

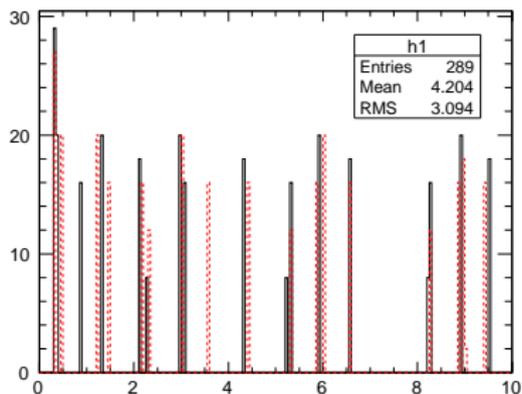
PMT position in Water Pool

Qing He

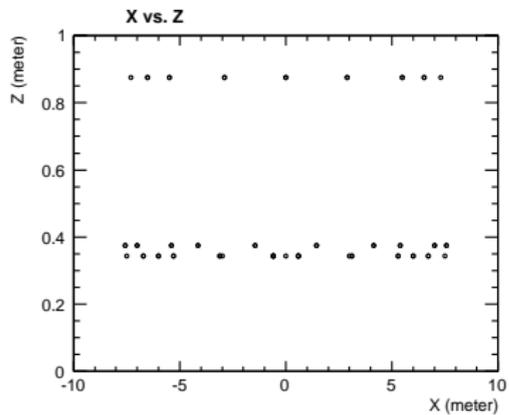
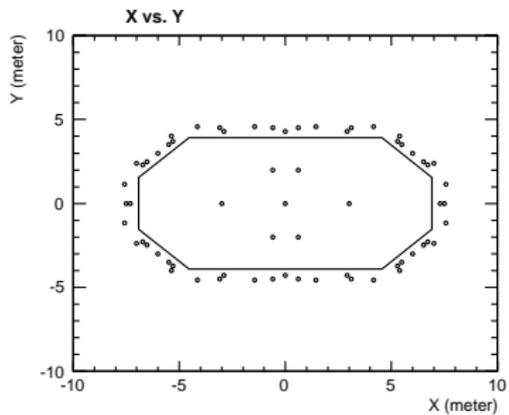
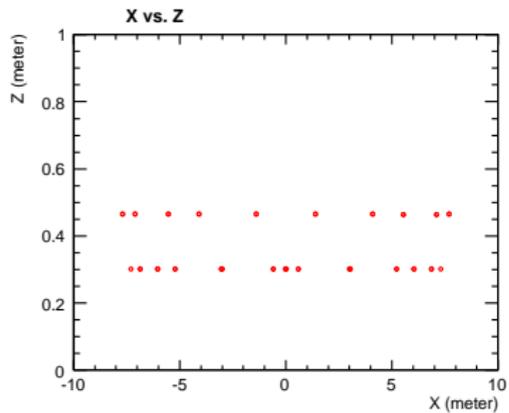
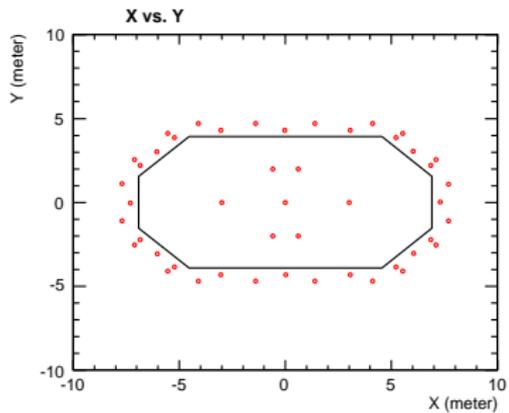
Princeton University

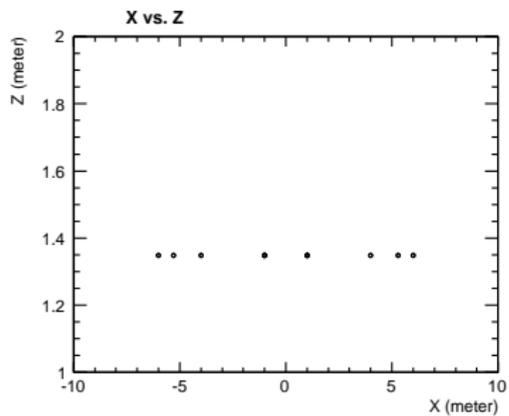
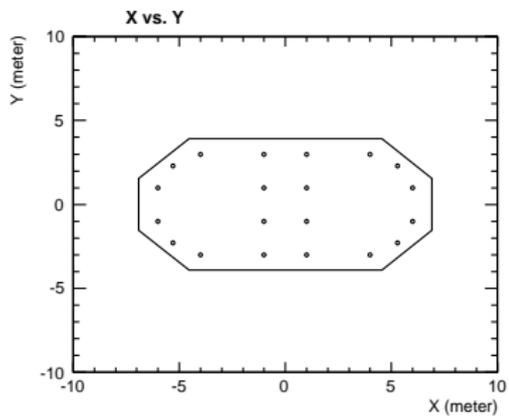
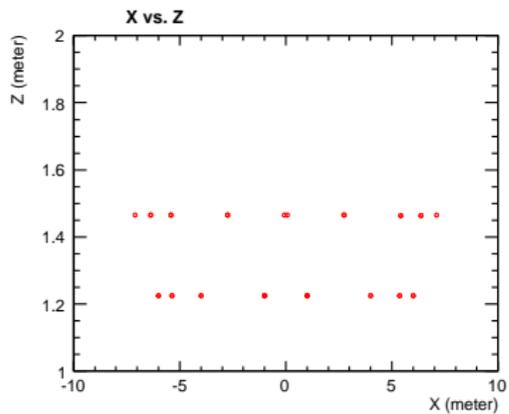
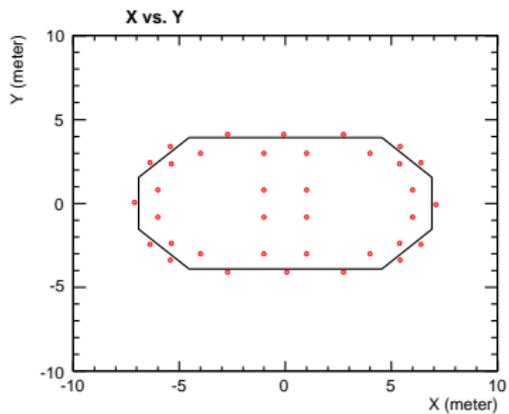
Dayabay Collaboration

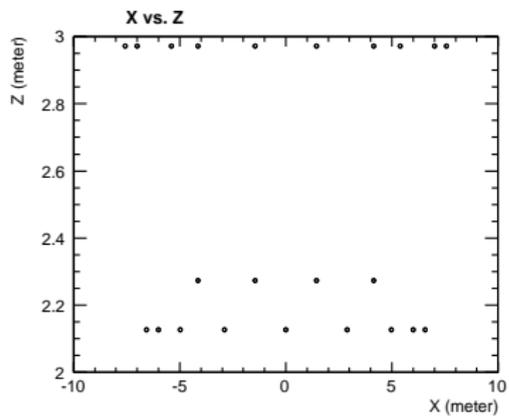
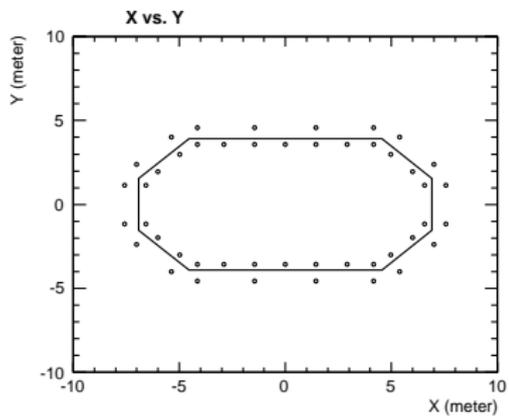
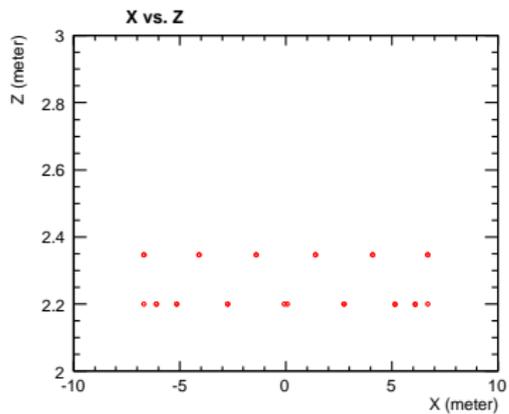
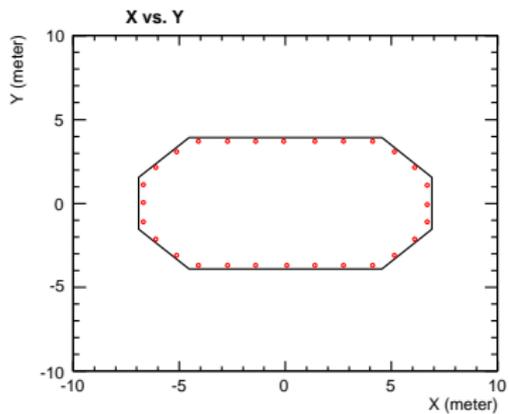
PMT position comparison

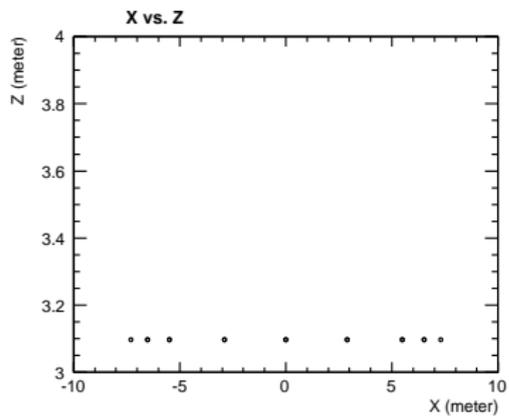
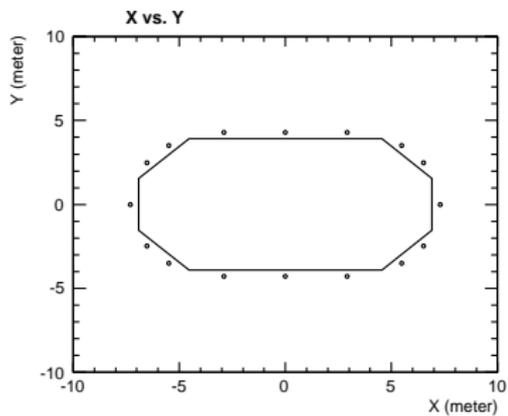
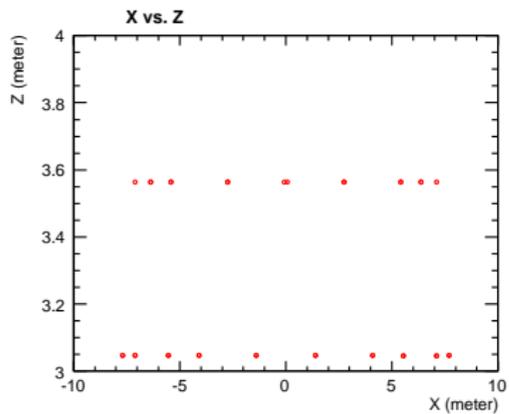
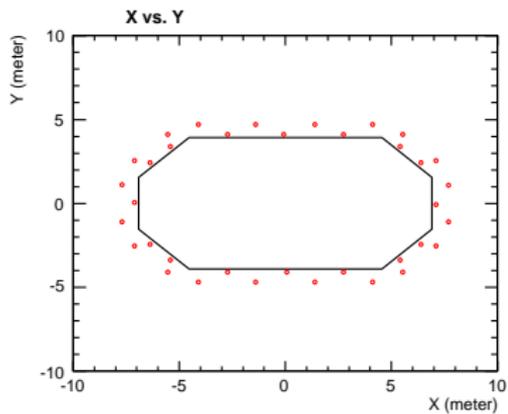


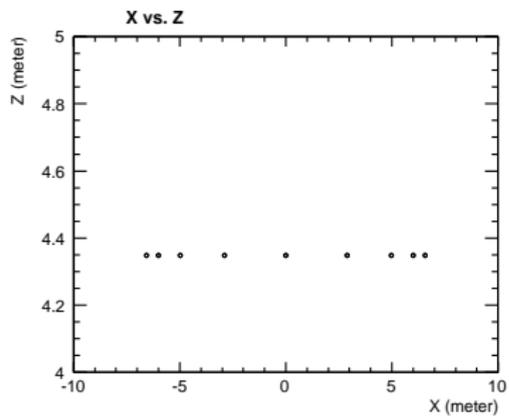
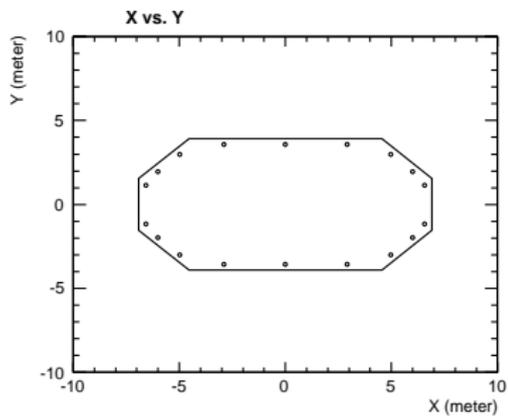
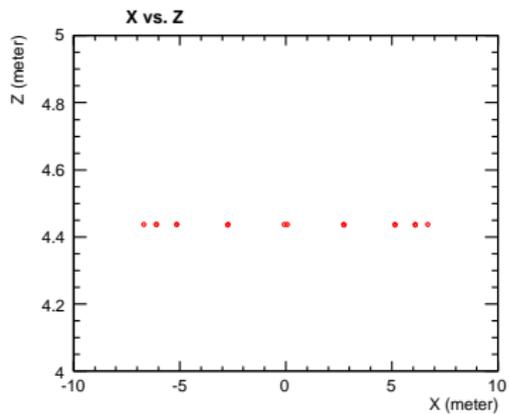
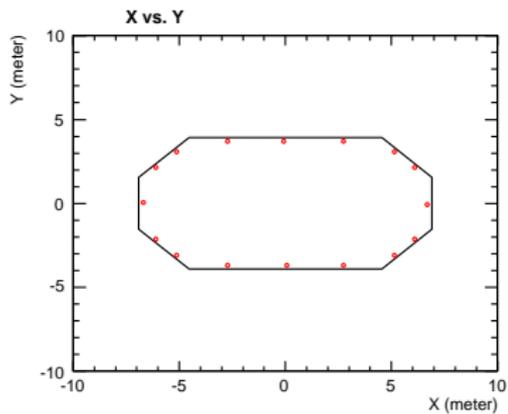
- PMT z position comparison (units: meter). 289 PMTs in NuWa, 291 PMTs in engineer's drawing.
- Black histogram: PMT positions in Nuwa
- Red: PMT positions in engineer's drawing

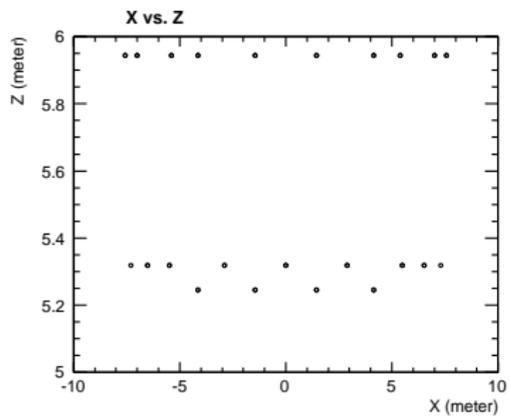
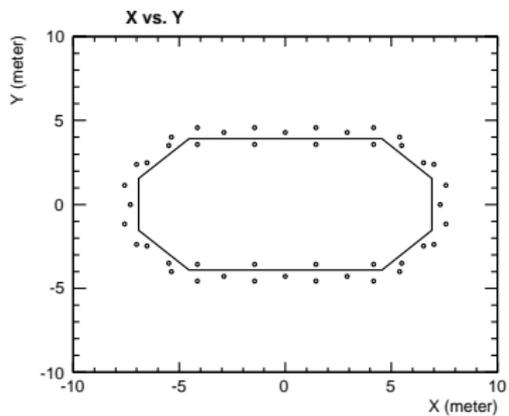
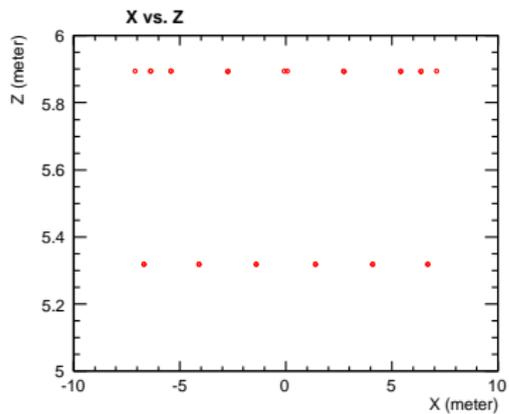
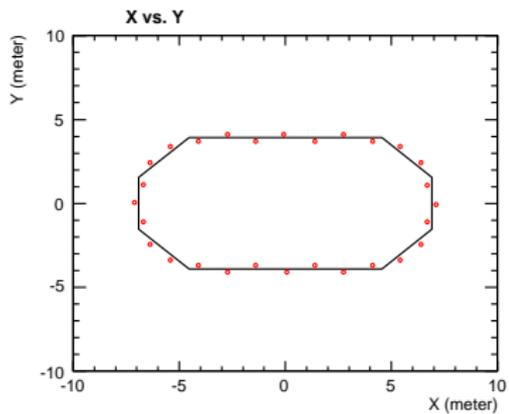


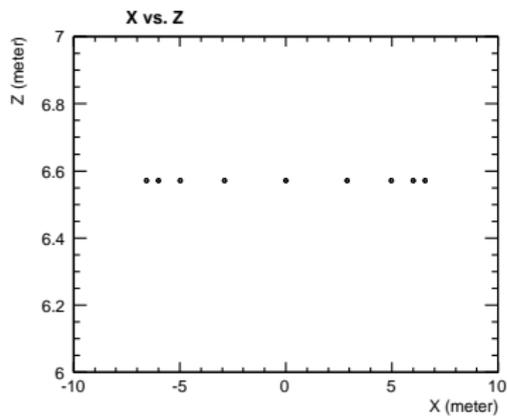
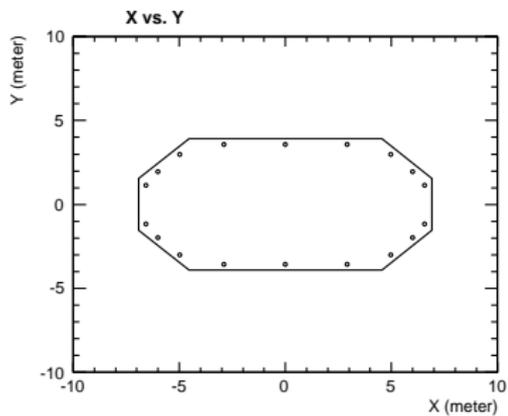
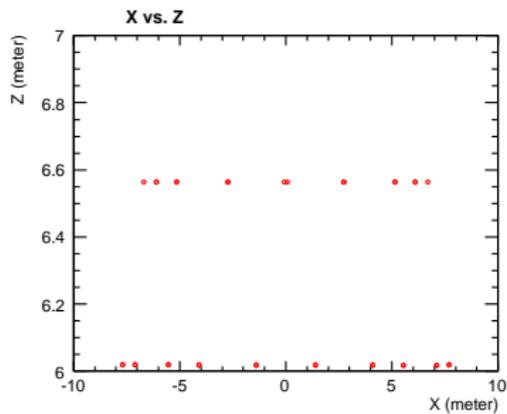
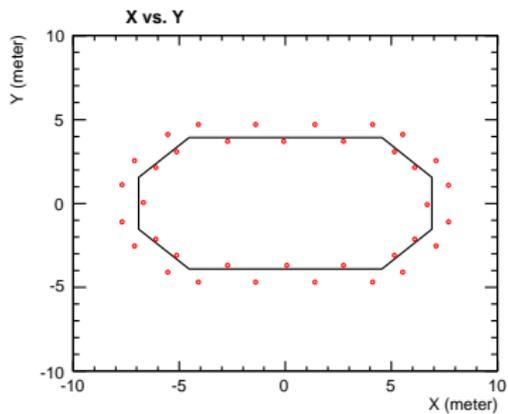


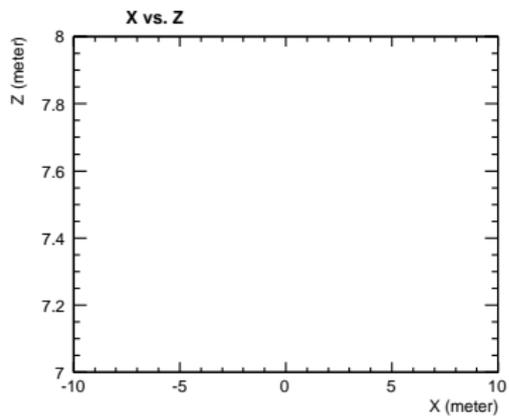
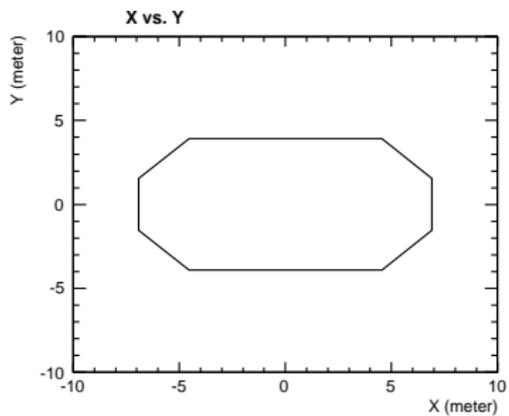
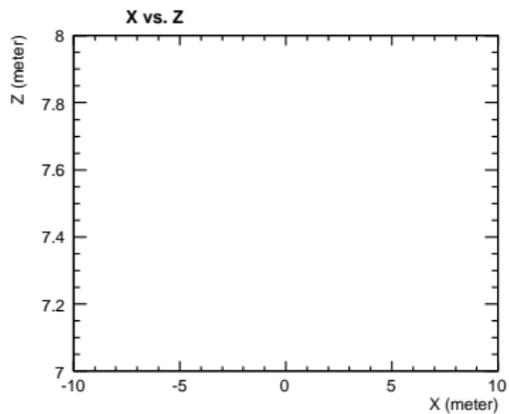
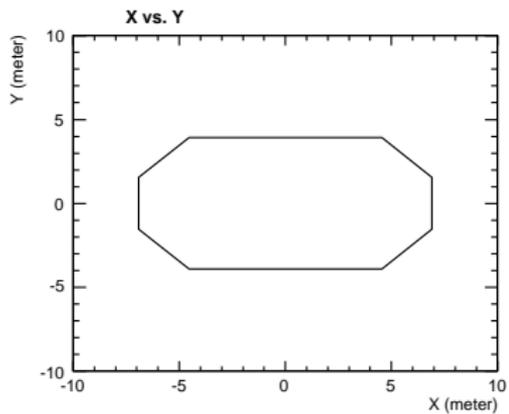


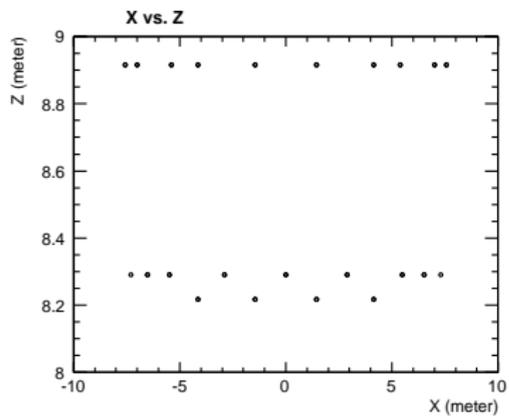
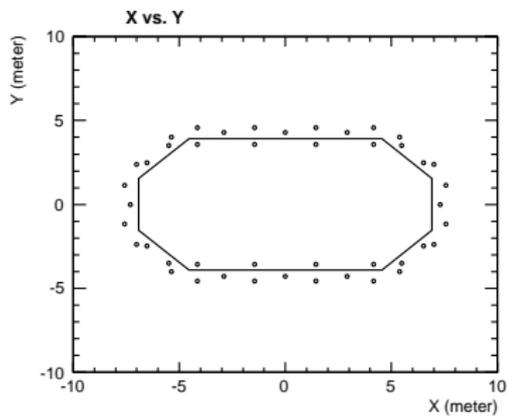
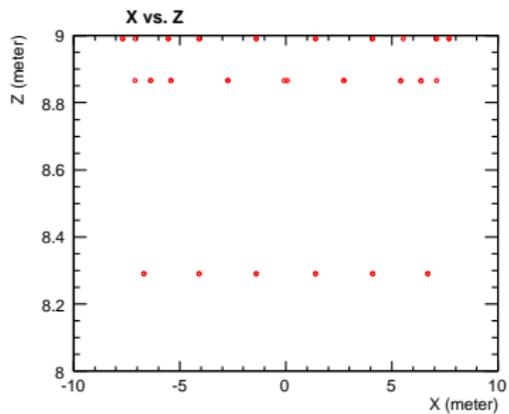
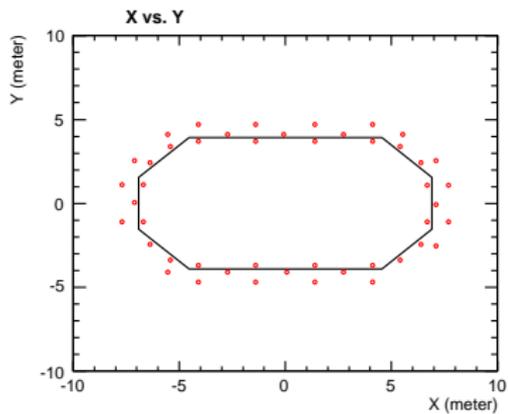


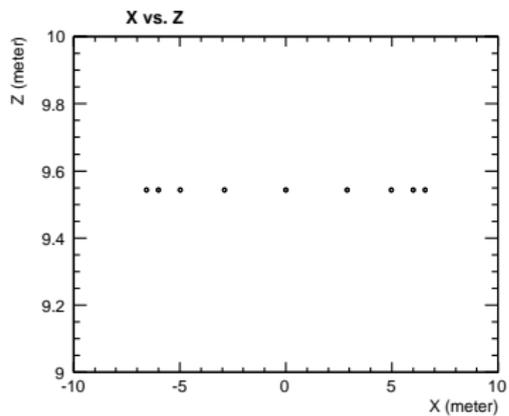
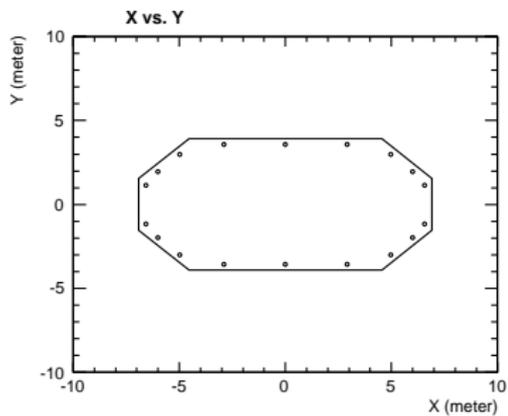
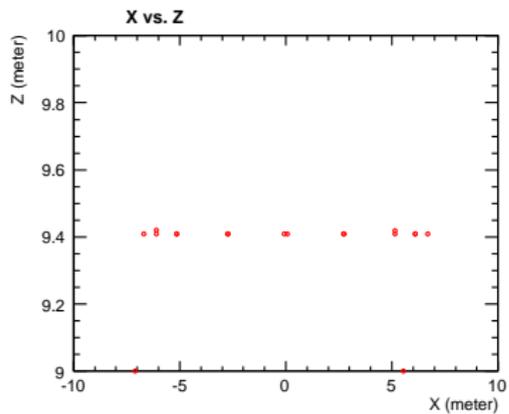
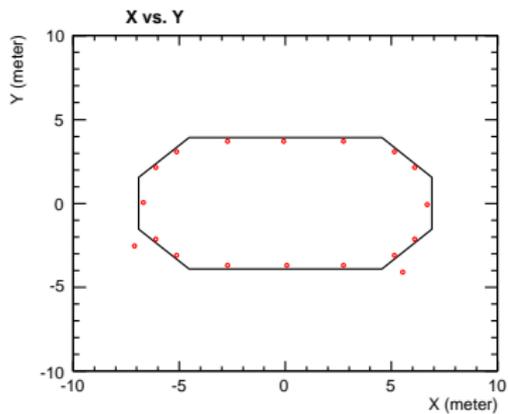






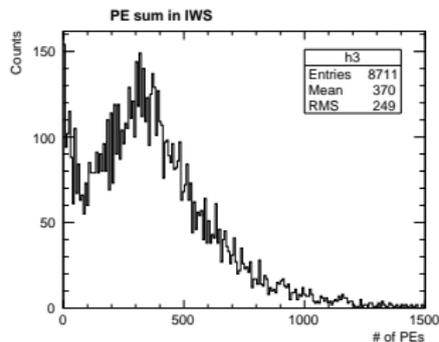
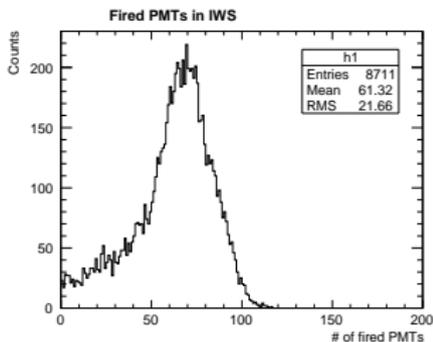
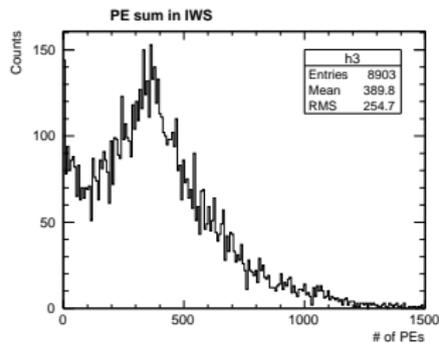
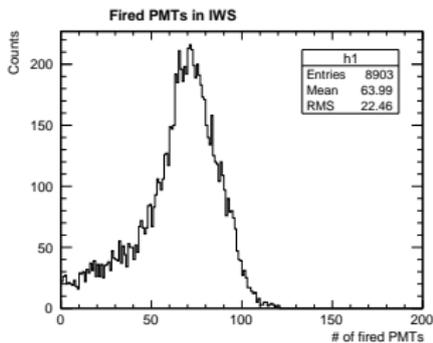




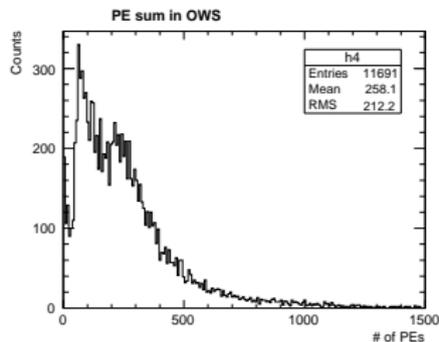
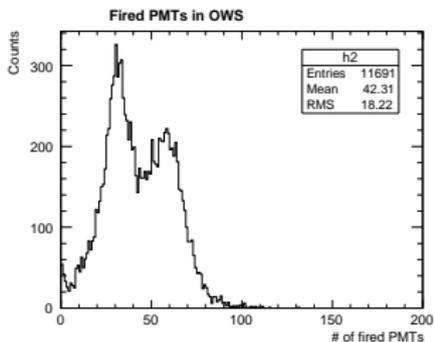
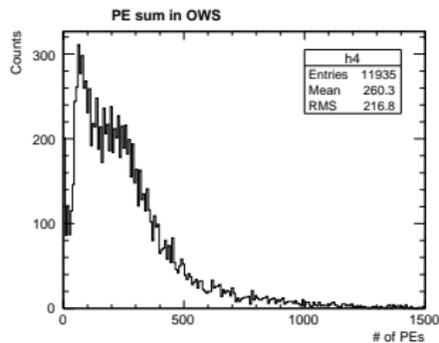
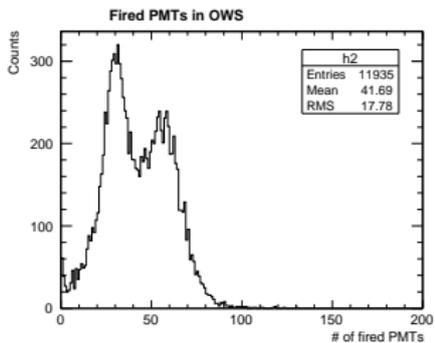


Compare with old geometry

- Old geometry: 116 IWS PMTs, 64 OWS PMTs facing outward, 109 OWS PMTs facing inward. (Results shown below are after fixing the bug described in Compare.pdf)
- New geometry: 120 IWS PMTs, 64 OWS PMTs facing outward, 107 OWS PMTs facing inward.

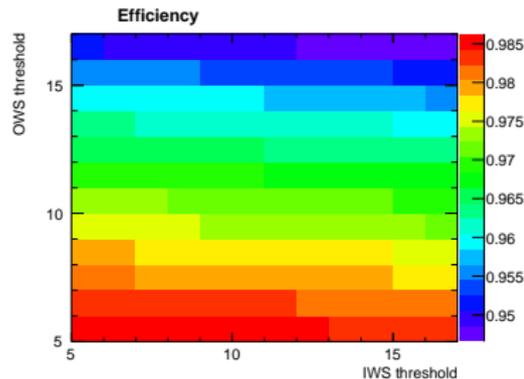
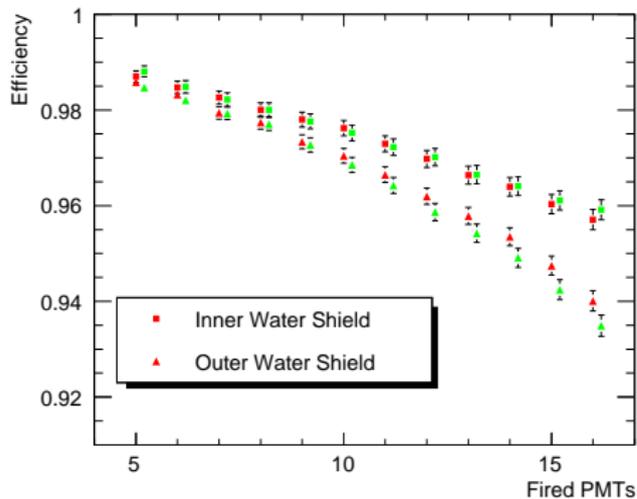


- Top: new geometry, bottom: old geometry



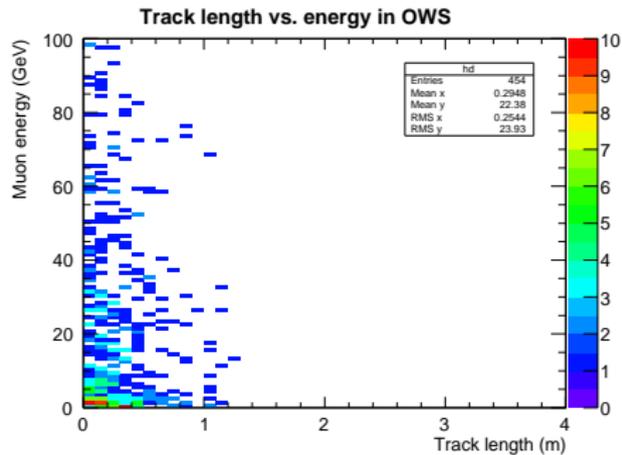
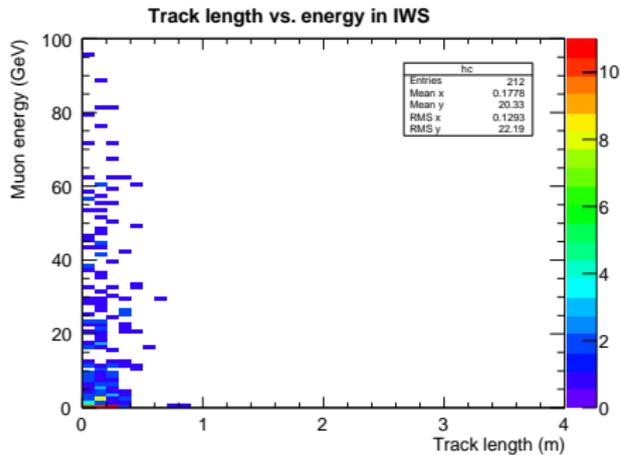
- Top: new geometry, bottom: old geometry

Muon efficiency

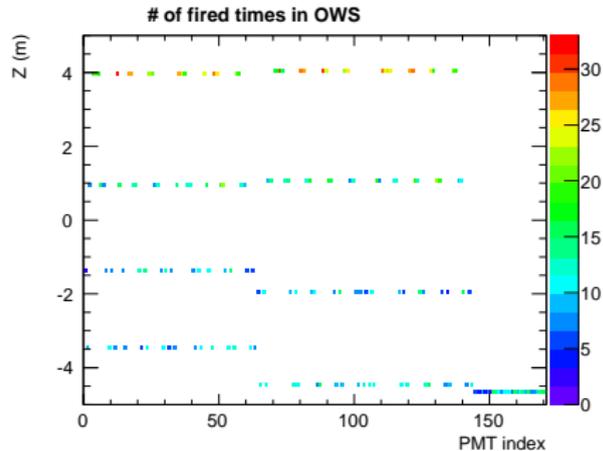
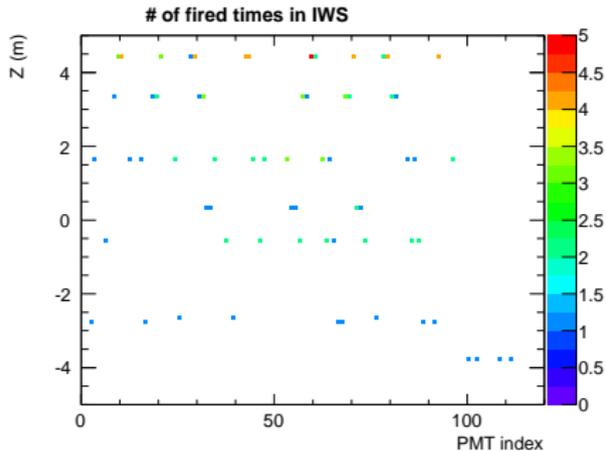


- Red: new geometry, Green: old geometry
- For IWS: 4 more PMTs, but no increase in efficiency. (Inefficient muons are corner clippers at the top region.)
- For OWS: 2 PMTs fewer, but higher efficiency. (Better arrangements than before.)

Inefficient muons



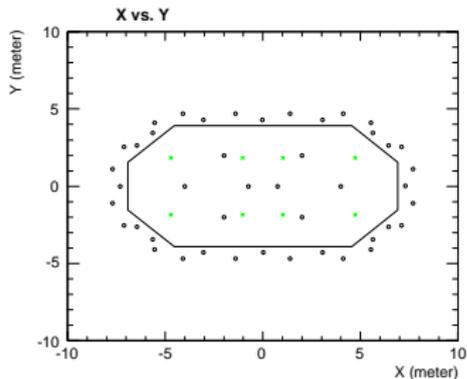
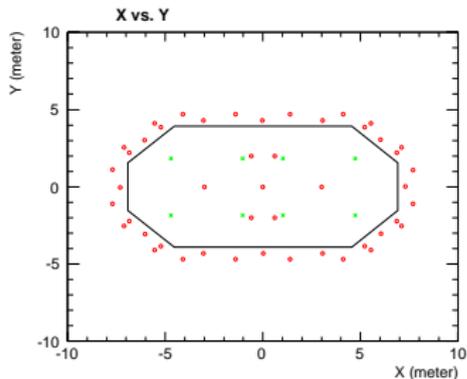
Inefficient muons



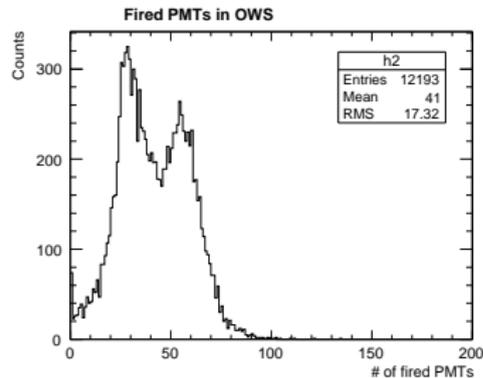
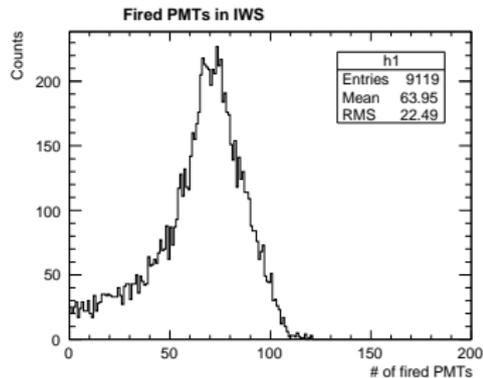
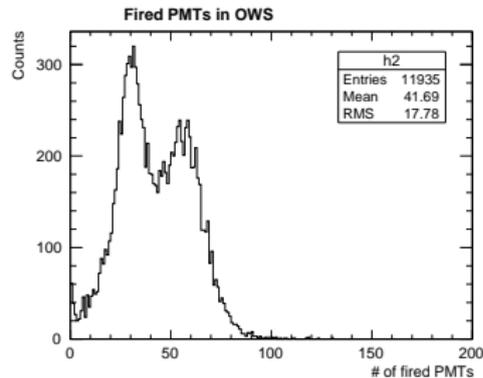
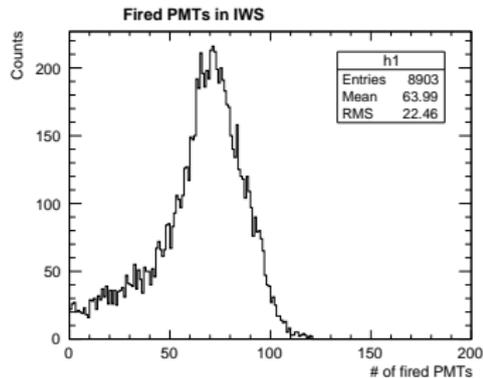
- More inefficient muons are corner clippers at the top region than the bottom.
- We may think to rearrange the PMTs to have more coverage at the top, however, RPC will help for corner clippers at the top, but not the bottom.

Remove 3 PMTs

Remove 3 PMTs in OWS

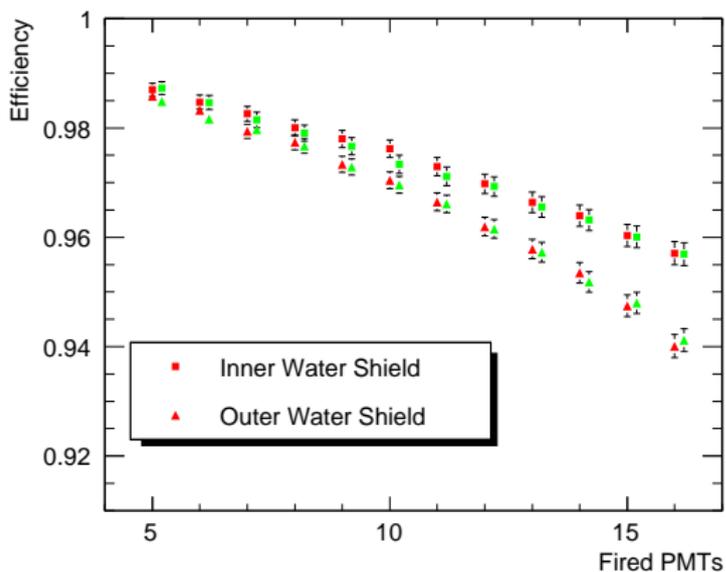


- Green points show the support structure for ADs.
- PMTs at the corner of OWS floor is very close to the bottom PMTs on the wall. Reduce 4 PMTs and adjust the positions at the corner.
- PMTs at the center of bottom floor is too concentrated at the center, adjust the PMT positions and increase the number by 1.



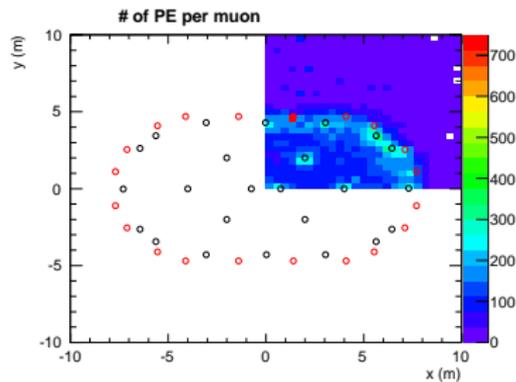
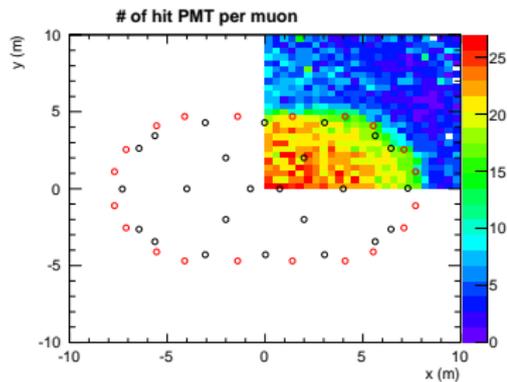
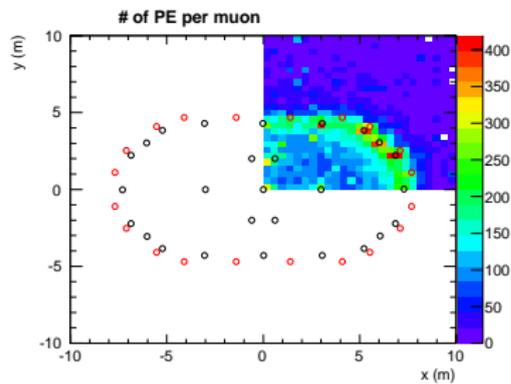
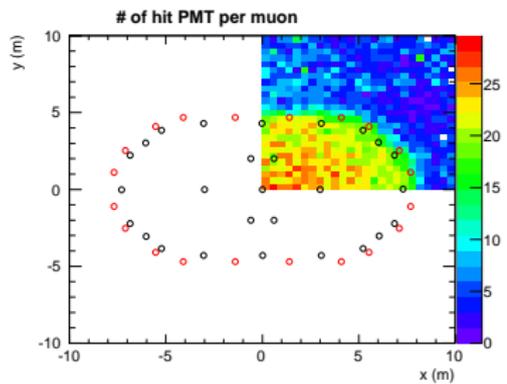
- Top: new geometry, bottom: remove 3 PMT in OWS.

Muon efficiency



- Red: new geometry, Green: remove 3 PMTs

Muons go through the bottom floor



- New PMT positions have better arrangement in OWS than before.
- More PMTs in IWS doesn't help for inefficient muons, we may rearrange PMTs in IWS.
- Proposed a way to remove 3 PMTs in the bottom of OWS and rearrange the PMTs to have better coverage in the bottom floor of OWS.