



DSG Contributions to NPS Status

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Detector Support Group
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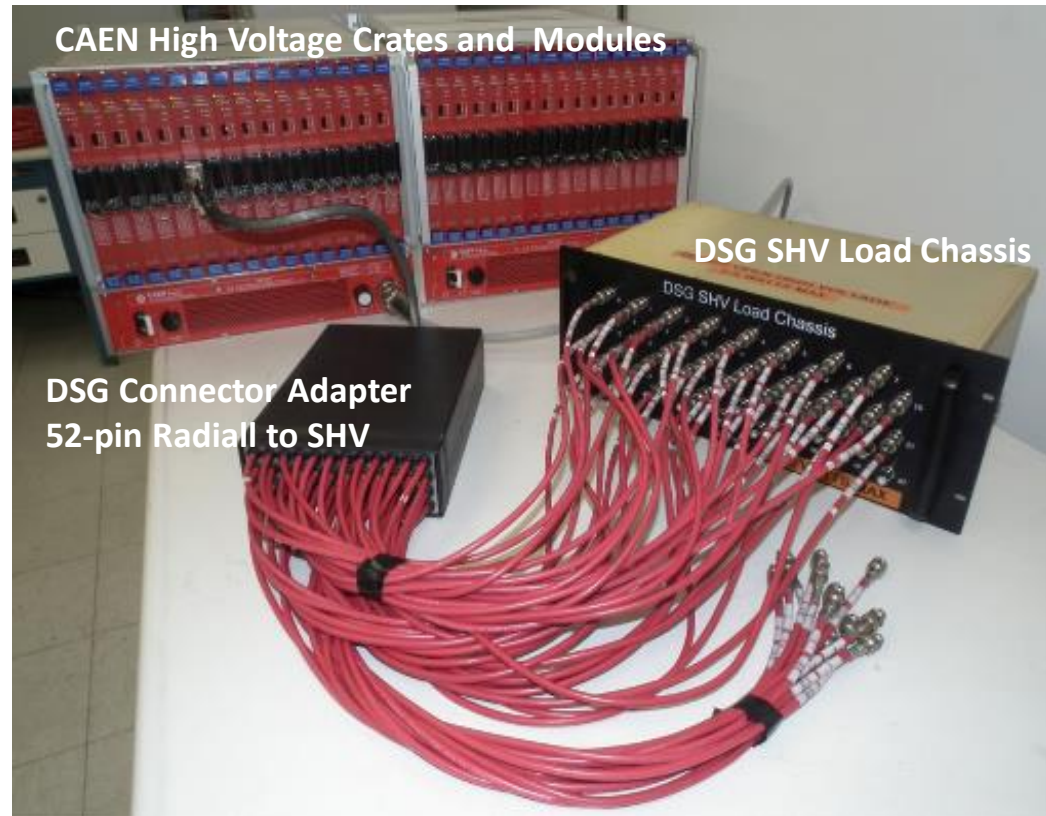
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DSG Contributors

- Testing & Analysis
 - Aaron Brown, Pablo Campero, George Jacobs, Marc McMullen
- Fabrication
 - Mindy Leffel
- EPICS Controls & Monitoring System
 - Mary Ann Antonioli, Aaron Brown, Brian Eng, Tyler Lemon
- Environment Monitoring & Interlock System
 - Peter Bonneau, Tyler Lemon

Testing & Analysis

- Testing 34 (A7030TN) CAEN HV modules and two SY4527 crates
 - Using GECO 2020
 - All modules tested
 - Three defective modules
 - Using EPICS server (in progress)
 - 18 of 34 modules tested
- Stability test details
 - Applied voltage: 1500 V
 - Resistive load: 2 M Ω
 - Duration: 24 hours

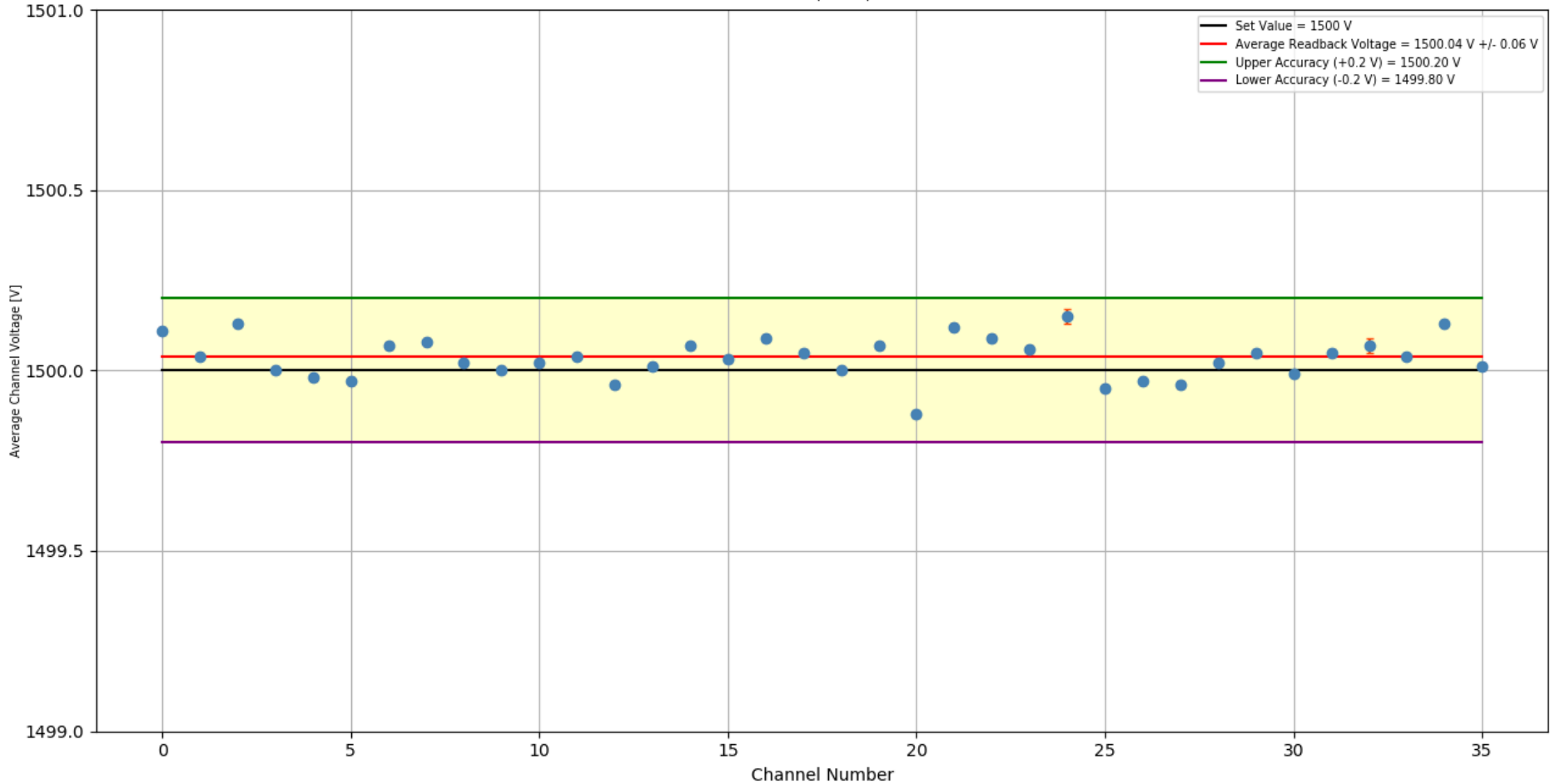


Test stand

Testing & Analysis (cont'd)

- Average readback voltage of each channel of module #262
 - All channels within manufacturer's specifications

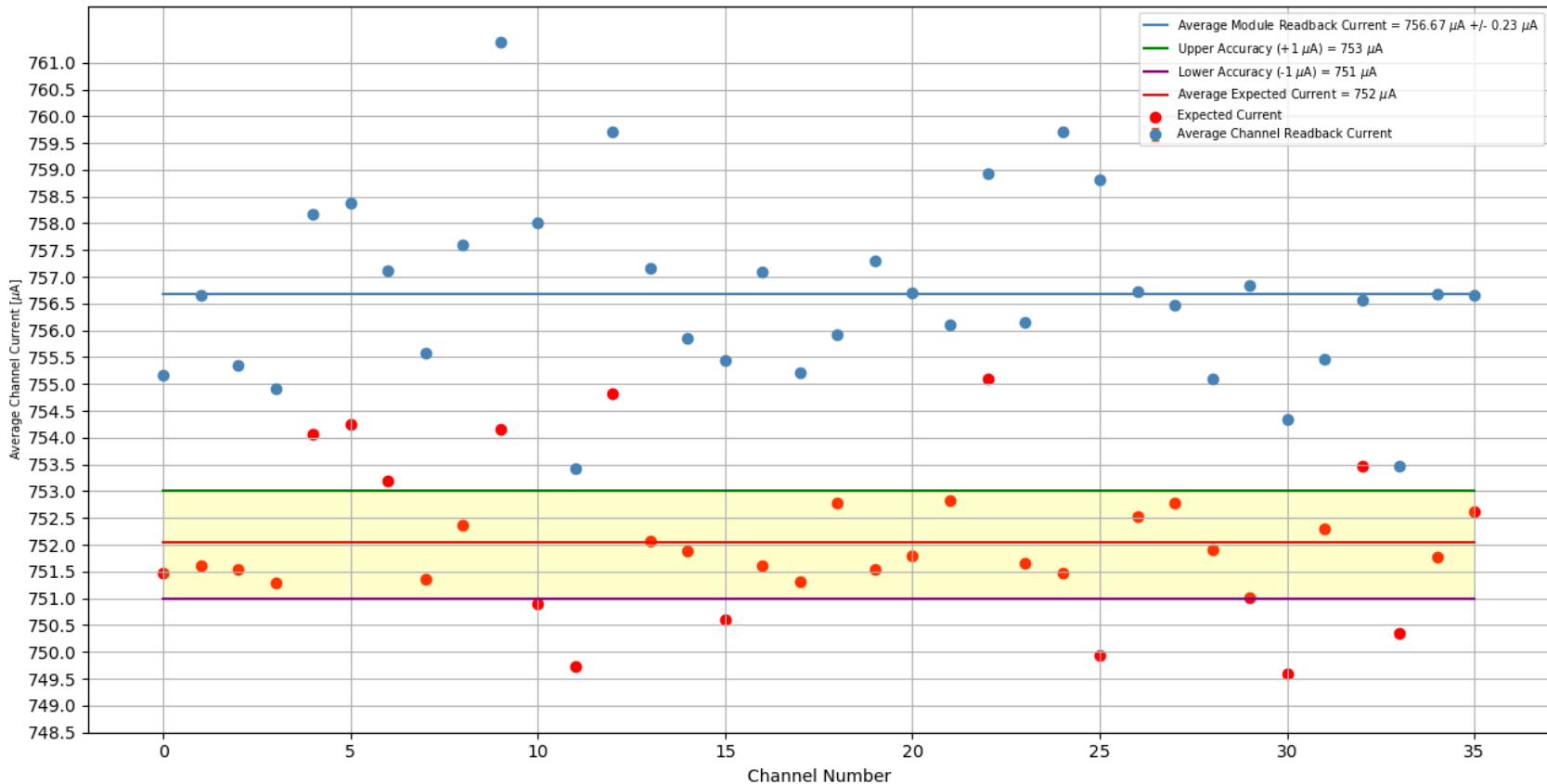
Stability Test 1500 V [With Load]: Trial #1, Crate #3, Slot #5, Board #262
Duration of Test (H:M:S) = 19:37:37



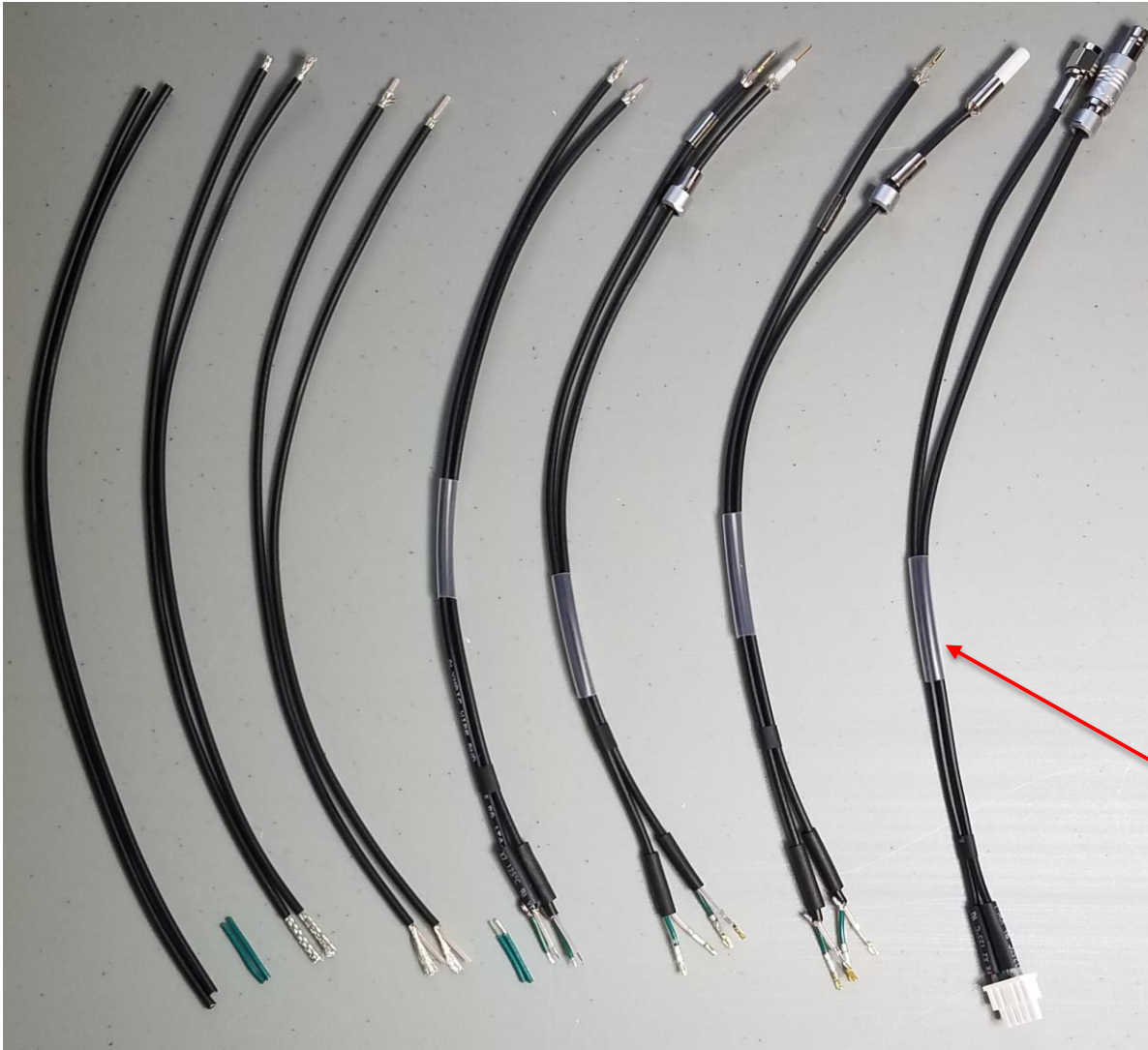
Testing & Analysis (cont'd)

- Average readback current of each channel of module #262
 - All channels above **expected** current value
 - Discrepancy between **expected** and **readback** is due to readback ($\sim 1\%$)
 - Spread of readback values ($\Delta I / 757 \mu\text{A}$) $\sim 1\%$

Stability Test 1500 V [With Load]: Trial #1, Crate #3, Slot #5, Board #262
Duration of Test (H:M:S) = 19:37:37



Fabrication: HV Divider Cables



- 650 cables of 1100 fabricated

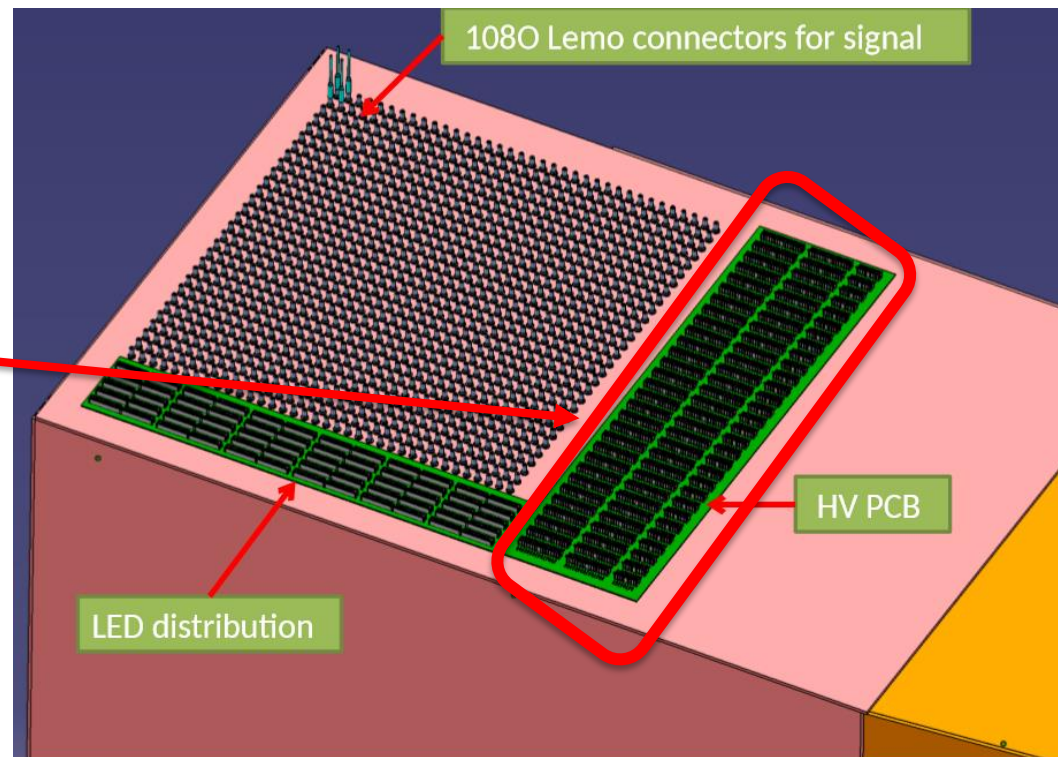
Finished cable

Cable fabrication sequence: left to right

Fabrication: Multi-conductor HV Cables

- Fabricating thirty-four 140' multi-conductor cables
- Procuring wires, connectors, and tools
- Researching connectors rated for 1100 V operations

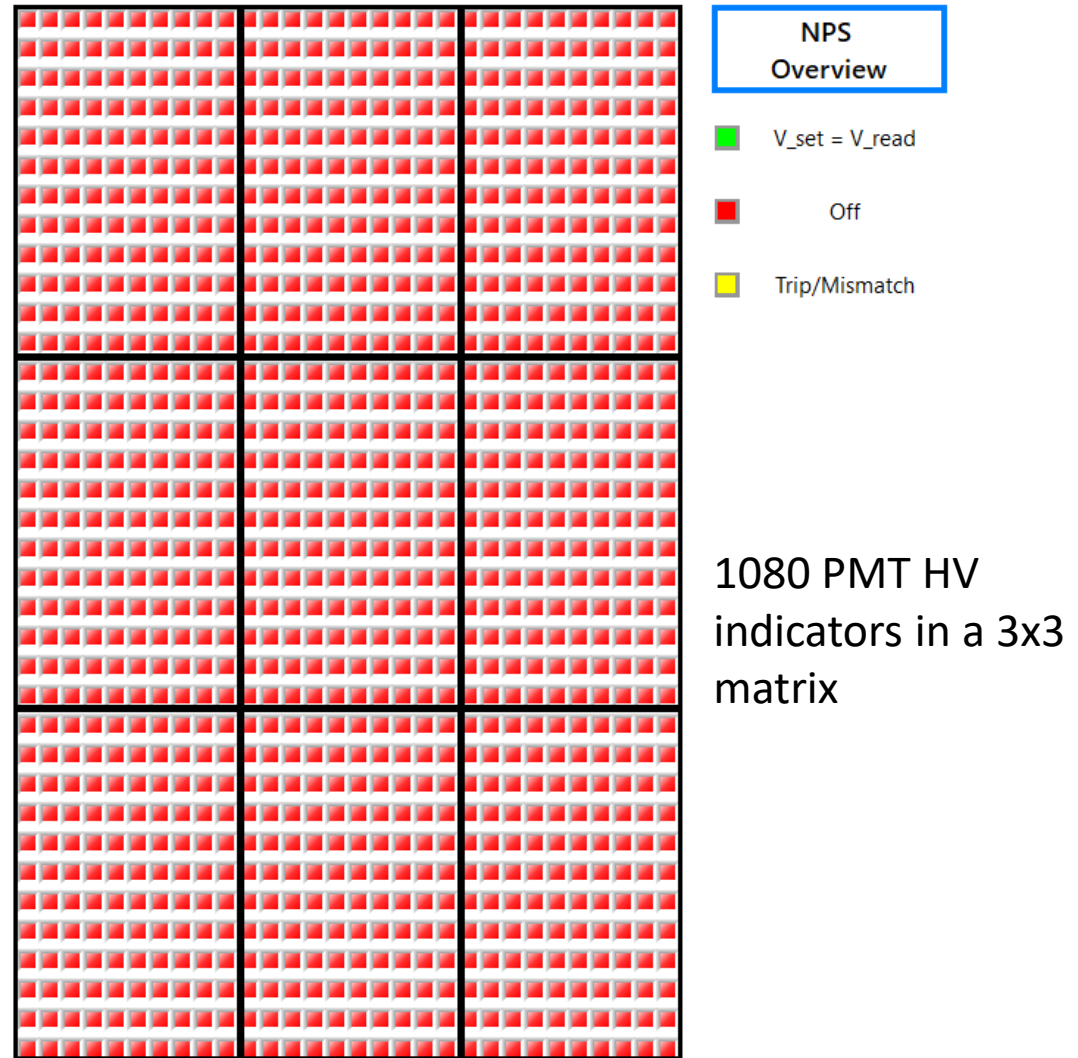
Mates for these connectors need to be rated for 1100 V operations.



Frame for NPS

EPICS Controls & Monitoring System

- Developing EPICS CSS-BOY screens
 - Overview Screen
 - Environmental Readback Screens
 - Chiller Temperature and Flow Screens



NPS Overview Screen

EPICS Controls & Monitoring System (cont'd)

- HV readback screen
- 30 x 36 grid of voltage and current readback for each PMT

-4:4 OFF ##### #####	-3:4 OFF ##### #####	-2:4 OFF ##### #####	-1:4 OFF ##### #####	1:4 OFF ##### #####	2:4 OFF ##### #####	3:4 OFF ##### #####	4:4 OFF ##### #####
-4:3 OFF ##### #####	-3:3 OFF ##### #####	-2:3 OFF ##### #####	-1:3 OFF ##### #####	1:3 OFF ##### #####	2:3 OFF ##### #####	3:3 OFF ##### #####	4:3 OFF ##### #####
-4:2 OFF ##### #####	-3:2 OFF ##### #####	-2:2 OFF ##### #####	-1:2 OFF ##### #####	1:2 OFF ##### #####	2:2 OFF ##### #####	3:2 OFF ##### #####	4:2 OFF ##### #####
-4:1 OFF ##### #####	-3:1 OFF ##### #####	-2:1 OFF ##### #####	-1:1 OFF ##### #####	1:1 OFF ##### #####	2:1 OFF ##### #####	3:1 OFF ##### #####	4:1 OFF ##### #####
-4:-1 OFF ##### #####	-3:-1 OFF ##### #####	-2:-1 OFF ##### #####	-1:-1 OFF ##### #####	1:-1 OFF ##### #####	2:-1 OFF ##### #####	3:-1 OFF ##### #####	4:-1 OFF ##### #####
-4:-2 OFF ##### #####	-3:-2 OFF ##### #####	-2:-2 OFF ##### #####	-1:-2 OFF ##### #####	1:-2 OFF ##### #####	2:-2 OFF ##### #####	3:-2 OFF ##### #####	4:-2 OFF ##### #####
-4:-3 OFF ##### #####	-3:-3 OFF ##### #####	-2:-3 OFF ##### #####	-1:-3 OFF ##### #####	1:-3 OFF ##### #####	2:-3 OFF ##### #####	3:-3 OFF ##### #####	4:-3 OFF ##### #####
-4:-4 OFF ##### #####	-3:-4 OFF ##### #####	-2:-4 OFF ##### #####	-1:-4 OFF ##### #####	1:-4 OFF ##### #####	2:-4 OFF ##### #####	3:-4 OFF ##### #####	4:-4 OFF ##### #####

PMT located in
Column -4, Row -4
from the origin

Environment Monitoring & Interlock System

- System monitors and interlocks (if needed) humidity, gas flow, temperature, chiller status, and fan speed
- Sends information to EPICS
- Researching sensors

Signal Type	Sensor	Qty	Location	Measurement Range	Manufacturer Part #	Comments
Temperature (Crystals)		126	Crystal Array	°C		Researching
Temperature (Electronics)		8	Detector Internal	°C		
Temperature (Ambient)		2	External ambient	°C		
Humidity (Electronics)		8	Detector Internal	0 - 100% RH		
Humidity (Ambient)		2	External ambient	0 - 100% RH		
N2 Flow meter		1		slm		
Fan Speed		4	Electronics Zone Heat exchanger	RPM		Heat Exchanger: Lytron 6320G3SB
Fan Speed		?	Crystals zone Array Heat exchanger	RPM		Researching
Flow	Chiller	1	Electronics Zone		Kodiak RC006G03BG3	RS232 Interface to Chiller
Pressure		1				
Set Readback Temperature		1				
Coolant Temperature		1				
Status		1				
Flow	Chiller	1	Crystal Array Zone		?	Researching
Pressure		1				
Set Readback Temperature		1				
Coolant Temperature		1				
Status		1				
Light Sensor		2	NPS Frame			Researching
Coolant Leak Sensor		1				

Environment Monitoring & Interlock System (cont'd)

- CSS-BOY screen can accommodate any number of sensors

CS-Studio
NPS_environment.opi

NPS Environment Monitoring

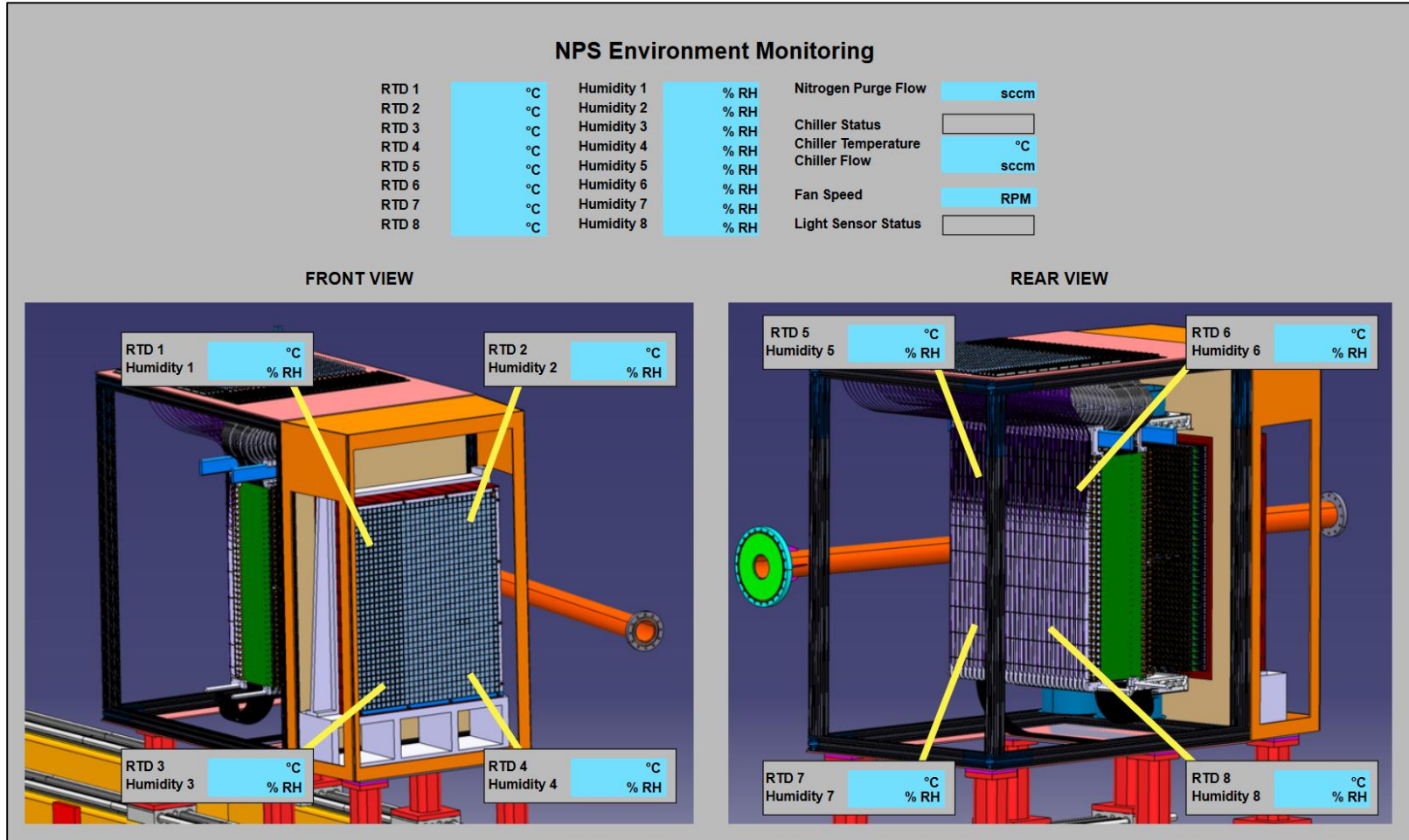
RTD 1	##### °C	Humidity 1	##### % RH	Nitrogen Purge Flow	##### sccm
RTD 2	##### °C	Humidity 2	##### % RH	Chiller Status	<input type="checkbox"/>
RTD 3	##### °C	Humidity 3	##### % RH	Chiller Temperature	##### °C
RTD 4	##### °C	Humidity 4	##### % RH	Chiller Flow	##### sccm
RTD 5	##### °C	Humidity 5	##### % RH	Fan Speed	##### RPM
RTD 6	##### °C	Humidity 6	##### % RH	Light Sensor Status	<input type="checkbox"/>
RTD 7	##### °C	Humidity 7	##### % RH		
RTD 8	##### °C	Humidity 8	##### % RH		

FRONT VIEW

REAR VIEW

Environment Monitoring & Interlock System (cont'd)

- WEDM for remote monitoring via JLab EPICSWEB
- WEDM screen copy of CSS-BOY screen



Current Work

- Testing & Analysis
 - CAEN HV system SY4527 crate and A7030TN modules
 - Interface with EPICS
 - Verify module specifications
- Fabricating cables
- Developing EPICS Controls & Monitoring System
- Investigating sensors and instrumentation for Environment Monitoring & Interlock System

DSG Website

- [NPS](#) section of DSG Hall C Technical Documentation
- Page updated as progress is made

Jefferson Lab

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EPICS
Manuals & Specifications
Notes & Talks
Printed Circuit Boards
Readings
Technical Drawings & Schematics
Testing & Analysis

Conclusion

- **DSG is actively participating in the NPS project**
 - Testing & Analysis of CAEN crates and modules
 - Fabricating and testing HV cables
 - Developing EPICS Controls & Monitoring System
 - Developing Environment Monitoring & Interlock System

- **Significant progress**

Thank You