



# Detector Support Group

## Weekly Report, 2018-10-03

### Summary

#### Hall C

- For test of end-of-life upgrade from Windows 7 to Windows 10:
  - ★ RS-LOGIX 5000 v16.04 installed on dsg-hallc-6 Windows 10 PC.
  - ★ With Windows 10 PC, able to connect to HMS PLC running RS-LOGIX 5000 v16 without any problems.
  - ★ With Windows 10 PC, able to connect to SHMS PLC running RS-LOGIX 5000 v20 without any problems.
- Modifications made to Quadrupole current regulation PLC program based on new comments and requirements received from Hall C.
- Development continued to implement PT2026 NMR unit in Hall C PLC system.
  - ★ Found that depending on magnitude of field, PT2026 needs different RF Pulse settings.
  - ★ Unit loses field lock easily when the dipole's current is changed.
  - ★ PT2026 field measurement is unstable.
    - PT2026 loses lock on field soon after dipole current is changed while PT2025 does not.

#### Hall B Solenoid

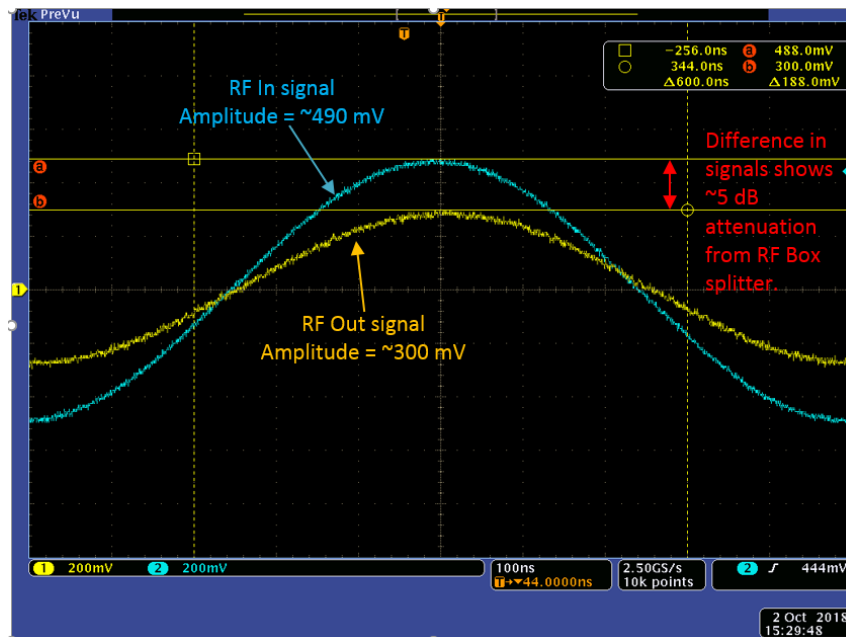
- Solenoid had fast dump on September 29, 2018.
  - ★ Based on PLC SOE, QD1:ch1 upper tripped first.
  - ★ FastDAQ data for voltage taps and QD voltage signals related to QD#1 did not show any voltage spikes prior to the dump.
  - ★ Noted that timing between when MPS's contactor and QD#1 trip had changed from previous trip on 8/30/2018.
    - SOE timestamp QD# trip is ~180 ms after MPS contactor appears to have opened in FastDAQ data.
  - ★ After analysis, the clear cause of QD#1 trip is undetermined.
- After approximately six hours, Solenoid cryo had recovered and magnet was ramped back to full field.
- Solenoid Voltage Taps Values at Fast Dumps table updated.
  - ★ Data for fast dump #11 from 1/23/2018 entered into table.
    - Based on FastDAQ data, QD1:Ch2 exceeded its 100 mV threshold.

#### HDice

- Debugged two NMR program issues on Rack #1.
  - ★ Issue 1: NMR program fails to trigger lock-in amplifier in both asynchronous (self-triggering) and synchronous (CT-box triggered) operation mode.
    - Lock-in amplifier was not responding correctly to buffer storage command.
    - Used lock-in amplifier test program to clear buffer fault and resolve issue.
  - ★ Issue 2: NMR program would freeze when liquid helium (LHe) temperature and liquid level sensors were enabled and program was run in synchronous mode.
    - Sensors initially connected to PC in rack with RS-485 ports when RS-232 ports are needed.
    - Found that sensors were trying to be read at the same time by NMR program, causing a timeout delay and the program to freeze.
    - Issue fixed by adding sequencing and 100-ms delays for temperature and LHe liquid level sensor readouts.

### HDice RF Box Test Station

- RF Box connection to instrumentation and 50-Ohm transmission line theory discussed.
- Initially, RF Box was distorting and not attenuating signals correctly.
  - ★ Found that RF Box's splitter requires MHz frequency for input signal.
  - ★ Once frequency of signal was raised from 1 kHz to 1 MHz, RF Box operated correctly.
- Set up oscilloscope to monitor input waveform from signal generator (0.5 V amplitude, 1 MHz sine wave) and RF Box's attenuated output signal.
  - ★ Verified correct output signal is received from RF Box when attenuator is set to 0 dB.



Screenshot of oscilloscope showing input (blue waveform) and output (yellow waveform) signal when RF Box is set to 0 dB attenuation. Signals are not identical because there is ~5 dB attenuation of input signal, regardless of attenuator setting, after it passes through RF Box's signal splitter.

### SVT

- Gain scans performed on SVT modules EEL 124 after HV-bypass cable was added to modules for bottom HV.
- Modules in Region 2 have started drawing more current on HV, prompting sensors' bias voltage to be lowered.
  - ★ Region 2, Sector 1, Bottom (R2S1B) bias voltage lowered to 28 V.
  - ★ R2S3B bias voltage lowered to 36 V.
  - ★ R2S5B bias voltage lowered to 25 V.

### FT

- Upgrades in progress for FT Hardware Interlock System.
  - ★ DSG cRIO-9035 test station set up for FT hardware configuration.
  - ★ Adding individual sensor settings for interlock time-over-threshold trip delay and signal averaging.
  - ★ Investigations underway of slow remote EPICS reset response.



# Detector Support Group

## Weekly Report, 2018-10-03

### Gas System

- Fabrication of MFC power chassis continued.
  - ★ 24V DC power supplies and YR2 power redundancy modules installed.
  - ★ Power supply wiring started.
  - ★ Heat shrink cut and attached to fuse connections.

### LTCC

- S3 currently filled with ~42 kg of C<sub>4</sub>F<sub>10</sub>.
- C<sub>4</sub>F<sub>10</sub> order is preparing to ship from F2 chemicals.

### MVT

- Because Mix 1 portion of gas system is unused, Hall B MVT personnel contacted to request disassembly of that channel, allowing the MFCs to be stored properly.

### RICH

- PRs placed for RICH backup N<sub>2</sub> supply pneumatic valves and components.

### SOLID HGC

- Detector gas P&I diagram and cost estimate generated.

### Hall D Solenoid PXI

- NI confirmed TimeSync bug causing ~30 second off set on PXI's timestamp to be uncorrectable with current software.
  - ★ Bug fix will require a new software version; timeframe of new software release unknown.

### cRIO Test Stations

- Tests developed for NI-9205 module dynamic range, gain error, and offset error using Krohn-Hite power supply.
  - ★ Tests also added to manual mode for ±0.2 V range and ±1 V range (total of six tests).
- Issue debugged in cRIO Test Station's program where memory was filling due programming error in NI-9205 module test software.
- Additional test station set up for the National Instruments single-board cRIO.
  - ★ Updated firmware and installed LabVIEW 2018 on single-board cRIO (sbcRIO).



# Detector Support Group

## Weekly Report, 2018-10-03

### MPOD Test Station

- Excel data logging added to voltage accuracy test.

### Safety

- Guidance provided to the Hall A GEM detector setup in EEL 124
  - ★ GEM detector is assembled and ready for testing but still requires ODH and pressure systems review for testing in cleanroom.
  - ★ Assistance offered to providing orifice and relief valve for N<sub>2</sub> gas bottles.
- Guidance provided on the Hall B's magnetic coil test setup in EEL 125.
  - ★ Hall B is testing the field produced by the coil using a class 2 supply.
  - ★ Tests will last under two weeks and will not require manipulation of energized contacts.
  - ★ Verified with safety personnel, Division Safety Officer, and EHS&Q that the test stand could operate without a B List.



# Detector Support Group

## Weekly Report, 2018-10-03

### Antonioli, Mary Ann

#### cRIO test station

- Wrote dynamic range test, gain error test, and offset error test.
  - ★ All tests use Krohn-Hite power supply.
- Using above tests, added tests for each to manual mode for  $\pm 0.2$  V range and  $\pm 1$  V range (total of six tests). Tested and debugged.
- Edited Note on gas system.
- Attended Drupal class.

### Bonneau, Peter

#### HDice

- Debugged NMR program issues on Rack #1 with Amanda, Tyler, and Pablo.
  - ★ NMR program failed to trigger lock-in amplifier while in both asynchronous (self-triggering) and synchronous operation mode.
  - ★ Lock-in amplifier was not responding correctly to buffer storage command.
  - ★ Used lock-in amplifier test program to clear buffer fault and resolve issue.
- Worked with Amanda, Tyler, and Pablo on the setup of the attenuator test for the RF splitter/attenuator box (RF Box).
  - ★ Discussed connection of RF Box to instrumentation and 50-Ohm transmission line theory.
- Wrote DSG note on the LabVIEW drivers needed for development of CAENels CT-box current measurement system.

#### FT

- Upgrades in progress for FT Hardware Interlock System:
  - ★ DSG cRIO-9035 test station set up for FT hardware configuration.
  - ★ Addition of individual sensor settings for interlock trip delay (time-over-threshold) and signal averaging.
  - ★ Investigations underway of slow remote EPICS reset response.

#### DSG

- Setup test and development station for the National Instruments single-board cRIO (sbcRIO-9627).
  - ★ Agilent logic analyzer would not power on; disassembled analyzer and reseated all internal PCBs to resolve issue.
  - ★ Updated firmware and installed LabVIEW 2018 on sbcRIO.

### Campero, Pablo

#### Hall C

- For task concerning end-of-life upgrade from Windows 7 to Windows 10:
  - ★ Installed RS-LOGIX 5000 v16.04 on dsg-hallc-6 Windows 10 PC.
  - ★ Connected to HMS PLC running version 16 with no problems.



## Detector Support Group

### Weekly Report, 2018-10-03

- Collaborated with Amanda to make modifications to Quadrupole current regulation PLC program based on new comments and requirements received from Hall C.
- Updated Hall C PLC tasks table and compiled Hall C weekly report.

#### Hall B Magents

- Investigated September 29, 2018 Solenoid fast dump.
  - \* Based on PLC SOE, QD1:ch1 upper tripped first.
  - \* Voltage taps and QDs voltage signals connected to QD#1 plotted.
    - Data did not show any voltage spikes prior to the dump time.
    - From analysis of timing between when MPS's contactor opened (timing based on IDCCT readouts) and QD#1 trip, noted that timing changed from previous trip on 8/30/2018.
    - After analysis, the clear cause of QD#1 trip is undetermined.
  - \* Extracted text file containing data for all 21 voltage taps and IDCCT with their timestamps for one second before and one second after the dump.
  - \* Monitored temperature in the coils and helium circuitry during the cryo recovery.
- Updating Solenoid Voltage Taps Values at Fast Dumps table.
  - \* Completed fast dump #11 occurred on 1/23/2018.
    - Based on the Solenoid FastDAQ data, QD1:Ch2 exceeded its 100 mV threshold.

#### HDice

- Debugged NMR LabVIEW program with Amanda and Tyler.
  - \* Found issues after temperature and LHe level sensors were connected in the NMR rack and NMR program was ran in synchronous mode.
    - CT-box was not communicating properly, causing program to hang up.
  - \* Verified wiring and proper connection of sensor and NMR rack instrumentation.
  - \* Ran self-test program to clear buffers on CT-box and lock-in amplifier.
  - \* Issue fixed by adding sequencing and 100-ms delays after temperature and LHe level sensor readouts in NMR program.
- Collaborated with Mary Ann to debug error in cRIO Test Station LabVIEW program where memory was filling due to error in VI used in NI-9205 module test.

#### Eng. Brian

##### Hall B Gas System

- DC R1-2 Magnehelic reading lost last week
  - \* Hall B Engineering knows and will look into it
  - \* MKS 223 still works; Magnehelic was a redundant, but more stable, pressure readout.

##### Hall B SVT

- Re-tested SVT modules in EEL 124 with gain scans after kludge cable added to modules for bottom HV.
- Found some modules in R2 had started drawing more current on HV



## Detector Support Group

### Weekly Report, 2018-10-03

- \* Bias voltage lowered as consequence
- \* <https://logbooks.jlab.org/entry/3602769>

#### Hall B Solenoid

- Solenoid dumped again on 8/29/2018
  - \* <https://logbooks.jlab.org/entry/3600579>
- Quick analysis says not VCLs this time, but no obvious cause from SOE or VTs.
  - \* Might be MPS itself or bad SOE module/relay.

#### Hall C Magnets

- PT2026 needs different RF Pulse settings when HMS dipole is at 1.8 T compared to when magnet is at 1.4T.
  - \* Unit loses field lock very easily when the current is changed.
  - \* Field measurement seems more unstable than PT2025 NMR unit.

#### Hall D PXI

- NI confirmed TimeSync bug that causes a ~30 second off set on PXI's timestamp will require a new version of software to fix bug.

### Hoebel, Amanda

#### HDice

- Debugged NMR Rack #1 with Tyler, Pablo, Mary Ann, and Pete.
  - \* Liquid level temperature sensors not working in the program.
    - Problem found to be that sensor were incorrectly in RS-485 ports when they should have been in RS-232 ports.
  - \* CT-Box would not trigger lock-in amp.
    - Power-cycled rack and replaced fuse in line driver power supply; did not fix problem.
    - When program ran in asynchronous mode, box popped up stating power supply module failed to trigger lock-in amp.
      - Program ran correctly in asynchronous mode without sensors.
      - Needed to run Pete's test program for lock-in amp to clear its buffer.
    - Found overall problem to be from liquid level and temperature sensors reading at the same time.
      - Moving each sensor readout to their own LabVIEW frame to be read out one after the other fixed problem.

#### Hall C

- Completed five of eight comments given by Hall C on quadrupole current regulation routine.

#### RF Box Test Station

- Debugged test station with Tyler and Pablo.



## Detector Support Group

### Weekly Report, 2018-10-03

- \* Sine-wave signal from signal generator was distorted on oscilloscope.
- \* Found that frequency setting of input signal was incorrect for RF Box's hardware.
  - Initial input signal was in kHz when it should have been MHz.

#### **Jacobs, George**

- RICH N2 gas system note in progress
- Placed PRs for RICH backup N2 supply pneumatic valves and components.
- Created SOLID HGC detector gas P&I diagram and cost estimate.

#### **Leffel, Mindy**

##### **Gas System**

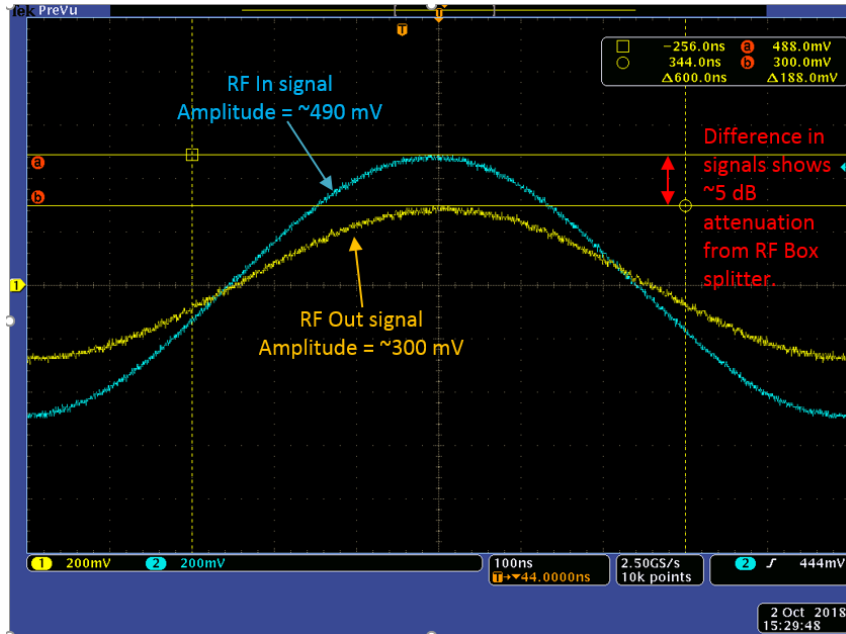
- Continued fabricating MFC power chassis.
  - \* Installed 24V DC power supplies and YR2 power redundancy modules.
  - \* Started wiring power supplies.
  - \* Cut and attached heat shrink to fuse connections.
- Attended Communications Barriers training.

#### **Lemon, Tyler**

##### **HDice**

- Debugged NMR rack in HDice lab with Amanda and Pablo.
  - \* Rack would freeze when run in synchronous mode, requiring all instrumentation to be rebooted.
  - \* Cause of freeze found to be program trying to read temperature and liquid level sensors at the same time.
  - \* Putting sensor readout into a sequence with 100-ms delay between sensors readings resolved error.
- Set up and debugged RF Box for attenuation testing.
  - \* RF box appeared not to be attenuating signals correctly.
  - \* Found that RF Box's splitter requires MHz frequency; was using kHz signal for test.
    - Once frequency of signal was raised to 1 MHz, RF Box operated correctly.
  - \* Set up oscilloscope to monitor input waveform from signal generator (0.5 V amplitude, 1 MHz sine wave) and RF Box's attenuated output signal.
    - Verified that correct output signal is received from RF Box when attenuator is set to 0 dB.
    - The RF Box's splitter causes a ~5 dB loss in signal before signal passes through attenuator.
    - Screen shot below shows input and output signal of RF Box when its attenuation setting is 0 dB.





Screenshot of oscilloscope showing input and output signal when RF Box is set to 0 dB attenuation. Signals are not identical because there is ~5 dB attenuation of input signal, regardless of attenuator setting, after it passes through RF Box's signal splitter.

**MPOD Test Station**

- Developed subVIs to write LV card voltage accuracy results to Excel.
  - ★ SubVI creates one array of raw data and processed results, converts data to a string, and writes data to a template Excel file.
- Attended Drupal content management system training.
  - ★ Drupal is the new system offered by JLab for maintaining the website.

**McMullen, Marc**

**Gas Controls**

- Continued work on the multi-plot display.

**LTCC**

- Provided status for the detector installation and fill level for S3 (~42Kg).
- Gas is preparing to ship from F2 chemicals (per G. Jacobs).

**MVT**

- Mix 1 portion of system is unused.
- Contacted Hall B MVT personnel to make changes to the status of the Saclay controls and request disassembly of that channel.
- Made changes to the SVT portion of the Gas Controls document.
- Completed draft of MFC Power Controls Chassis



## Detector Support Group

### Weekly Report, 2018-10-03

#### Safety

- Provided guidance to the GEM detector setup in EEL 124
  - ★ The GEM detector assembly for Hall A is assembled and ready for testing.
  - ★ Detector group is waiting on ODH review and the completion of a pressure systems review.
  - ★ Assistance offered to providing orifice and relief valve for N2 gas bottle they will use.
- Provided guidance on the magnetic coil field test setup in EEL 125.
  - ★ Hall B is testing the field produced by the coil.
  - ★ Tests use a class 2 supply, but with no manipulation or exposure to contacts.
  - ★ Test is slated to last less than 2 weeks.
  - ★ All required safety personnel contacted to assure that the test stand could operate without a B List.
    - Confirmed by the Division Safety Officer and EHS.