NPS Collaborator's Meeting Update

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Contents

- Cable Fabrication/Procurement
- CAEN HV Testing
- CSS-BOY Screen Development
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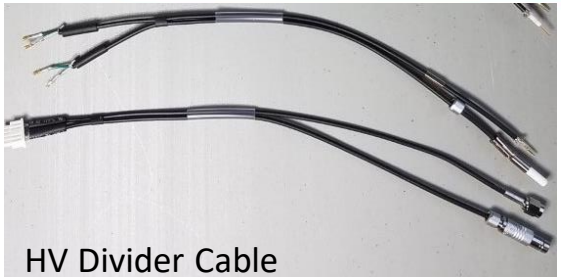
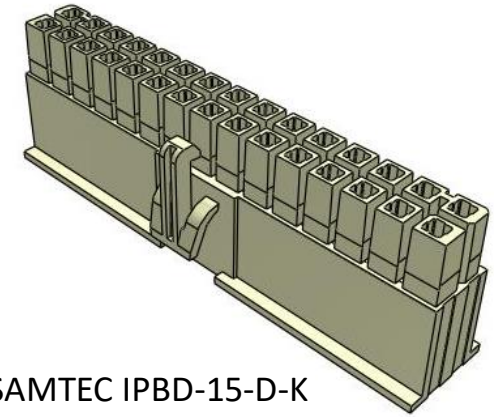
Cable Fabrication/Procurement

- HV divider cable status
  - 820 of 1100 fabricated
- 142’ HV cables
  - PR for 42 cables submitted on 08/24/2020
  - Buyer (Jami Anthony) ordered on 09/28/2020
  - ETA: December 2020
- SAMTEC connectors
  - PR for 100 8-pin, 50 15-pin submitted on 09/16/2020
  - Buyer (Brittany Tolbert) ordered on 09/17/2020
  - ETA: November 2020
- Radiall connectors
  - PR for 40 connectors submitted on 08/24/2020
  - Buyer (Albert DeChristopher) ordered on 08/26/2020
  - ETA: November 2020


HV Divider Cable


SAMTEC IPBD-15-D-K


Radiall 52-pin connector

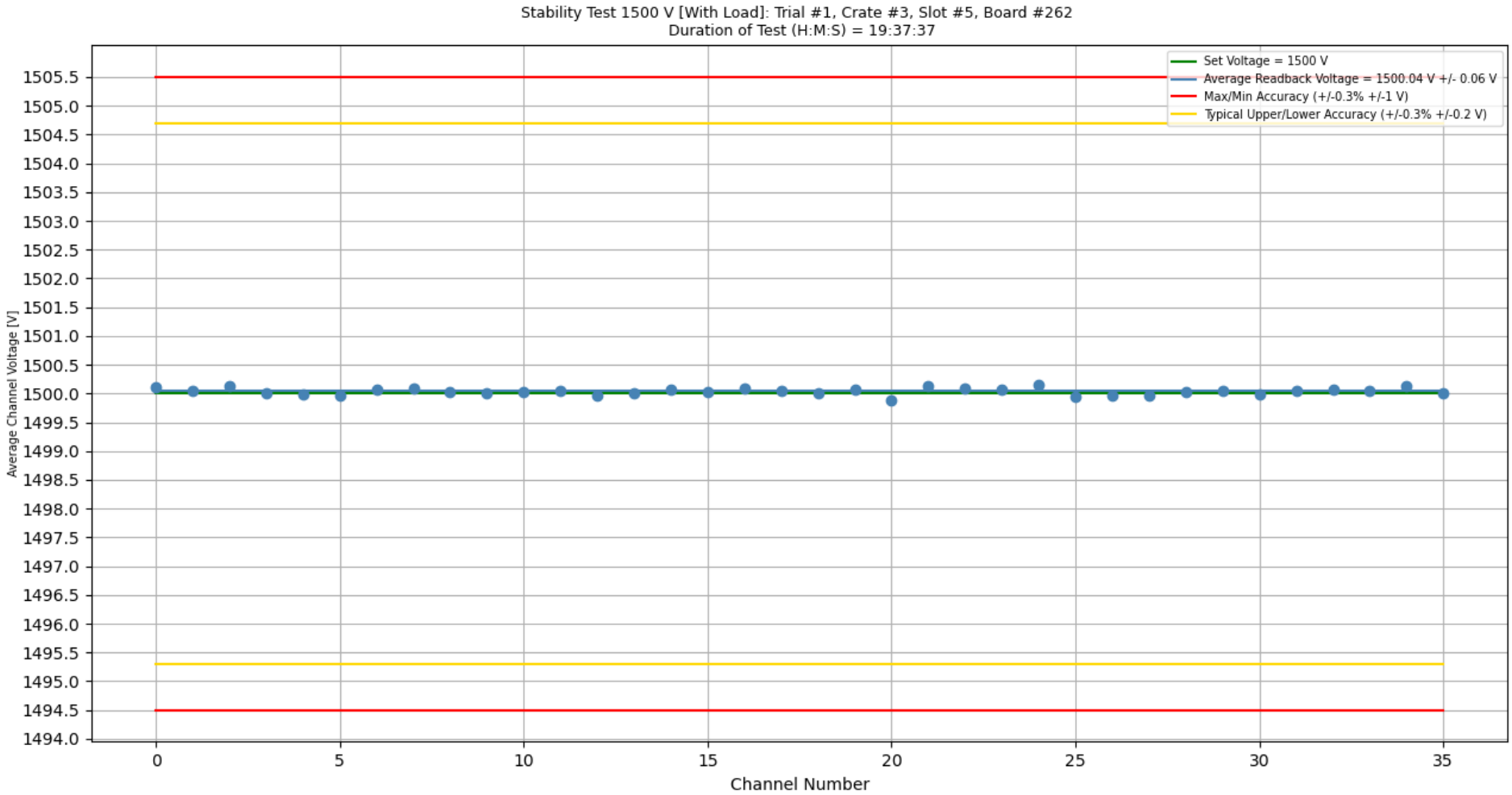
CAEN HV Testing

- Stability testing is complete
  - All modules tested using GECO 2020 and EPICS
  - GECO 2020 testing analysis summary for voltage and current
- Voltage and current analysis plots have been uploaded to the NPS section of the DSG technical documentation website

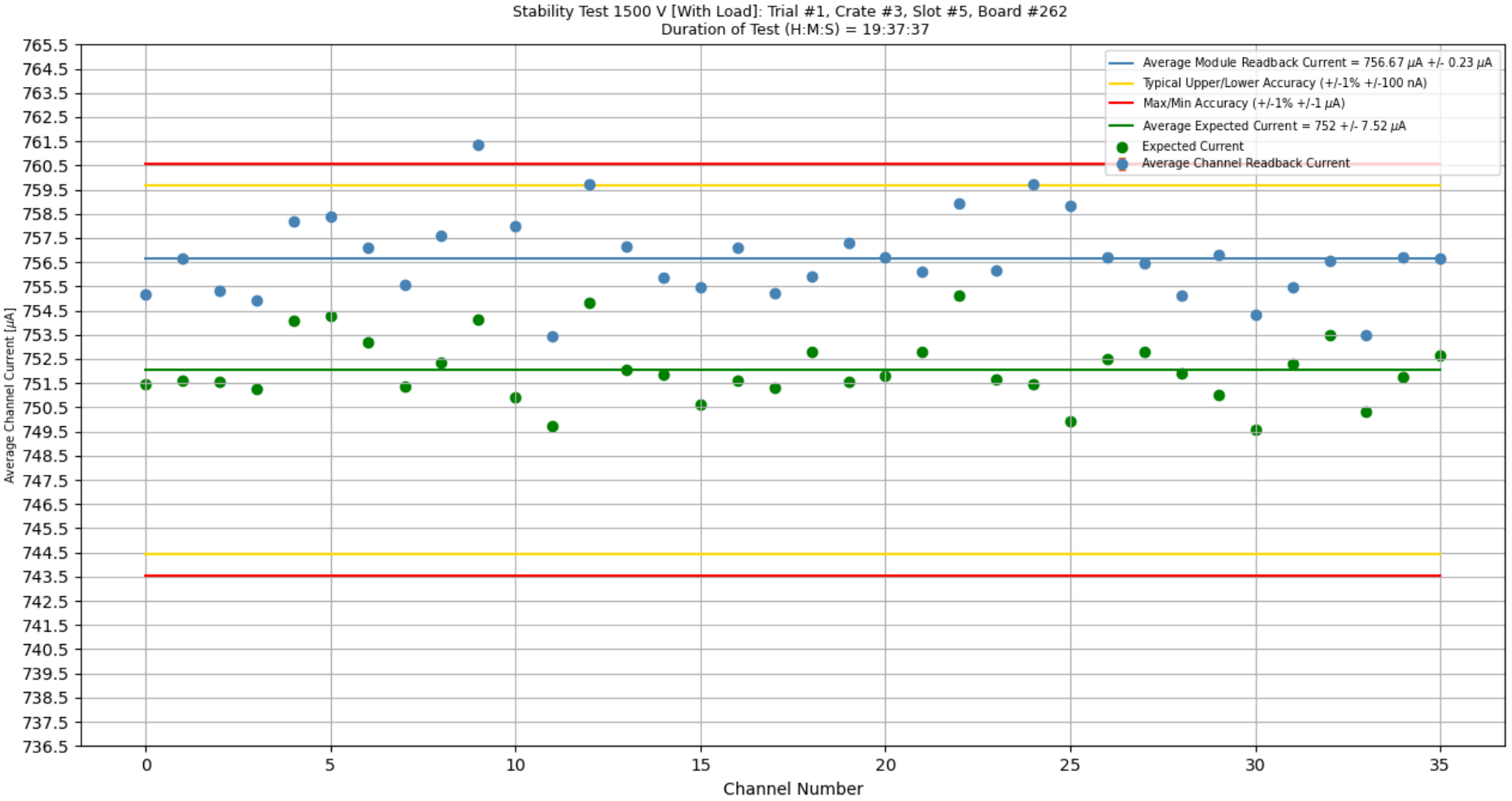
GECO TESTING: Voltage Stability					
#	Board #	Date	Stability Test w/ Load	Analysis w/ Load	Status
1	128	02/19/20	1500 V	Average voltage for all channels within manufacturers specs.	
2	173	02/04/20	1500 V	Average voltage for all channels within manufacturer's specs.	
3	184	02/06/20	1500 V	Average voltage for all channels within manufacturer's specs.	
4	256	03/02/20	1500 V	Average voltage for all channels within manufacturers specs.	
5	262	02/18/20	1500 V	Average voltage for all channels within manufacturers specs.	
6	297			Not tested due to pin issue	
7	299	02/04/20	1500 V	Needs to be retested due to pin issue	
8	301	02/13/20	1500 V	Average voltage for all channels within manufacturers specs.	
9	302	02/28/20	1500 V	Average voltage for all channels within manufacturer's specs.	
10	304	02/07/20	1500 V	Average voltage for all channels within manufacturer's specs.	
11	309	06/29/20	1500 V	Average voltage for all channels within manufacturer's specs.	
12	313	06/26/20	1500 V	Average voltage for all channels within manufacturer's specs.	

Snippet of the testing analysis summary for voltage stability testing showing the analysis for the first twelve of 34 modules

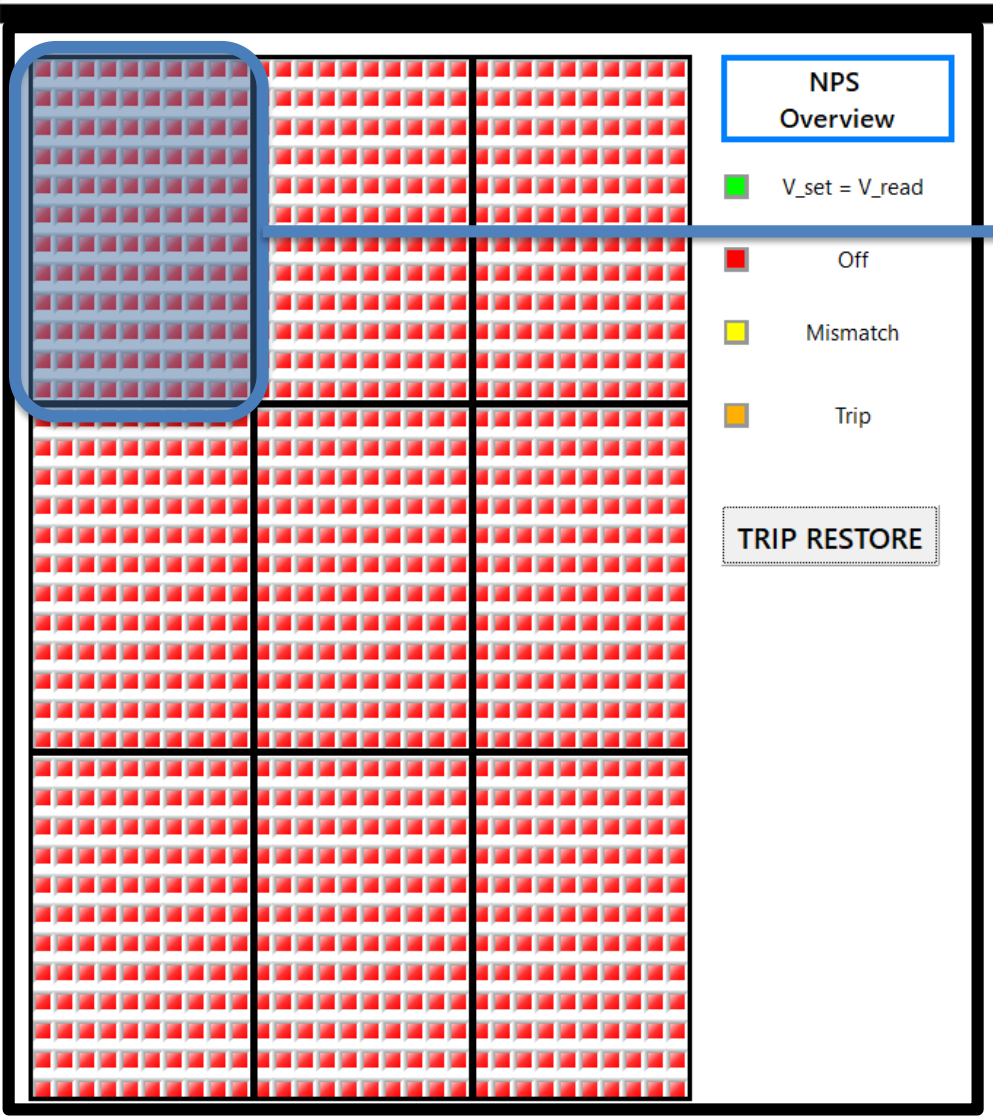
Voltage Stability Plot for Module #262



Current Stability Plot for Module #262



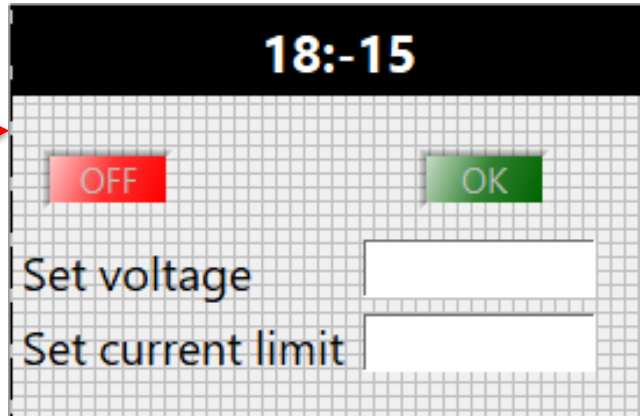
CSS-BOY Screen Development



- Sub-grid (1,1) screen of the NPS Overview screen
- 12x10 grid with voltage and current-limit settings readback for each PMT in the grid

CSS-BOY Screen Development

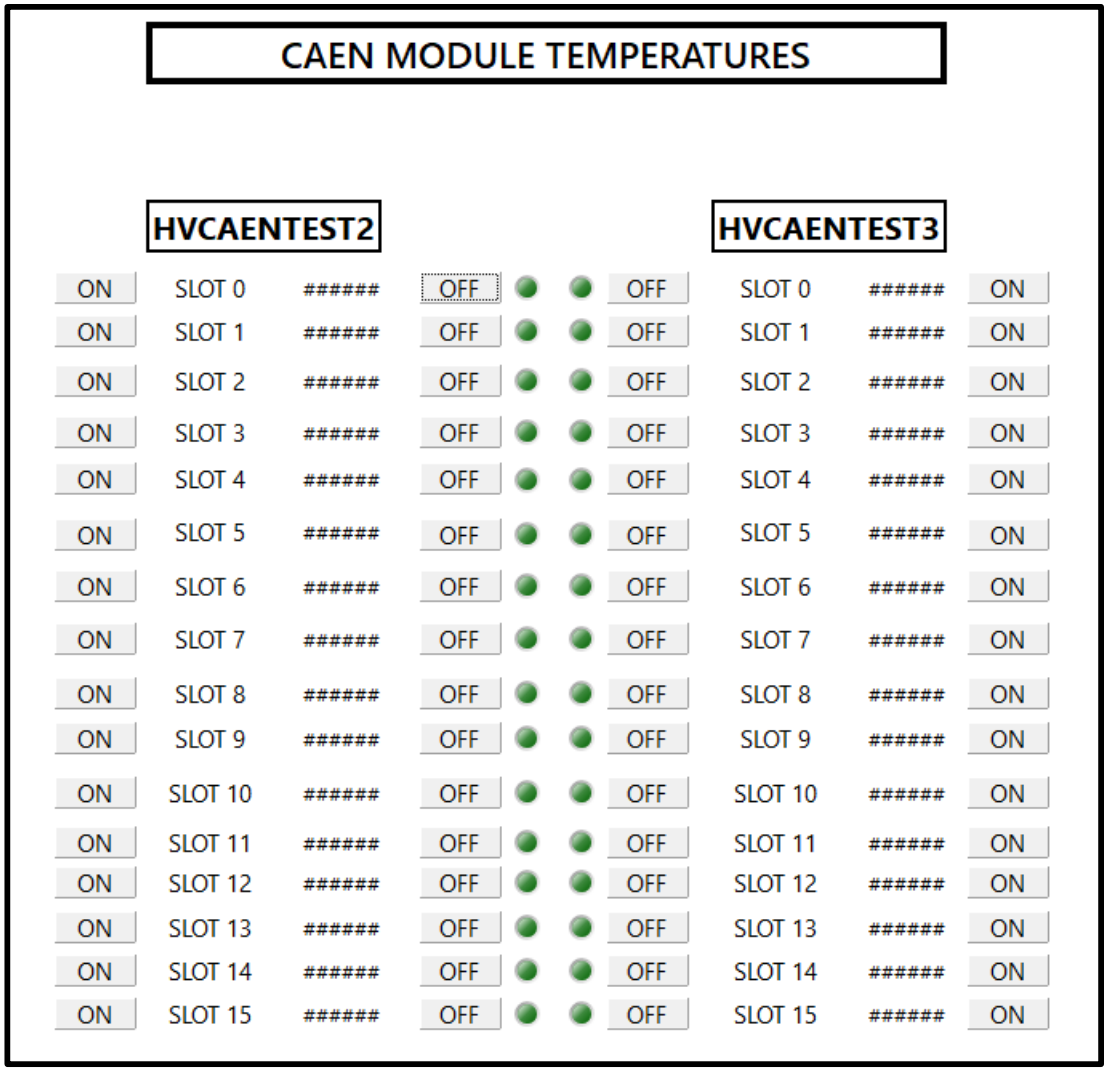
Sub-grid (1,1)



- Voltage and current limit setting screen for PMT in position 18:-15
- Screen shows if the PMT is powered ON (green), OFF (red), or if it is in a “Tripped” state (yellow)
- One of these screens will be made for each PMT
- Currently 180 of 1080 completed

CSS-BOY Screens Development

- Screen to show internal temperature for each module
- If module temperature goes above specified value, module automatically shuts off
- LEDs indicate whether module is ON or OFF
- Buttons allow modules to be turned ON and OFF manually



Interlock System Development

Sensor Type	Qty	Locations
Temperature	136	Crystal Array, Detector Internal, Electronics, Ambient
Humidity	10	Detector Internal, Ambient
Fan Speed	4	Electronics Zone, Heat Exchanger
Light Sensor	2	Crystal Array
Coolant Leak Sensor	2	Crystal Array, Electronics Zone

- Sensor list has been updated to reflect the type and number of sensors that will be needed for the NPS interlock system

Parameters	RTD	Thermistor	Thermocouple
Accuracy	±0.1 to ±1°C	±.05 to ±1.5°C	±1 to ±2.2°C
Stability	0.05°C/year	0.2°C/year	1.5°C/year
Excitation	Required	Required	None
Output	Resistance	Resistance	Voltage
Output linearity	Linear	Non-linear	Non-linear
Response time	1 to 10 s	0.12 to 10 s	0.5 to 10 s
Range	-200 to 650°C	-100 to 325°C	-270 to 1800°C
Relative cost	High	Low to Moderate	Low
Signal conditioning needed (long leads)	No	No	Yes
Self-heating	Yes, minimal	Yes, highly	No
Detector example	Hall D Comcal	CMS ECAL	Primex HYCAL
Overall advantages	Stable Accurate Linear	Fast Accurate Low cost	High temps Low cost

- Researching temperature sensors for use in detector interlock system; DSG Note 2020-35
- Table shows characteristics for three different types of temperature sensors
- An RTD, like the Omega PT100, is the front runner

Conclusions

- Ordered all components for multi-conductor HV cable
- Completed stability testing of CAEN HV modules
- Developing Controls & Monitoring screens
- Researching sensors for the interlock system
- Good progress

Thank You