Detector Support Group
Select Projects

Amrit Yegneswaran

DSG Staff


Mary Ann (20)


Peter (27)

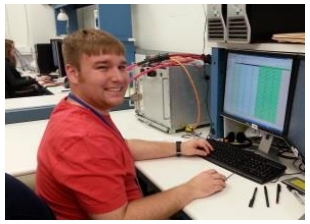

Aaron (<1)


Pablo (4)


Brian (20)


George (5)

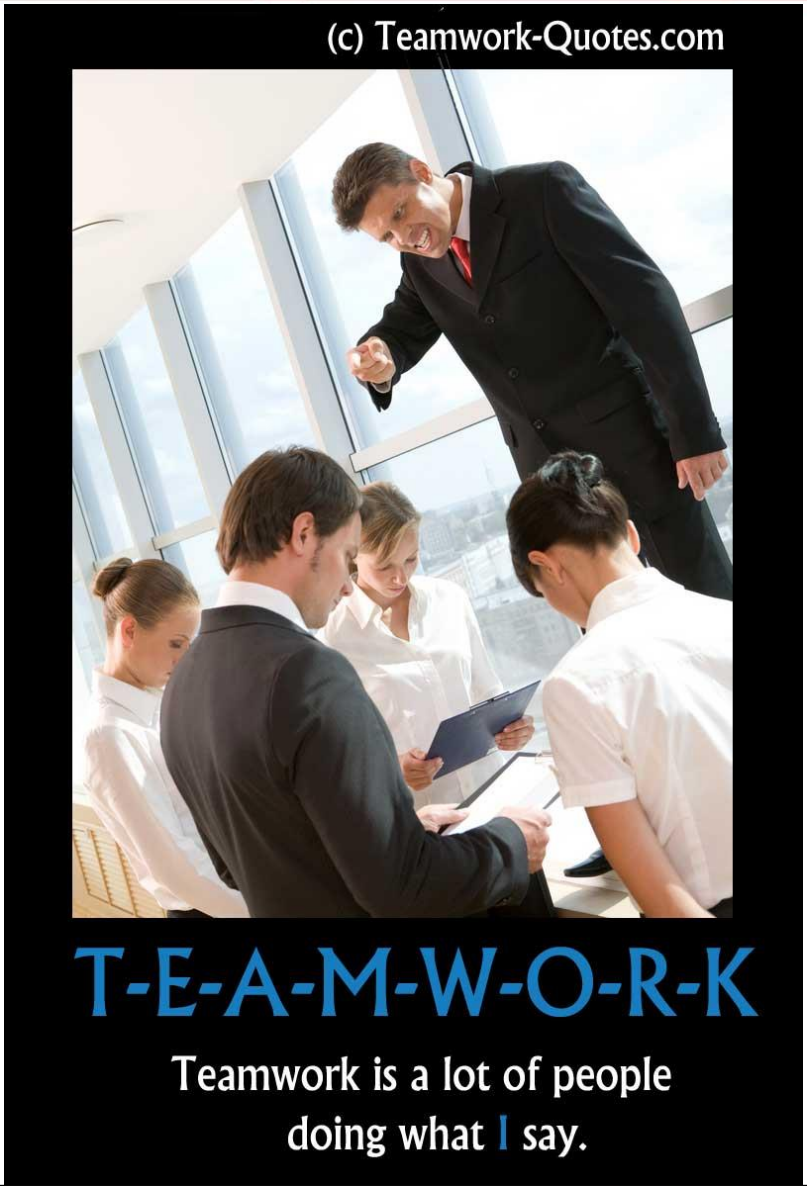

Mindy (20)


Tyler (4)

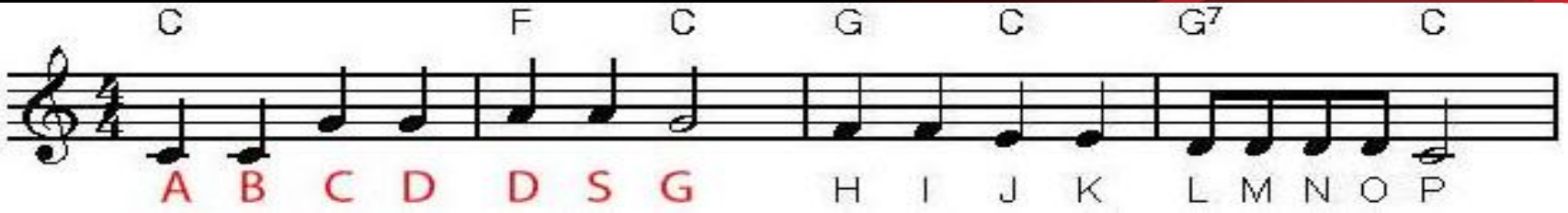

Marc (23)

Give me *the child for the first* ***seven years*** *and I will* ***give*** *you the* ***man.***
Jesuit maxim widely attributed to Ignatius Loyola

DSG is all about teamwork



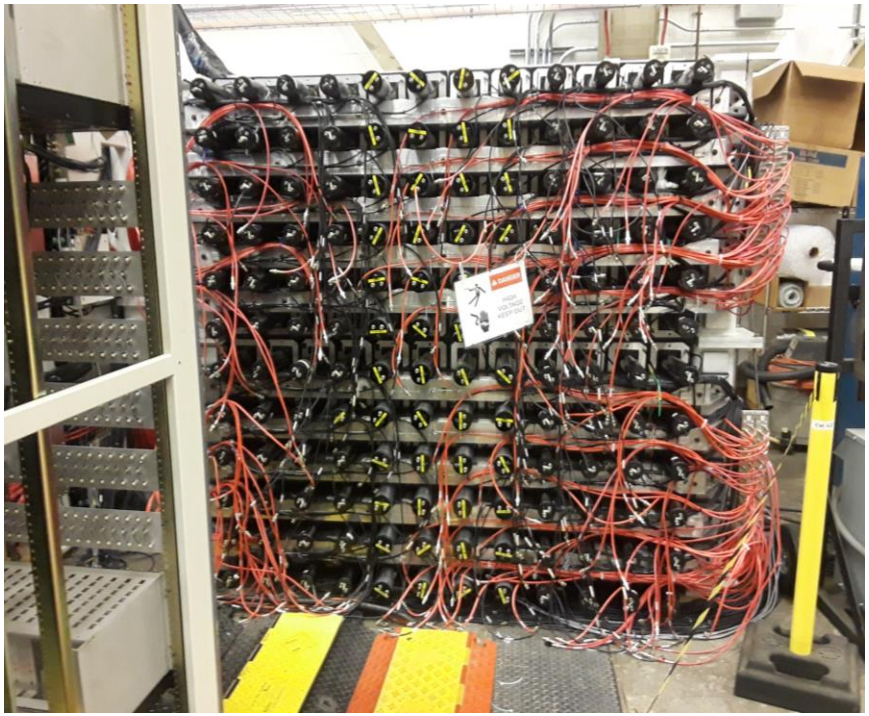
Contents



- **Hall A**
  - SBS & BB: cable fabrication; super-module fabrication; GEM gas system
  - HRS: dipole magnet power supply's controls and monitoring system
- **Hall B**
  - RICH: cooling; humidity and temperature sensor
  - Torus & Solenoid: readout system
- **Hall C**
  - HMS/SHMS: magnet HMI screens → CSS-BOY; HV Tcl/Tk screens → CSS-BOY
  - NPS: testing of CAEN SY4527
- **Hall D**
  - Solenoid: upgrade of PXI system; WEDM screens
- **DSG**
  - Accelerator: populating VME fast shutdown board, wire-bonding tests
  - R&D & Safety: Test stations; focus on safety

Hall A: SBS Cable Fabrication and Routing

- Cable fabrication for HCAL
  - Search, seize, and secure cables in ESB
  - 95% of ~1888 cables fabricated
- HCAL HV cable labeling and routing



~300 HV cables routed on HCAL in Test Lab

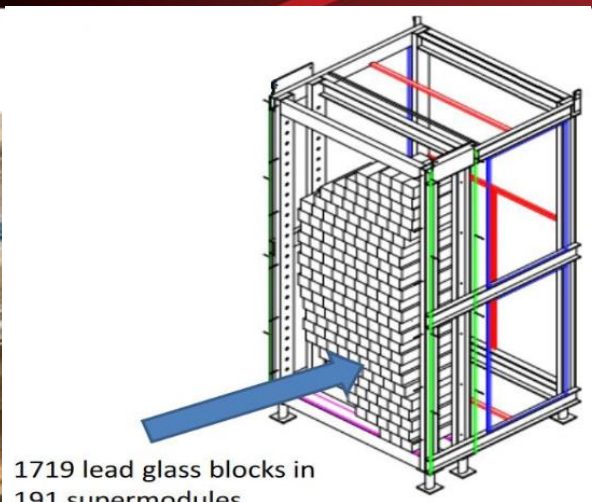
DSG Note 2019-45

Search, seize, and secure cables in ESB

"He believed in youth and youth made him its confidant"
dedication to George Edward Cunningham, Berkeley CA

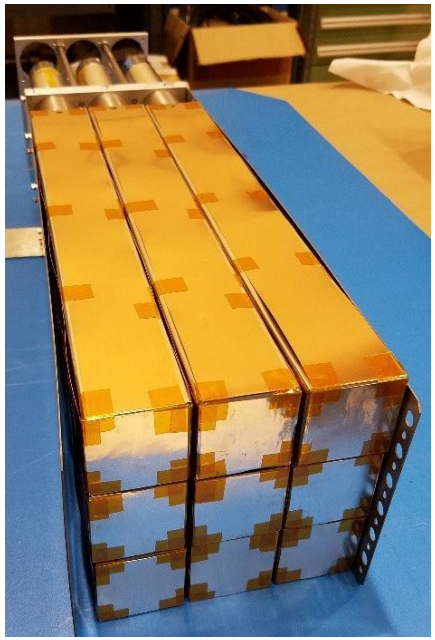
Hall A: BB ECAL Super-module Assembly

- 126/191 super-modules assembled.



Top: diagram of BigBite ECAL showing configuration of 191 super-modules

- Each super-module has:
  - Nine lead-glass blocks with light guides
  - Wrapped in aluminum foil and copper
  - Support frame with screws, springs, and plates hold them in place



Left: Partially assembled super-module showing the nine wrapped lead-glass blocks. Light guides are on opposite end of blocks in photo

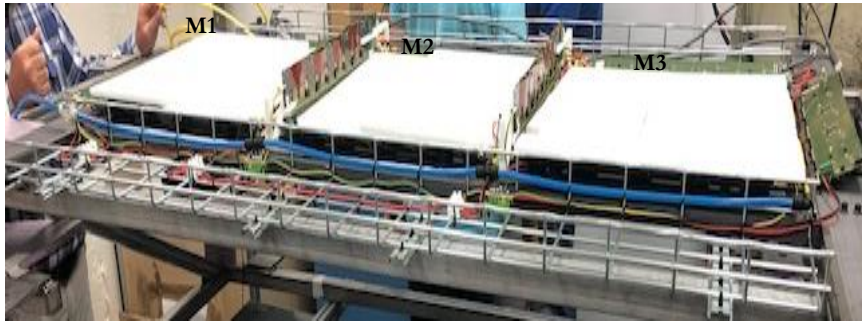
[DSG Note 2019-48]

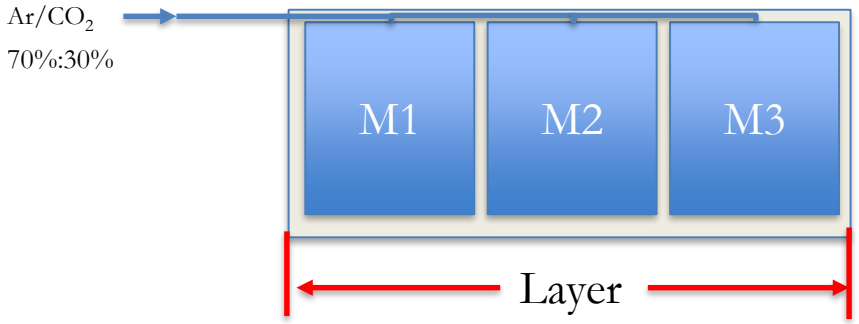
Hall A: SBS & BB GEM Gas System

INFN Layer Configuration

3 modules per layer

1 gas line per layer

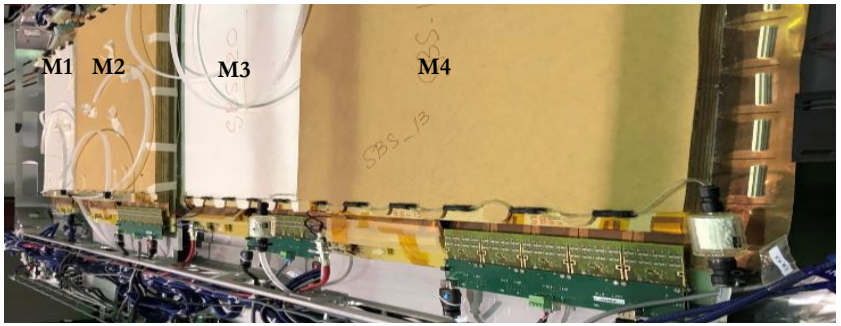


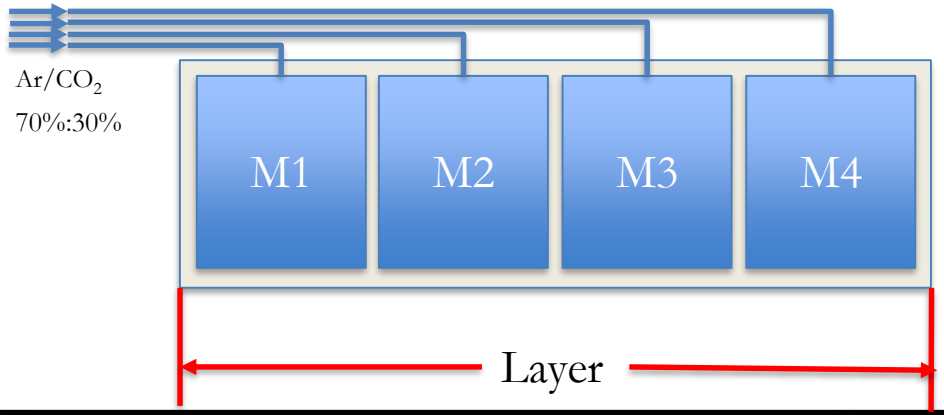


UVA Layer Configuration

4 Modules per layer

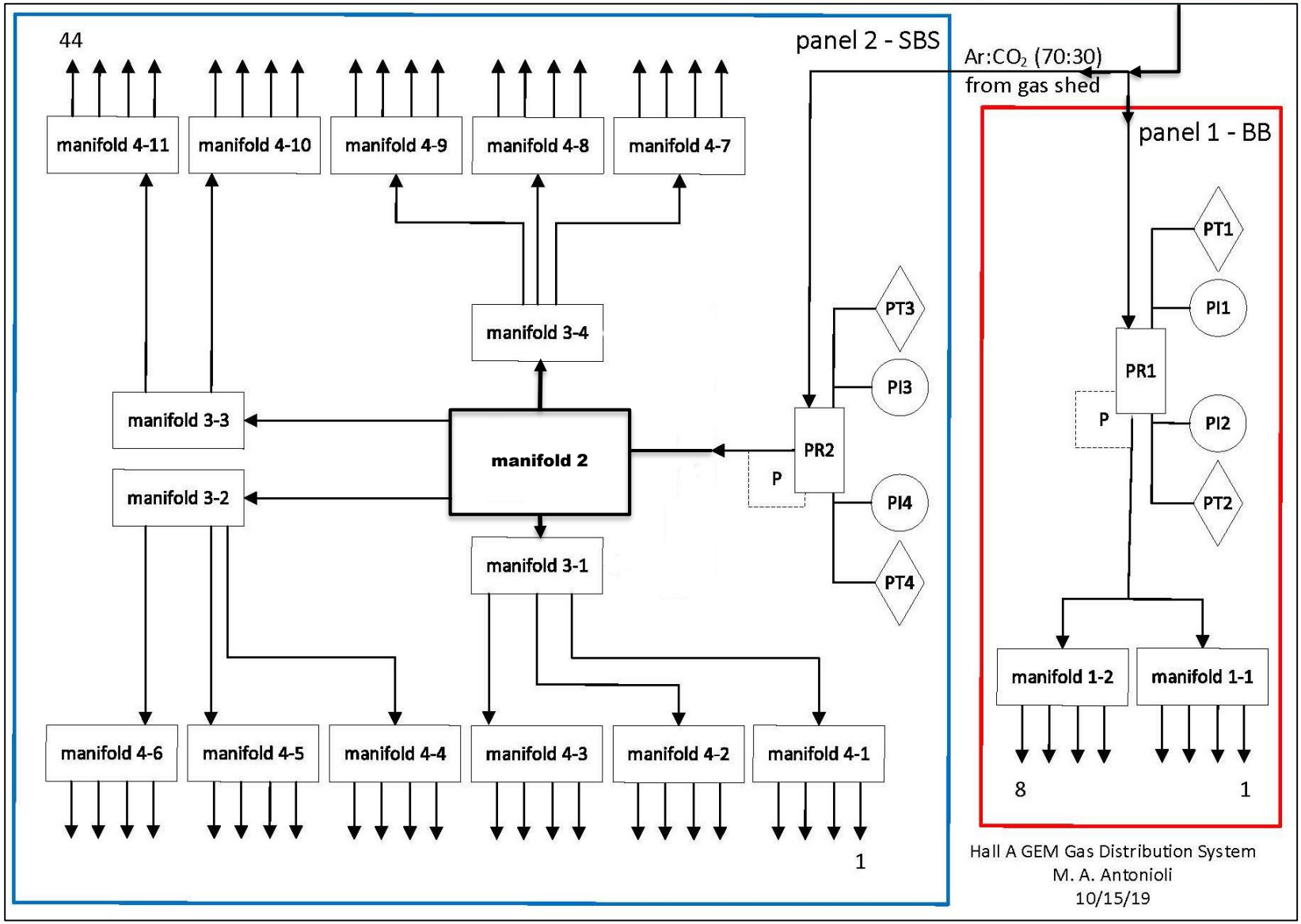
4 Gas line Per layer





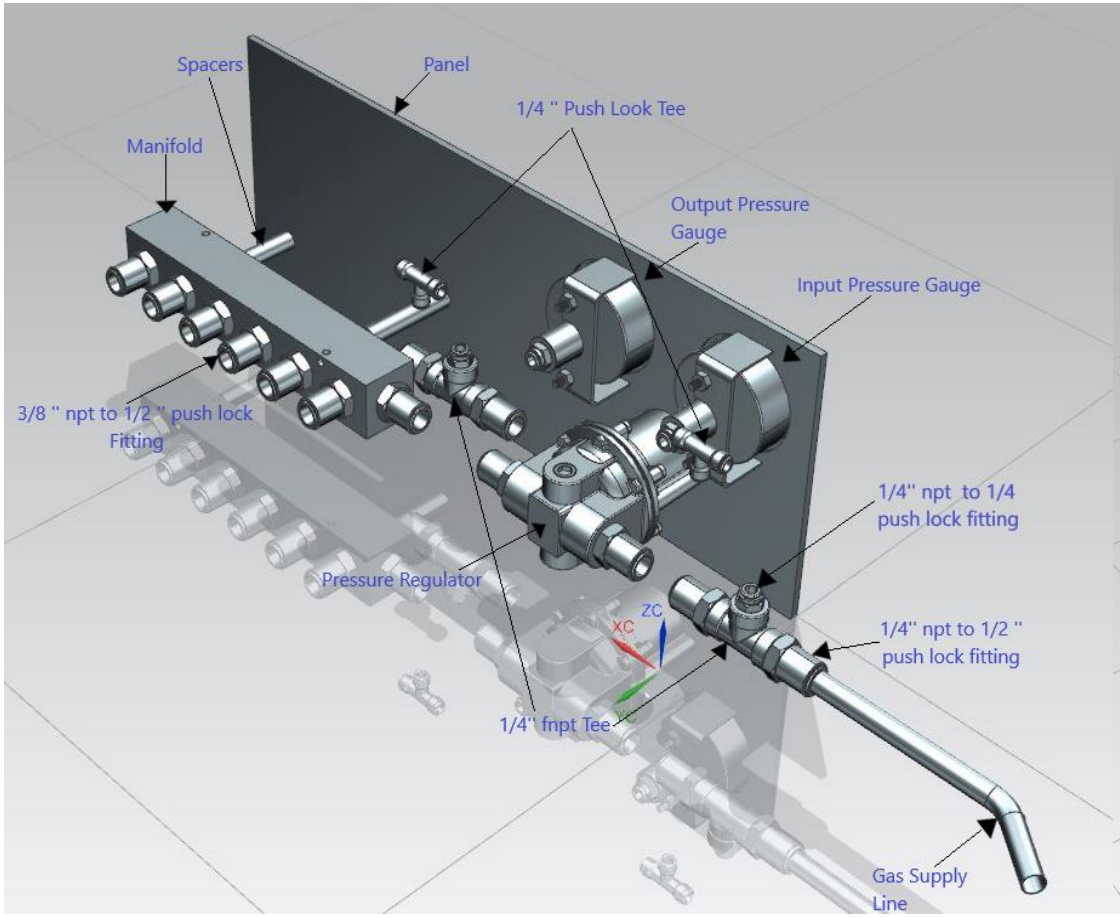
DSG Talk 2019-17

Hall A: SBS & BB GEM Gas System

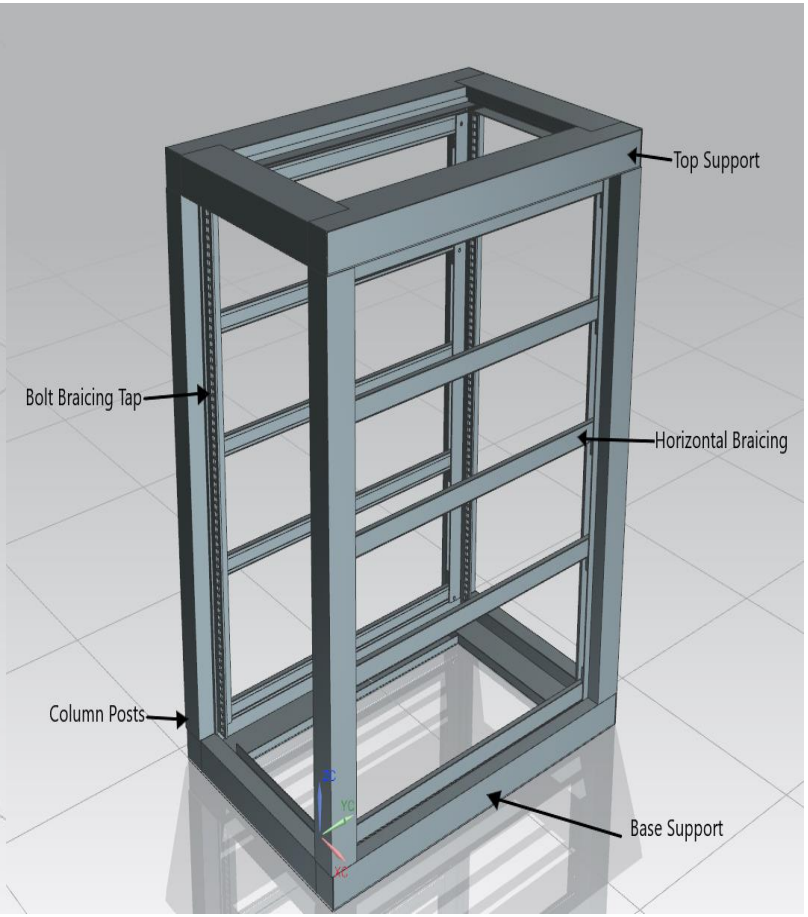


Hall A: SBS & BB GEM Gas System

- Developing 3D-CAD model of gas system in NX-12



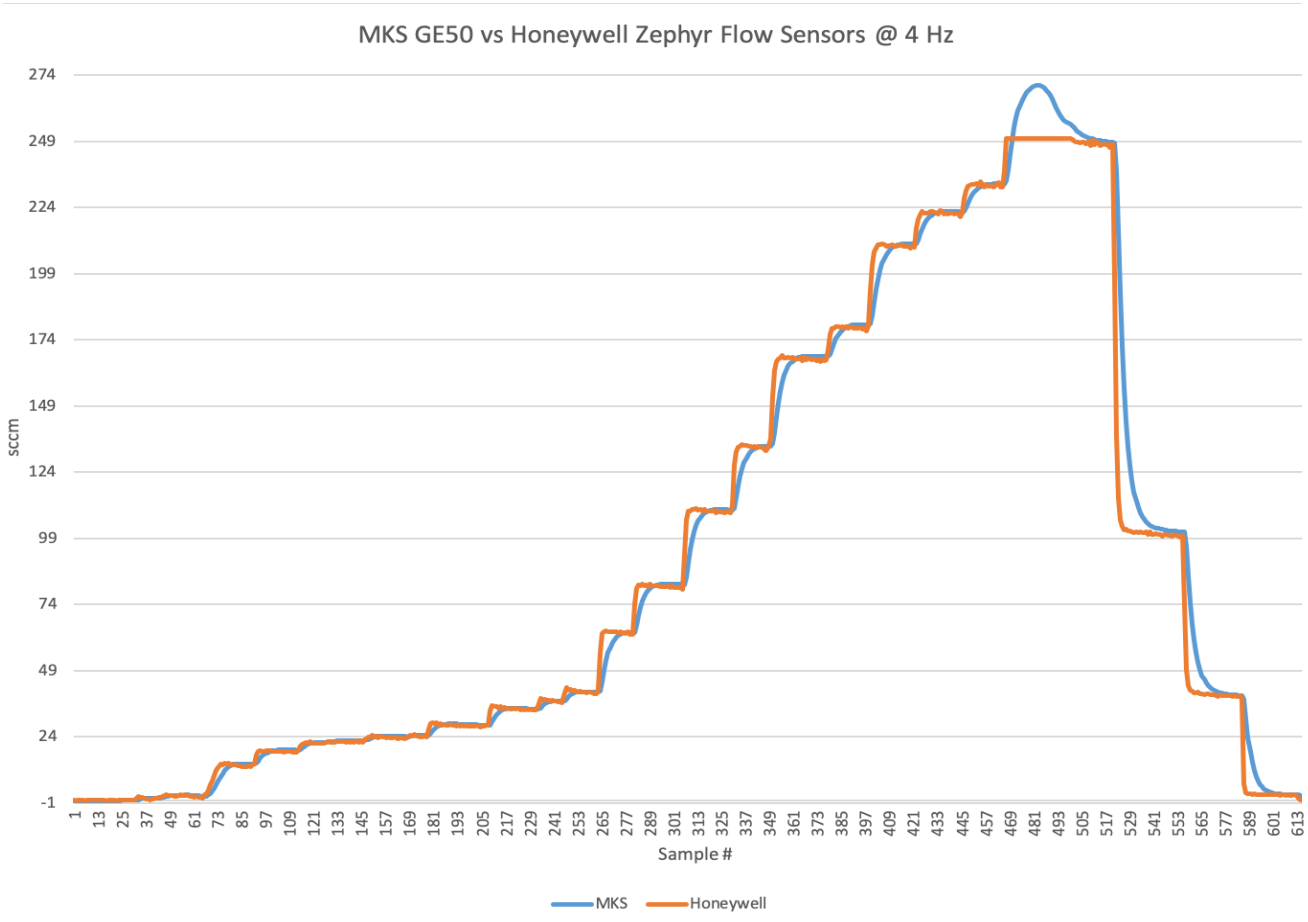
Isometric View of GEM Gas System's components



Isometric View of GEM Gas System's rack assembled

Hall A: SBS & BB GEM Gas System

- Honeywell Zephyr Evaluation



Series	Honeywell Zephyr™ HAF Series-High Accuracy ±50 SCCM to ±750 SCCM
Signal conditioning	amplified, compensated
Technology	silicon die with thermally isolated heater
Flow/pressure range	±50 SCCM to ±750 SCCM
Output	analog (Vdc), digital (I^2C)
Power consumption	**3.3 Vdc:** 40 mW typ. (no load) (analog); 23 mW typ. (no load) (digital) **5.0 Vdc:** 55 mW typ. (no load) (analog); 38 mW typ. (no load) (digital)
Port style	long port, short port
Media compatibility	dry non-corrosive gases
Temperature range	**operating:** -20°C to 70°C [-4°F to 158°F] **compensated:** 0°C to 50°C [32°F to 122°F]
Dimensions (H x W x D)	**long port:** 20 mm x 36 mm x 19,9 mm [0.79 in x 1.42 in x 0.78 in]; **short port:** 17,6 mm x 28,8 mm x 19,9 mm [0.69 in x 1.13 in x 0.78 in]
Features	high accuracy, high sensitivity at very low flows, high stability, low pressure, linear outpu,; customizable, full calibration and temperature compensation

DSG Talk 2019-17, DSG Note 2019-49, DSG Note 2019-50

Hall A: Dynapower PLC Control System

- Upgrade of PLC used in HRS Dipole Magnet Power Supplies
  - Evaluated potential systems (different vendors & products)
  - Setup (code development) and deployed selected system

OLD – SLC500 → NEW - CompactLogix

DSG-Note 2019-29, DSG-Note 2019-40

Thanks Jack

Dsg-halla <dsg-halla-bounces@jlab.org>
on behalf of Jack Segal <segal@jlab.org>
Tue 6/11/2019 8:34 PM

Brian,
Many thanks to you and the DSG. The Left Dipole finally seems to be doing what it was intended to do 24 years ago. It now has redundant protections that function correctly. Your prompt help while I was trying to understand how things were configured and how to correct the errors is much appreciated. Again, thanks!

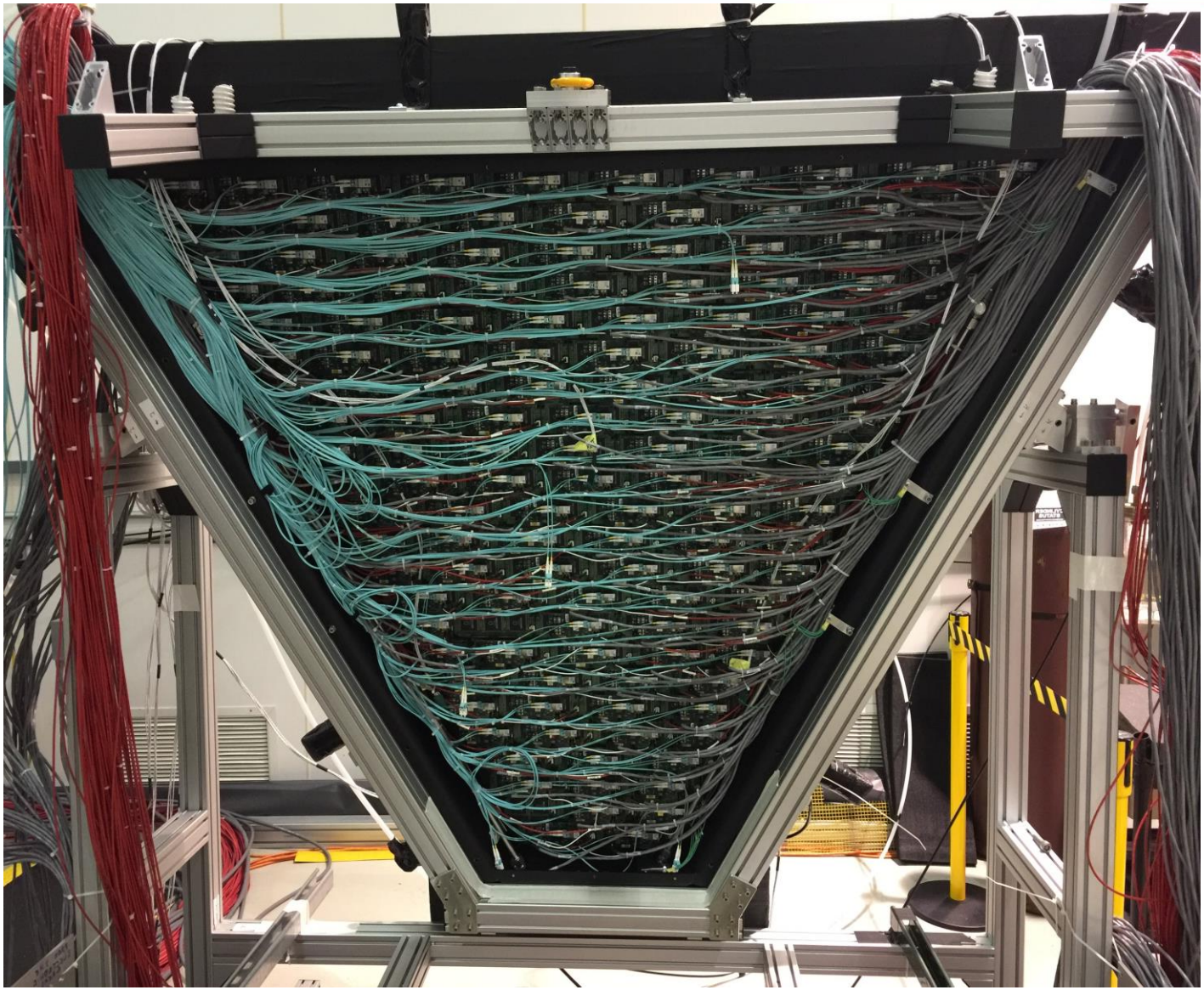
DSG's inner child

Hall B: RICH Cooling Investigation

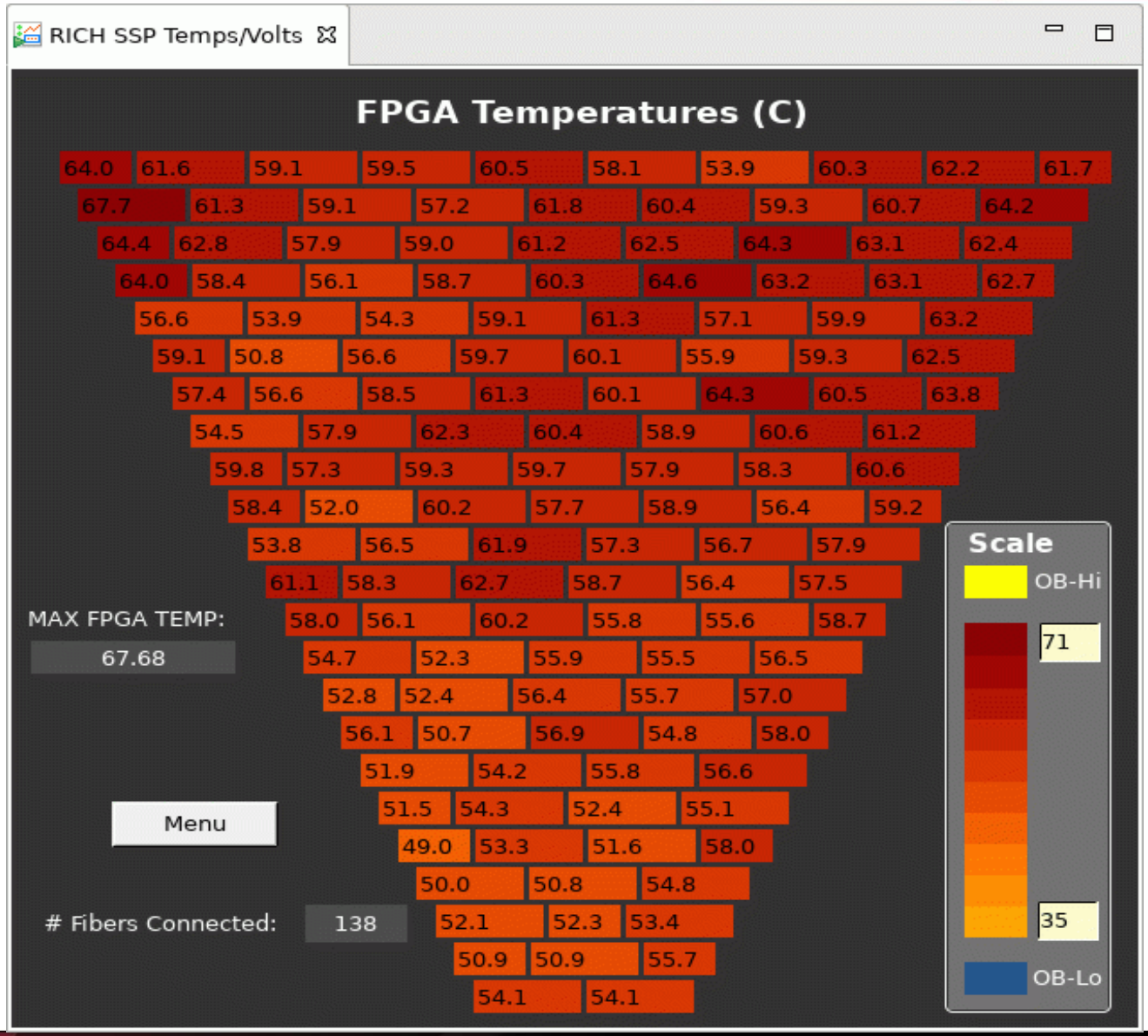
Electronic Panel

Internal cabling

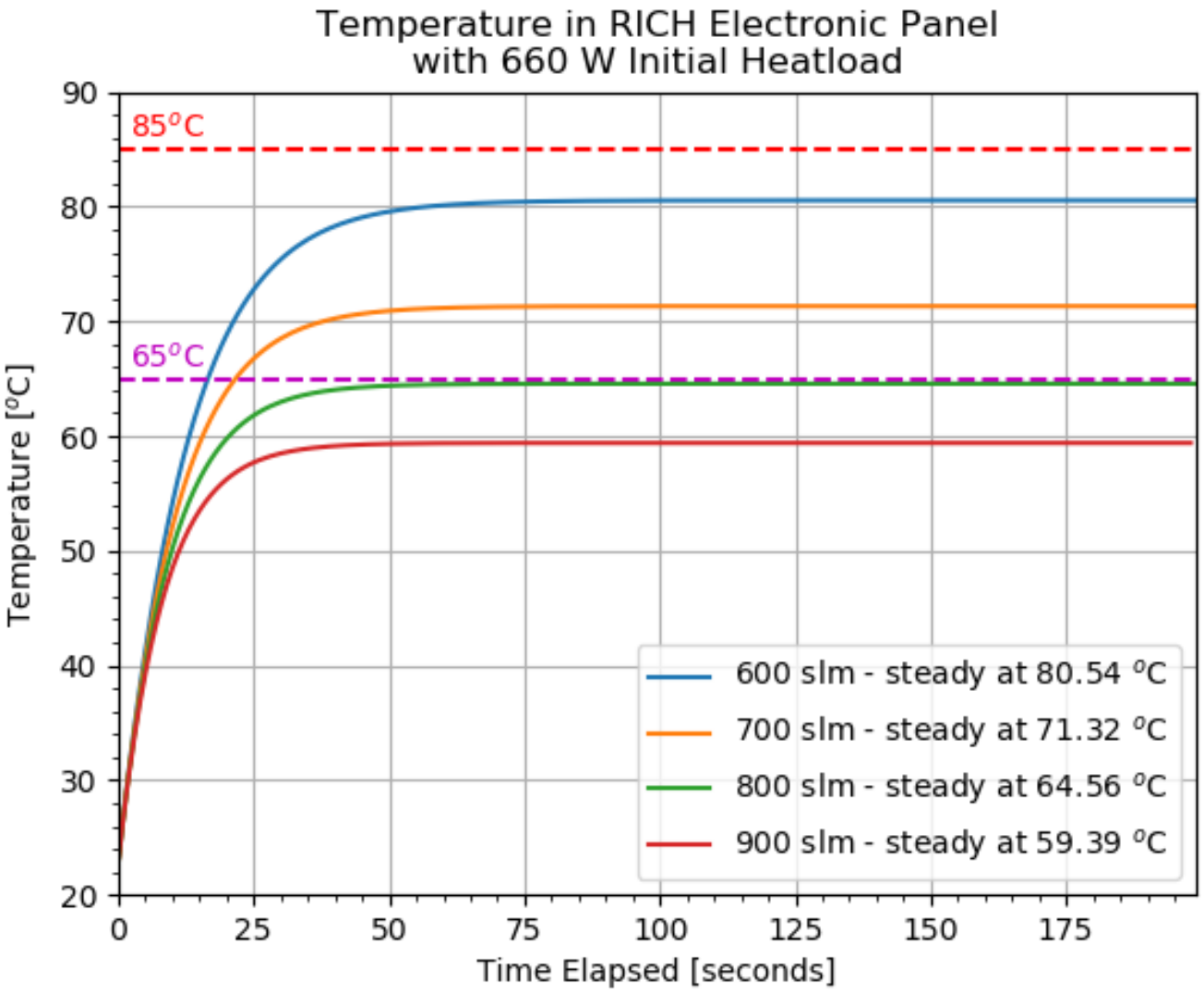
Red ~ HV
Gray ~ LV
Light gray ~ Sensor
Green ~ Data



Hall B: RICH Cooling Investigation

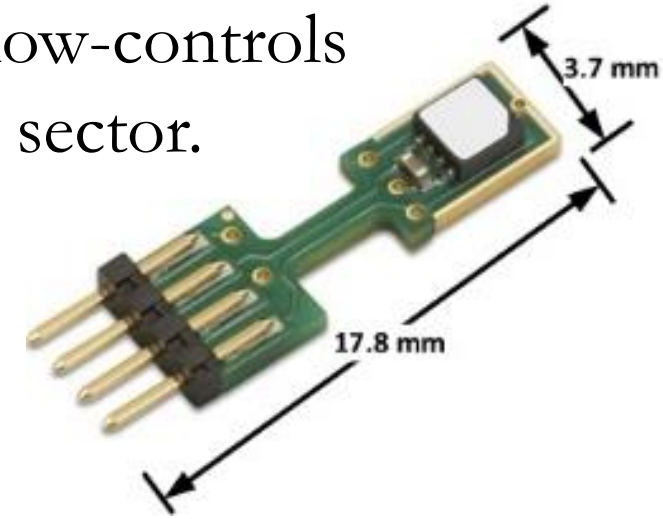


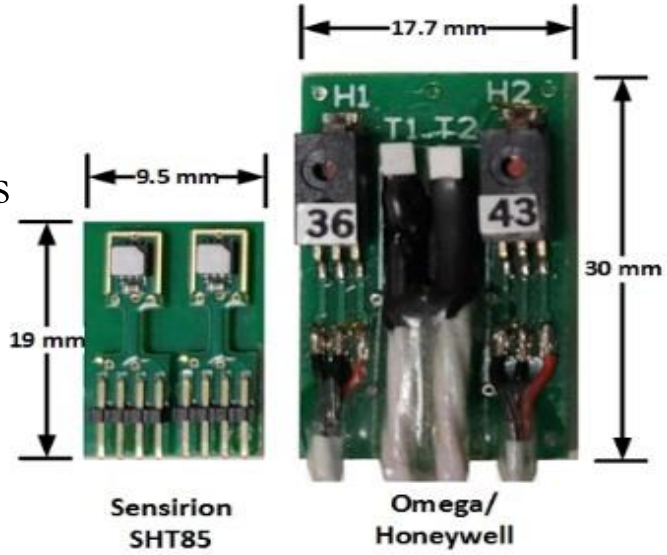
Hall B: RICH Cooling Investigation



Hall B: Sensors for New RICH

- Improve temperature and humidity slow-controls measurement systems for next RICH sector.
- Sensirion SHT85 Sensor
  - New product released on 11/2018
  - Accuracy
    - ✓ Humidity: ±1.5% RH, temperature: ±0.1°C
- Compare to currently used Honeywell/Omega
  - Smaller size of sensor assembly
  - Reduced # of cables/connectors
  - Compatible with existing slow-controls electronics
  - Compatible software support (including EPICS)
  - Lower cost



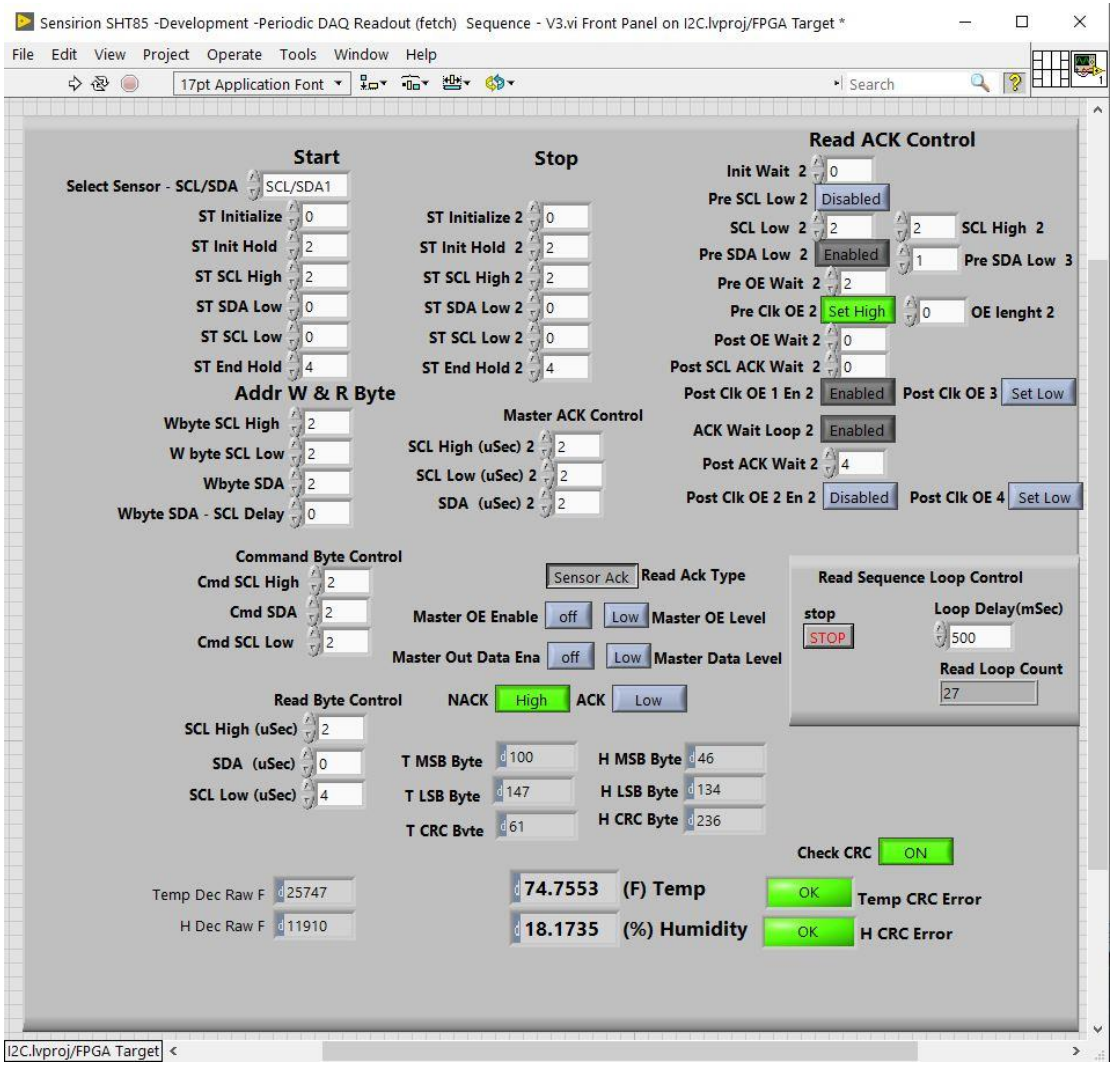


DSG Note 2019-43

HallB: Sensors for New RICH

- Developing FPGA code
  - Addressed issue with single-shot readout sequence
  - Testing in progress

[DSG Note 2019-44]
[DSG Note 2019-47]

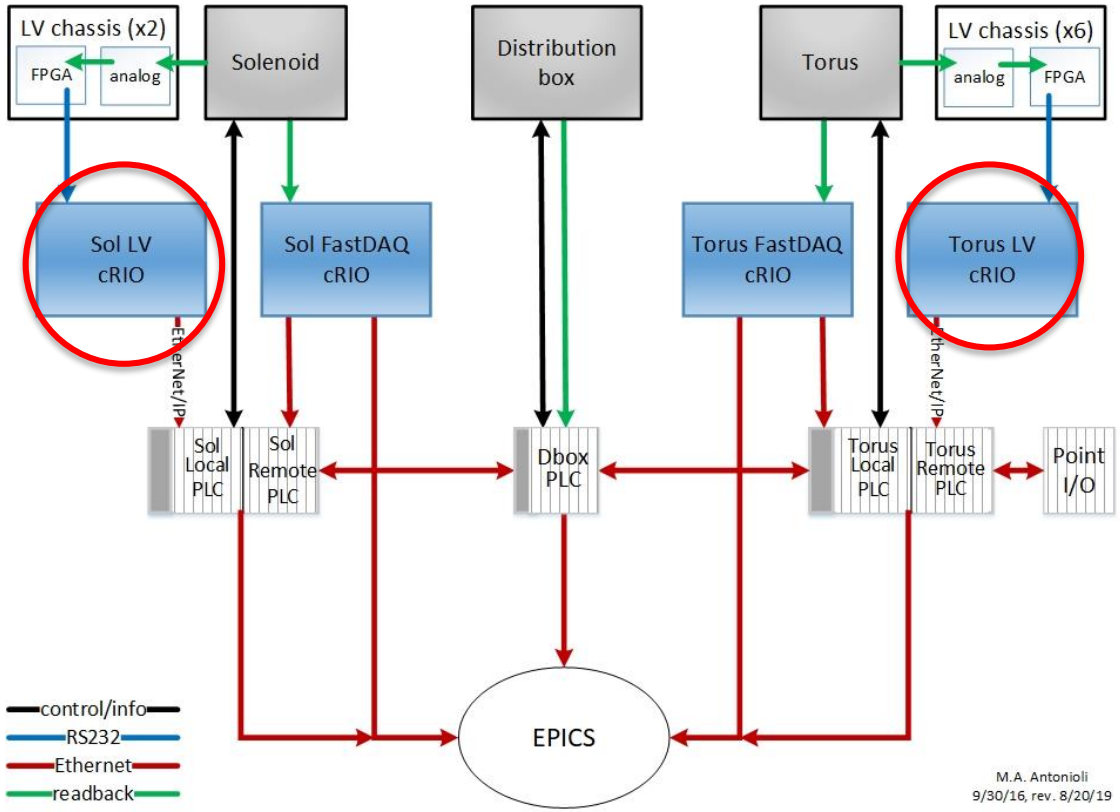


Serial Communication Timing Test Screen

Hall B: Solenoid and Torus Magnet Readout System

- Replace current LV Chassis FPGA with DE0-Nano-SoC or some other improved FPGA board
  - LV cRIOs have failed, removing them eliminates point of failure
  - New board would communicate directly with PLC

[DSG Talk 2019-24]
[DSG Note 2019-53]



Present readout configuration

Thanks Ruben

Dsg-hallb_magnets
on behalf of Ruben Fair
Thu 9/5/2019 10:11 AM

Tyler and the DSG,
This is excellent work. Great report and summaries.
We very much appreciate your contribution and your continuous improvement efforts. Looking forward to seeing which solution is the most reliable and cost effective.
Thank you
Ruben

DSG's inner child

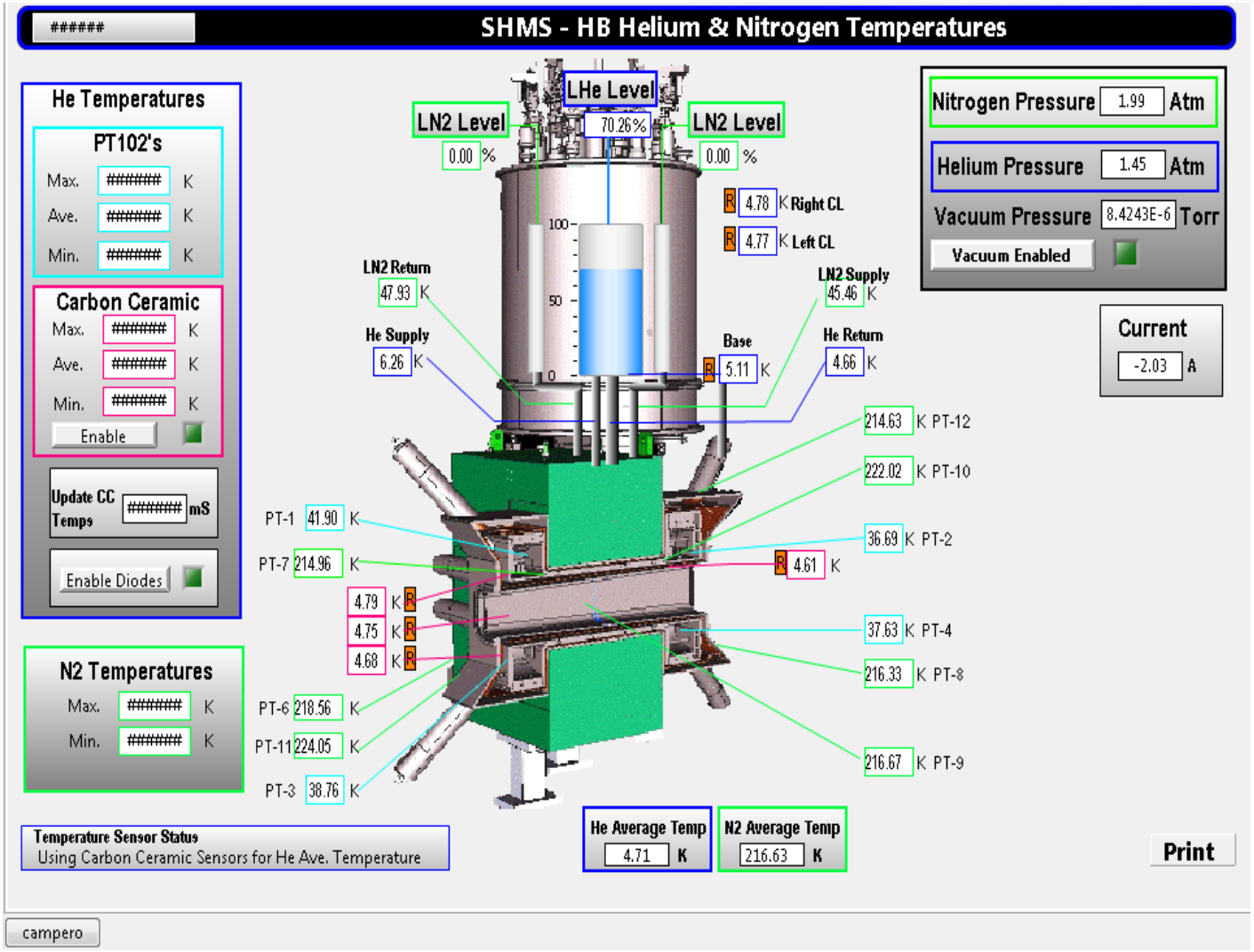
Hall C: HMS/SHMS Magnet HMI screens to EPICS CSS-BOY

- Motivation
  - Standardization
  - Enables data archiving and thereby facilitates debugging
  - Enhancements of display and functions facilitates magnets' controls and monitoring

- 275 HMI screens need to be addressed

DSG Note 2019-20
DSG Note 2019-22
DSG Note 2020-02
DSG Talk 2019-07
DSG Talk 2019-13

Hall C: HMS/SHMS Magnet HMI screens to EPICS CSS-BOY



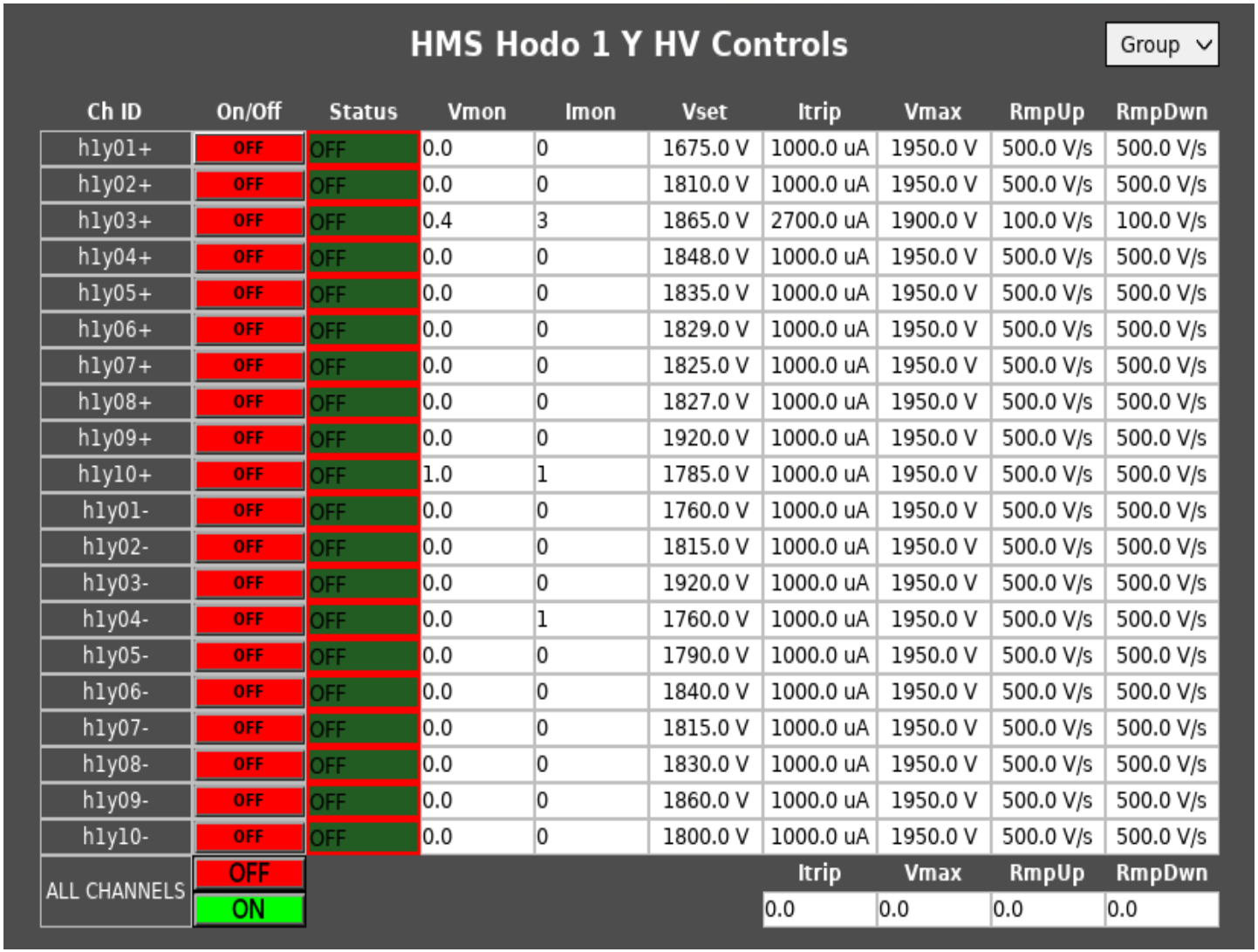
CSS-BOY screen for SHMS – Horizontal Bender magnet's Helium and Nitrogen temperatures. This screen combines Helium and Nitrogen HMI PLC screens.

Hall C: HV Tcl/Tk system to EPICS CSS-BOY

- Motivation for CSS
  - Standardization
  - Faster
    - ✓ Opens screens in seconds as opposed to minutes (yawn)
    - ✓ Screens are static and do not have to be rebuilt unless configurations change
  - Uses a Python script to build screens based on configuration files.
    - ✓ Script builds all screens in seconds
  - Includes CSS-compatible backup/restore program and start-up script.
  - Start-up script allows multiple instances of screens to be opened simultaneously and provides a consistent user experience for all users

DSG Note 2019-27, DSG Note 2019-34, DSG Note 2019-36, DSG Note 2019-42
DSG Talk 2019-13

Hall C: HV Tcl/Tk system to EPICS CSS-BOY



HMS Hodo 1 Y HV Controls — Group

Ch ID	On/Off	Status	Vmon	Imon	Vset	Itrip	Vmax	RmpUp	RmpDwn
h1y01+	OFF	OFF	0.0	0	1675.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y02+	OFF	OFF	0.0	0	1810.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y03+	OFF	OFF	0.4	3	1865.0 V	2700.0 uA	1900.0 V	100.0 V/s	100.0 V/s
h1y04+	OFF	OFF	0.0	0	1848.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y05+	OFF	OFF	0.0	0	1835.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y06+	OFF	OFF	0.0	0	1829.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y07+	OFF	OFF	0.0	0	1825.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y08+	OFF	OFF	0.0	0	1827.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y09+	OFF	OFF	0.0	0	1920.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y10+	OFF	OFF	1.0	1	1785.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y01-	OFF	OFF	0.0	0	1760.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y02-	OFF	OFF	0.0	0	1815.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y03-	OFF	OFF	0.0	0	1920.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y04-	OFF	OFF	0.0	1	1760.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y05-	OFF	OFF	0.0	0	1790.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y06-	OFF	OFF	0.0	0	1840.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y07-	OFF	OFF	0.0	0	1815.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y08-	OFF	OFF	0.0	0	1830.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y09-	OFF	OFF	0.0	0	1860.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s
h1y10-	OFF	OFF	0.0	0	1800.0 V	1000.0 uA	1950.0 V	500.0 V/s	500.0 V/s

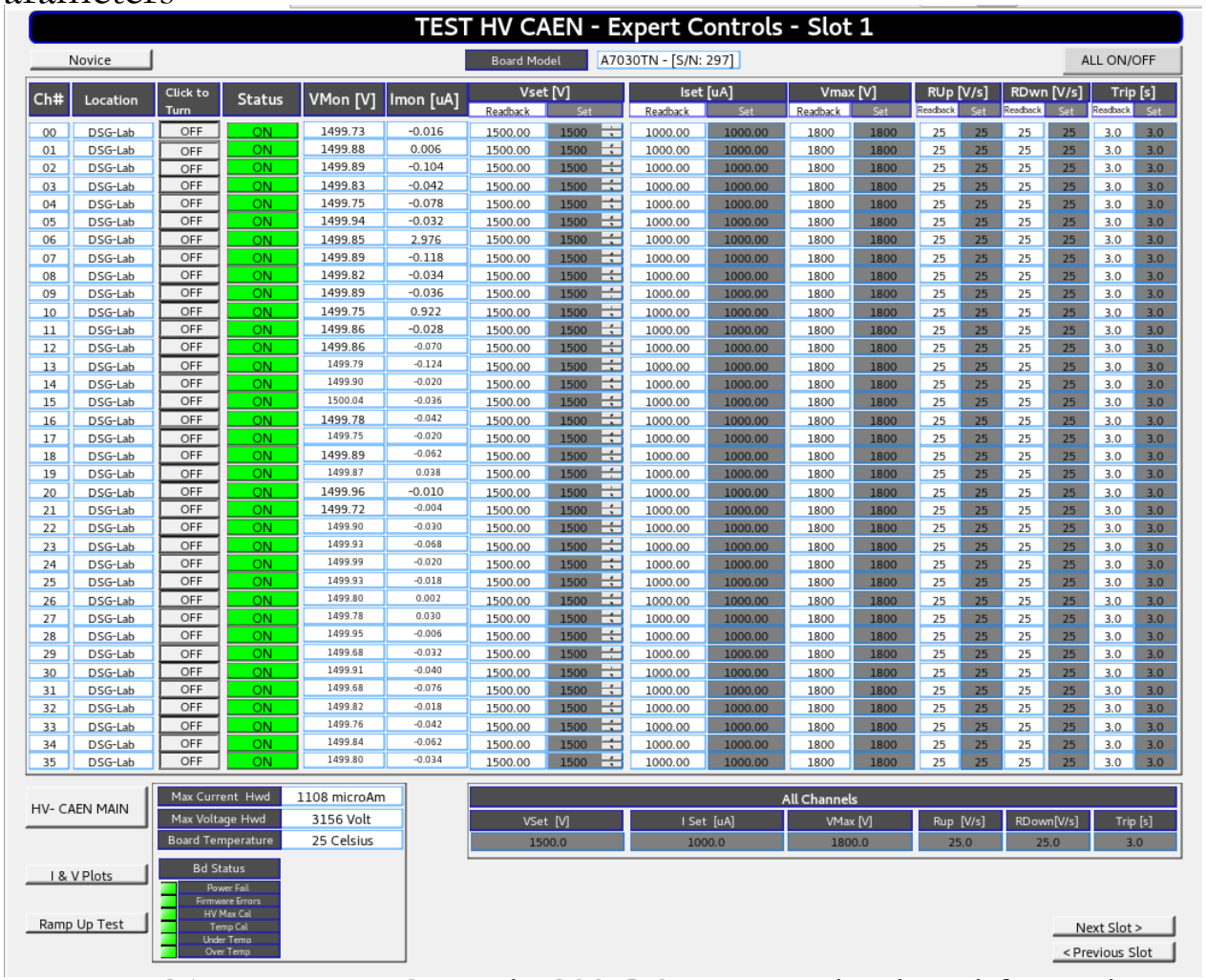
ALL CHANNELS	Itrip	Vmax	RmpUp	RmpDwn
OFF / ON	0.0	0.0	0.0	0.0

List-view controls screen for HMS Hodoscope 1 Y.

Hall C: Investigation of CAEN SYS 4527 and HV cards A7030TN

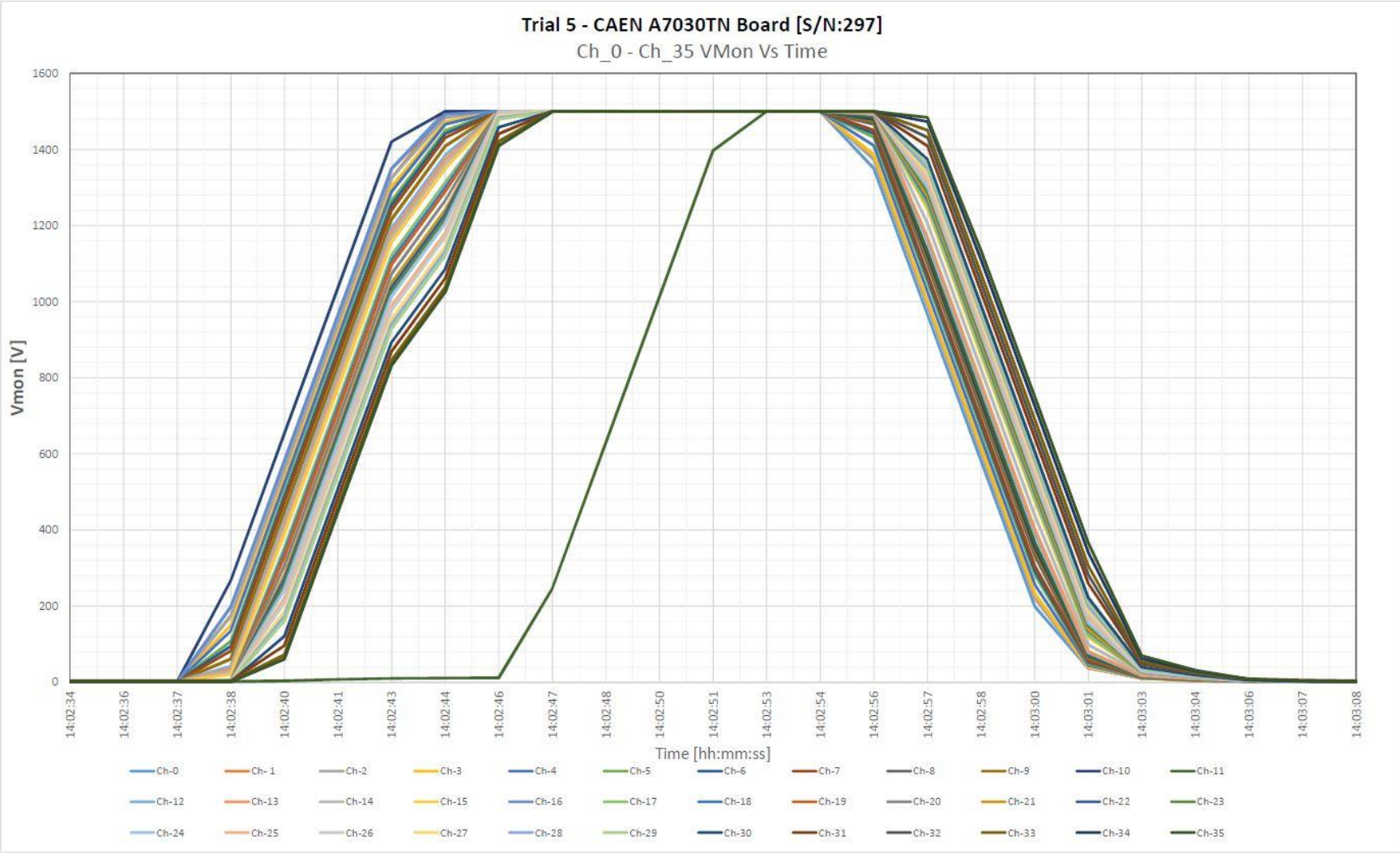
- Issues with SY4527 and HV card A7030TN
  - Changing set values of parameters
  - Ramp-up latency
  - Ignoring commands

[DSG Note 2019-46]
[DSG Note 2019-54]
[DSG Note 2020-01]
[DSG Talk 2019-18]
[DSG Talk 2019-23]
[DSG Talk 2019-28]



HV CAEN Expert Controls CSS-BOY screen developed for testing

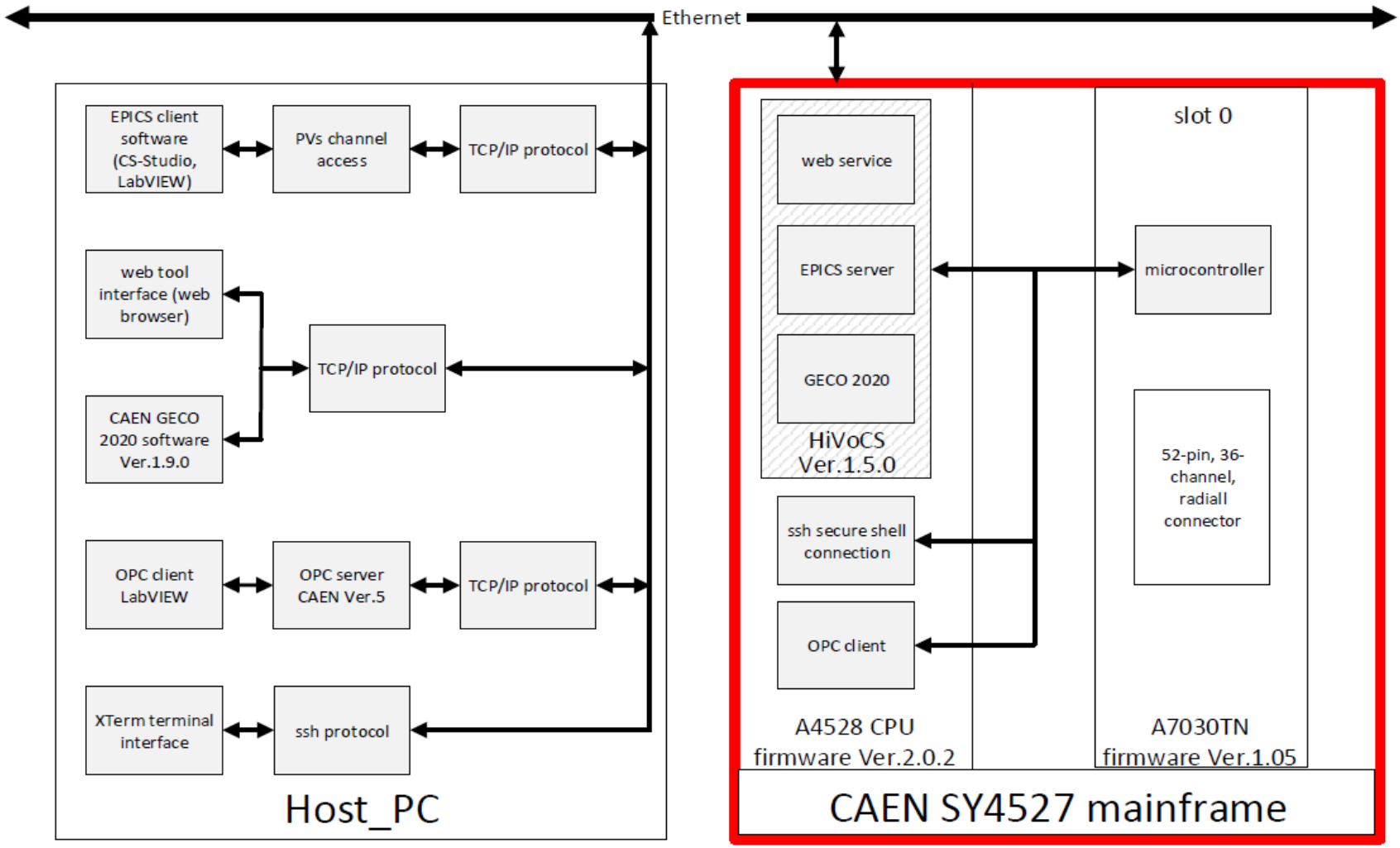
Hall C: Investigation of CAEN SYS 4527 and HV cards A7030TN



Ramp-up latency

Hall C: Investigation of CAEN SYS 4527 and HV cards A7030TN

- Test system configuration possibilities



Thanks Alberto

Dsg-hallc_controls <dsg-hallc_controls-bounces@jlab.org>
on behalf of
Alberto Lucchesi
<a.lucchesi@caen.it>
Fri 9/13/2019 8:25 AM

Dear Pablo,
thanks to your suggestions we were able to reproduce the same test as described in your document and we found some interesting information…

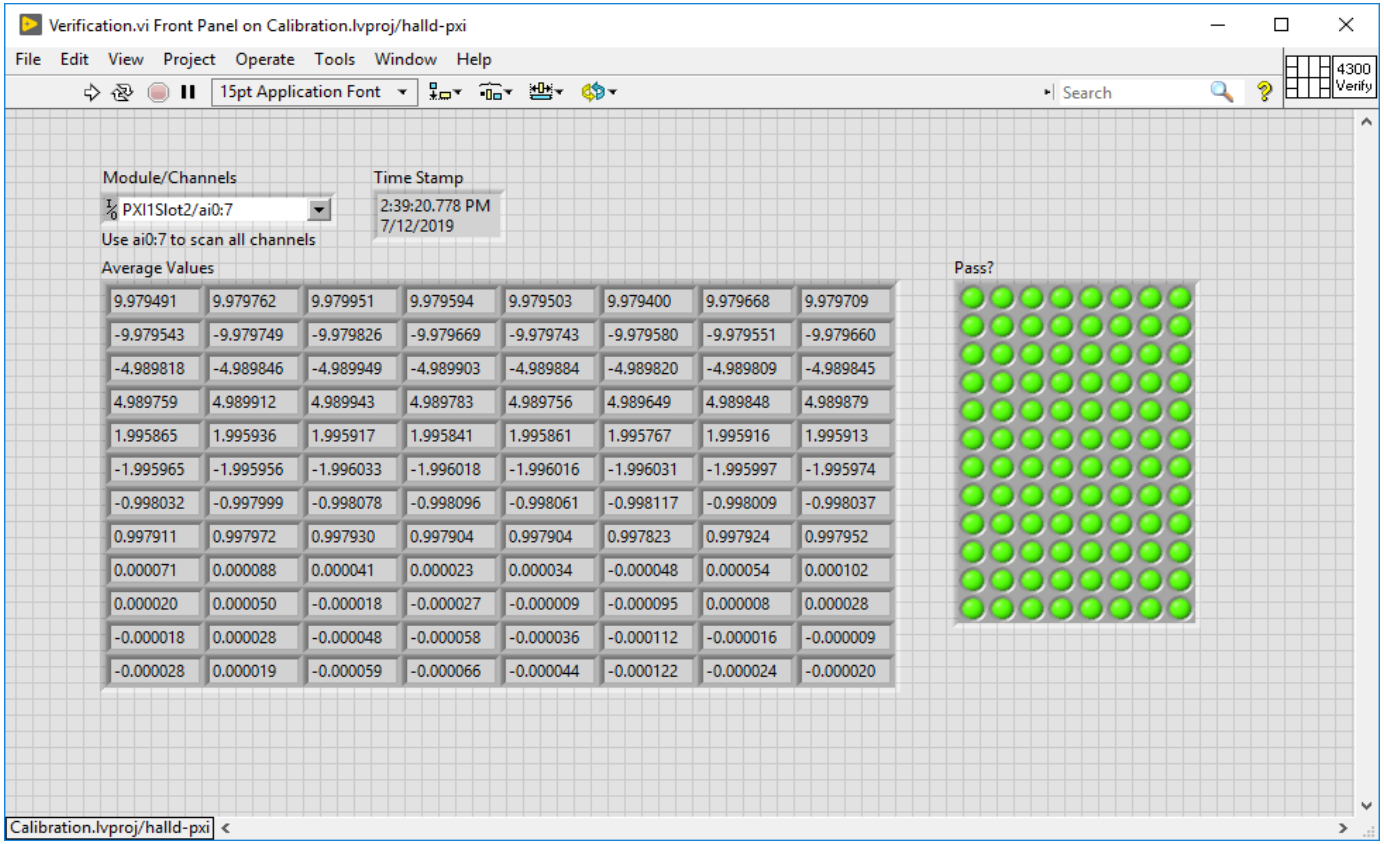
DSG's inner child

Dsg-hallc_controls <dsg-hallc_controls-bounces@jlab.org>
on behalf of Alberto Lucchesi
<a.lucchesi@caen.it>
Mon 9/30/2019 7:26 AM

Dear Pablo,
from the log I'm convinced that the ramp delay is something related to the board firmware. I say this because looking the log it is clear that all the power on commands are received by the boards at the same time, but for a reason that we have to understand, sometime a channel doesn't perform the ramp correctly but its first 5/6 steps are anomalous…

Hall D: Upgrade of PXI system

- Upgrade and maintenance of PXI system used for FastDAQ (10 kHz to EPICS) of solenoid signals
  - LabVIEW upgraded to 2019, ADC module calibrations performed

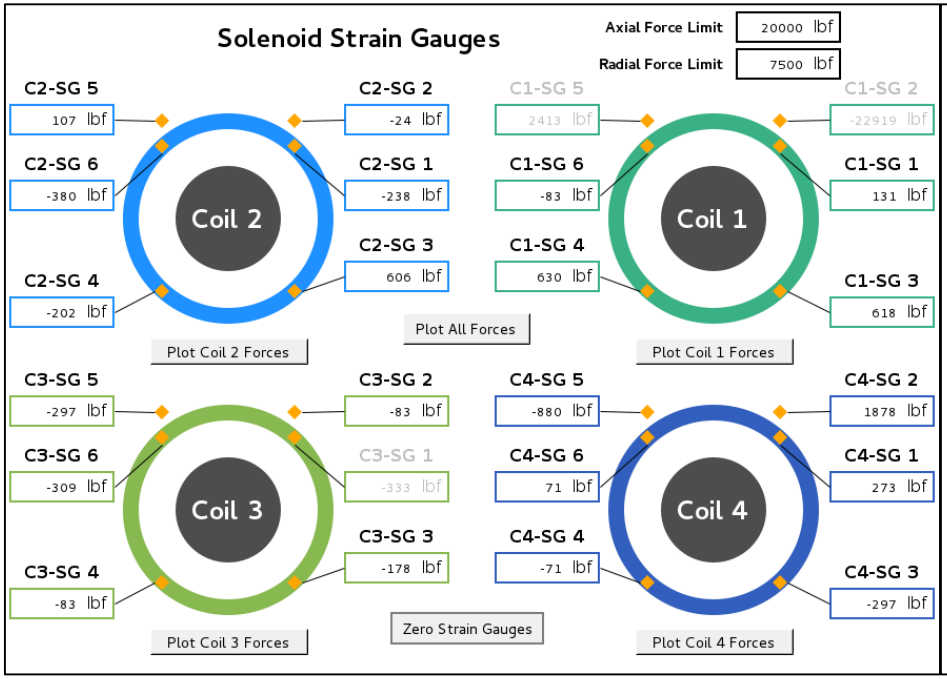


[DSG Note 2019-52]

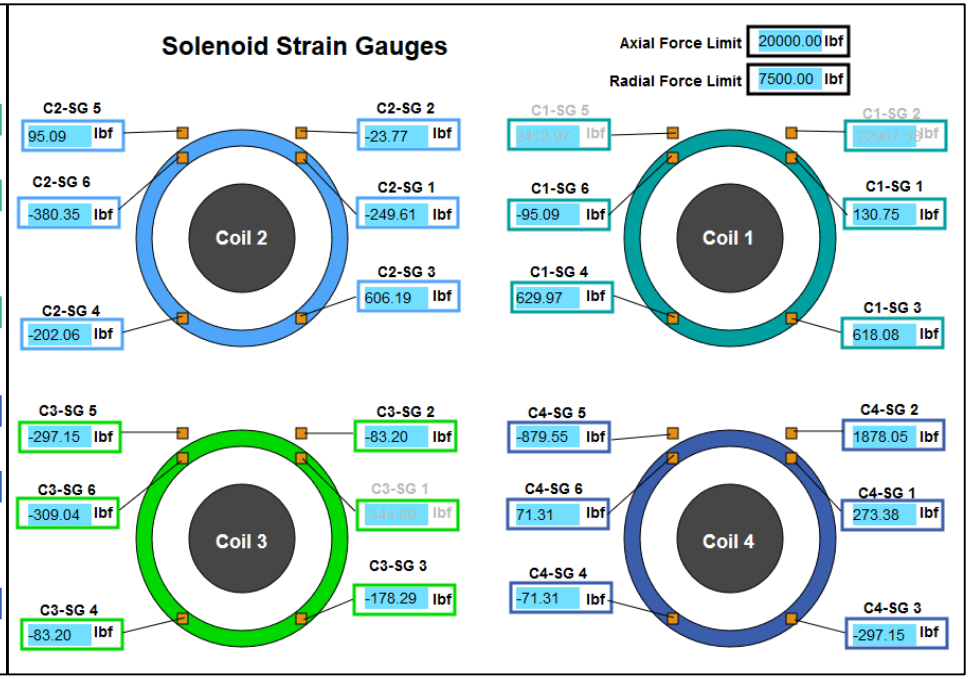
ADC Calibration for Slot 2

Hall D: WEDM

- 19 CSS screens converted to WEDM for off-site monitoring.



Solenoid Strain Gauges CSS screen



Solenoid Strain Gauges WEDM screen

[DSG Note 2019-51](), [DSG Talk 2019-19]()

Thanks Tim

whitey@jlab.org
Re: [Dsg-halld_plc] Hall D WEDM status
Dsg-halld_plc
on behalf of Timothy Whitlatch
Mon 6/24/2019 9:25 AM

Hi Tyler,
This is a great start.
ComCal Environment is fine
DIRC Environment is fine
Main Gas System GUI is fine
CDC Gas system not needed
FDC gas system not needed
Gas system solenoid valve monitor not needed
hall temperature is fine
Solenoid Cryo is fine
Solenoid Interlocks is fine
Solenoid strain gauges is fine
Solenoid vacuum is fine
Solenoid voltage taps is fine
Can the Hall camera screens be linked?

Thanks,
Tim

Dsg-halld_plc
on behalf of Timothy Whitlatch
Mon 7/15/2019 10:30 AM

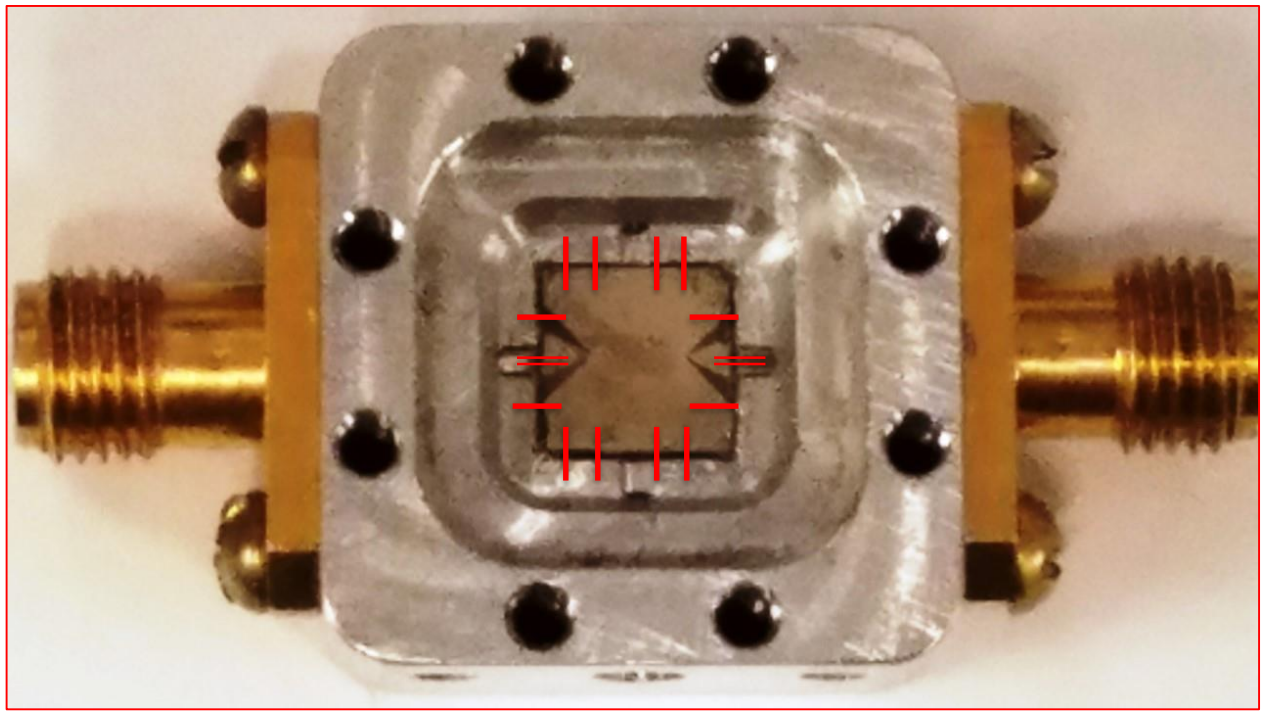
Hi Tyler,
This is very nice and very useful!
Thank you for following through on this.

Tim Whitlatch
Hall D Engineer
Jefferson Lab
757-269-5087

DSG's inner child yet again!

DSG: Accelerator

- Populating of VME fast shutdown boards for accelerator
  DSG Note 2019-25



- Wirebonding
  - Sample made of superconducting Nb3Sn, and what is patterned on the surface is a resonator.
  - Will be cooling down sample to 4K - 2 K and measure how much energy gets dissipated in heat at a frequency around 2-3GHz. (Junki Makita)

DSG: R&D and Safety

- NI cRIO Test Station development
  - LabVIEW program to test 18 different types of cRIO modules
  - 18 different types of modules tested

  DSG Note 2019- 17, DSG Note 2019-30
- PLC Test Stand development

  DSG Note 2019- 23
- Prevented three potentially dangerous incidents in EEL
  - "An ounce of prevention …"

Thanks Patrizia!

Patrizia Rossi
Thu 10/3/2019 4:45 AM

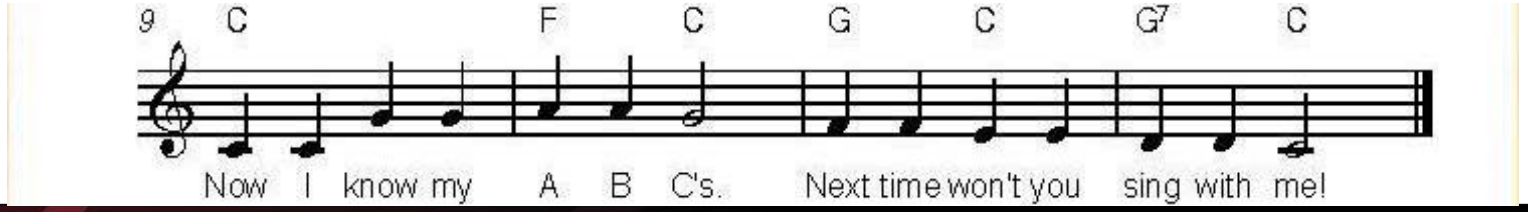
Dear Marc,
many thanks for sending out this note to let us know about the commendable behaviour of Mary Ann and Mindy.

I am very proud of my group.

patrizia

END

- DSG makes crucial and critical contributions to all Halls
- DSG staff well versed with detector hardware and software
  - Controls and Monitoring systems
  - Safety Interlock Systems
  - Detector modelling and detector performance analysis
  - Research and design
- DSG staff
  - Tenacious problem solvers
  - Capable communicators
  - **And most importantly have infectious pleasant personalities**



Questions?