

## Detector Support Group

Weekly Report, 2017-10-25

### Status

#### RICH

- EEL 121b small cleanroom made darker for reflectivity tests.
  - ★ Before the move to cleanroom, light noise in test station was ~1 pA on photodiodes.
  - ★ Photodiodes after move to cleanroom measured ~350 pA of light noise.
  - ★ Light noise in cleanroom ~30 pA after eliminating light noise, an order of magnitude reduction.
- Reflectivity test station optics realigned for calibration.
- Reflectivity measured for spherical mirror 6.
  - ★ Reflectivity measured in three spots: two visually bad spots and one visually good spot.
  - ★ All spots had reflectivity ~85%.
    - Results thought to be due to extra light noise in cleanroom.
- Load test of stiffening tool conducted.
  - ★ Load test performed for 10 minutes at 0 degrees and 65 degrees at 125% of RICH detector's weight.



Load test of stiffening tool

- Four electronic panel interlock cable bundles installed in hardware interlock cRIO.
  - ★ Each cable bundle contains two humidity sensors and two RTDs.
- Black ¼" OD gas line for nitrogen system replaced with white ¼" OD line.



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- ★ Black line to be installed inside detector for nitrogen distribution.
- Internal pressure for the electronics panel calculated.
  - ★ Considered total flow rate ~ 800 L/min from two air inlet lines.
  - ★ Inside pressure found to be ~ 101337 Pa = 14.697 psi.
  - ★ Differential pressure calculated between inside and outside (atmospheric) pressures  $\Delta P = 0.04$  inH<sub>2</sub>O.
- Issues with SD memory card file-check at real-time program start-up debugged for hardware interlocks.
  - ★ SD card would intermittently show file read failures. Corrected test timing in configuration file library to fix the problem.
- Interlock system components ordered:
  - ★ UPS for NI cRio system.
  - ★ Temperature and humidity sensors.
- Holes drilled and tapped for bulkhead connectors on the panel for the mirror volume.
- Stiffening tool disassembled and stored in EEL/125.
- Six HTSB sensor end cables fabricated.
- Panels for gas lines and instrumentation machined.
- Dry tent components machined and pre-assembled.

#### ET

- Hodoscope LV channel disable debugged.
  - ★ Voltage was not turned off for second channel during interlock trip.
  - ★ MPOD card reprogrammed.
- Condensation sensor cable fabricated.

#### DC

- TCUs calibrated and connected to standard gas.
  - ★ TCU flow of standard started at 200 cc/m.
  - ★ Mix 1 TCU reading is 2.75V.
  - ★ Mix 2 TCU reading is 2.66V.

#### Gas Systems

- Flow for HTCC adjusted to 15 L/m.
- CO<sub>2</sub> ordered for DC.



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#### Antonioli, Mary Ann

- Worked on **RICH** sensor cables.
  - ★ Made four 4-cable, 65', bundles, attaching 1" pieces of heatshrink along the bundle to keep cables from tangling.
  - ★ Soldered two 15-pin D-sub connectors.
- Worked on cRIO **test stand**.
  - ★ Wrote code to write to spreadsheet and debugged.
  - ★ Removed write to and read test value of 0 V due to extreme precision values, compared to other precision values.
- Began editing and layout of Brian's second Note.

#### Bonneau, Peter

##### RICH

- Worked with Tyler and Mindy on the instrumentation test and debugging of the RICH Hardware Interlock System hardware.
  - ★ Investigated issues with the SD memory card file check at real-time program start-up. SD card would intermittently show file read failures. Corrected test timing in configuration file library that fixed the problem.
  - ★ Tested and debugged temperature / humidity sensor assemblies prior to installation.
  - ★ Troubleshooting procedures for humidity sensors was reviewed with sensor assembly installers.
  - ★ Humidity calibration constants of the installed sensor assemblies was documented.
- Researched compressed air cooling methods.
  - ★ Air – water heat exchanger cooled by LCW – chiller is the most common method.
  - ★ Atlas Copco recommended adding the compressed air chiller after the air tank.
- Ordered in components for RICH Interlock System.
  - ★ UPS for NI cRio system.
  - ★ Temperature and humidity sensors.

##### SVT

- SVT Hardware Interlock System
  - ★ Completed development, test, and debug of EPICS temperature, humidity, dew point, and cooling system threshold user interface.

##### Forward Tagger

- FT Hardware Interlock System debugging.
  - Worked with Amanda on the debugging of hodoscope LV channel disable for the Weiner Mpod crate.



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#### Campero, Pablo

##### RICH

- Prepared six cables for humidity and temperature sensors that will be use in the RICH nitrogen volume, with Mindy.
  - \* Six portion cables completed (wire lengths: 2x12', 2x15', 5' and 18').
    - Prepared bundles of 3 (Humidity sensors) and 4 wires (temperature sensors).
    - Used heat shrink wraps to route the cables.
    - Soldered and assembled D-Sub connectors to the cables.
  - \* Prepared eight 65' long cables.
    - Grouped bundles of 3 and 4 wires.
- Assembled stiffening tool and attached it to the trolley for Load test.
  - \* Load test performed for ~ 5000 [lb]
- Debugged two humidity sensor used for the RICH electronic panel, with Tyler.
  - \* Measured excitation voltage and checked continuity for the humidity sensors wires.
  - \* Tight wires in the terminal block located next to the cRIO modules.
  - \* Verified correct readouts (~40 %) at hardware interlock user interface EPICS screen.
- Calculated the trapezoid highs in the electronic panel to have a total area divided in two equal parts.
  - \*  $h_{Total} = 1.26$  [m],  $h_1 = 0.46$  [m], and  $h_2 = 0.80$  [m]
  - \* Based in the results:
    - Noticed heat will be housed in the widest trapezoidal area.
    - Analyzed the option to increase the number of holes in the supply air manifold.
- Calculated internal pressure for the RICH electronic panel.
  - \* Considered total flow rate ~ 800 [l/min] from two air inlet lines.
  - \* Found inside pressure ~ 101337[Pa] = 14.697 [psi].
  - \* Calculated differential of pressure between inside and outside (atmospheric) pressures  $\Delta P = 0.04$  [inH<sub>2</sub>O].

#### Eng, Brian

##### SVT

- Got V450 schematic from vendor, still seeing if there's an easy way to modify the PCB, but they suggested doing it externally.
- De-cabling has been pushed back to allow RICH time to seal detector/install PMTs.

##### RICH

- Disassembled stiffening tool in EEL/124 with Pablo to transport to EEL/127 for load test.
- Assembly of modified parts on the DC R3 trolley to be used as part of the weight for the load test (weight of cart ~1400 lb.).
- Re-assembled stiffening tool on cart.
- Transferred load test parts over to Test Lab due to insufficient height of EEL crane.



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- Performed load test of stiffening tool in horizontal and vertical positions, both passed.
- Returned 2x 2500 lb. blocks (used as anchors for load test) from Test Lab to inside ACC fence with Marc and Mindy.
- Located and transported unistrut and flame retardant plastic for the dry tent to be used for aerogel assembly. Did initial assembly in EEL/127, INFN will do the final assembly of the dry tent in EEL/124.
- Worked with Marc to drill and tap holes for the bulkhead connectors on the panel for the mirror volume.
- Disassembled stiffening tool & modified parts for the load test and moved them to EEL/125.

### Hoebel, Amanda

- Re-calibrated **DC** TCUs for standard mix with Marc.

#### RICH

- Took apart stiffening tool with Brian and Marc.
- Participated in load test of stiffening tool.
- Created program to calculate middle line of electronics panel trapezoid to cut area in half.
  - ★ Line is 445.5 mm from top and 824.5 mm from bottom.
- Made 72 labels for cables.

#### ET

- Debugged hodoscope LV card not turning off voltage to second channel during interlock trip.
  - ★ Used MUSE program to check card settings for MPOD crate.
  - ★ “No ramp at switch off” was selected.
    - Deselected option.
    - Initiated trip, channel turned off LV.
- Created plant services request to turn on compressed air in EEL 125.
- Created and edited weekly report.

### Jacobs, George

#### GAS Systems

- Had discussions about adding fans to the RICH air cooling exhaust lines.
- Had discussions about RICH N2 purge supply for testing.
- Received bulkhead gas fittings for RICH.
- Moved MVT pre-mix cylinders to target gas pad.

#### HALLB

- Ordered ¼” and ½” black tubing for RICH.
- Ordered CO2 for DC.
- Crane ops for RICH.
- Received ¼” and ½” black tubing for RICH.
- Preparing slides for TCB meeting.



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- Completed new P-Card training.

#### Leffel, Mindy

##### RICH

- Completed sensor end of six HTSB cables with Pablo.
  - \* Attached heat shrink, soldered cable extensions and soldered D-sub connectors.
- Cut cRIO end of cables with Mary Ann and Pablo.
  - \* Cut eight bundles 65' long.

##### ET

- Completed the condensation sensor cable with Pablo.

#### Lemon, Tyler

##### RICH

- Measured reflectivity of spherical mirror 6.
  - \* Measured reflectivity in three spots: two visually bad spots and one visually good spot.
  - \* All spots had reflectivity ~85%.
  - \* Poor results thought to be due to extra light noise in cleanroom.
- Made EEL 121b small cleanroom darker for reflectivity tests.
  - \* Before move to cleanroom, light noise in test station was ~1 pA on photodiodes.
  - \* Photodiodes before eliminating light sources in cleanroom measured ~350 pA of light noise.
  - \* Light noise in cleanroom ~30 pA after eliminating light noise.
- Realigned reflectivity test station optics to improve calibration results.
  - \* Currents measured by photodiode during calibration ~ 10 time less than previous measurements.
  - \* During debugging of low results, noted alignment beam is not completely horizontal at experimental photodiode.
  - \* To make beam horizontal, have to adjust angle of laser using thumbscrews until beam is horizontal.
  - \* If adjusted too much using thumbscrews, have to start entire process over.
- Attended load test of stiffening tool.
  - \* Load test performed in Test Lab with stiffening tool in horizontal and ~65° positions.
  - \* Stiffening tool passed load test.
- Installed four electronic panel interlock cable bundles in hardware interlock cRIO.
  - \* Each cable bundle contains two humidity sensors and two RTDs.
  - \* Cables to be used near electronic panel when installed in RICH.
  - \* Sensors put in use for monitoring electronic panel on cosmic stand and humidity of aerogel dry tent.
- Replaced black 1/4" OD gas line in use for nitrogen system with white 1/4" OD line to be able to install black line inside RICH for nitrogen distribution.



## Detector Support Group

### Weekly Report, 2017-10-25

#### McMullen, Marc

##### DC

- Calibrated TCUs and connected 10.2% CO<sub>2</sub> in Argon gas standard. Started TCU flow of standard @ 200cc/m.
  - \* Mix 1 TCU reading is 2.75V.
  - \* Mix 2 TCU reading is 2.66V.

##### RICH

- Assembled stiffening tool on to DC R3 strongback.
  - \* Disassembled stiffening tool from DC R3 strongback.
- Completed load test of stiffening tool @ 0 degrees and 65 degrees with the load equivalent to 3031lbs for 10 minutes each.
- Machined RICH panels for gas lines, and instrumentation.
- Machined and pre-assembled dry tent components.
- Coordinated meeting with Jlab EHS&Q department to ensure the dry tent was within Jlab fire protection rules.

##### MVT

- Met with the installation engineer to discuss cable routing.
  - \* Hall b technical staff will run the MFC and pressure transducer cables, DSG will terminate and install the gas controls interface.
- Network cable received and delivered to Hall B mechanical.

##### HTCC

- Adjusted flow to 15Lpm.