Detector Support Group

We choose to do these things "not because they are easy, but because they are hard".

Weekly Report, 2023-06-28

Hall A - GEp

Mindy Leffel

- Terminated one high voltage cable with two Fischer connectors, 1of 23 completed

Hall A – Møller

Brian Eng

- Updating cost estimates for director's review
  - ✶ Siemens quote hasn't changed significantly
  - ✶ Cable, connectors, and rack line item will need to be increased; currently ~$25 K but does not include voltage tap cable, inter-rack cables and connectors and ferrules
- Received two flowmeters (vortex shedding type with integrated temperature and relays for both flow and temp)
  - ✶ Manually tested temperature with DMM and started wiring to evaluate Siemens PLC
- Reviewed comparator specifications document Specification: PMAG0000-0100-S0043

Hall B - Central Calorimeter

Mindy Leffel

- Cut twenty-four, 15' coax cables

Hall B – Gas System

Brian Eng

- Continued researching network WiFi access for microcontroller, without using CUE username or rotating guest password
  - ✶ Temporarily connected to cRIO via USB port, which shows up as another serial port on cRIO
  - ✶ Not reliable in the limited testing done; had to disconnect/reconnect when lost communications

Hall C – NPS

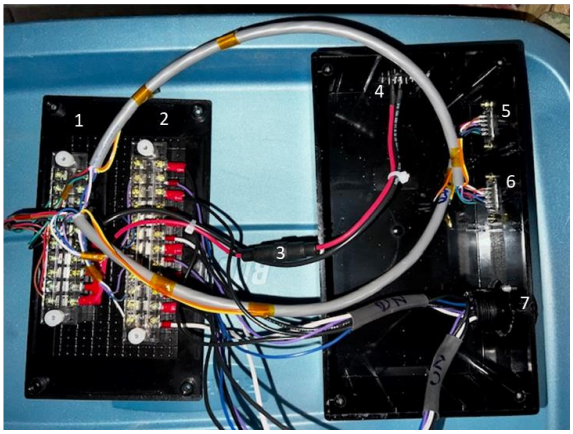
Mary Ann Antonioli, Peter Bonneau, Aaron Brown, Pablo Campero, Brian Eng, Mindy Leffel, and Marc McMullen

- Debugging issues with communication between LabVIEW and EPICS in LabVIEW program
  - ✶ Signals from Boolean buttons are not being written to EPICS shared variables
  - ✶ LabVIEW appears to be reading process variables, but not writing changes to process variables
- Debugged problems with process variable names in the production version of EPICS softIOC
- Designed and fabricated a distribution box for the chiller flowmeters
  - ✶ Provides 24 V of power to the two chiller sensors
  - ✶ Routes flow, temperature, and pressure signals from the sensors to the Keysight terminal block

Component view

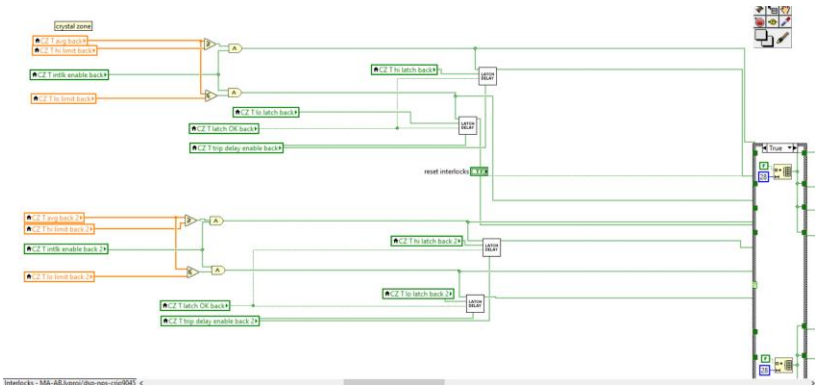
1. Distribution box
2. Cable to Keysight terminal block
3. Cable to crystal zone chiller sensor
4. Cable to electronics zone chiller sensor
5. External power supply
6. Keysight terminal block

Internal box wiring

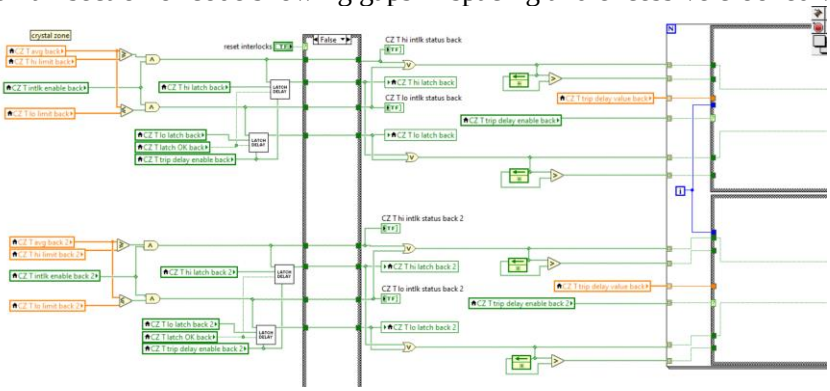


1. Power distribution block
2. Signal distribution block
3. Fuse (0.05 A)
4. Power supply connector
5. Electronics zone sensor connector
6. Crystal zone sensor connector
7. Keysight terminal block connector

- Began cleaning up LabVIEW code
  - ✶ Fixing messy wiring caused by LabVIEW (for unknown reason)



Small section of code showing gaps in spacing and excessive crooked wiring



Same code, cleaned up, reducing spacing

  - ✶ Deleting unnecessary code
  - ✶ Fixing minor errors
- Working on 3D model
  - ✶ Relabeling components
  - ✶ Setting up fluid and solid domains
  - ✶ Merging individual crystal elements and dividers to the detector volume model with the simplified cooling system
- Researching methods to analyze thin structures efficiently
- For alarm test system process variable simulator, developing templates for simulating detector frame sensors (temperature and humidity) and the crystal zone cooling circuit

Hall D – JEF

Mindy Leffel

- Wrapped ten crystals with 3M foil and Tedlar; 811 wrapped to date

EIC - DIRC

Peter Bonneau, Tyler Lemon, and Marc McMullen

- Interlock PCB
  - ✶ Continued design review
  - ✶ Started netlist check, which ensures all circuits are connected correctly and are not shorted to any unintentional circuits or planes
  - ✶ Increased plane clearance from 16 mils to 20 mils
- Created an estimated Gantt chart for project
- Developing backend of linear stage controls for Python user interface program

EIC – RICH

Tyler Lemon

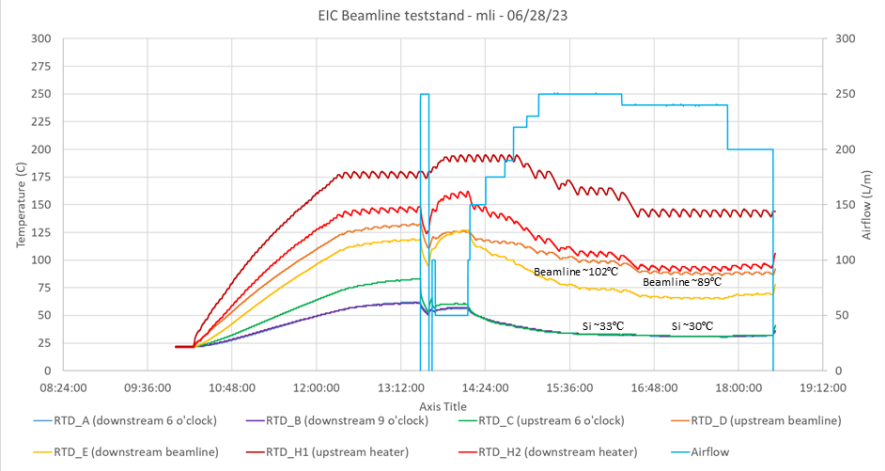
- Met with collaborators to discuss path forward for UV mirror reflectivity tests
  - ✶ Spectrum measurement range of compact CCS spectrometers is acceptable for EIC RICH mirrors; can quantify power of light with wavelengths from ~193 nm to ~1000 nm
  - ✶ Main wavelength range of concern for mirror is ~200 nm – 250 nm
- Continued communicating with Thorlabs on how to order a custom, fiber-optic reflection probe bundle with solarization-resistant fibers
  - ✶ With current probe on hand, fibers are susceptible to UV damage over time
- Investigating new UV light sources
  - ✶ Source's output light power should stabilize quickly after powering on and be stable over several hours
  - ✶ Information received from Thorlabs and Newport on candidates and how to adapt source to output light into optical fibers

EIC - Thermal Test Stand

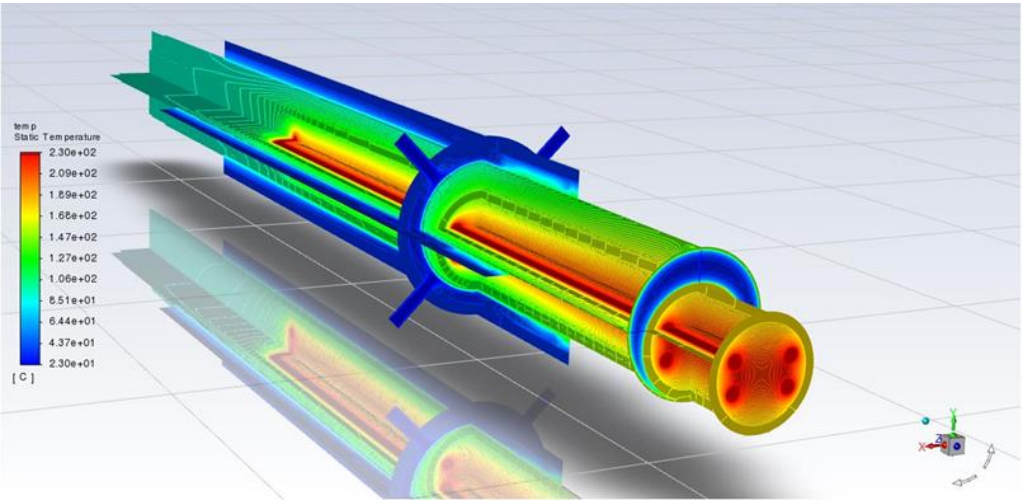
Pablo Campero, Brian Eng, George Jacobs, and Marc McMullen

- Replaced oil soaked insulation around the oil fill connection
- Wrote operating procedure for the test stand controls

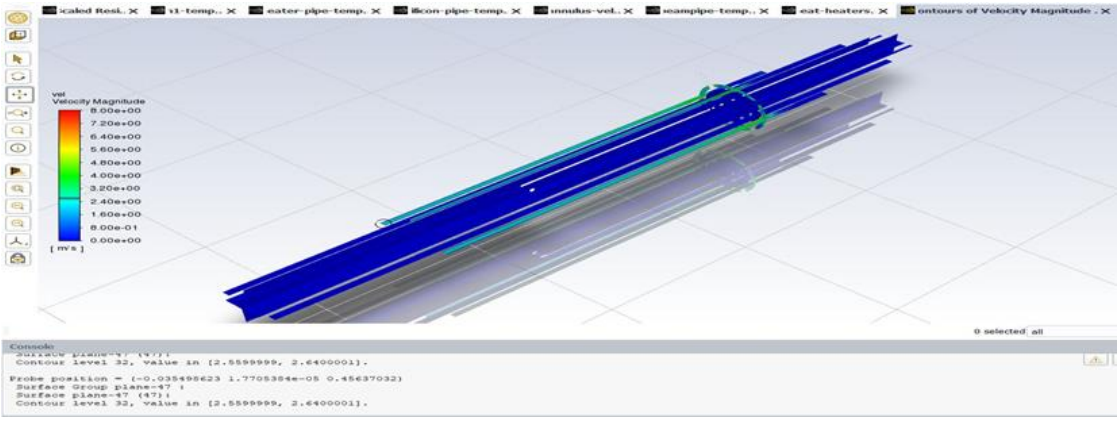
- Using multi-layered Mylar instead of Aerogel to insulate the beamline, ramped up test stand to 190ºC and attempted to cool the simulated silicon surface to 30ºC, while maintaining 100ºC on the beampipe
  - ✶ With the beampipe at ~102ºC, airflow of 250 l/m, the simulated silicon surface was cooled to ~33ºC (RTDs A, B, and C)
  - ✶ Beampipe temperature was lowered to ~89ºC, airflow of 240 l/m, which cooled the silicon surface to 30ºC



- Thermal analysis
  - ✶ Configured Fluent in K-epsilon (turbulent) model
    - Airflow mass rate for the inlets at 150 SLM and 23°C
    - Constant thermal properties for the mineral oil
    - Heater elements at fixed temperature of 230°C
    - Disabled gravity effect from the model
    - Simple method for solution

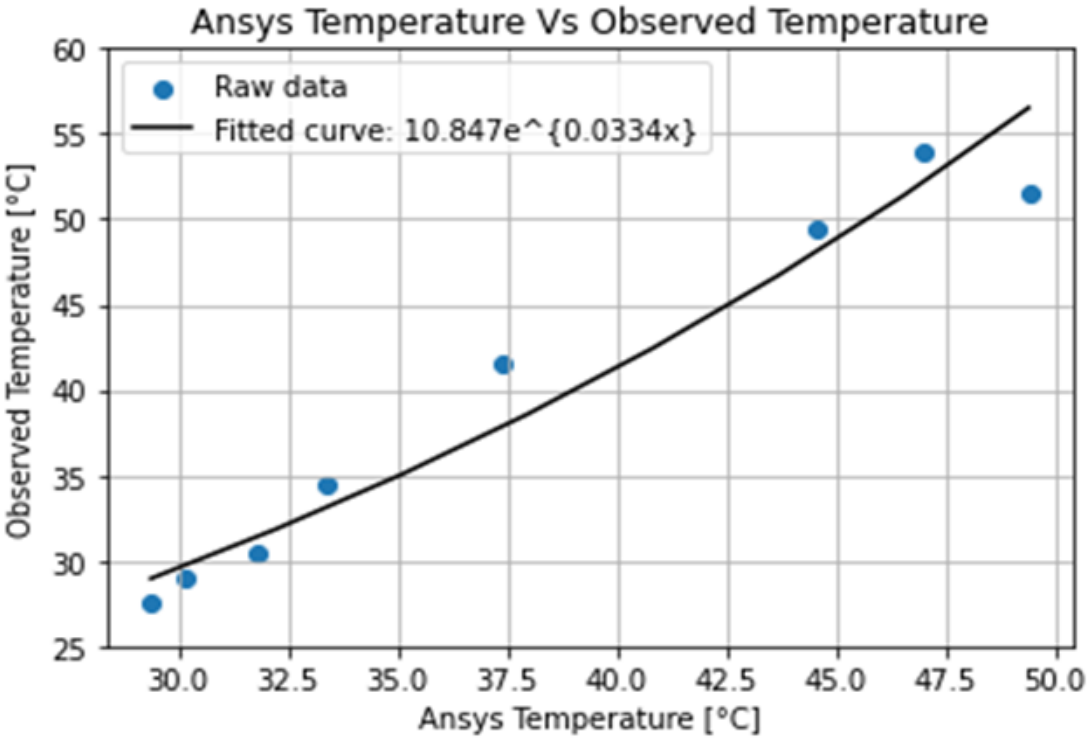


Temperature contour plot. Beampipe and heater pipe temperatures are variable along the *z*-axis, probes measuring ~159°C and 176 °C; silicon pipe temperature is 36.6 °C



Velocity contour plot; velocity at the outlet was ~ 2.5 m/s, no back flow noted

- Wrote python code to fit exponential regression model for the Ansys temperature and the measured temperature



- Using exponential regression calculator to find R-squared value for the exponential regression model, calculated value to be 95.25%