SoLID HGC Update

Zhiwen Zhao for HGC group 2021/01

Outline

- preRD simulation
- Magnet shielding
- Gas system
- Prototype at Regina
- Mirror coating at SBU

preRD detector response

electron passing SC1 and having p.e. on readout





"e central" evenly shooting e- of 0<P<5GeV near Cherenkov tube axis from z=0

preRD sim and data comparison with CO2

- Sim details
 - PMT effective photon sensor area ratio (packing fraction) ~ 0.8
 - Optical
 - cut off 200nm
 - QE (WLS coated)
 - Gas refraction
 - Absorption
 - Mirror reflectivity
 - digitization

Sim needs a factor 0.6 to match data in term of Npe.

The reasons are still under investigation



Figure 4: Two-dimensional distribution of NPE vs. N_{quads} for MaPMTs in the low rate and high rate environments. The top row is from beam test and the bottom row is from simulation.

- After cutting on EC central module (including 3 live small modules and 1 dead small modules)
- Background of mostly SPE not simulated

preRD sim and data comparison with CO2



Figure 5: Distributions of NPE for a specified number of fired quadrant channels. The top panel is from the high rate beam test. The bottom panel is from the high rate simulation where the black and red lines represent high energy electrons and neutral pions from the target respectively.

Sim needs a factor 0.6 to match data in term of Npe. The reasons are still under investigation

Gas system

- Goal: a preliminary design to understand basic feature and help cost estimation
- Gary Swift and Zhiwen Zhao met with JLab experts from physics and engineering a few times. The design idea is converging and we are working on more details.

Basic SoLID HGC Gas System Layout PH Dry Nitroger Supply from Hall B SoLID HGC Heated Hear Diaphragm Pum MFG Local C4F8 Supply

Only half of HGC tank is shown

• Sharing HallB gas purifying system

- Only need new heated gas line to connect HallA and B as HallB has a spare line to gas shed
- HallB also has N2 line if we want to use

Magnetic Shielding

- A rough prototype with 2 of 0.095" iron (NETIC) layers was tested to have transverse shielding factor 10 and longitude shielding factor 5
- A nice protype with proper ٠ machining and annealing built by "Magnetic Shield Corporation"
 - 2 of 0.095" NETIC outer layers and 1 mu-metal inner layer
 - To be tested this year







Prototype at Regina

- Long delay at machine shop due to COVID shutdown, just started in January
- Fabricate windows (by March)
 - Thin Al and CF front windows
 - Al back window
- Then seal and test and study it
- Hopefully, complete everything by June



parts for back window



SBU mirror coating

- Evaporator Vacuum generation \rightarrow p = ~ 6 x 10⁻⁷ torr
- Electron beam on target! ٠
- Commissioning under way.







Main Menu

backup

Magnetic Shielding test

for 2 of 0.095" NETIC (iron) layers in an external field 90G

Defining axis and coordinate



SoLID HGC Prototype

C\$125k grants allow the U.Regina group to construct 1¹/₃ SoLID HGC modules for testing.

Questions to be addressed:

- Enclosure deformation at 1.7 atm operating pressure (investigate design and metal alloy options).
- Performance of the O-ring seals against adjacent units.
- Performance of thin entrance window in terms of light and gas tightness (test several options).



Conceptual design by Gary Swift, Duke U.





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