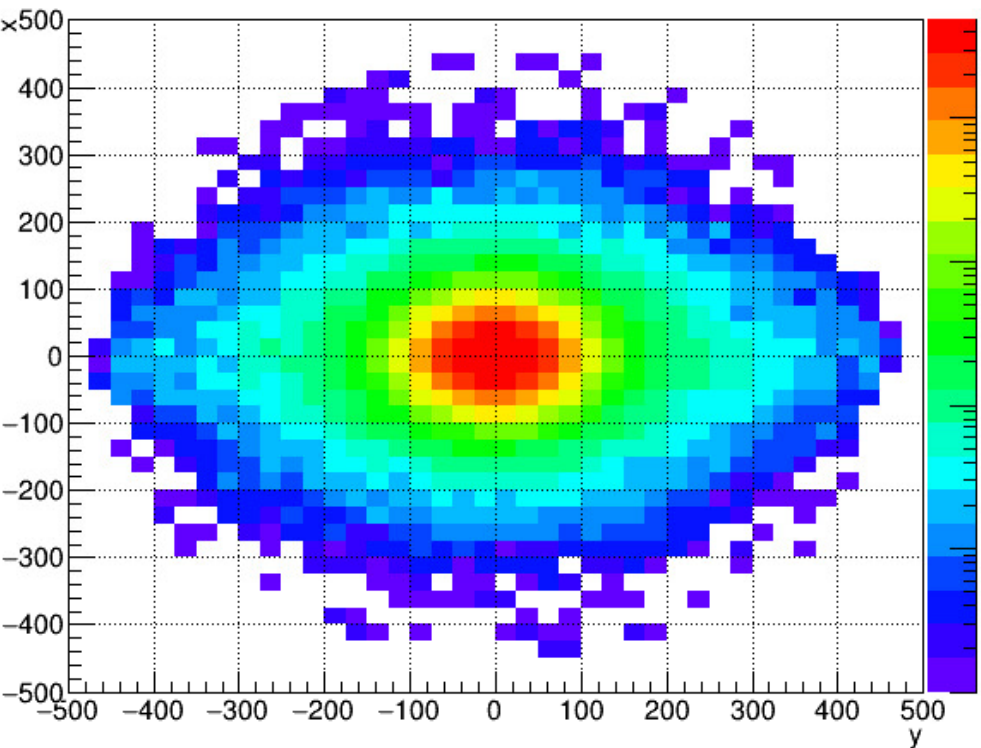
x:y {volume==2204 && PDGid==11}



PREX Vacuum

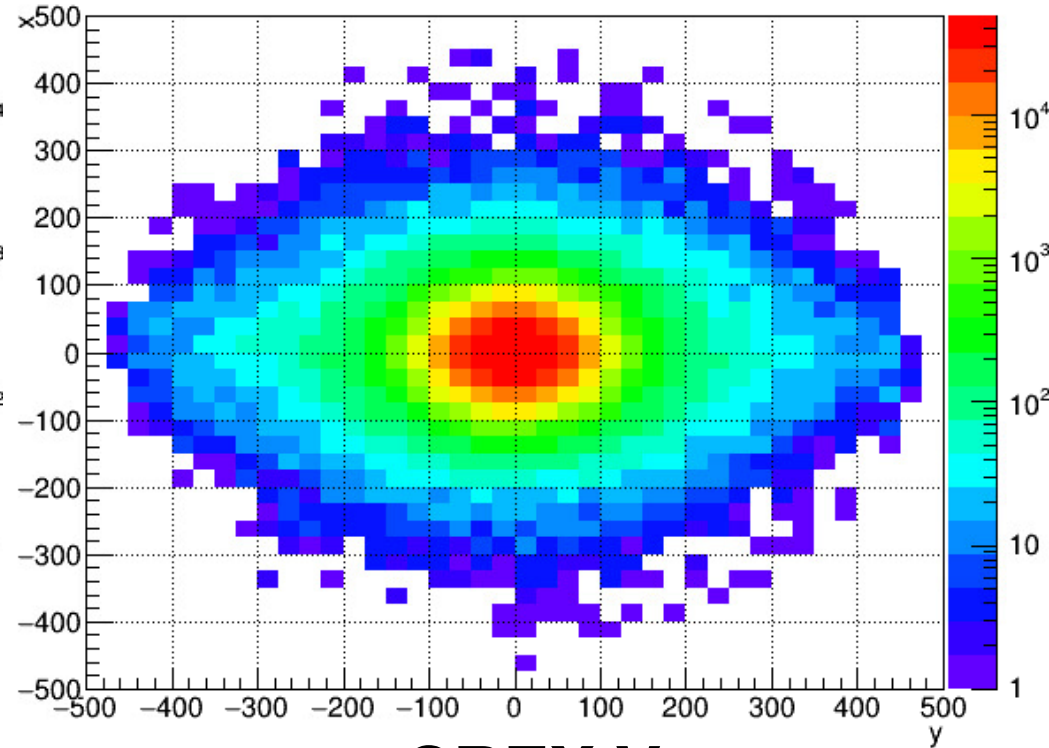
Electrons @ 24m

x:y {volume==2204 && PDGid==11}



CREX Current

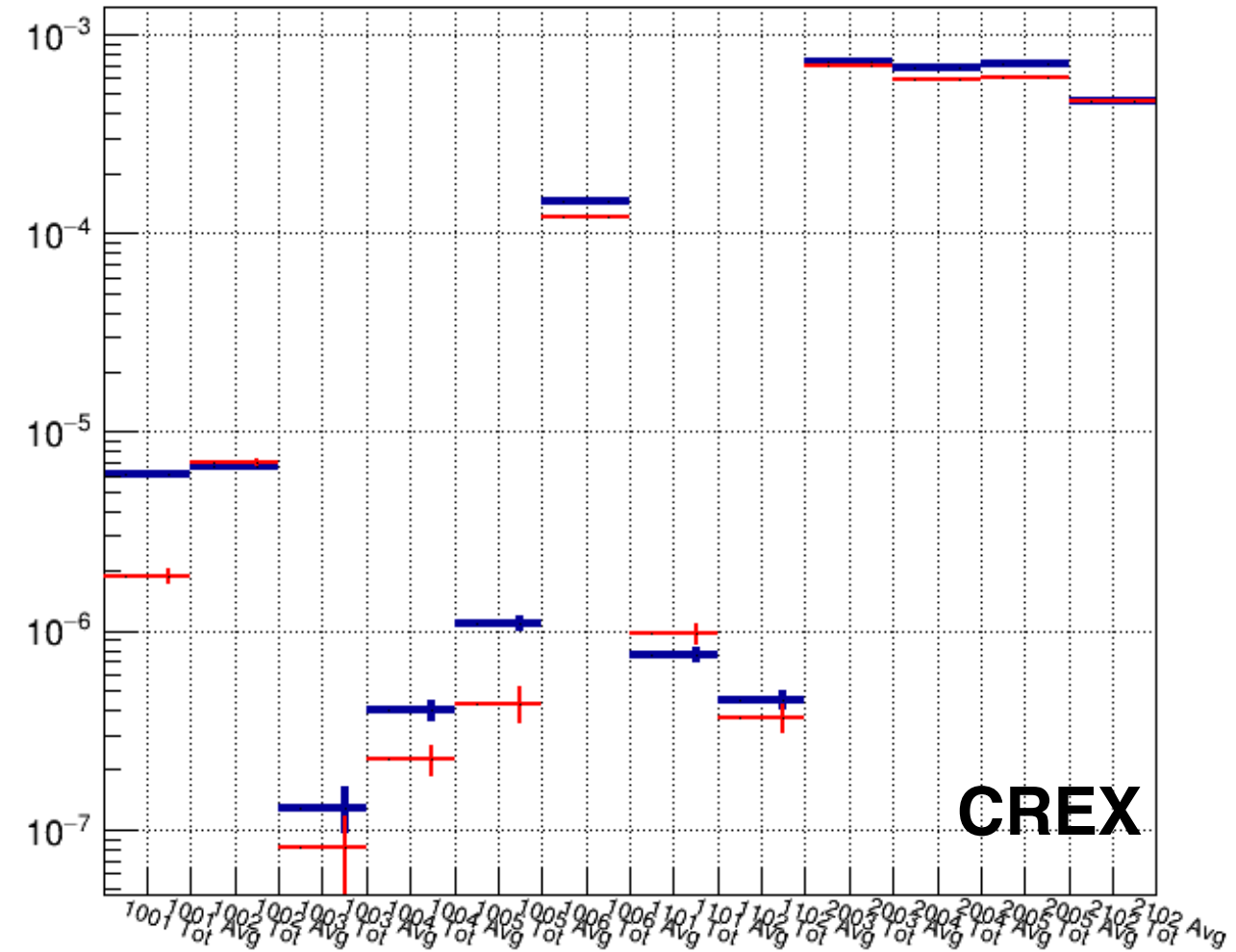
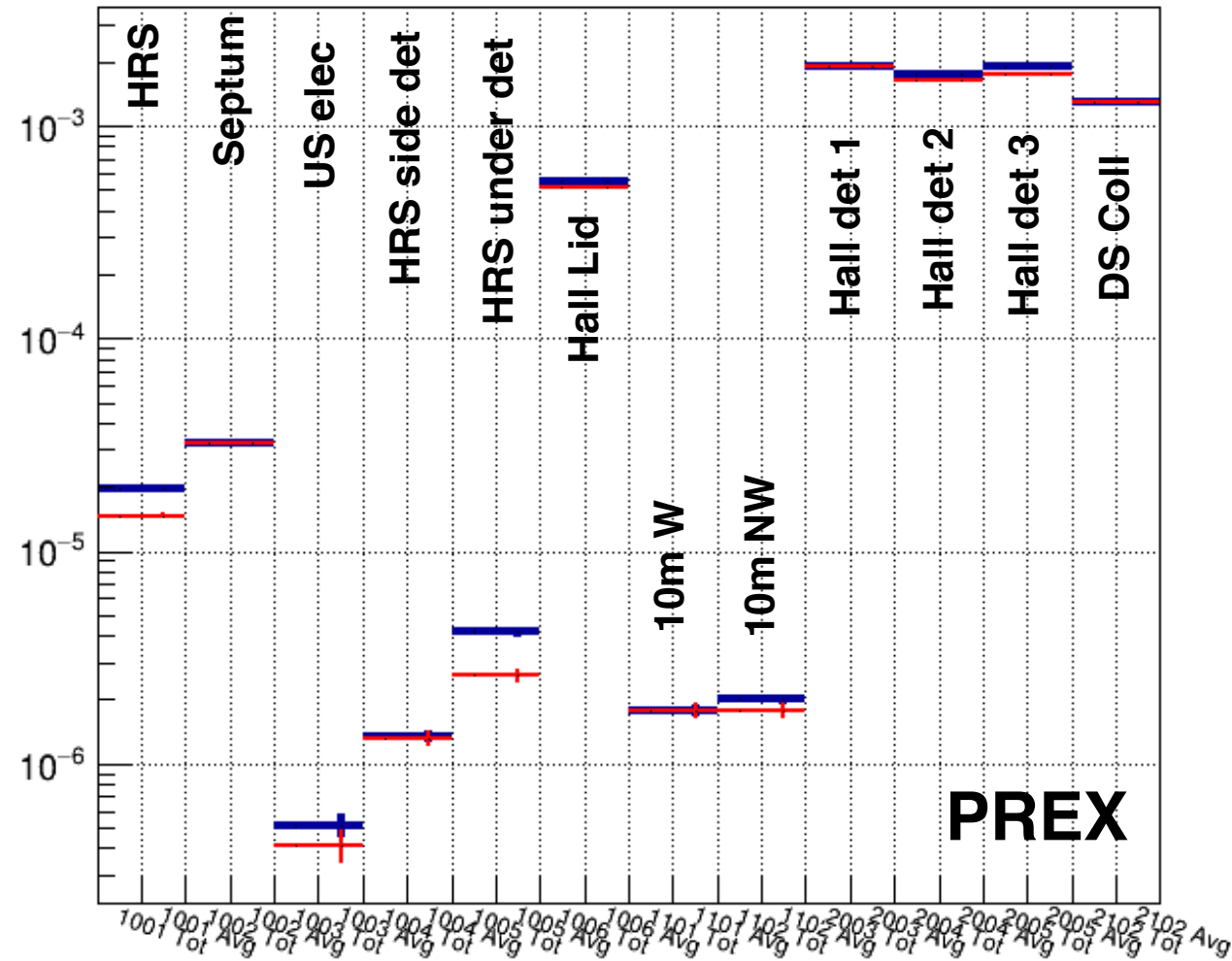
x:y {volume==2204 && PDGid==11}



CREX Vacuum

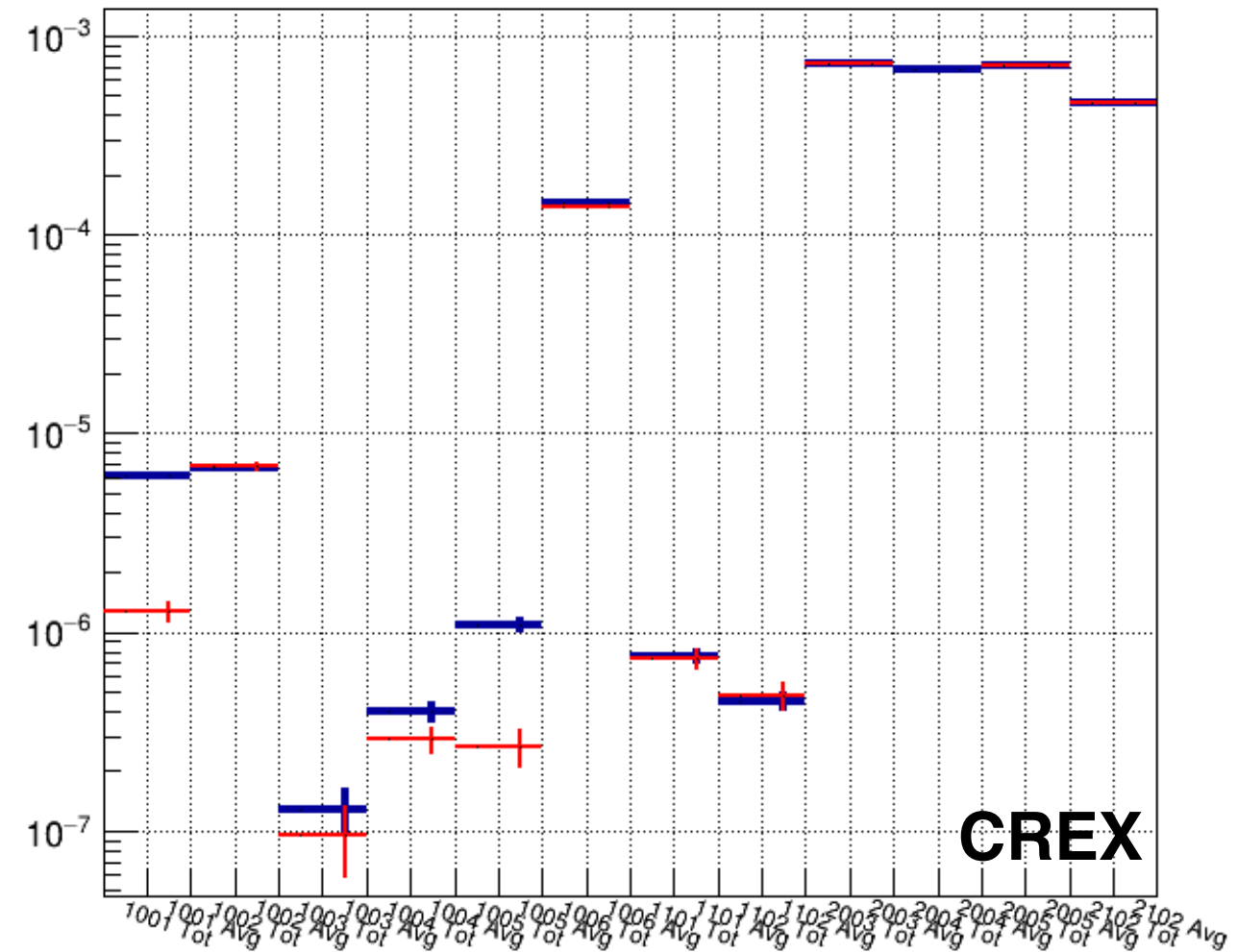
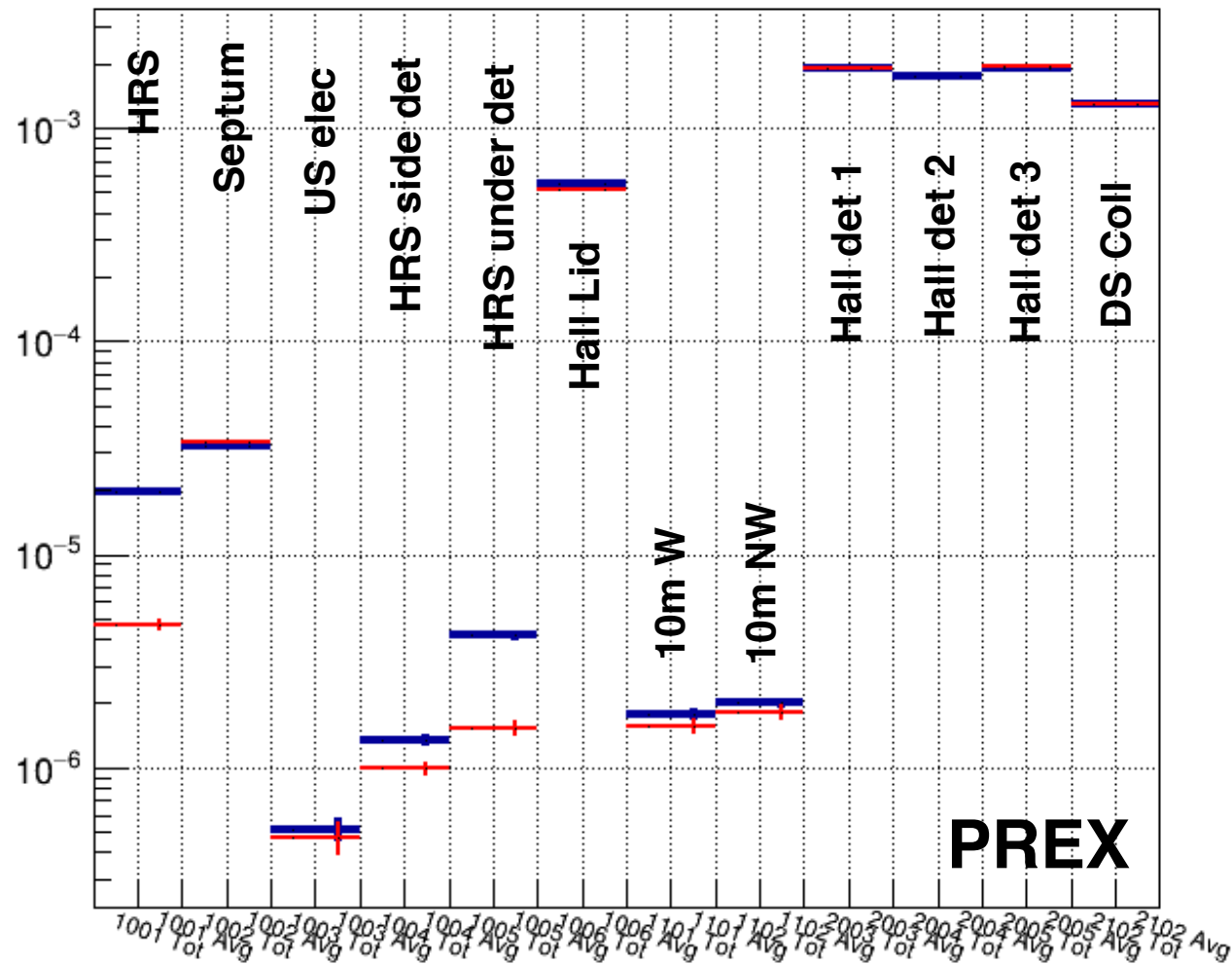
Electrons @ 24m

No donut



- Current in blue, comparison in red
- As expected this helps CREX quite a bit

New HRS + 2ftIron



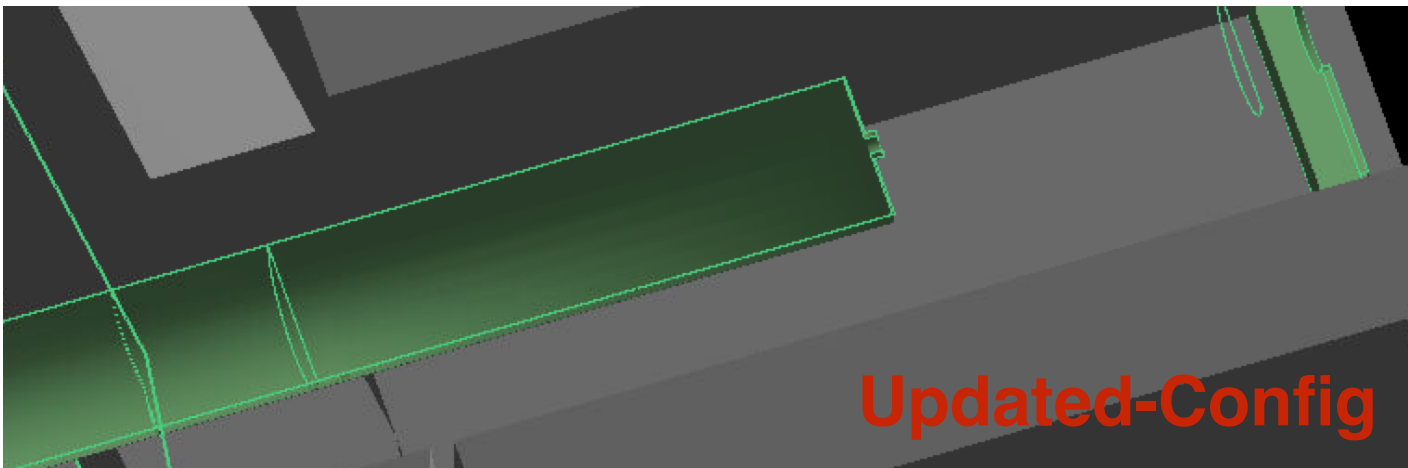
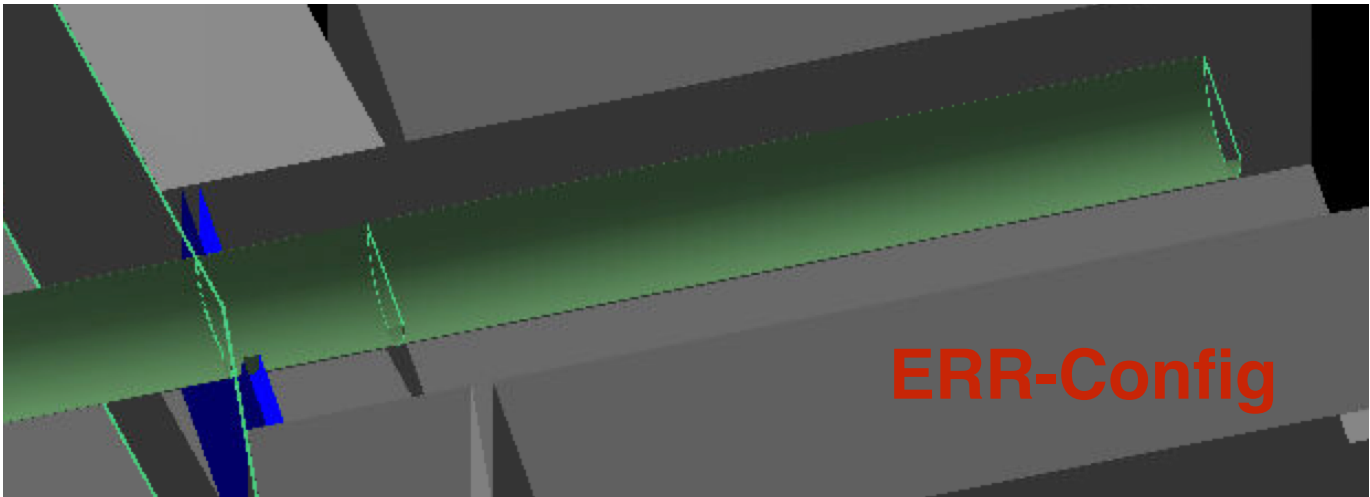
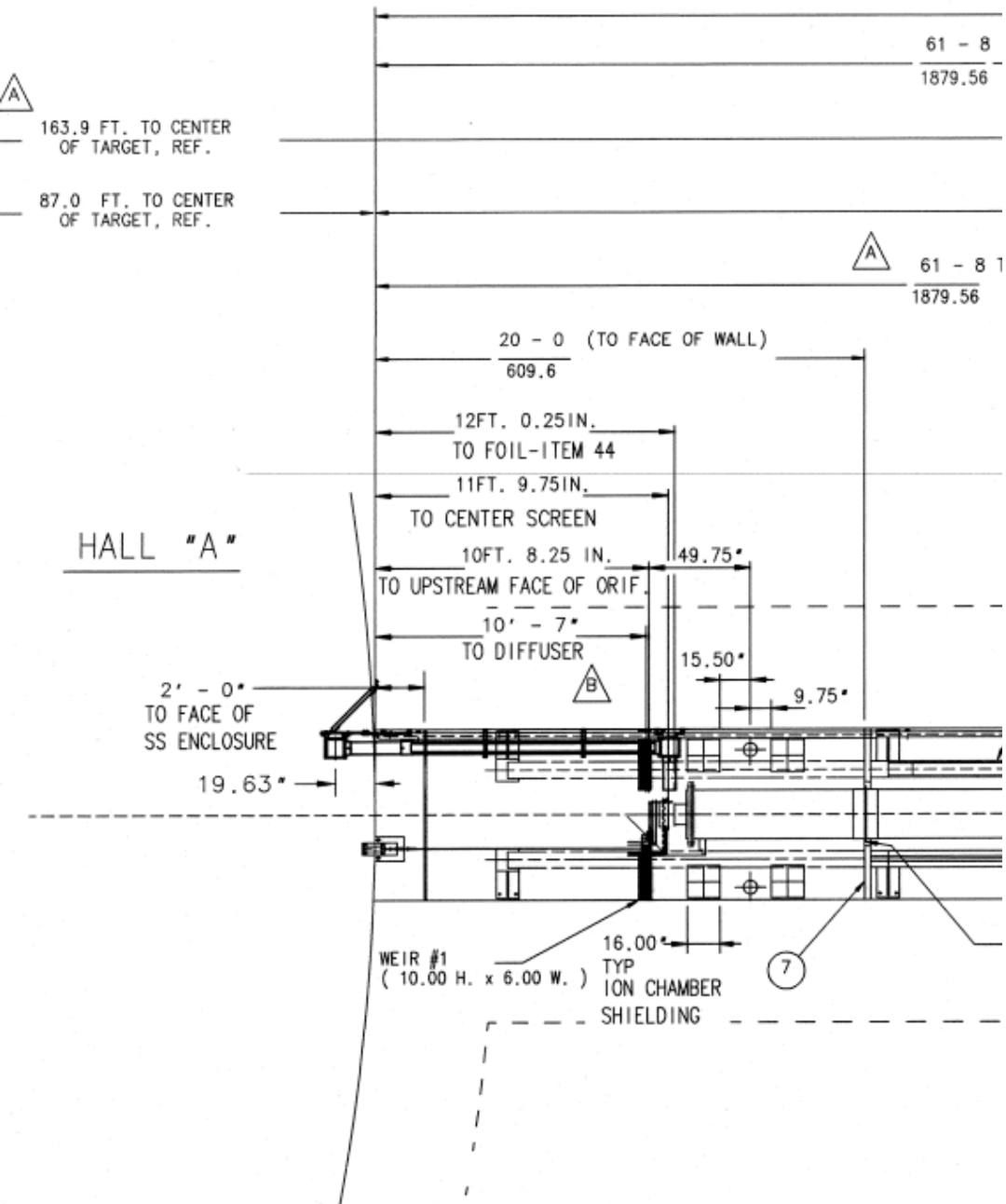
- Current in blue, comparison in red
- As before the 2ft of Iron helps with radiation seen at the platform

Previous Summary table

| | Total NEIL/cm2 | uncert | Ratio to P1 | uncert | Total NEIL/cm2 | uncert | Ratio to P1 | uncert |
|-------------------------------|----------------|----------|-------------|--------|----------------|----------|-------------|--------|
| PREX1 (ERR dump) | 4.60E+10 | 1.79E+09 | 1.00 | 0.06 | 7.43E+10 | 4.92E+09 | 1.00 | 0.09 |
| PREX1 (actual dump) | 4.05E+10 | 1.68E+09 | 0.88 | 0.05 | 7.78E+10 | 5.39E+09 | 1.05 | 0.10 |
| PREX2 ERR | 4.96E+09 | 6.72E+08 | 0.11 | 0.02 | 1.09E+10 | 2.61E+09 | 0.15 | 0.04 |
| PREX2 current | 5.77E+10 | 5.69E+09 | 1.25 | 0.13 | 7.60E+10 | 1.85E+10 | 1.02 | 0.26 |
| P2 with P1pipe | 2.12E+10 | 3.38E+09 | 0.46 | 0.08 | 4.39E+10 | 1.31E+10 | 0.59 | 0.18 |
| P2 current+4in | 4.46E+10 | 4.64E+09 | 0.97 | 0.11 | 6.68E+10 | 1.45E+10 | 0.90 | 0.20 |
| P2 current+Conc | 2.38E+10 | 3.44E+09 | 0.52 | 0.08 | 2.76E+10 | 1.04E+10 | 0.37 | 0.14 |
| P2 current+ (Conc*2) | 1.54E+10 | 1.81E+09 | 0.33 | 0.04 | 1.72E+10 | 4.07E+09 | 0.23 | 0.06 |
| P2 current+ (Conc*0.5) | 2.70E+10 | 2.63E+09 | 0.59 | 0.06 | 2.40E+10 | 6.13E+09 | 0.32 | 0.09 |
| P2 current+Poly | 2.19E+10 | 3.09E+09 | 0.48 | 0.07 | 5.40E+10 | 1.59E+10 | 0.73 | 0.22 |
| P2 current+4in+1ftCont | 1.83E+10 | 2.84E+09 | 0.40 | 0.06 | 2.69E+10 | 7.95E+09 | 0.36 | 0.11 |
| P2 current + donut shield | 5.27E+10 | 5.61E+09 | 1.15 | 0.13 | 8.28E+10 | 1.98E+10 | 1.11 | 0.28 |
| P2+2Pipe+2ftIron | 2.30E+10 | 3.01E+09 | 0.50 | 0.07 | 1.51E+10 | 6.31E+09 | 0.20 | 0.09 |
| P2+2Pipe+2ftIron+Wdonut | 2.38E+10 | 3.10E+09 | 0.52 | 0.07 | 1.68E+10 | 5.59E+09 | 0.23 | 0.08 |
| | | | | | | | | |
| CREX ERR | 6.73E+09 | 2.05E+09 | 0.15 | 0.04 | 1.31E+10 | 6.57E+09 | 0.18 | 0.09 |
| C5 current | 3.86E+10 | 7.80E+09 | 0.84 | 0.17 | 4.70E+10 | 1.96E+10 | 0.63 | 0.27 |
| C5 current+4in | 9.86E+09 | 2.61E+09 | 0.21 | 0.06 | 3.80E+10 | 2.11E+10 | 0.51 | 0.29 |
| C5 P1pipe | 7.31E+10 | 1.12E+10 | 1.59 | 0.25 | 1.06E+11 | 3.38E+10 | 1.43 | 0.47 |
| C5 current+Conc | 2.23E+10 | 5.78E+09 | 0.49 | 0.13 | 3.21E+10 | 1.65E+10 | 0.43 | 0.22 |
| C5 current+(Conc*2) | 1.73E+10 | 3.23E+09 | 0.38 | 0.07 | 2.68E+10 | 1.00E+10 | 0.36 | 0.14 |
| C5 current+(Conc*0.5) | 1.70E+10 | 3.35E+09 | 0.37 | 0.07 | 1.09E+10 | 5.20E+09 | 0.15 | 0.07 |
| C5 current+Poly | 1.86E+10 | 5.13E+09 | 0.40 | 0.11 | 1.40E+10 | 1.01E+10 | 0.19 | 0.14 |
| C5 current+ 2Pipe septum | 3.85E+10 | 8.70E+09 | 0.84 | 0.19 | 9.65E+10 | 3.52E+10 | 1.30 | 0.48 |
| C5 current+ 4in+1ftConc | 1.01E+10 | 3.28E+09 | 0.22 | 0.07 | 3.85E+10 | 2.35E+10 | 0.52 | 0.32 |
| C5 current+2Pipe+donut shield | 4.09E+10 | 7.86E+09 | 0.89 | 0.17 | 4.73E+10 | 2.41E+10 | 0.64 | 0.33 |
| C5+2Pipe+2ftIron | 1.78E+10 | 5.20E+09 | 0.39 | 0.11 | 1.00E+10 | 5.61E+09 | 0.13 | 0.08 |
| C5+2Pipe+2ftIron+Wdonut | 2.35E+10 | 6.03E+09 | 0.51 | 0.13 | 2.21E+10 | 1.30E+10 | 0.30 | 0.18 |

PREX 1 radiation estimation

Hall A dump configuration from Keith W. for 2010:



- PREX 1 estimates were done with a rudimentary dump configuration (most of the radiation to electronics came from within the hall proper)
 - The splash back from the dump was simulated by putting a stainless steel wall at the entrance of the dump tunnel
- The updated configuration with 4in aperture and the Al wall produced similar levels of radiation to the HRS platform

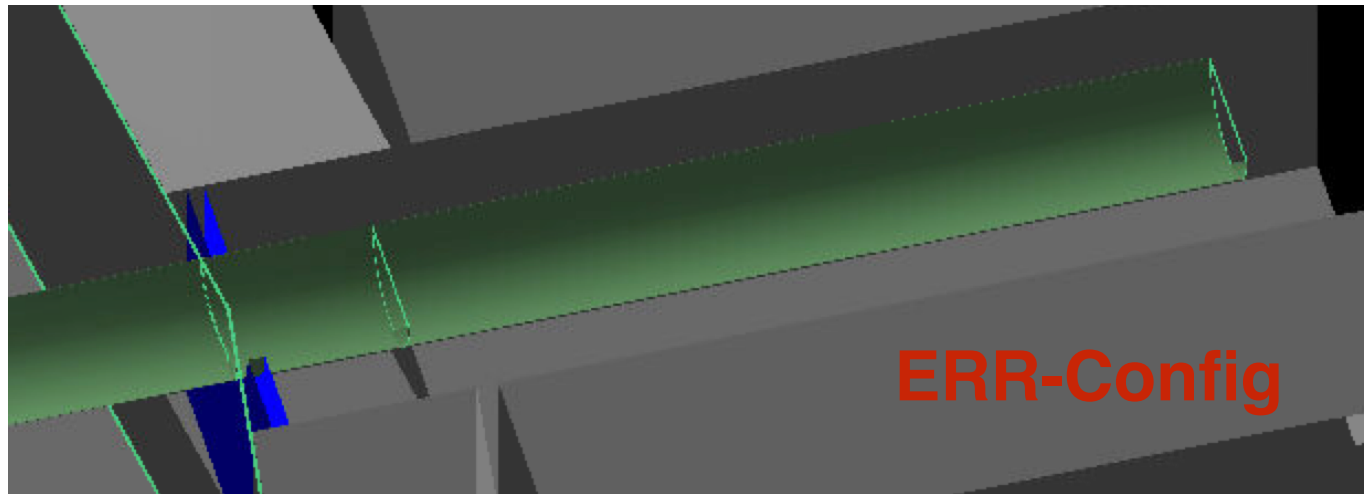
| | ERR | Update |
|--------------------|---------|---------|
| HRS rad [NEIL/cm2] | 2.3E+11 | 2.1E+11 |

ERR estimates

1MeV n_{eq} / cm²

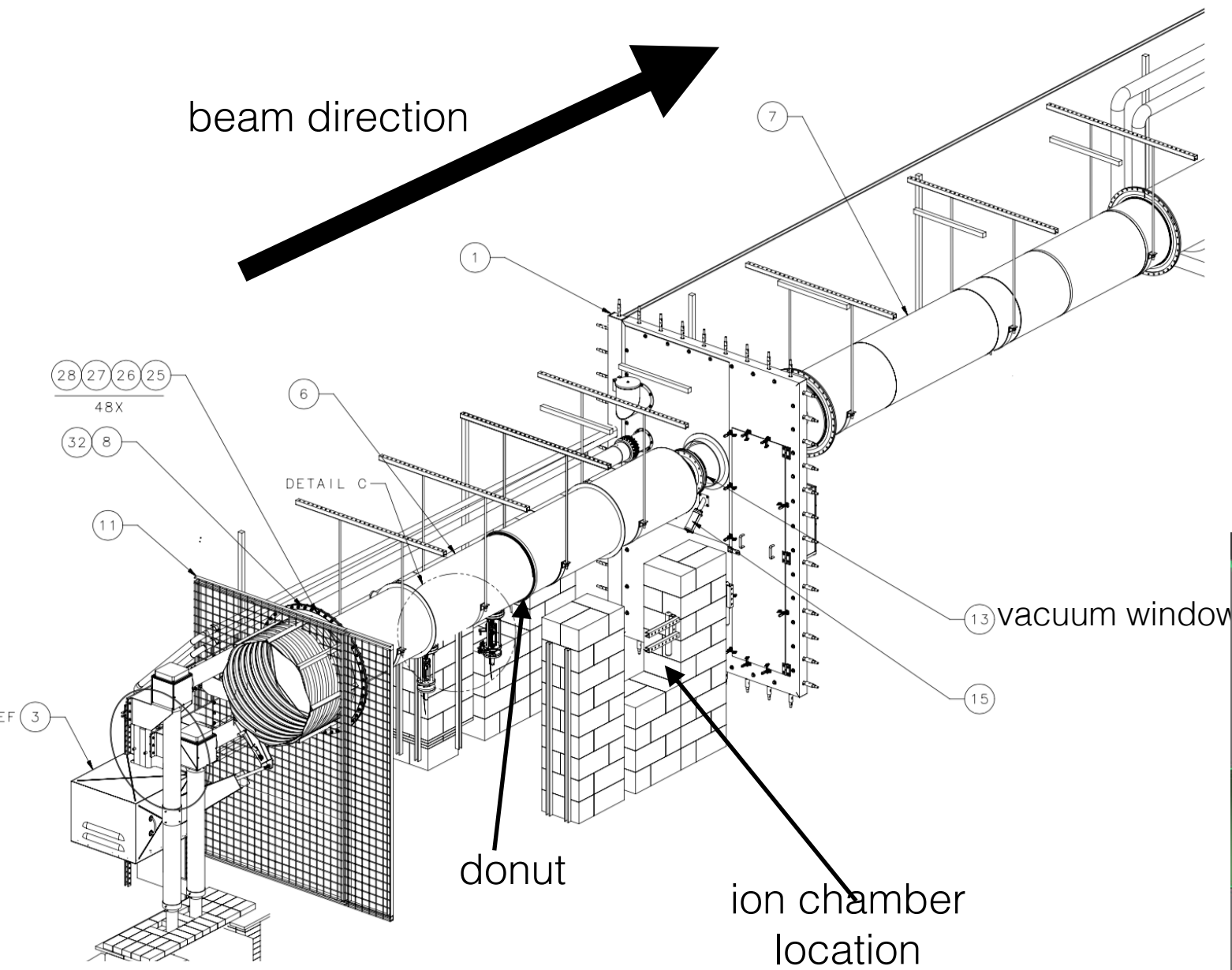
| HRS power supply | PREX-I | PREX-II | CREX | P2/P1 | CREX/P1 | P2/H2 | P2/PVDIS |
|------------------|----------------|----------------|----------------|-----------|------------|------------|------------|
| neutron | 1.0E+11 | 7.6E+09 | 1.5E+10 | 7% | 20% | 70% | 73% |
| electron | 1.2E+11 | 1.4E+10 | 2.1E+10 | 11% | 12% | 94% | 84% |
| total | 2.3E+11 | 2.1E+10 | 3.6E+10 | 9% | 16% | 83% | 80% |

NIEL thresholds: Semiconductor damage $\sim 10^{13}$, Optocoupler damage $\sim 10^{11}$

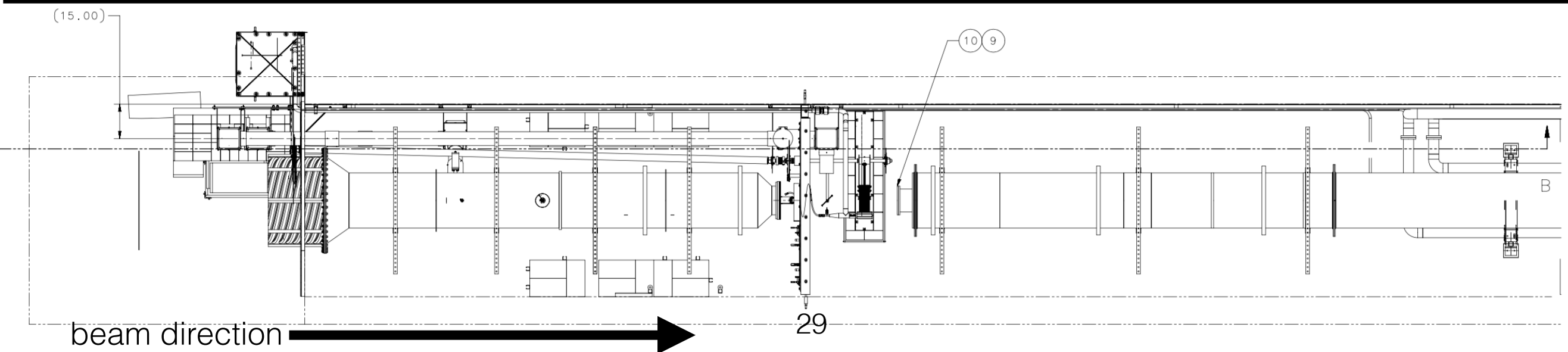
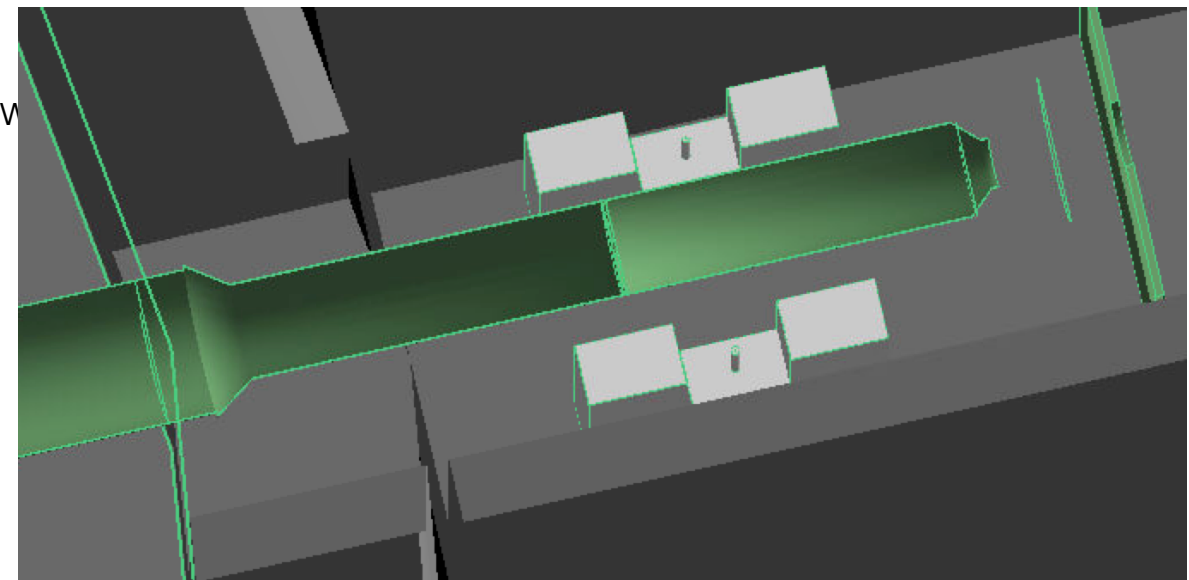


- Focus for design of PREX2 and CREX was successfully cleaning up the radiation from the target and collimator
- We used the same dump configuration for our simulations of PREX2 and CREX
 - We were unaware of changes made to the dump, so we expected our estimate to be reasonable

Current Hall A Dump configuration



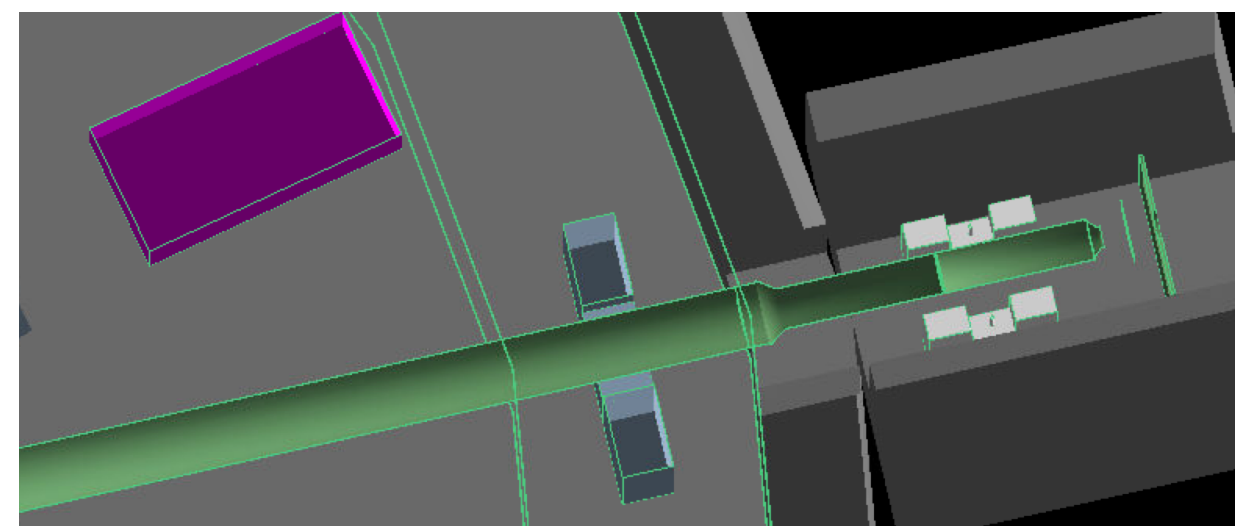
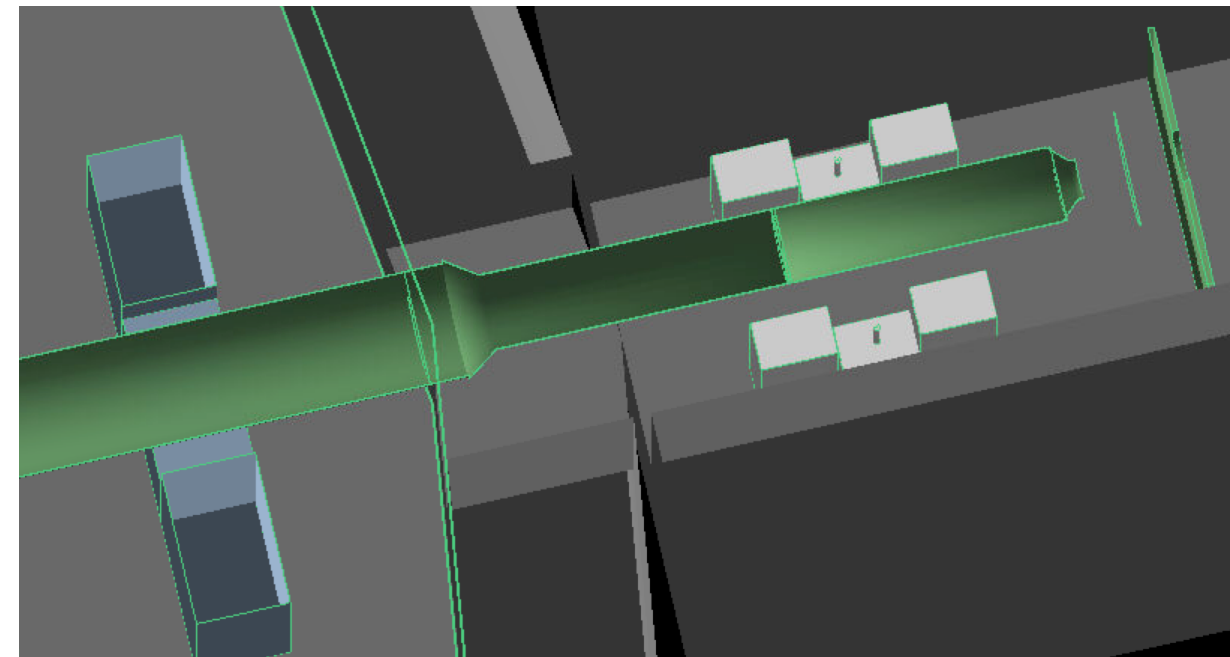
- For PREX2/CREX we will not need to use the diffuser
- We implemented the major features of the current design in the simulation
 - including the 4 cm Al aperture at ~midway until the Al door



Updated PREX2 and CREX estimates

| | P2/P1 (ERR) | C/P1 (ERR) | P2/P1 (now) | C/P1 (now) | C(4in)/ P1 | P2(2ft)/ P1 |
|--------------------|----------------|---------------|----------------|---------------|---------------|----------------|
| ratio to PREX 1 | 0.09 | 0.16 | 1.25 | 0.84 | 0.20 | 0.33 |

- The current dump configuration presents 2 problems:
 - the neck down intercepts scattered electrons (this is a problem for PREX2)
 - the aperture intercepts significantly more electrons than in the previous configuration (part of the problem for PREX2, the big issue for CREX)
- Increasing the aperture by ~6 cm (to the old 4in level) the CREX problem is basically solved
- Adding 2 feet of concrete to block the entire line of sight to the HRS detector reduces the PREX2 dose significantly
 - This base shielding design would be possible within the geometrical constraints inside the hall @12.5 deg



Conclusions and optimization plans

- The current dump configuration has the potential to produce significant radiation doses to the HRS electronics platform
- We have identified a 0th order mitigation scheme
 - optimization will follow (material, position, size)
- We plan to add the rest of the dump in the simulation to ensure nothing else could cause an issue

Radiation - entire run values

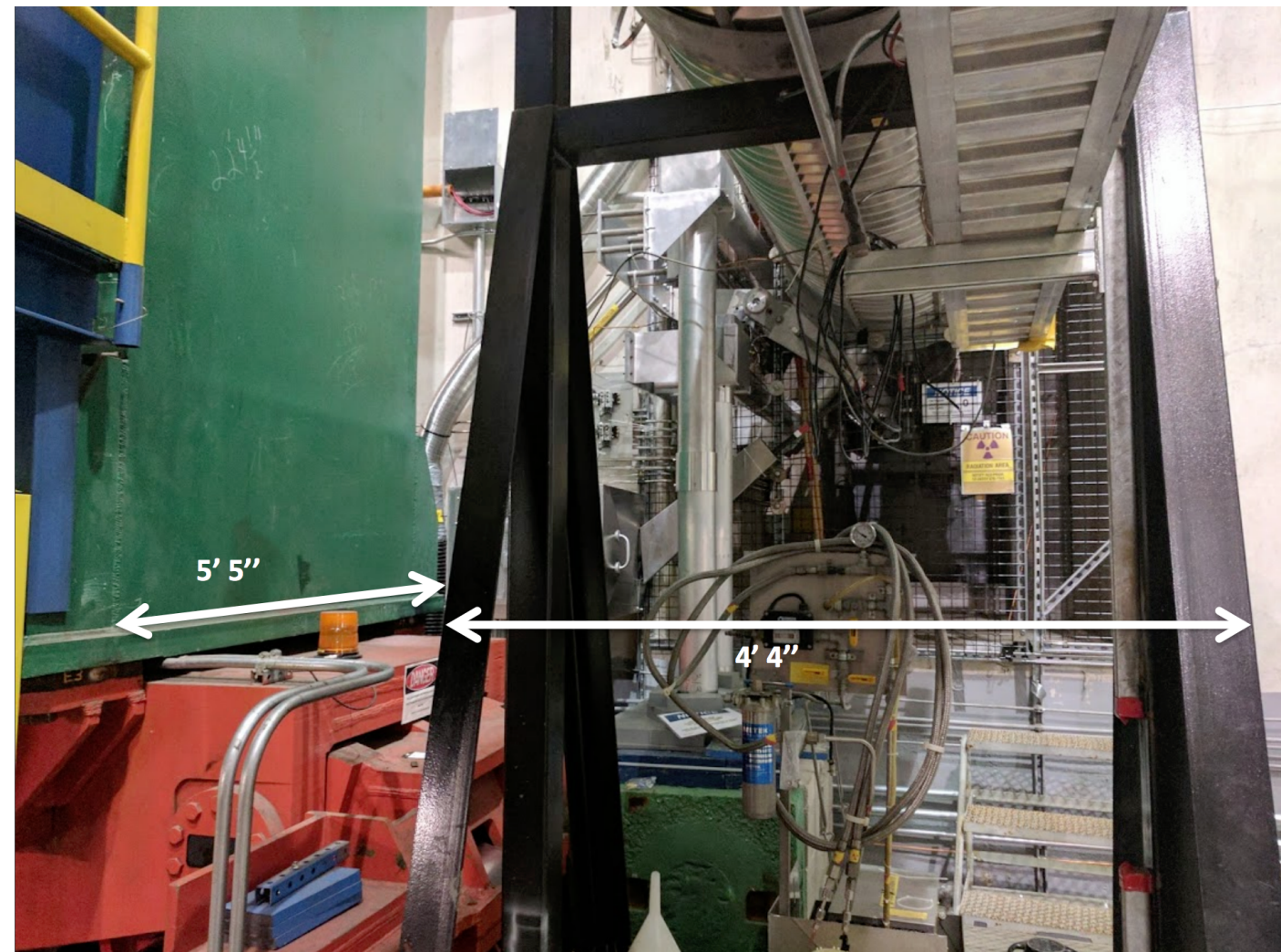
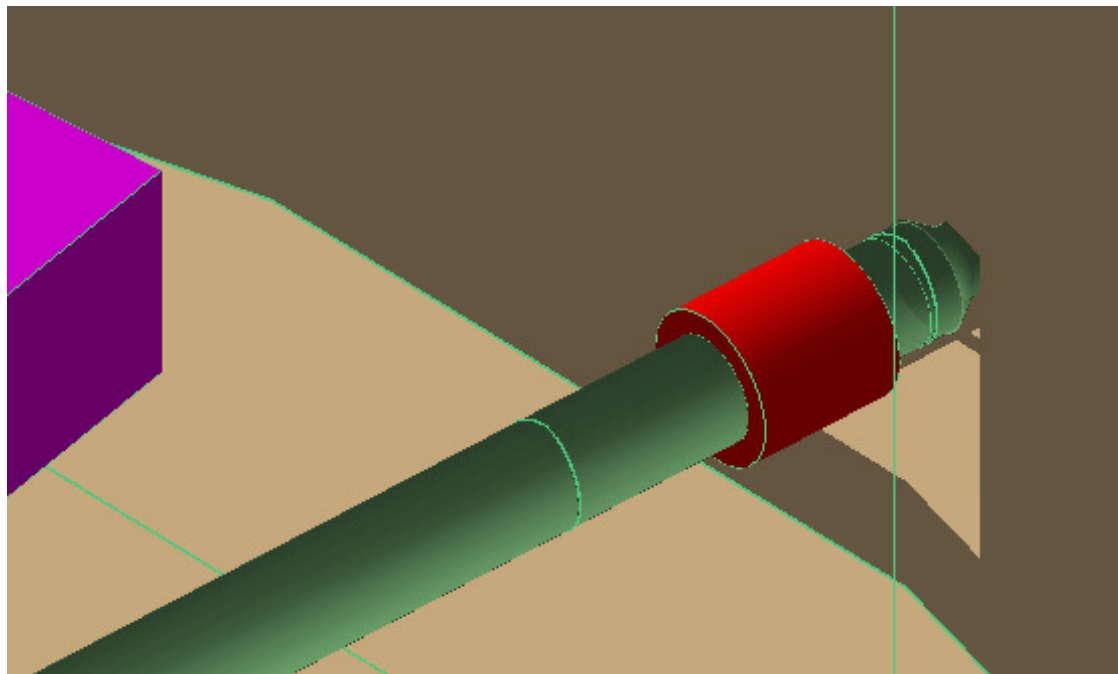
| | HRS detector | | | | Under detector | | | |
|-------------------------------|----------------|----------|-------------|--------|----------------|----------|-------------|--------|
| | Total NEIL/cm2 | uncert | Ratio to P1 | uncert | Total NEIL/cm2 | uncert | Ratio to P1 | uncert |
| PREX1 (ERR dump) | 4.60E+10 | 1.79E+09 | 1.00 | 0.06 | 7.43E+10 | 4.92E+09 | 1.00 | 0.09 |
| PREX1 (actual dump) | 4.05E+10 | 1.68E+09 | 0.88 | 0.05 | 7.78E+10 | 5.39E+09 | 1.05 | 0.10 |
| PREX2 ERR | 4.96E+09 | 6.72E+08 | 0.11 | 0.02 | 1.09E+10 | 2.61E+09 | 0.15 | 0.04 |
| PREX2 current | 5.77E+10 | 5.69E+09 | 1.25 | 0.13 | 7.60E+10 | 1.85E+10 | 1.02 | 0.26 |
| P2 with P1pipe | 2.12E+10 | 3.38E+09 | 0.46 | 0.08 | 4.39E+10 | 1.31E+10 | 0.59 | 0.18 |
| P2 current+4in | 4.46E+10 | 4.64E+09 | 0.97 | 0.11 | 6.68E+10 | 1.45E+10 | 0.90 | 0.20 |
| P2 current+Conc | 2.38E+10 | 3.44E+09 | 0.52 | 0.08 | 2.76E+10 | 1.04E+10 | 0.37 | 0.14 |
| P2 current+ (Conc*2) | 1.54E+10 | 1.81E+09 | 0.33 | 0.04 | 1.72E+10 | 4.07E+09 | 0.23 | 0.06 |
| P2 current+ (Conc*0.5) | 2.70E+10 | 2.63E+09 | 0.59 | 0.06 | 2.40E+10 | 6.13E+09 | 0.32 | 0.09 |
| P2 current+Poly | 2.19E+10 | 3.09E+09 | 0.48 | 0.07 | 5.40E+10 | 1.59E+10 | 0.73 | 0.22 |
| P2 current+4in+1ftCont | 1.83E+10 | 2.84E+09 | 0.40 | 0.06 | 2.69E+10 | 7.95E+09 | 0.36 | 0.11 |
| P2 current + donut shield | 5.27E+10 | 5.61E+09 | 1.15 | 0.13 | 8.28E+10 | 1.98E+10 | 1.11 | 0.28 |
| CREX ERR | 6.73E+09 | 2.05E+09 | 0.15 | 0.04 | 1.31E+10 | 6.57E+09 | 0.18 | 0.09 |
| C5 current | 3.86E+10 | 7.80E+09 | 0.84 | 0.17 | 4.70E+10 | 1.96E+10 | 0.63 | 0.27 |
| C5 current+4in | 9.86E+09 | 2.61E+09 | 0.21 | 0.06 | 3.80E+10 | 2.11E+10 | 0.51 | 0.29 |
| C5 P1pipe | 7.31E+10 | 1.12E+10 | 1.59 | 0.25 | 1.06E+11 | 3.38E+10 | 1.43 | 0.47 |
| C5 current+Conc | 2.23E+10 | 5.78E+09 | 0.49 | 0.13 | 3.21E+10 | 1.65E+10 | 0.43 | 0.22 |
| C5 current+(Conc*2) | 1.73E+10 | 3.23E+09 | 0.38 | 0.07 | 2.68E+10 | 1.00E+10 | 0.36 | 0.14 |
| C5 current+(Conc*0.5) | 1.70E+10 | 3.35E+09 | 0.37 | 0.07 | 1.09E+10 | 5.20E+09 | 0.15 | 0.07 |
| C5 current+Poly | 1.86E+10 | 5.13E+09 | 0.40 | 0.11 | 1.40E+10 | 1.01E+10 | 0.19 | 0.14 |
| C5 current+ 2Pipe septum | 3.85E+10 | 8.70E+09 | 0.84 | 0.19 | 9.65E+10 | 3.52E+10 | 1.30 | 0.48 |
| C5 current+ 4in+1ftConc | 1.01E+10 | 3.28E+09 | 0.22 | 0.07 | 3.85E+10 | 2.35E+10 | 0.52 | 0.32 |
| C5 current+2Pipe+donut shield | 4.09E+10 | 7.86E+09 | 0.89 | 0.17 | 4.73E+10 | 2.41E+10 | 0.64 | 0.33 |

Area for HRS det: 4e5 cm²
Area for Under det: 6e4 cm²

PREX2 - comparison

current setup + donut shield:

- * 131 cm in z
- * 20 cm in r (46 to 66 cm)
- * DS edge ~50 cm from the edge of the hall (would require some refinement to fit in)

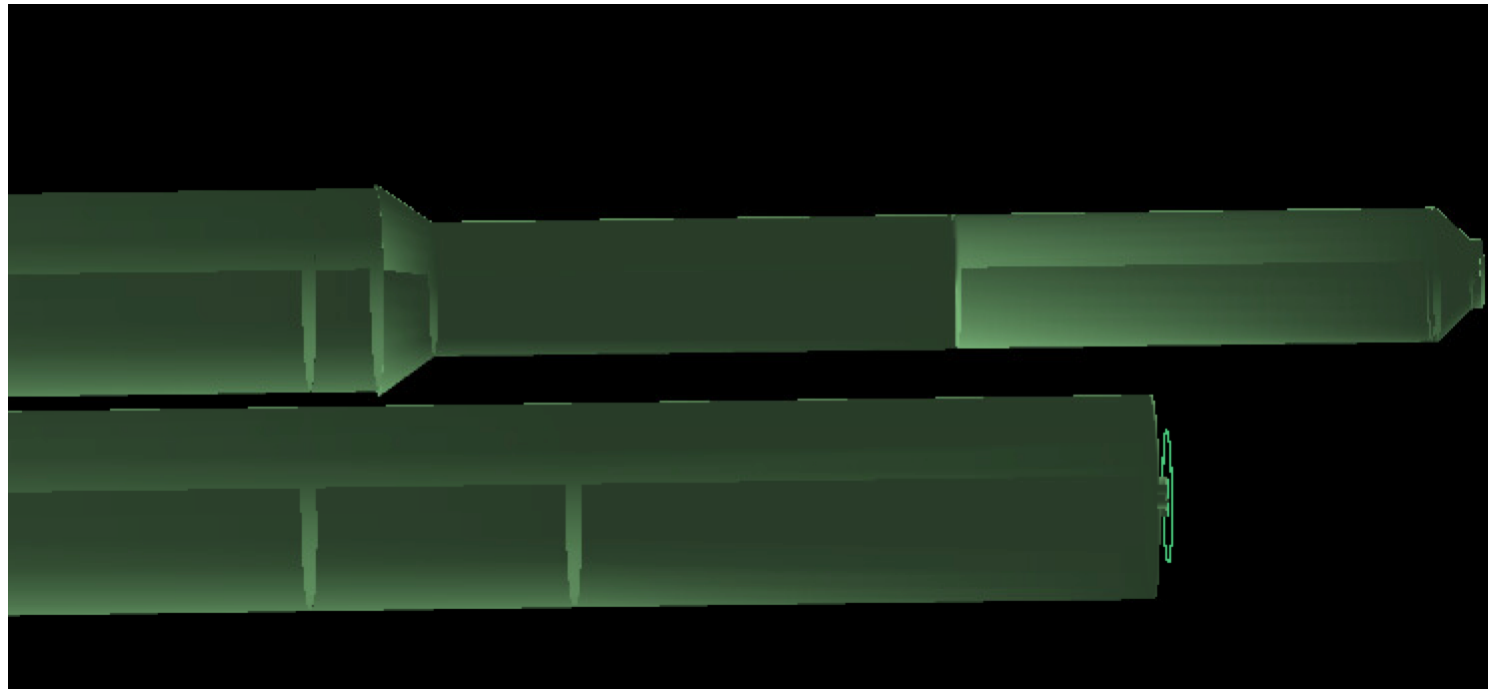


!

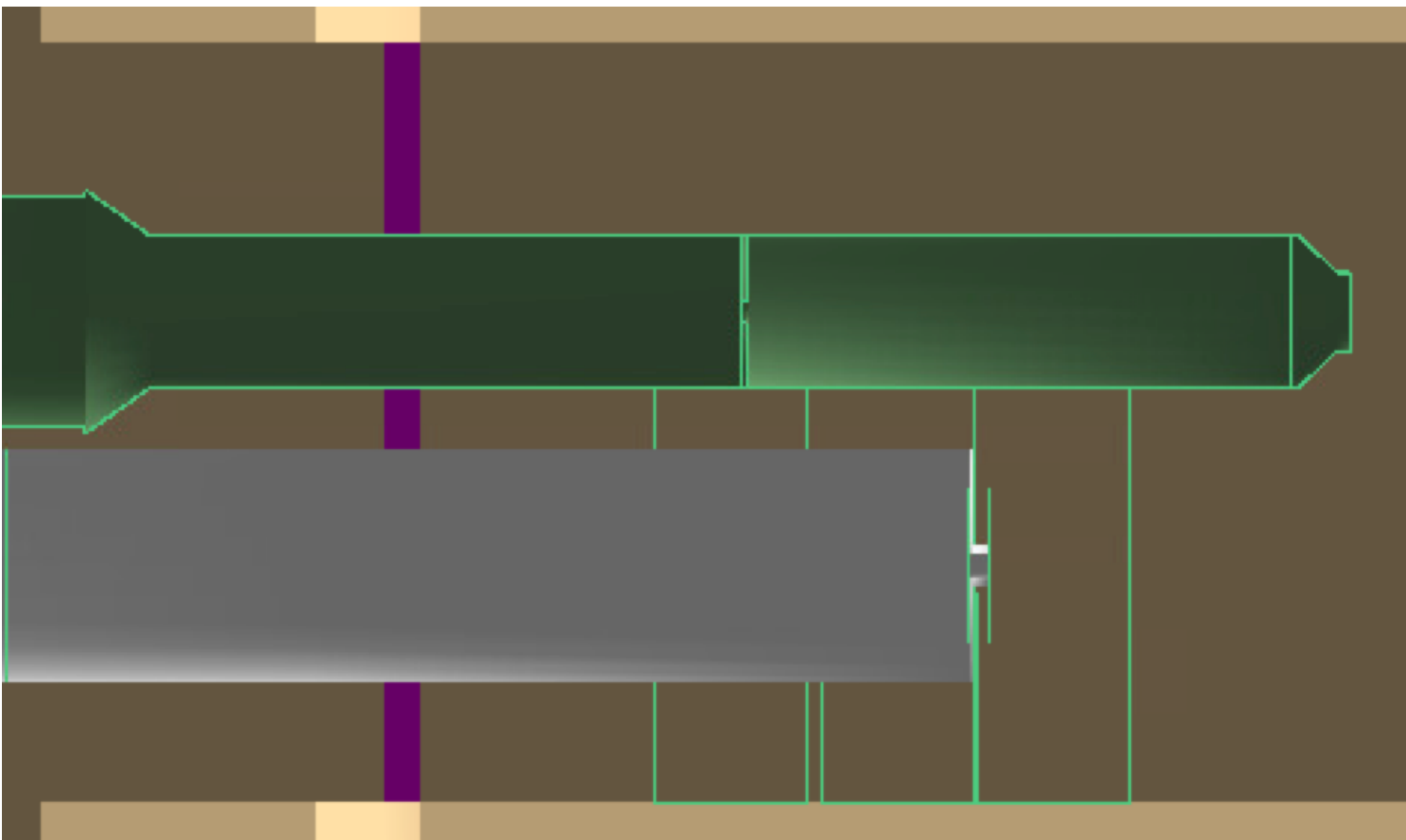


-

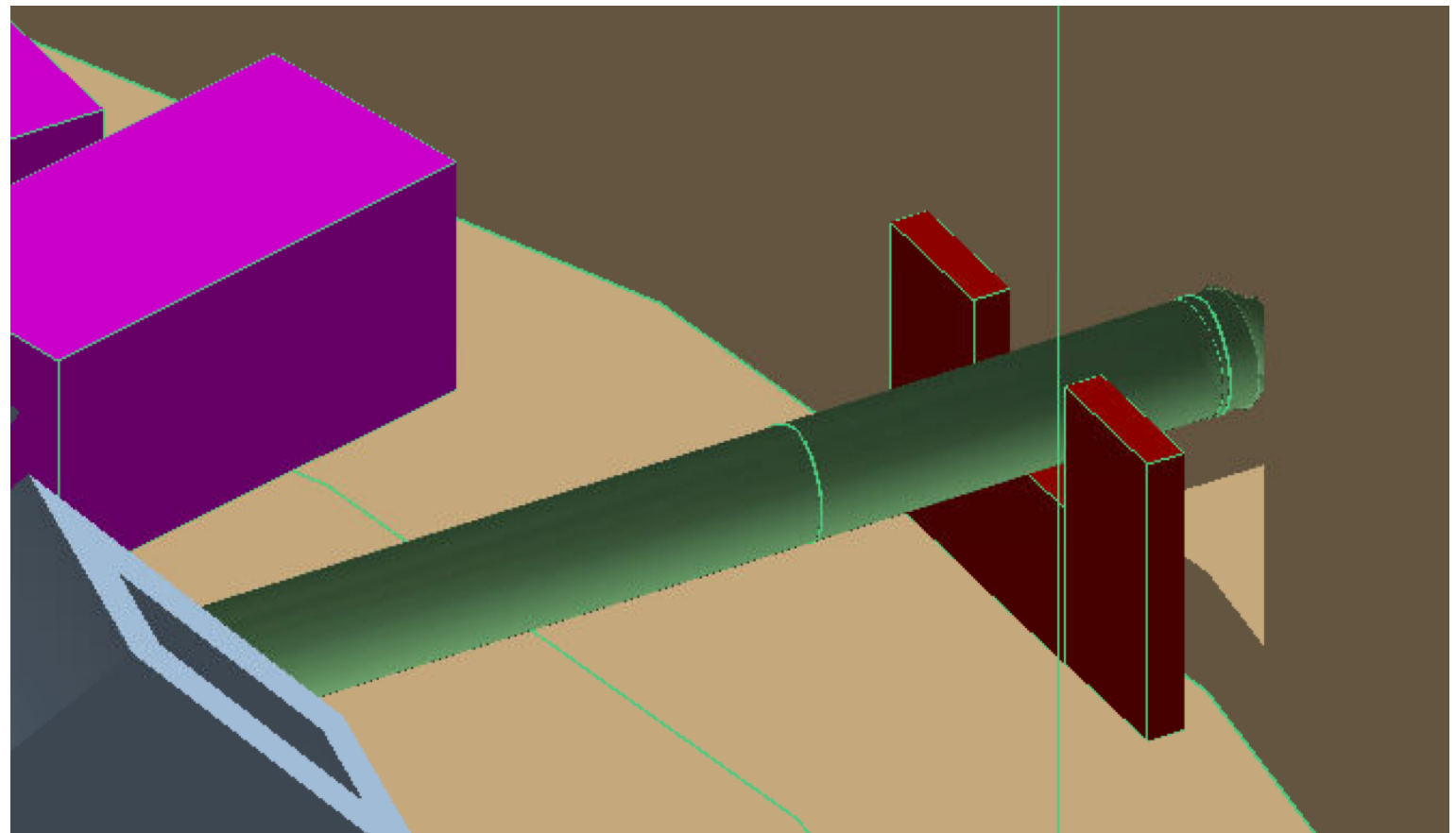
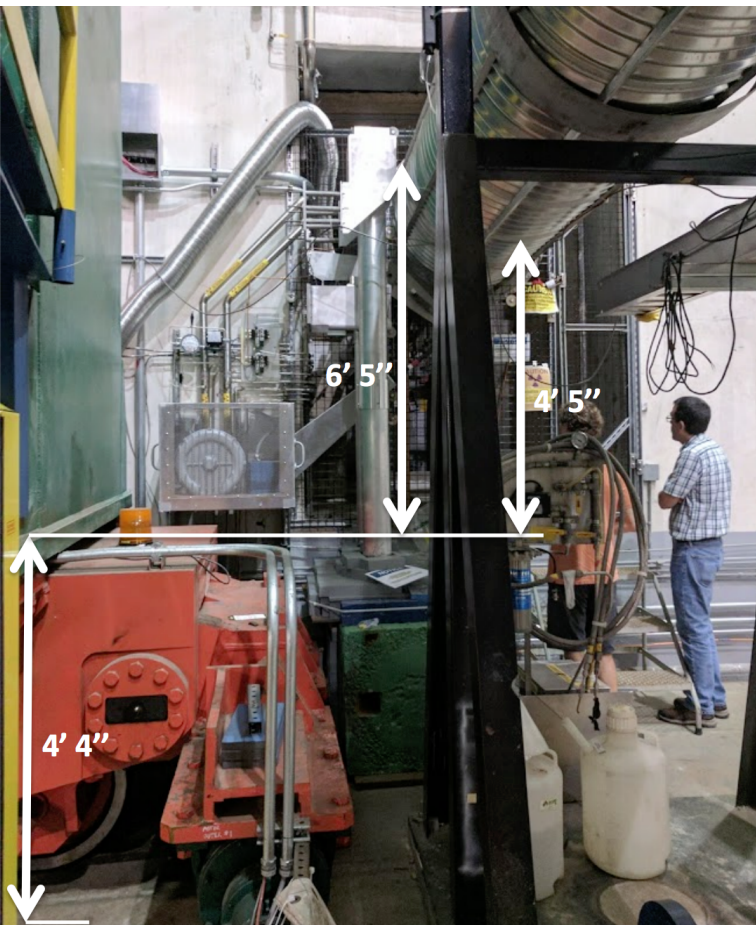
GDML implementation



- Furthermore Kent noticed that the neck down in my configuration didn't match the drawing (or reality)
- now the neck-down is right after the wall similarly to what we have in the hall

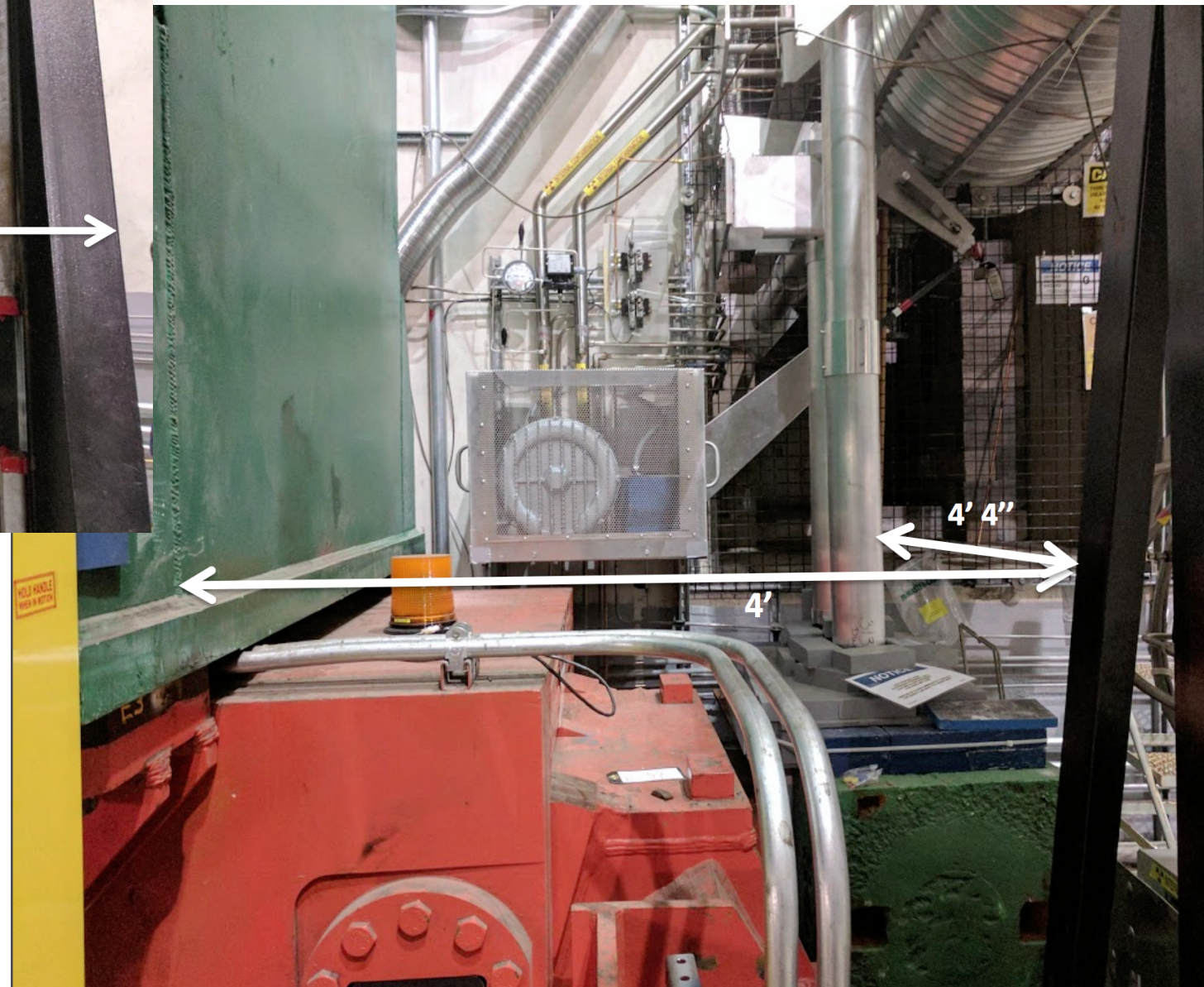
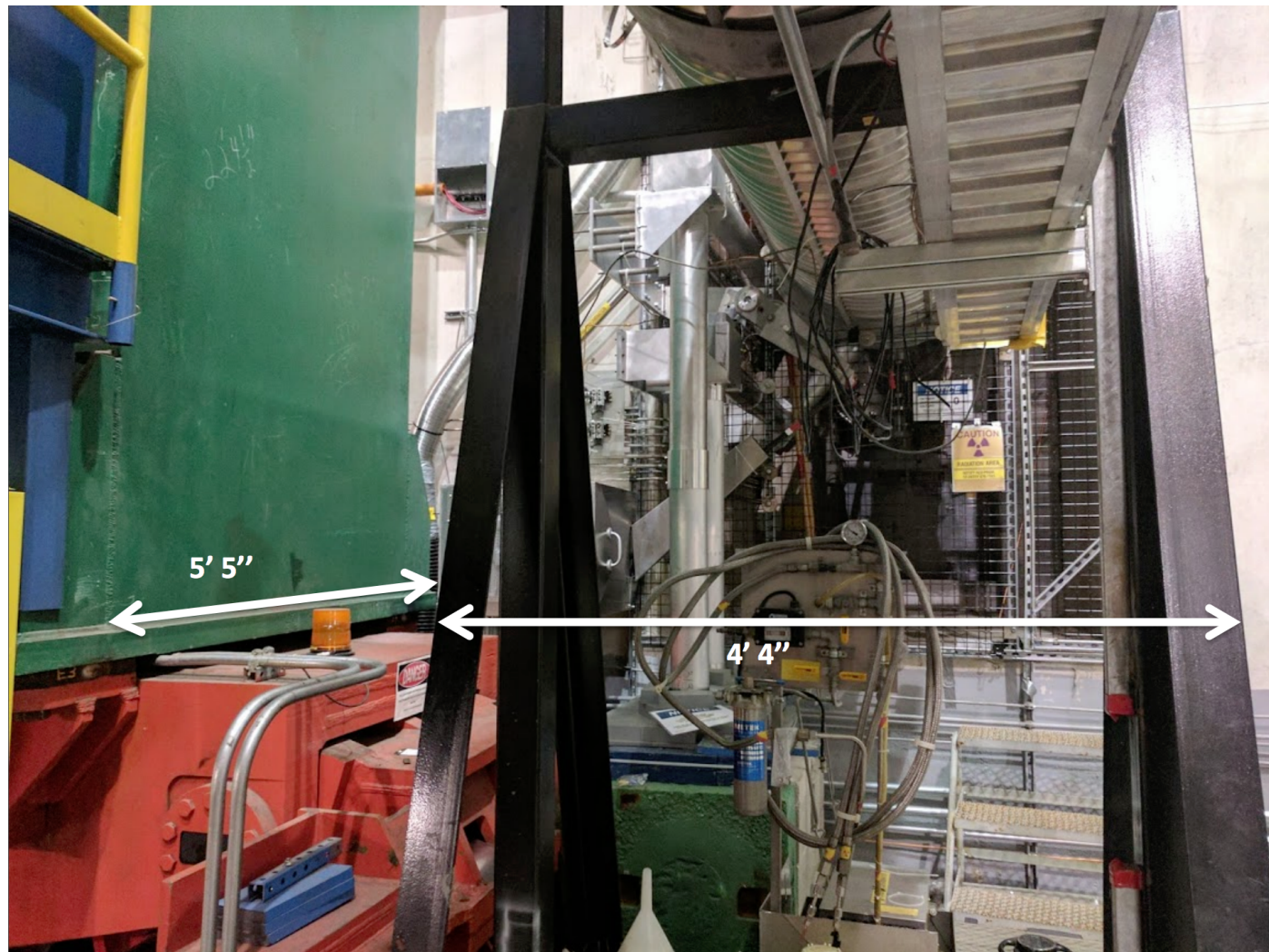


Shielding concept



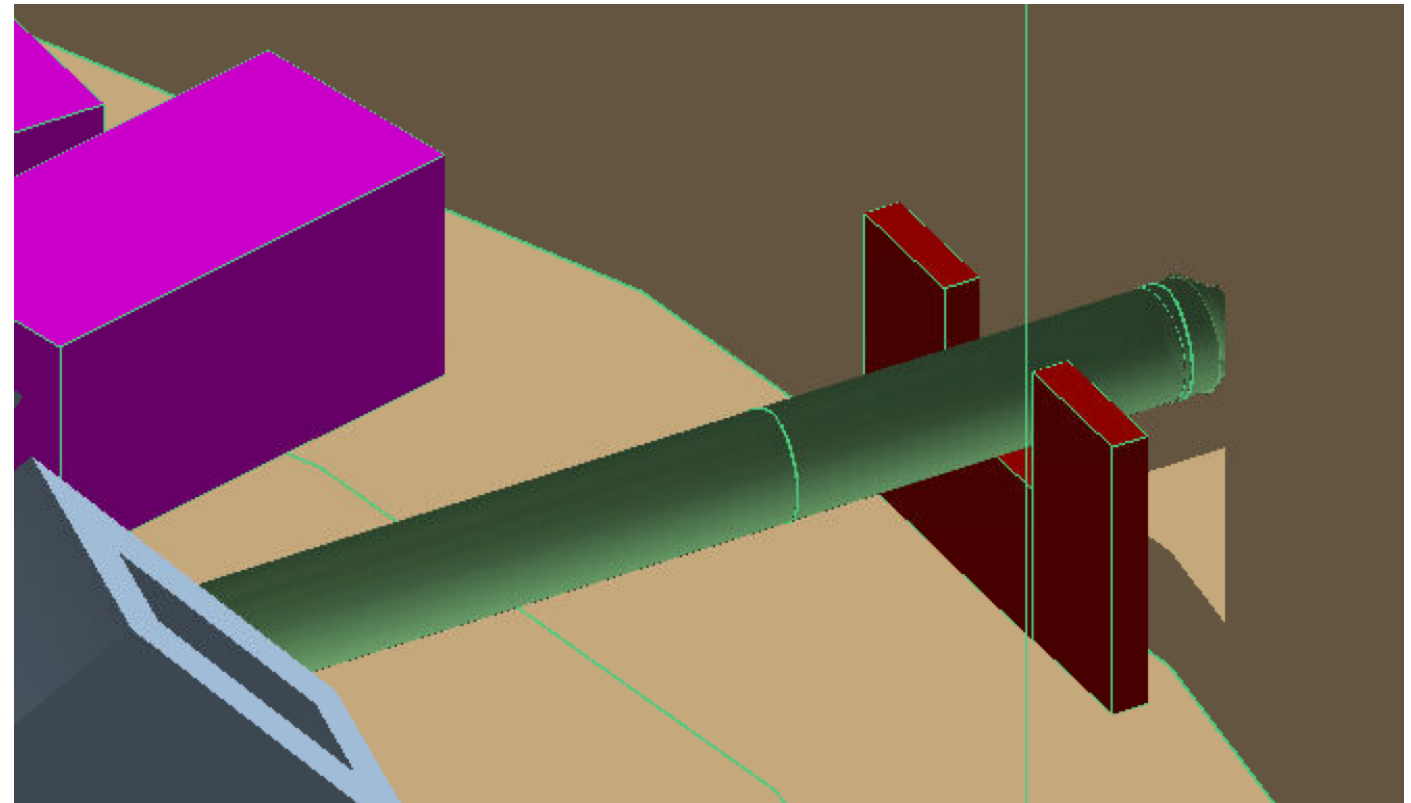
- Sanghwa, Dave and I went over to the hall and we made some measurement of the space available to us with the HRS parked in the 12.5 deg position
- I implemented 3 simple 1 foot thick shielding blocks in the simulation (ran for both concrete and Polyethylene)

Hall Configuration



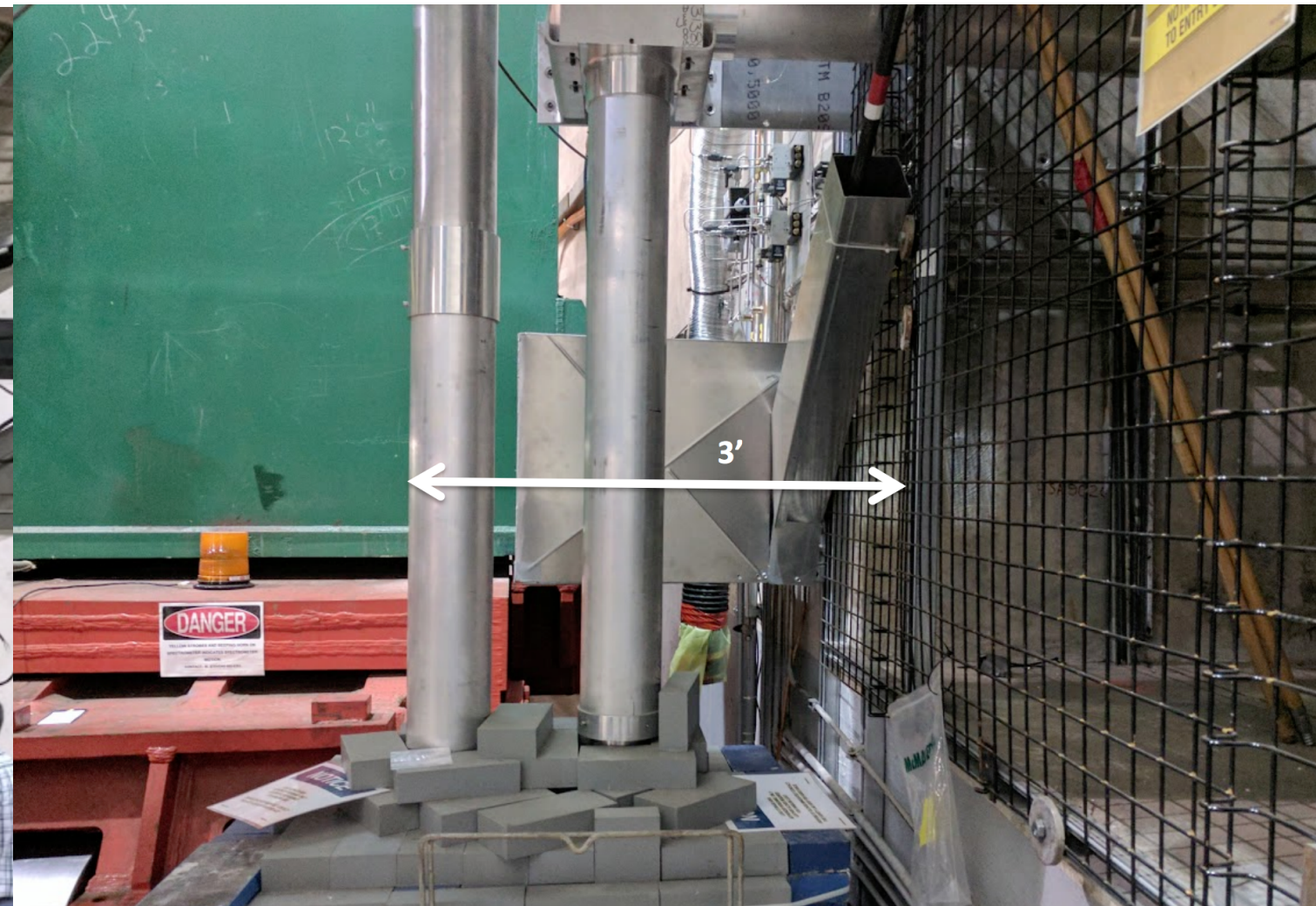
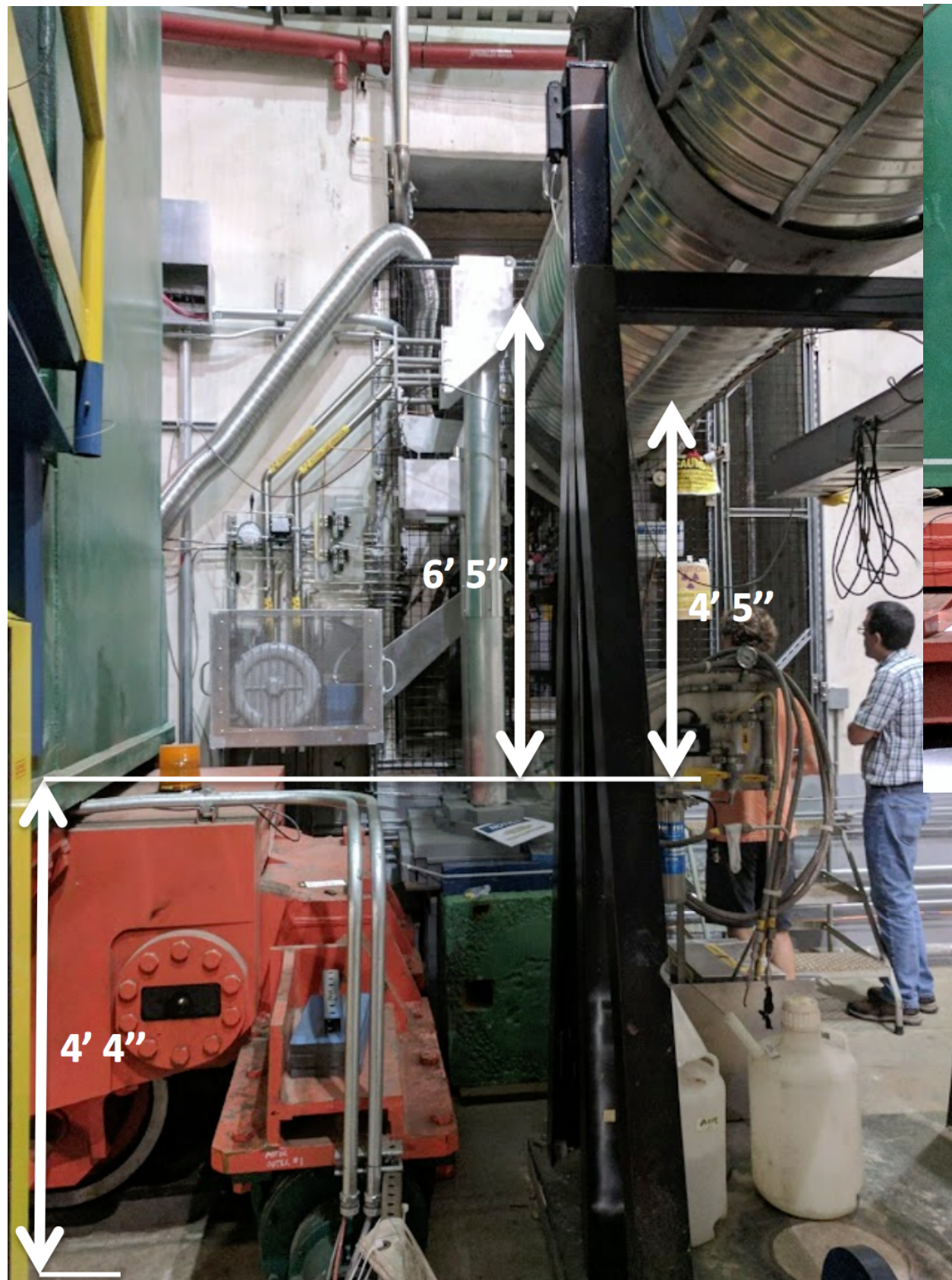
- 10 cm thick Steel wall (in green) is not present in our simulation

Hall Configuration



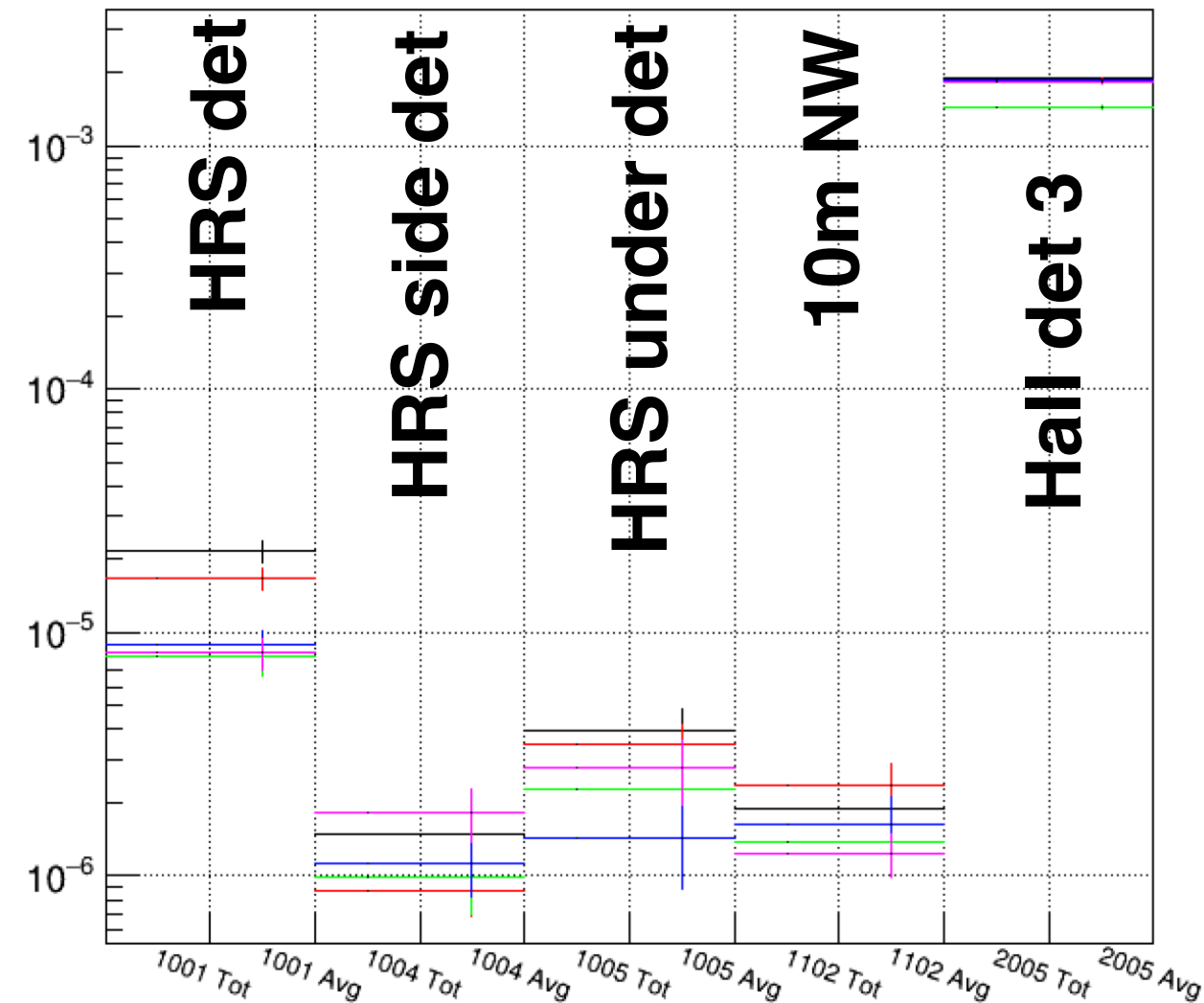
- 10 cm thick Steel wall (in green) is not present in our simulation
- moreover, the hrs “electronics box” we have now doesn’t cover the whole area where electronics exist and may be too forward

Hall Configuration



PREX2 - HRS rad damage

summary histogram per electron on target| neilLogX



Black: current setup

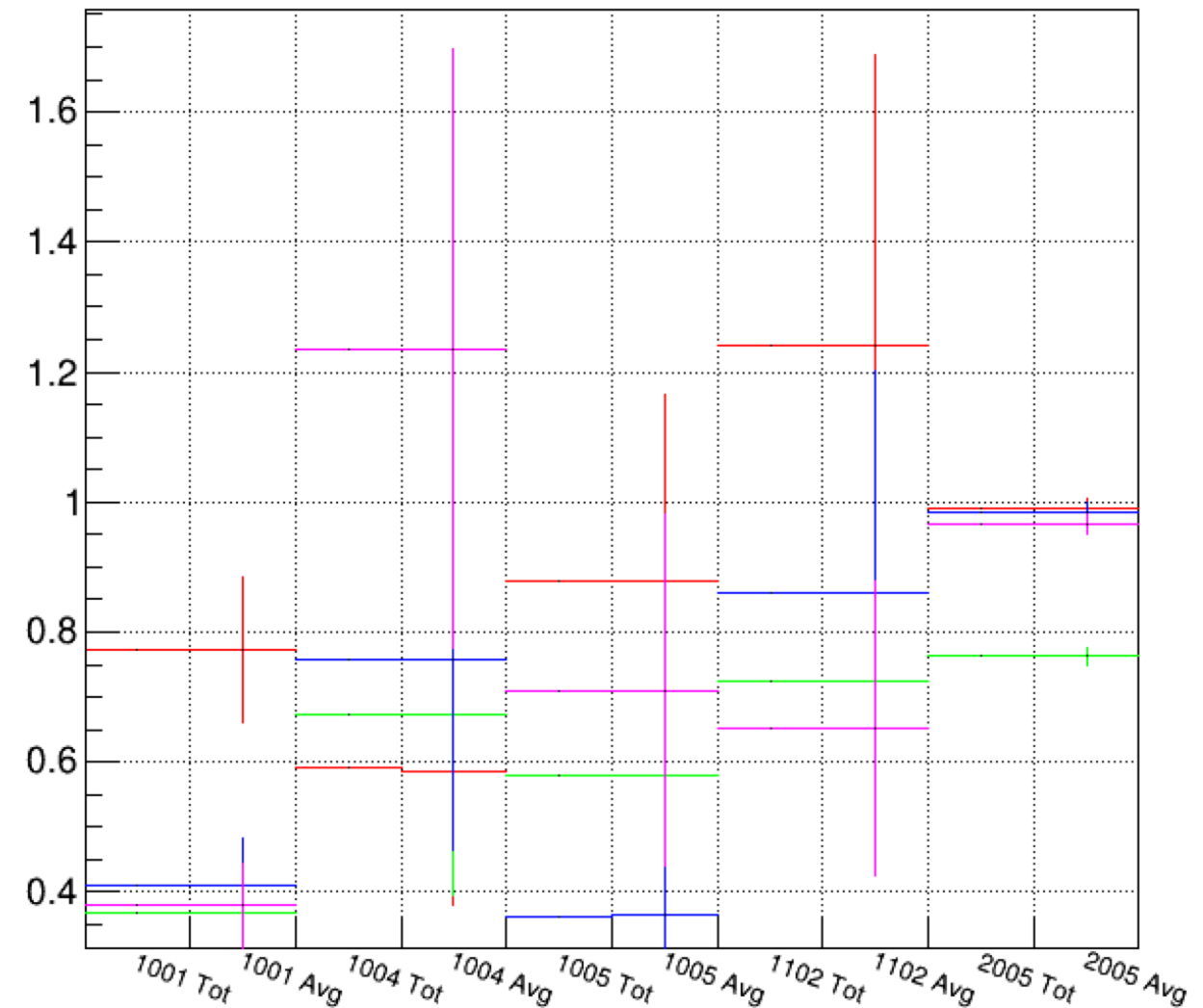
Red: current setup + 4 in donut

Green: PREX 1 dump

Blue: current setup + concrete Shield

Magenta: current setup + Poly Shield

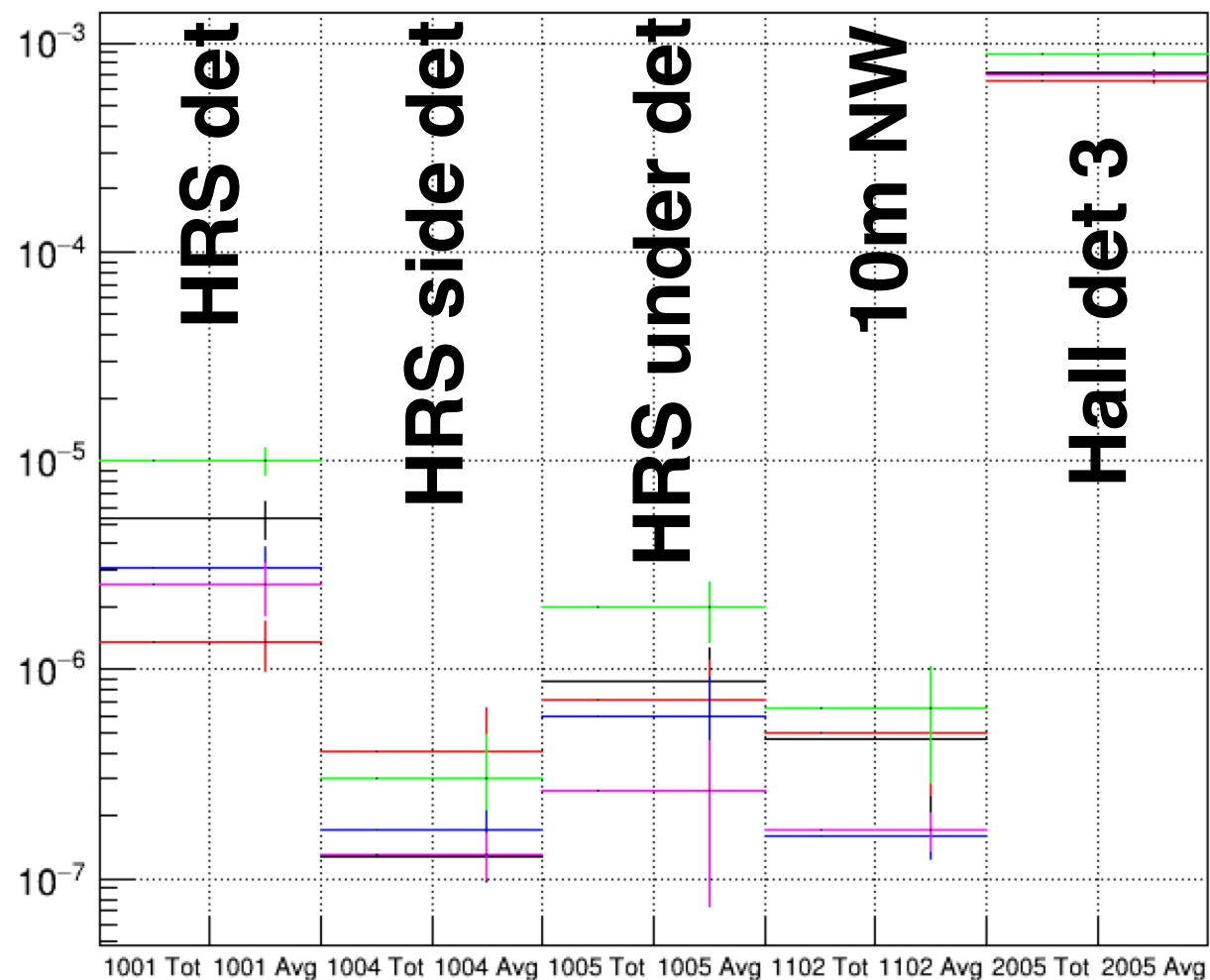
summary histogram per electron on target| neilLogX



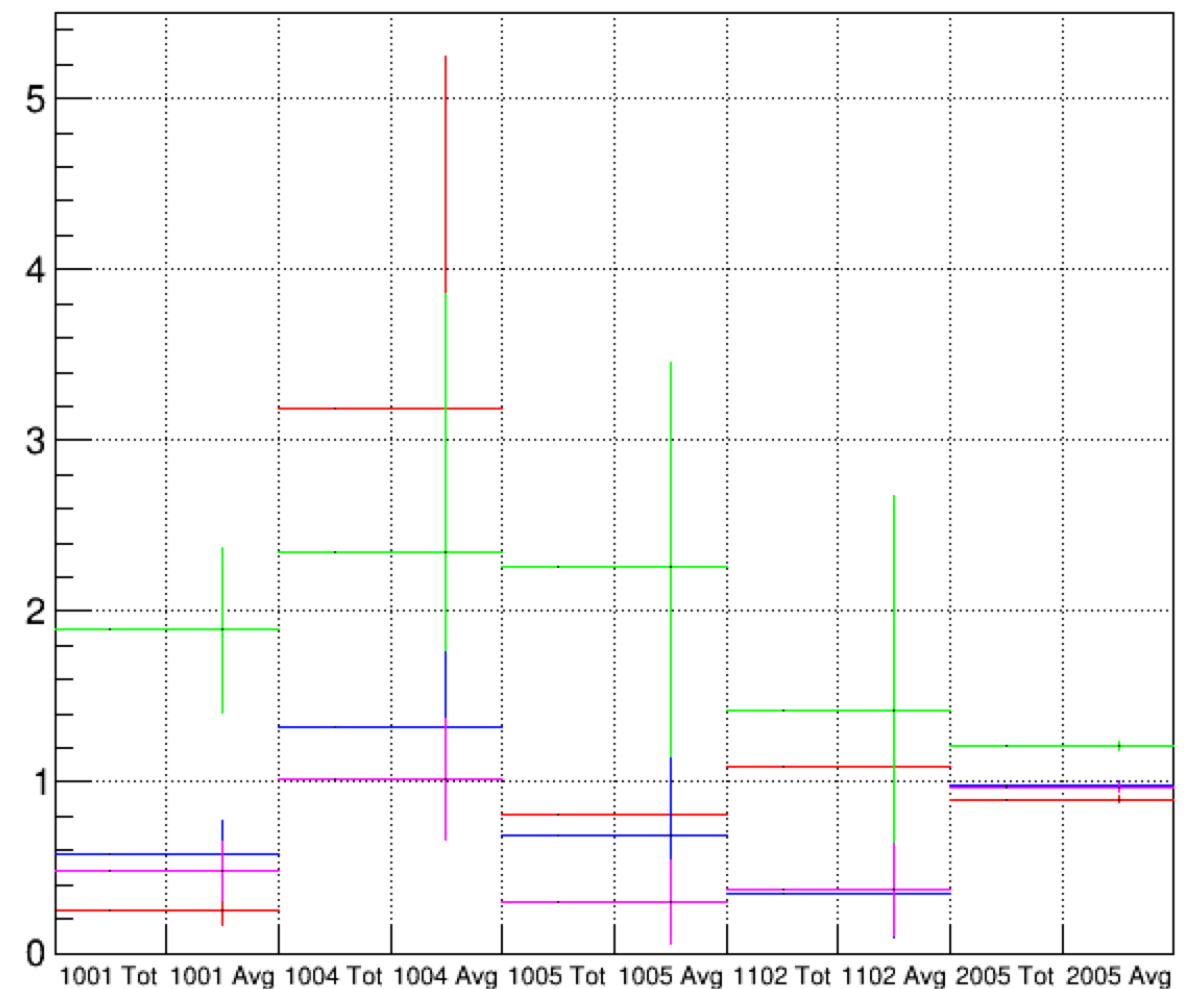
- Best configuration seems to be the PREX1 beam pipe, followed closely by the current pipe with shielding

CREX - HRS rad damage

summary histogram per electron on target| neilLogX



summary histogram per electron on target| neilLogX



Black: current setup

Red: current setup + 4 in donut

Green: PREX 1 dump

Blue: current setup + concrete Shield

Magenta: current setup + Poly Shield

- For CREX having a large aperture can provide significant improvement