SoLID HGC Update

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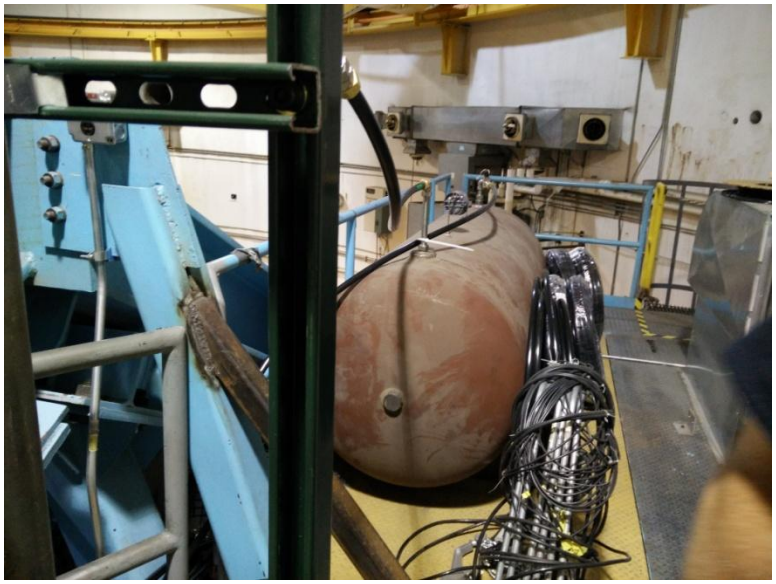
Gas

- We started with C4F10, then switched to C4F8O mainly due to availability concern. We are rethinking now.
- The two gases are very similar in term of performance and handling.
- Jlab has no problem using either one, as long as they know how much we will use and keep track of it, according to Bert Manzlak
- Availability:
  - For C4F10, the same supplier CLAS12 LTCC uses, “F2 chemicals in UK” has current cost ($150/kg sample or $135/kg bulk) and future cost ($200/kg?)
  - For C4F8O, only found a supplier with 6 times more expensive
- Total amount about 2000kg, cost $400k for C4F10
  - 300kg to fill up, 200kg left in gas system
  - approved PAC day 300, calendar day 600
  - 2kg/day loss on average (1.5/kg was for CLAS6)

CLAS12 LTCC gas system

- C4F10 stored in gas shed outside of HallB, mainly due to ODH concern, need 6 pipe lines and a regulating tank in hall
- Running at 1atm, to keep it slightly positive pressure at <1% atm level which is close natural env variation, the gas system is needed and recycling is only a by-product
- Purge with N2 which doesn't mix with the much heavies gas
- parts ~200k, a lot of man power to build and maintain it

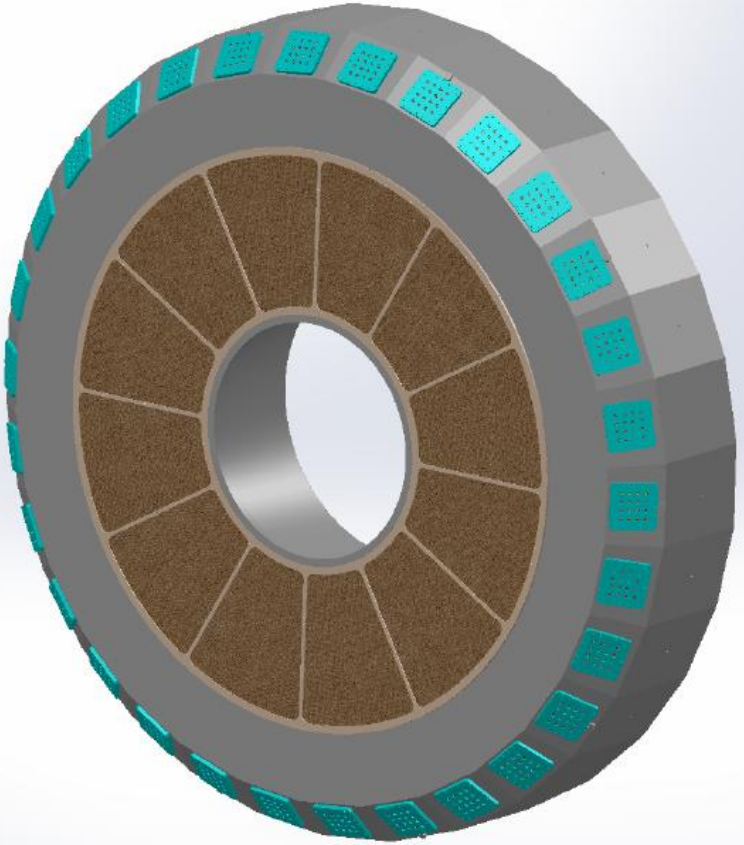


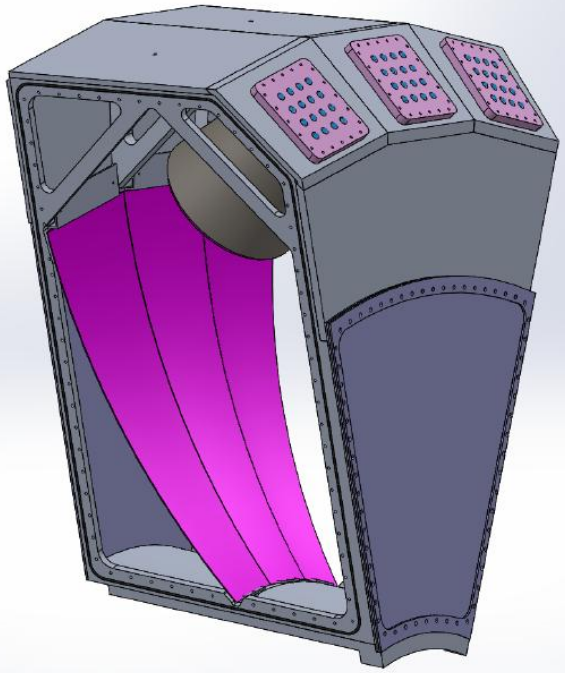
HGC gas system

- pressure control at 1% level is not very important for physics performance
  - N ~ 1-1/(n*beta)^2, (n-1) ~ p
- At 1.5atm, the pressure control is not important for engineering concern either
- We could do a fill-and-seal system
  - A much simpler gas system, lower cost to build and maintain
  - might spend more on gas (who pays for gas?)

Structure

- 10 sectors are connected to form one volume with no side panel
- engineering more demanding than 6 sectors with side panels like LGC
- Maybe sync two GC designs in segmentation? Need some study of how side panels impact physics and background





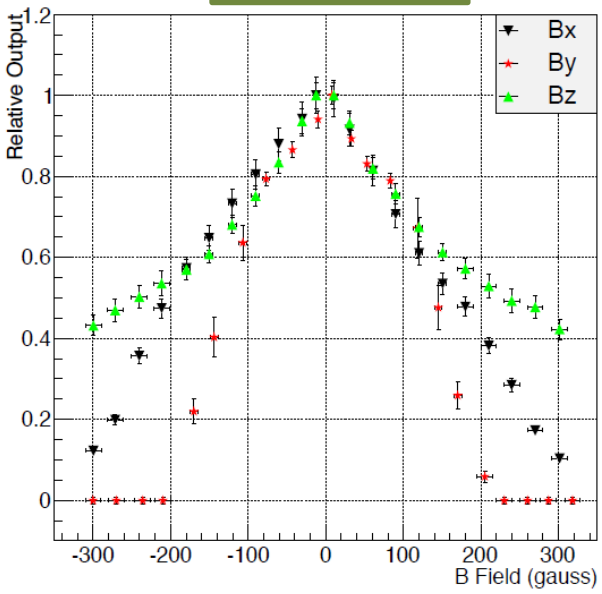
Issues related to others

- For current Al back window, the thickness is 1/4 or 3/8 inch depending Al type. Is the background OK for SPD, MRPC and EC preshower?
- Both windows will bulge out, we will try to design to accommodate some, but may need more room in Z to avoid pressing on LGC and SPD/MRPC
  - Front window, thin film, bulge at 10 cm level?
  - Back window, thin Al, bulge at 1-3cm level?
  - our endcap is VERY tight in Z, tweaking the magnet endcap?

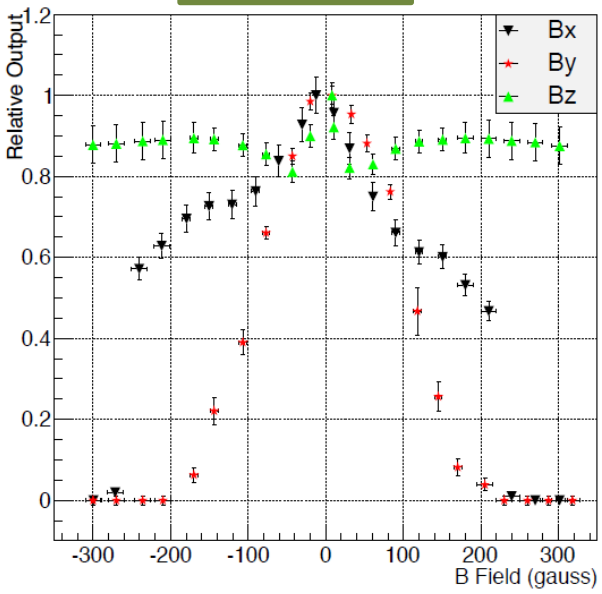
MAPMT test

- Duke bought 16 MAPMT H12700-03 for prototype
- Weizhi Xiong tested all of them to see how sum of all pixels affected by field
- H8500-03 has similar behavior like the previous test
- H12700-03 seems having the longitudinal effect stronger at >50G
- We will reevaluate how good our shielding cone work and need to test for the whole assembly of 4x4 PMT

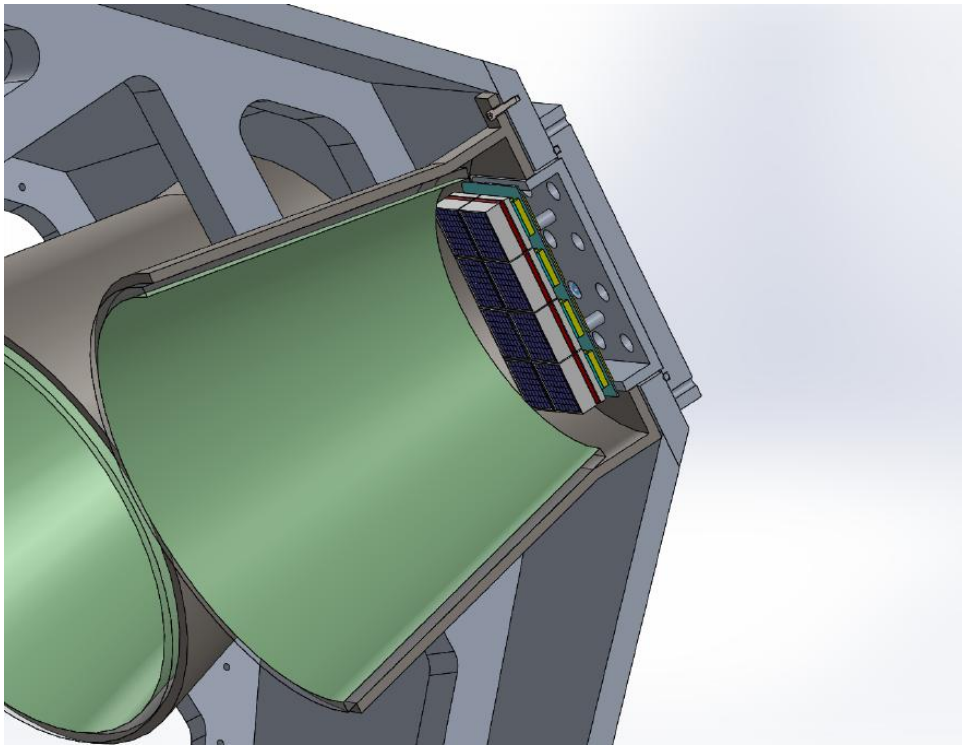
H12700-03



H8500-03



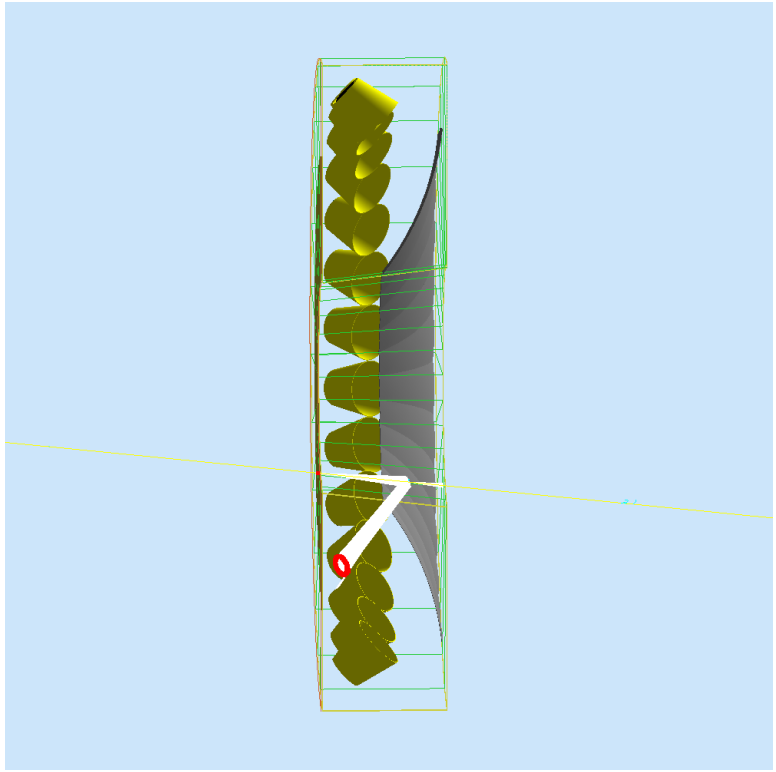
Readout

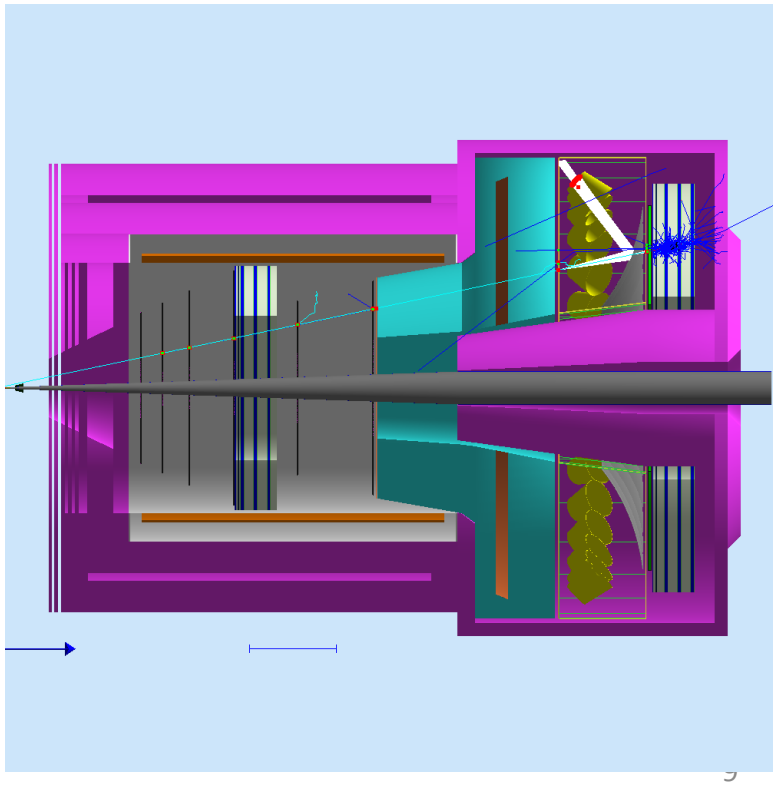


- MAPMT H12700-03
  as default
- Need to design an electronic board with amplification (10x) and good noise level and integrated with gas tight system
- We are searching for existing solution and may develop new things with jlab electronic group
- We will follow closely the MAROC3 being tested by CLAS12 RICH

Simulation

- Moved from standalone Geant4 code into GEMC
- Various study under way





Prototyping

Do it in stages

1. Testing thin window on a frame with high pressure to to study deformation by pressure and weight (at UofR)
2. Making tank, fake mirror and fake PMT module, then testing mounting and high pressure with some regular gas (at UofR)
3. Testing a mirror and a reflection cone with similar surface and coating, but not necessary same geometry for some optical property. (at UofR or jlab?)
4. Testing PMT with readout board, FADC and shielding cone under field (at jlab)
5. Setup a fill-and-seal gas system (at jlab)
6. make a real mirror and reflection cone and shielding cone with real gas and DAQ to do a full beam test (at jlab or somewhere else)

Possible collaboration with LGC

Garth Huber from UofR will apply funding from Canada in 2015/10