Detector Support Group

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

Weekly Report, 2021-02-24

Summary

Hall A – GEM

Peter Bonneau, Brian Eng, George Jacobs, Mindy Leffel, Tyler Lemon, Marc McMullen

- Completed integration of pressure readout software into GEM readout software
- Updated GEM WEDM webpage with heartbeat and timestamp
- Tested and labeled 120 of 272 BNC-to-LEMO cables

Hall A – SoLID

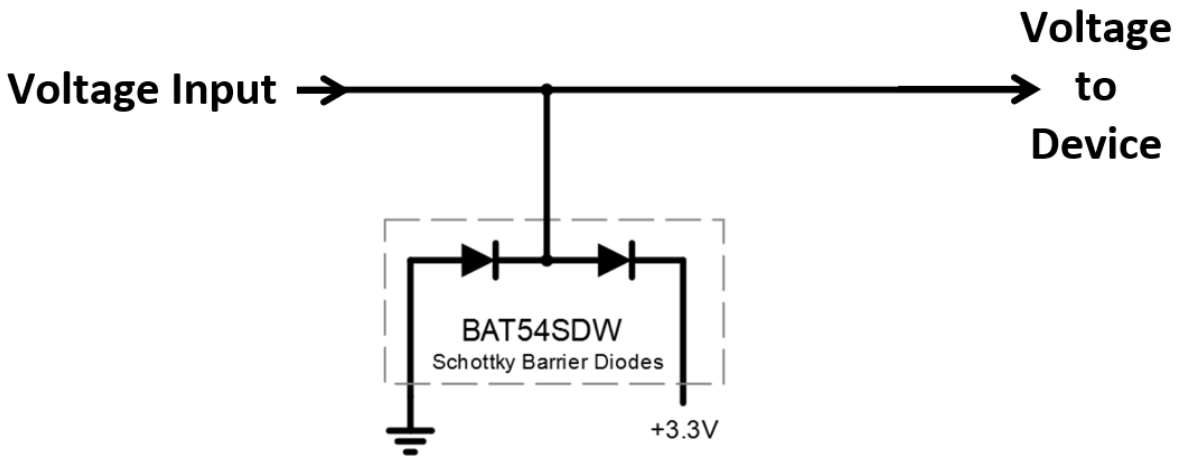
Mary Ann Antonioli, Pablo Campero, Mindy Leffel, Marc McMullen

- Researching mass flow controllers based on operating ranges and diameter of pipes
- Populated five of eight constant current source PCBs

Hall B – RICH II

Peter Bonneau, Tyler Lemon

- Modeling, using ANSYS, SHT-35 sensor PCB to determine whether heat generated by Rio Mezzanine Card (RMC) buffer drivers will affect the temperature sensors
- Developed virtual RMC input circuit using online circuit simulator
    - ✶ Verified use of Schottky barrier diodes in circuit would help protect items from over or under-voltage conditions



Simplified Schottky barrier diode schematic for device inputs on RMC

- Development of grounding scheme for hardware interlock system backplane PCB
    - ✶ Cat 7 cable shields from the RJ-45 connector will be connected on the backplane and isolated from the LV and chassis grounds
        - ▪ Cat 7 cable shield's ground will be connected to an isolated jack mounted on the rear of the chassis
    - ✶ A floating 3.3 V power supply powers the SHT-35 sensor's PCBs, the RMC buffer drivers, and the pull-up resistors
    - ✶ The 3.3 V power supply ground will be connected to the sbRIO PCB ground

- Advantages of implementing an SHT-35 Dual-Sensor PCB

Parameter	Omega / Honeywell Dual-Sensor PCB Used for RICH - I	Sensirion SHT35 Dual-Sensor PCB Planned for RICH - II
Accuracy	Humidity: ±3.5% RH, Temperature: ±0.15˚C	Humidity: ±1.5% RH, Temperature: ±0.1˚C
Sensor Configuration	Separate temperature & humidity sensors	Integrated temperature & humidity sensor
Interface Signal	Humidity: Analog voltage Temperature: RTD - resistance	Digital serial interface using two-wire I^2C communication protocol.
Data error-detecting	None	Cyclic Redundancy Check (CRC) on each measurement (Temperature & Humidity)
Calibration of output	User must externally linearize and calculate temperature compensation on the analog output.	Linearization and temperature compensation calculations are done internally by the sensor.
Size of PCB	17.7 mm x 30 mm	9.5 mm x 19 mm
# of Conductors	14 conductors, 4 wires	8 conductors, 1 wire
PCB Connector	None. Wires soldered directly to sensor and PCB	Latching 8-pin (easy PCB replacement)
Sensor protection	None.	Sensor opening is covered by a PTFE membrane. Protects the sensor from dust and contaminants.
Readout Electronics	Requires two ADC channels for humidity and two RTD read-out channels for temperature	Two low-cost digital serial data channels
Supply Voltage	Honeywell humidity sensor: +5V, Humidity measurement is affected by the supply voltage	2.15V to 5.5V, Humidity measurement is not affected by variation in the supply voltage
Sensor cost per PCB	~$140 total for 4 sensors (2 temp, 2 humidity)	~$12 total for 2 integrated sensors

Hall C – CAEN Testing

Mary Ann Antonioli, Aaron Brown, George Jacobs

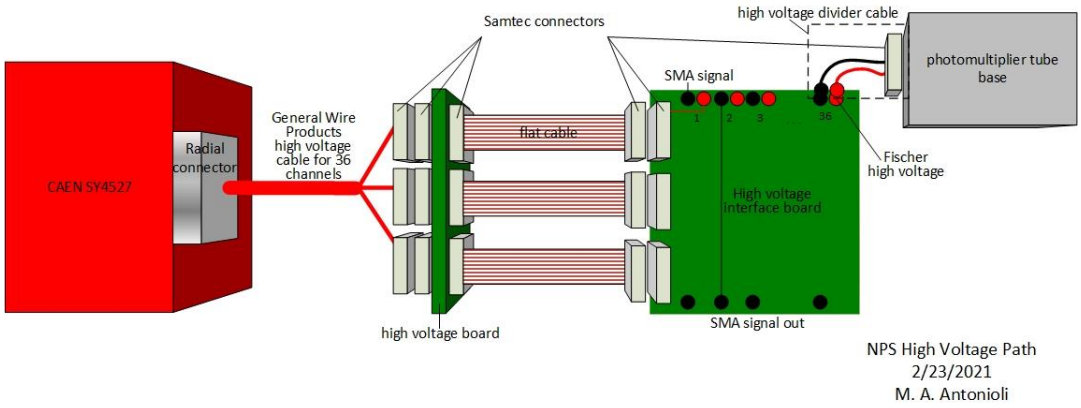
- Modified, using Python, trip test and analysis programs to accommodate the 24 channel CAEN A1535 and A7435 HV modules (four and seven of each type, respectively)
- Completed ramp testing for the A1535 and A7435 HV modules
- Generated ramp testing plots for modules
  - ✶ Two modules (063 and 766) failed
- Completed trip testing for remaining modules

Hall C – NPS

Mary Ann Antonioli, Peter Bonneau, Aaron Brown, Pablo Campero, George Jacobs, Mindy Leffel, Tyler Lemon

- Generated dew point contour plots to refine Frame Humidity and Dew Point fault chart
  - ✶ Dew point will now interlock at ≤ 4°C
- Designing Hardware Interlock System that uses three types of National Instruments (NI) cRIO modules
  - ✶ NI-9485 Relay module – enables/disables two CAEN SY4527 HV crates and the crystal and electronics zone chillers
  - ✶ NI-9870 RS232 serial module – reads and sets temperature and reads status from crystal and electronics zone chillers
  - ✶ NI-9205 ADC module – reads status of door interlock, humidity sensor power supply, chiller AC interlock units, and HV interlock
- Designing PCB for Radiall-to-SAMTEC HV test chassis which will provide connection for three SAMTEC connectors

- Completed wiring diagram for Radiall-to-SAMTEC HV cable test chassis
- Fabricated five of 40 Radiall-to-SAMTEC connectors HV cables
- Generated drawing to show HV cables fabricated by DSG and all HV connections

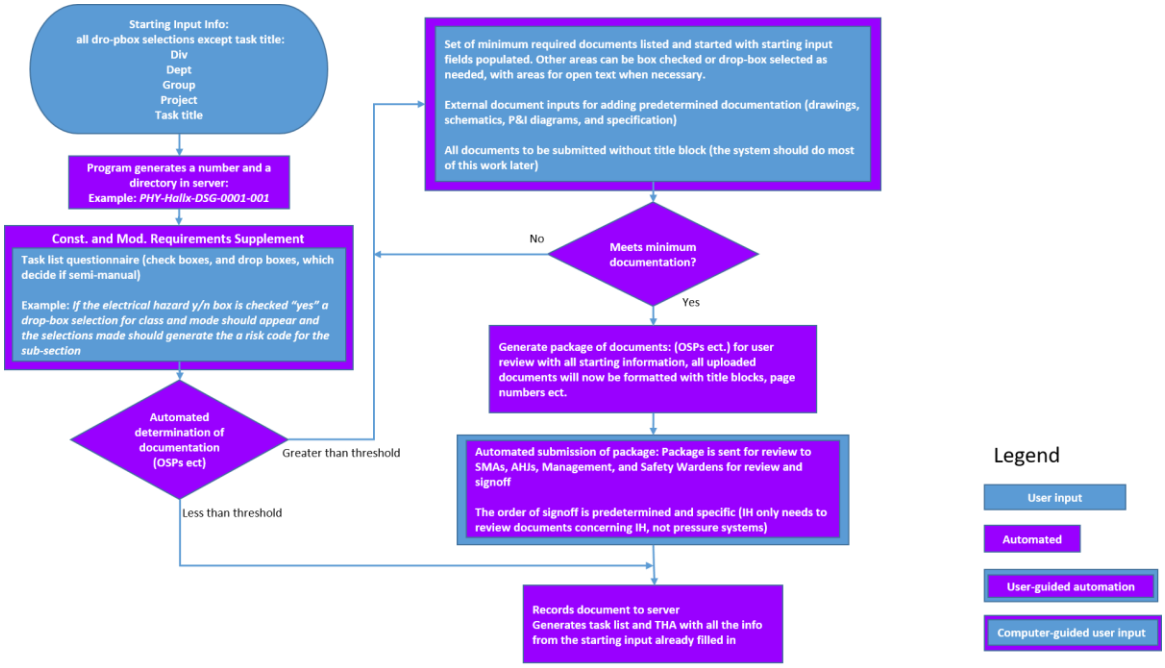


HV connections

DSG – Implementation Team

Marc McMullen

- Developed a process diagram for implementation guidelines for the proposed application of the Construction and Modification supplement for custom and non-NRTL designs



Process diagram of implementation guidelines for application of Construction and Modification supplement