



Detector Support Group

Weekly Report, 2016-1-20

Project Summary

Hall B

1. Gas System Hardware

Team: George, Marc, Mindy, Sahin
Goal: Setup for PID test.
Due: 01/15/2016
Comment: Hall B Engineering *still* needs to fix: circuit breaker (extension cord is being used), bolt rack, and solenoid panel.
Status: **Hardware installation by DSG completed on 01/13/2016.**

2. Gas System Slow Controls

Team: Brian, George, Marc, Mary Ann, Amanda, Tyler
Goal: Complete PID test.
Due: 01/31/2016
Comment: Control program works. Determining optimal settings.
Status: **Slow controls works well, 01/12/2016.**

3. Magnet Slow Controls

Team: Brian, Peter, Amanda, Tyler
Goal: Setup PLC workstations and look at code.
Due: 01/15/2016
Comment: Detailed steps for task 1a provided.
Status: **Able to read code, 01/12/2016.**

4. Detector pre-installation, cleaning, repairing, and testing

Team: Mary Ann, Mindy, Anatoly, Sahin
Goal: Complete LV cables.
Due: 02/29/2016
Comment: N/A.
Status: **CLAS12 DC LV cables completed, 01/16/2016.**

5. DC Installation

Team: George, Marc, Mindy, Sahin
Goal: Prepare for August installation!
Due: N/A.
Comment: Installation scheduled to start 08/01/2016. For an estimated installation time of one chamber per week, installation would be completed end of January 2017. *This estimate does not include time contingency.* Plan is to first install all six chambers of RI, flow gas, and check the chambers, then proceed to RII and then to RIII. If an 'on-board' problem is detected after installation of a region, to fix the problem would require a week. If we anticipate problems with two boards of the total 252 boards (~1%),



Detector Support Group

Weekly Report, 2016-1-20

installation would be completed mid January 2017. If time contingency is included, completion date would be end of January 2017.

Status:

Yet to start.

6. HDICE

Team: Peter, Brian, Mary Ann, Amanda, Tyler, Mindy, Sahin
Goal: Fabricate prototype RF cables.
Due: 01/31/2016
Comment:

Mathematica data file set incomplete. Craig suggested Wei start to get more familiar with the notebooks since he would need to be the one to fill in any missing blanks and make changes based on new setup. **What? After more than a year!**

Status:

First cable of eight fabricated.

7. HTCC

Team: Mary Ann, Mindy, Anatoly, Sahin
Goal: Fabricate cables.
Due: 07/31/2016
Comment: Fifty HV cables cut. Signal cable moved to ESB for cutting. Appropriate tools acquired.

Status:

Work in progress.

DSG

8. Databasing in SQLite

Team: Amanda, Tyler, Brian
Goal: Database and histogram HV currents of SVT modules.
Due: 01/15/2016
Comment: **It appears 6 of 66 modules in current SVT assembly has issues.**

Status:

Histogramming of Hamatsu, burn-in, and December 2016 currents completed, 01/15/2016.

9. Test Station

Team: Tyler, Amanda, Mary Ann, Peter, Brian
Goal: Communicate to cRIO/ output to excel
Due: 01/15/16
Comment: Given the current work load, this project has been deferred to a later time.

Status:

Communication established, 01/11/2016; trying to write output to EXCEL.



Detector Support Group

Weekly Report, 2016-1-20

Antonioli, Mary Ann

Hall B

DC

- Seven more HV cards are available for testing. After troubleshooting initial problems, began testing one.
- LV cables completed.

SVT

- Retrieved HV and LV currents and HV voltages, and entered into Excel spreadsheet.

Arslan, Sahin

Hall B

DC

- Completed work on solenoid distribution box .
- Routed cables, so there would be no trip hazard.
- Transferred R3 LV cables to ESB.
- Cleaned 5 HV modules.

HTCC

- Cut with Anatoly, 50x18' HV cables.
- Transferred LV cable spools to ESB to be cut.

Forward Tagger

- Provided, with Anatoly's help spare bottle of N₂ to forward tagger team.

Hall D

- Attended Tech meeting.

Bonneau, Peter

Hall B

Magnet Systems

- Installed and examined CLAS12 Torus Magnet Power Supply PLC code via Studio 5000 V27.
- Researched hardware communication interface requirements for Danfysik System 8500 Magnet Power Supply (MPS).
- Wrote initial communication check-out procedure for MPS to 435NBX ASCII PLC Gateway module.

HDICE

- Component analysis of RF Switching/Attenuation Unit completed.
 - * Some key components have significant price increases.
 - Programmable attenuators increased from \$679 to \$1190 (2 per unit).
 - * Several components have been discontinued.
 - Discontinued parts have been researched and suitable equivalent replacements have been found.
 - * Due to price increases, cost is ~ 5.5K.



Detector Support Group

Weekly Report, 2016-1-20

SVT

- Monitored SVT Hardware Monitoring System Interlocks on a daily basis.
 - ★ cRio CPU usage averaged ~ 9% over the week.

DSG

PLC

- Trained T. Lemon on Allen Bradley PLC systems.
 - ★ Showed how to setup Ethernet communication to an Allen Bradley L35E PLC processor.
- Debugged and corrected issue with DSG website.

Eng. Brian

Hall B

SVT

- Started initial investigation into modules with higher HV current, started with R2 S6 and made plots of current.
 - ★ Noticed that current increase is a sudden spike, not a gradual increase.
- Working with Amanda on compiling a list of module components to look for correlations in problem modules (all bottom sides: R1 S8, R2 S6, R4 S1, R4 S9, R4 S12).

HDICE

- Teleconference with Craig and Wei.
 - ★ Craig suggested Wei start to get more familiar with the notebooks since he would need to be the one to fill in any missing blanks and make changes based on new setup.
- Wei sent updated/missing *PolarizationFunction* code.
- Ordered additional connectors for air-core cable and worked with Mindy on assembly procedure.
 - ★ Plan is to fabricate enough cable assemblies to replace a single rack's worth of equipment interconnects.

Magnets

- Looking over documentation to come up with a cable assembly to do initial testing with NBX module.

Hoebel, Amanda

Hall B

DC

- Discussed with Tyler and Mary Ann, PID loop setup in LabVIEW for the gas system.

SVT

- Worked on SVT sensor current histograms
 - ★ Original currents from Hamamatsu and burn-in currents from Fermi [Fig. 1].

Detector Support Group

Weekly Report, 2016-1-20

- ★ Original currents from Hamamatsu and December 2015 currents (December currents shifted by about 109 [nA] to align with original) [Fig. 2].
- ★ December and January currents [Fig. 3].

Figure 1

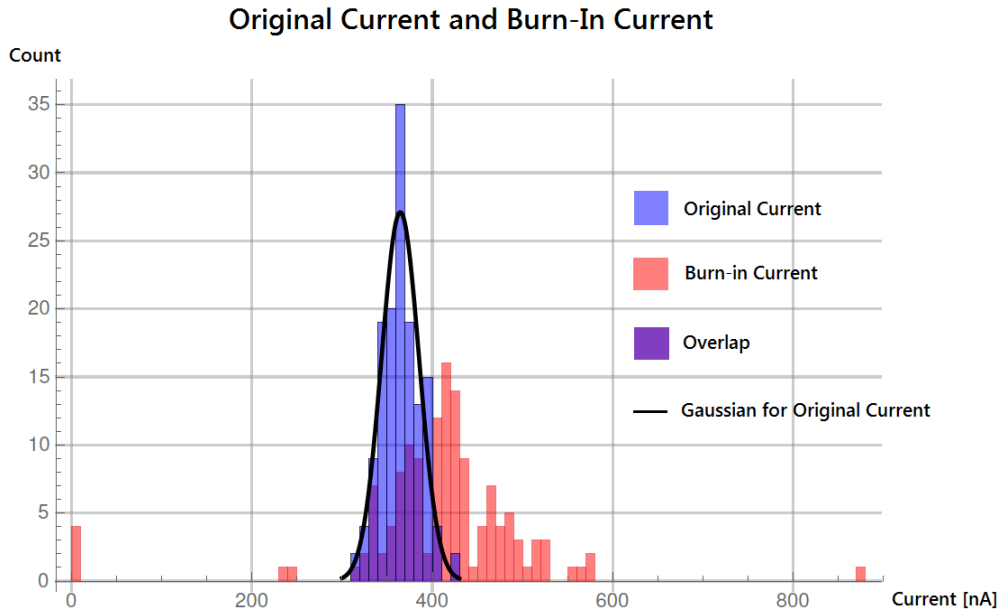


Figure 1 shows the distribution of original currents measured by Hamamatsu and burn-in currents measured at Fermilab. A gaussian curve is fitted over the original currents as the original currents have a gaussian distribution. The burn-in currents do not have a gaussian distribution.

Figure 2

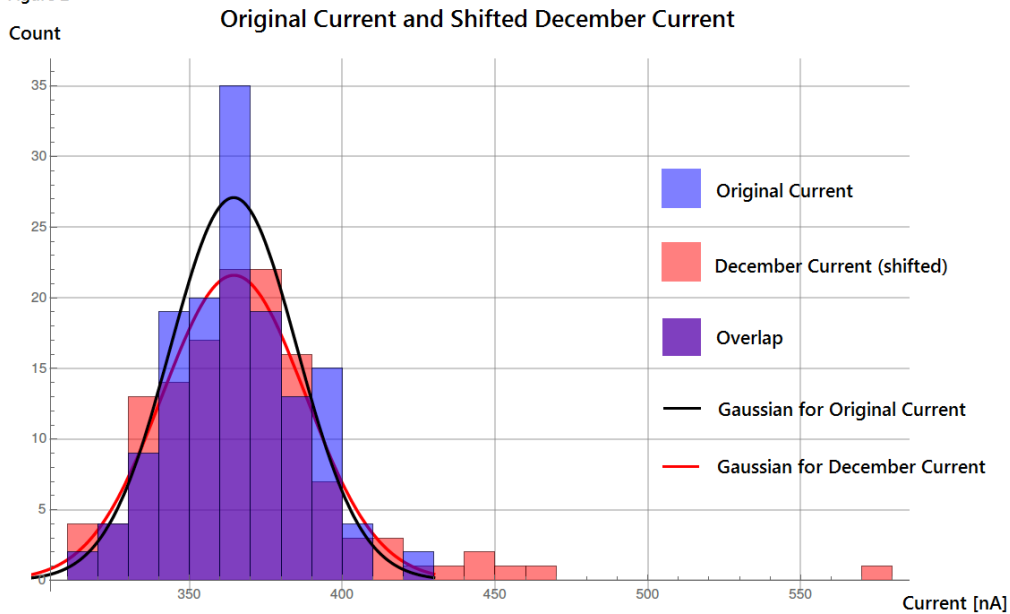


Figure 2 shows the original currents and December currents. The December currents are shifted by about 109 [nA] to display the nearly-identical standard deviation of both distributions. Gaussian curves have been fitted on the original and December currents



Detector Support Group Weekly Report, 2016-1-20

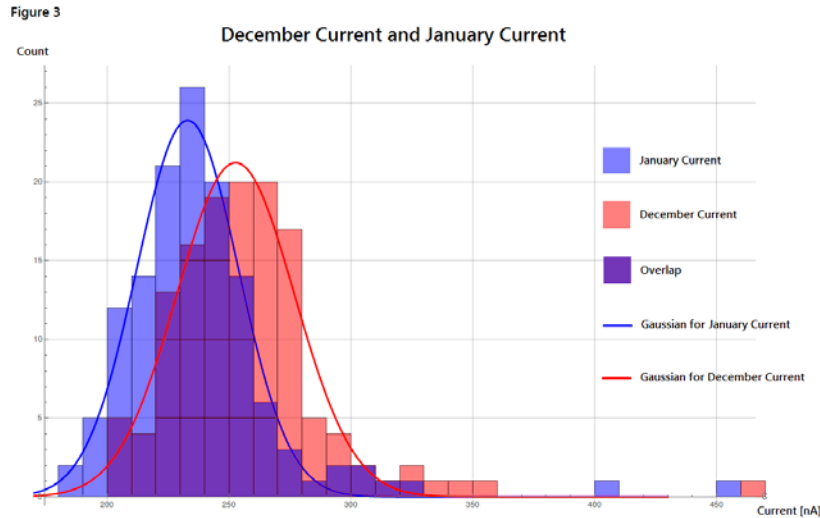


Figure 3 shows the currents for December and January. Gaussian curves are fitted on both December and January distributions. It is shown that the January values fall behind the December values by about 20 [nA]. We are looking into the reasons for the values above 400 [nA].

Jacobs, George

Hall B

DC

- Trouble shooting CAEN Sys 527 HV used for the DC test stand in EEL rm. 125.
- Proposed purchase of new HV mainframe, modules, and connectors to begin migration away from CAEN System 527.

Gas System

- Development testing DCGAS PID.
 - * Discovered a bad exhaust pump, frozen motor, and a bad channel in the MKS 647B.
- Determined optimized R1-2 DCGAS PID parameters for test setup in steady state and for pressure transients.
- Provided feedback on DCGAS PID control GUI.
- Ordered split flexible conduit for DCGAS cables running from L2 to L3 space frame in Hall B.

Leffel, Mindy

Hall B

DC

- Completed fabrication of all LV. cables.
 - * Terminated LV cables for R3S5SL5-SL6 and R3S6SL5-SL6.

HDice

- Started terminating cables 24" N- to-N cables.

HTCC

- Verified correct crimp tools and cable strippers are on hand.



Detector Support Group

Weekly Report, 2016-1-20

Hall D

- Attended Tech meeting.

Lemon, Tyler

Hall B

Slow Controls

- Attended meeting.
 - * Update to RHEL7 almost complete, issue with security system reverting to old script for port forwarding is last update needed.
 - * Want to use existing PLC in hall for Cryotarget but parameters being read from Cryotarget are needed from Saclay before the PLC can be used.
 - * Four VME crates updated and running newest version of EPICS.
 - * EPICS monitoring system is in the process of being built for the hall.

Gas System

- Replaced with Marc basic PID test VI in Labview code with an auto-tuning PID test VI
 - * Deployed program to cRIO.
 - * Did not work properly because the auto-tuning VI does not work with Real Time Systems.
- Observed with George transients in the gas system and how PID test parameters affect the corrections.
 - * Changed the flow of the gas into the tanks in order to cause a transient.
 - * Changed PID parameters to find the best values to correct transients quickly.

DSG

cRIO Test Station

- Wrote program to compare size of a text file to the size of a binary file.
 - * RTD data simultaneously written to text and binary file.
 - * Binary file is smaller on average.

McMullen, Marc

Hall B

Gas System

- Worked with Jacobs, Eng, and Lemon on PID test stand on SFL1 south.
 - * Installed gas lines.
 - * Modified LabView PID loop program to remove setpoint range and continued debugging the system.
 - * PID is operational and is able to control the tank pressure within 0.05 in H₂O of the set point, as flow is changed to simulate ambient pressure fluctuations.
- Informed Hall B Mechanical the status of the Gas System Test Stand and relayed work required to be done for the installation of the rack and gas panel.



Detector Support Group

Weekly Report, 2016-1-20

- Researched temperature controls equipment used for the C₄F₁₀ distillation unit. This information is required to complete the third gas system chassis.

Sitnikov, Anatoly

Hall B

DC

- Tested continuity on 12-pin connectors of DC LV cables and confirmed color code.
 - ★ Completed 42 cables.
- Changed gas cylinder for DC R1S4 with Sahin.
- Moved LV cables for DC 3 region, signal cables(9 bobbin) to building #23 with Sahin.

HTCC

- Measured and cut 50 HV cables with Sahin.



Detector Support Group

Weekly Report, 2016-1-20

Work Request for Hall B Magnet Slow Controls

November 6th, 2015

- I. **Task 1:** Test power supply PLC code with actual Danfysik Power supply.
Background: Josh has written a new PLC driver and did some limited testing (simulation) for communicating with the 4000 A Danfysik power supplies. Prospective PLC programmer will need knowledge of Danfysik power supply communication protocols, serial communications through RTA 435-NBX module, and will need to coordinate testing with the DC Power group. The code is intended to be reusable, so it will be relevant for both Torus and Solenoid. Actual testing will likely occur with the Solenoid power supply.
Time Estimated: 2 man-weeks: 1 each for testing and debugging.
- II. **Task 1a:** Work with Wesley Moore to define/develop EPICS screen(s) for power supply status/control
Background: Hall B is using CSS/BOY (VERY similar to Hall D). Programmer would need to understand the underlying data structure for the MPS control, be familiar (or be made familiar) with Hall D's PSU EPICS screens and work with Wesley to get the screens defined and functioning. Test the power supply control through the EPICS interface. Assuming this is the same person as 1, above.
Time Estimated: Anticipate this would be 2 weeks of effort.
- III. **Task 2:** Work with Wesley Moore to define/develop Cryo EPICS screens for Distribution Can and Torus Service Tower.
Background: Familiarity with the Hall D and Cryo group practices, specifically those regarding valve control. Programmer will need to be able to navigate the PLC programs to determine which tags are relevant, understand the underlying data structures, simplify the P&ID's in order to get 'enough' information onto the EPICS screens for Cryo control.
Time estimated: 1 week each for Distribution Can and Torus Service Tower.
- IV. **Task 3:** Solenoid Bore Heater control (out of scope work):
Background: Krister and Josh have put together a preliminary control system for the solenoid bore heaters. If their preliminary system is approved, this could be a stand-alone task within the overall Solenoid PLC program. This is ON-OFF control of 32 heaters based on the readout of 16 thermocouples. Task would include some definition of wiring, generation of wiring diagrams, hardware configuration, and actual control code.
Time Estimated: 2-3 man-weeks.
- V. **Task 3b:** Work with Wesley Moore to define/develop EPICS screen for Solenoid Bore Heater Control
Background: Not available
Time Estimate: 1 week
- VI. **Task 4:** Coordinate checkout of Distribution Box PLC program after Distribution Box installation.
Background: Download PLC code to PLC, verify all IO, verify operation and read-back from valves, perform initial setup of temperature readout units and LN2 readout unit. Ensure data is being transferred to/from EPICS correctly. During checkout, identify and correct any wiring problems or software bugs.
Time Estimated: 2 weeks.