



# Detector Support Group

## Weekly Report, 2016-10-26

### Ongoing Projects

#### Magnet Control System

##### Solenoid

- cRIO Ethernet Toolkit to PLC package installed to enable access to write to and read data from Solenoid/Torus PLC via Ethernet.
- Solenoid PLC programming and Solenoid Service Tower instrumentation work started.

##### Torus

- Torus Fast DAQ cRIO's communication loss effects investigated.

#### Gas System

- cRIO issue with EPICS Client + real-time application issues being debugged.
  - \* Auto reboot doesn't work.
  - \* Escalated discussions to next higher level of NI support, still no resolution.
  - \* Worked around by using a startup VI, if an executable is not possible.
- HTCC OSP for hall operations discussion with Yuri Sharabian.
- DCGAS critical path tasks: timelines, lead times, and relief valves discussions with Mac Mestayer, Bob Miller, and Saptarshi Mandal.
- "Bertha" power unit for **RICH** air compressor discussions with Walt Akers
  - \* Plan to borrow rather than buy.
- Hall B MVT Gas Mixing System's operators manual generated.
- Hall B Gas System's ESAD (section 3.6) completed.
- MVT mixing system drawing updated.

#### RICH

- $d_0$  measurement with fit procedure repeated for mirrors 1 and 4.

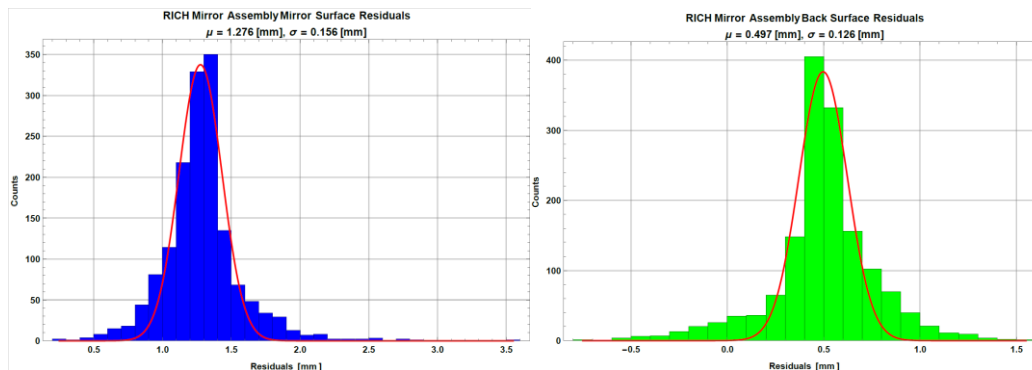
Mirror	Configuration	Measured		Parabolic Fit		
		d0 (mm)	z (mm)	d0 (mm)	z (mm)	R (mm)
3	Horizontal	1.17	57.00	1.22	56.48	2705.82
3C	Horizontal	1.29	60.50	1.40	60.42	2701.88
4C	Horizontal	1.39	61.00	1.46	61.09	2701.21
5	Horizontal	1.41	57.50	1.49	57.90	2704.40
2C	Horizontal	1.19	56.50	1.34	56.48	2705.83
	Vertical	1.21	61.50	1.36	61.69	2700.62

Figure 1: Table of  $d_0$  measurement results of tests performed Oct. 19 – Oct. 25, 2016.

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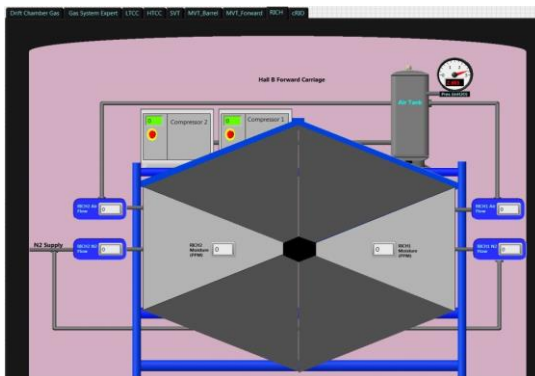
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- Residuals of radius of curvature for mirror assembly calculated.



Histograms of mirror assembly radius of curvature residuals with Gaussian fit.  
Left in blue is mirror surface; right in green, back surface.

- RICH** monitoring tab added to Gas Controls GUI.



RICH monitoring tab on Hall B Gas Controls GUI

### FT

- Hardware Interlock System meeting with Raffaella De Vita and Gary Smith.

### HDice

- Capability to choose tests in **HDice** RF Attenuation/Switching Unit test added.
- NMR Control VI tested.

### DC

- DC HV cables retrieved from stacked baskets.
  - ★ Cables sorted by region and length.
  - ★ Inventory list generated.
- Ten multi-connector cables and 119, nine-contact Amp cables tested.
- Cables moved to Hall B.

### SVT

- SVT trips being investigated.
  - ★ According to EPICS, first thing that tripped was coolant flow, which is unlikely short of chiller malfunction.



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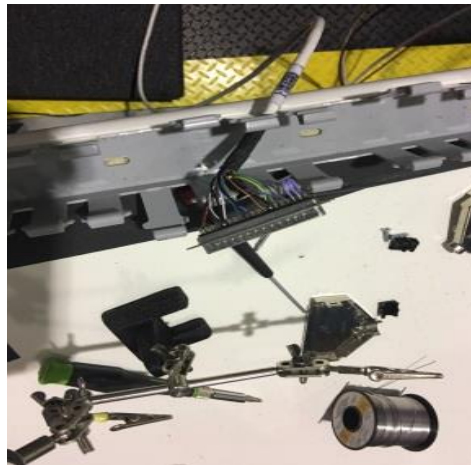
### Antonioli, Mary Ann

- Conducted spot reflection testing on five **RICH** mirrors, with Tyler.
- Completed first edit of DC and LTCC **Gas System** manuals.
- Added capability to choose tests in **HDice** RF Attenuation/Switching Unit test. Currently debugging.
- Solved problem with National Instruments RS-232 box in **HDice** lab, with Amanda.

### Arslan, Sahin

#### SVT

- Replaced N<sub>2</sub> bottle.
- Ordered two-part conductive silver epoxy to fix faraday cage grounding brackets.
- Re-soldered broken wires of R3 LV cable at MPOD side.



### Bonneau, Peter

#### Magnet Systems

- Working with Pablo on development of Solenoid magnet PLC programming and instrumentation.
  - ★ Electric valve programming architecture was examined.
  - ★ Hardware interfaces/signal conditioning for valve position readback via LVDT was reviewed.
  - ★ Valve control interface to PLC was investigated.
- Working with Pablo on troubleshooting Torus magnet programming and instrumentation.
  - ★ PLC response to communication error with LV cRIO was investigated.
  - ★ Interlocks for Fast Daq were reviewed in the code.
- Monitored Torus instrumentation and cryogenic system status via EPICS during low current testing.
  - ★ MPS current readback signal was not initially in Mya archiver database.
  - ★ Several trips due to LC and SG occurred at 100 A.

#### Forward Tagger

- Met with Raffaella De Vita and Gary Smith regarding Hardware Interlock System.
  - ★ Interface card has been installed in chiller.



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### HDice

- Worked with Amanda on installation and testing of NMR instrumentation in rack #2 in HDice lab.
  - ★ Driver and code for installation of CT-Box on HDice lab computer has been completed. CT-box successfully ran test program.

### Campero, Pablo

#### Magnet

- Installed cRIO Ethernet Toolkit to PLC package to enable access to write to and read data from Solenoid/Torus PLC via Ethernet.
- Programming Solenoid Magnet PLC and developing instrumentation for Solenoid Service Tower.
- Researched valve and wiring schematics for Solenoid Service Tower.
  - ★ LVDTs signal conditioners will be implemented for electric valves to read back their positions and send to PLC analog input modules.
- Modified PLC program to make PID control over valves EV8611CD, EV8670BY, EV8611JT, and EV8612.
- Worked with Peter on effects of communication loss in Fast DAQ Torus.
  - ★ Analyzed Torus PLC program updates.
    - Added routine to detect loss of communication between FastDAQ cRIO and PLC, automatically generating controlled ramp down after 6 seconds.
    - Removed filler common error for LV cRIO to PLC loss comm—no automatic action taken by PLC to go to controlled fast dump.
- Revised interlock logics in Torus PLC program.
- Emphasized importance to procure spare cRIO controller for Solenoid-Torus control systems.
- Monitored EPICs screen for MPS, Cryo system, and Buffer Dewar system on daily basis.
  - ★ Nominal value displayed on MPS EPICs screen is 4000 A, which is the max current capacity of MPS.
  - ★ Magnet was taken to 500 A, 1000 A and finally 2000 A; it reached 50% of nominal current.
  - ★ An analysis need to be done at 100 A in upcoming week, because there were several trips due to load cells and strain gages during ramp.

### Eng, Brian

- Looking into SVT trips; according to EPICS, first thing that tripped was coolant flow, which is unlikely short of chiller malfunction.
- More debugging of gas system cRIO issue with EPICS Client + real-time application; escalated to next higher level of support, but still no resolution. Issue can be worked around by using a startup VI if an executable is not possible.

#### Magnets

- Activated EtherNet/IP toolkit for LabVIEW 2016.



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- Torus ramped to 2000 A. Planned for 100 A soak test over weekend, but tripped numerous times. Recovered by clearing interlocks and powering back up, until it had a software quench.

### Hoebel, Amanda

#### HDice

- Debugged RF Attenuation Unit LCD screen with Mary Ann.
  - \* Screen would not display RF attenuation information.
  - \* Problem was found to be incorrect RS-232 and RS-485 setting in NI MAX.
    - RS-232 “transceiver mode” should be set to “Auto 232.”
    - RS-485 “transceiver mode” should be set to “2 Wire Auto.”
- Tested NMR Control VI.
  - \* Ran 5 NMR configurations with and without CT-Box.

#### Forward Tagger

- Attended hardware interlocks meeting.
  - \* Tracker will not be interlocked.
  - \* Hodoscope crate door interlock feature removed.

### Jacobs, George

- Discussions with Mac Mestayer, Bob Miller, and Saptarshi Mandal about DCGAS critical path tasks, timelines, lead times, relief valves, etc.
- Discussions with Walt Akers about borrowing a “Bertha” power unit for RICH air compressor.

#### GAS Systems

- Writing Hall B Gas System Operators Manual for Purge Type Systems.
- Wrote Hall B MVT Gas Mixing System Operators Manual.
- Compiled Hall B MVT Gas Mixing System Operators Manual Appendixes.
- Completed ESAD section 3.6 for Hall B Gas Systems.
- Updated MVT mixing system drawing.

### Leffel, Mindy

#### DC

- Used aerial man lift to retrieve single-ended differential ECL module.
- Accommodating work request from Fast Electronics Group, working with M. Taylor.
  - \* Retrieved DC HV cables from stacked baskets.
  - \* Sorted cables by region and length.
  - \* Made an inventory list.
  - \* Tested 119 nine-contact Amp cables and 10 multi-connector cables.
  - \* Took cables to Hall B.

### Lemon, Tyler

#### RICH

- Repeated  $d0$  measurements with fit procedure for five mirrors, with Mary Ann.
- Imaged mirrors in table above using Shack-Hartmann sensor, with Mary Ann.



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- ★ Images sent to INFN collaborators for analysis.
- Uploaded data from optical tests to:  
<http://www.jlab.org/Hall-B/secure/clas12/RICH/Mirrors/CMA>
- Wrote DSG note on  $d_0$  measurements.
- Fit Gaussian to histograms of mirror assembly radius of curvature residual raw data using Mathematica (Figure 2).
  - ★ Mirror surface fit: Mean residual =  $1.276 \text{ mm} \pm 0.156 \text{ mm}$
  - ★ Back surface fit: Mean residual =  $0.497 \text{ mm} \pm 0.126 \text{ mm}$

### McMullen, Marc

#### Gas System

- Reviewed LTCC THA/OSP and submitted suggested changes.
  - ★ THA evaluated general maintenance to be done in future. Risk assessed as a 3 before mitigation and then reassessed as a 1, post mitigation. *However, no mitigation was listed.* Suggested that it be removed, and have a separate THA written if necessary.
  - ★ Provided documentation for gas controls instructions to be added to OSP.
- Met Yuri Sharabian and discussed OSP for HTCC hall operations.
  - ★ Emphasized that Hall B Mechanical would be in charge of daily gas operations and on-call support, as per management.
- Added RICH monitoring tab to Gas Controls GUI.
  - ★ Completed section in Gas Controls manual.
- Wrote gas controls section for Hall B ESAD.