



U.S. DEPARTMENT OF
ENERGY



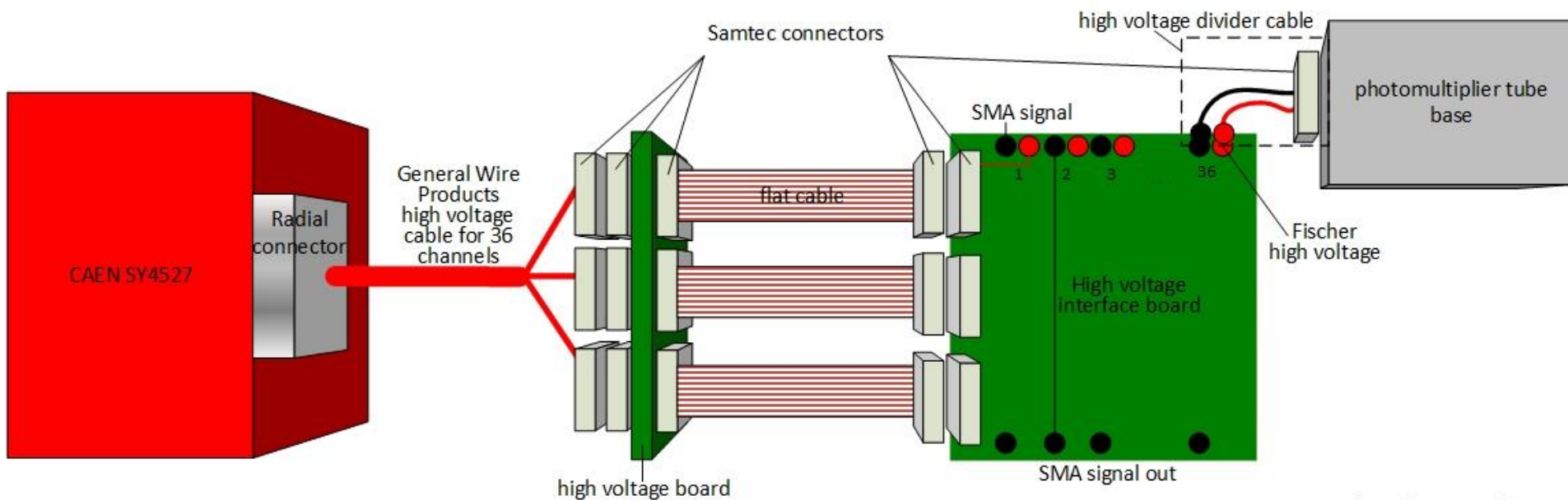
DSG NPS Collaborators' Update

Aaron Brown and the Detector Support Group
April 1, 2021

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NPS HV Schematic

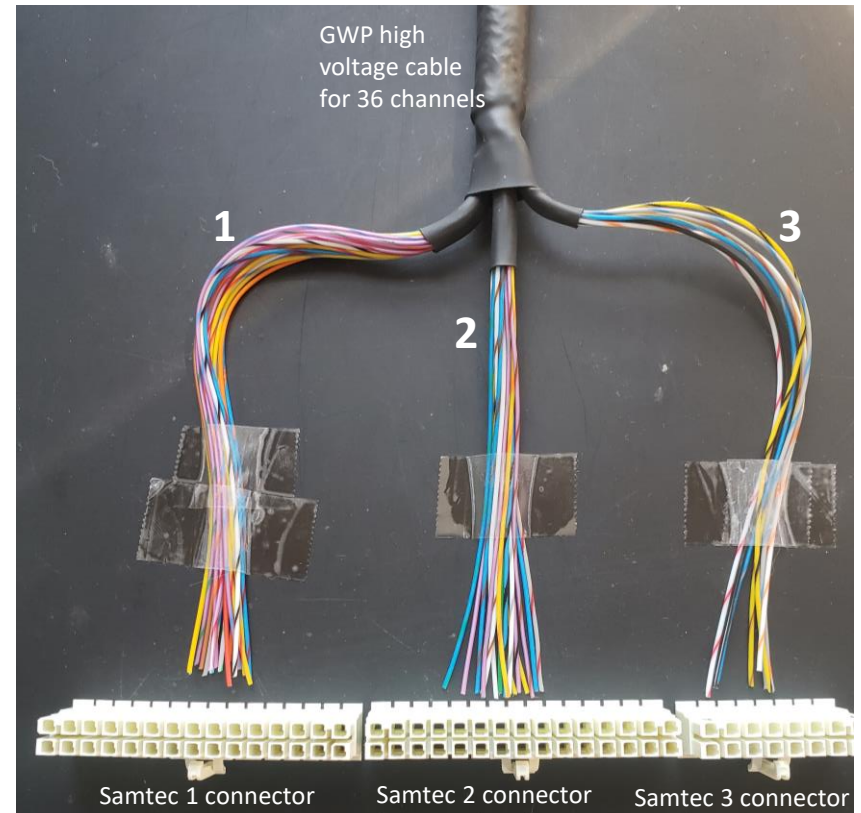


NPS High Voltage Path
2/23/2021
M. A. Antonioli

- Mindy Leffel is fabricating the 36-channel high voltage cables

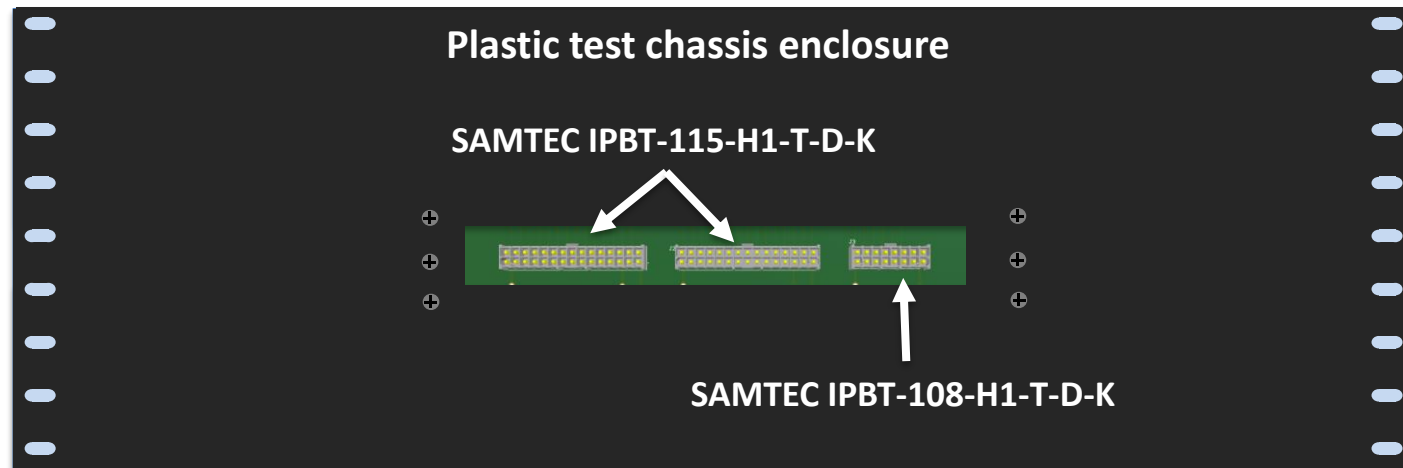
HV Supply Cable: Fabrication

- Mindy Leffel completed fabrication of five of 40 cables
- Grounding wire connected to each braided shield at Radiall connector end
- SAMTEC connectors (labeled 1, 2, and 3) have 15, 15, and 6 HV channels, respectively



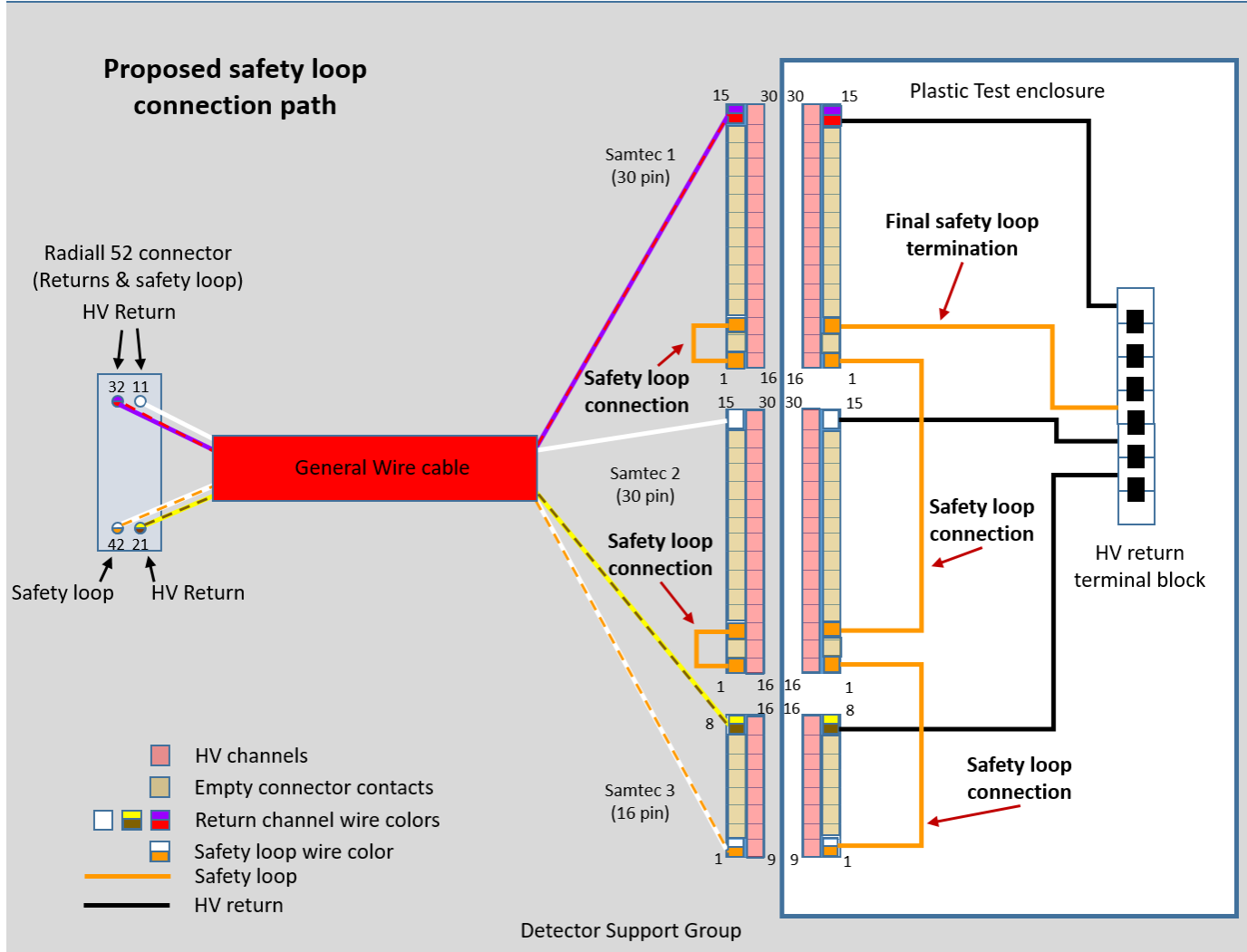
HV Supply Cable: Testing

- Two 30-pin and one 16-pin SAMTEC connectors mounted on test chassis PCB
- Populated with thirty-six 2-M Ω resistors
- HV supply cable connects to CAEN A7030TN module with a Radiall 52-pin connector and test chassis with three SAMTEC connectors



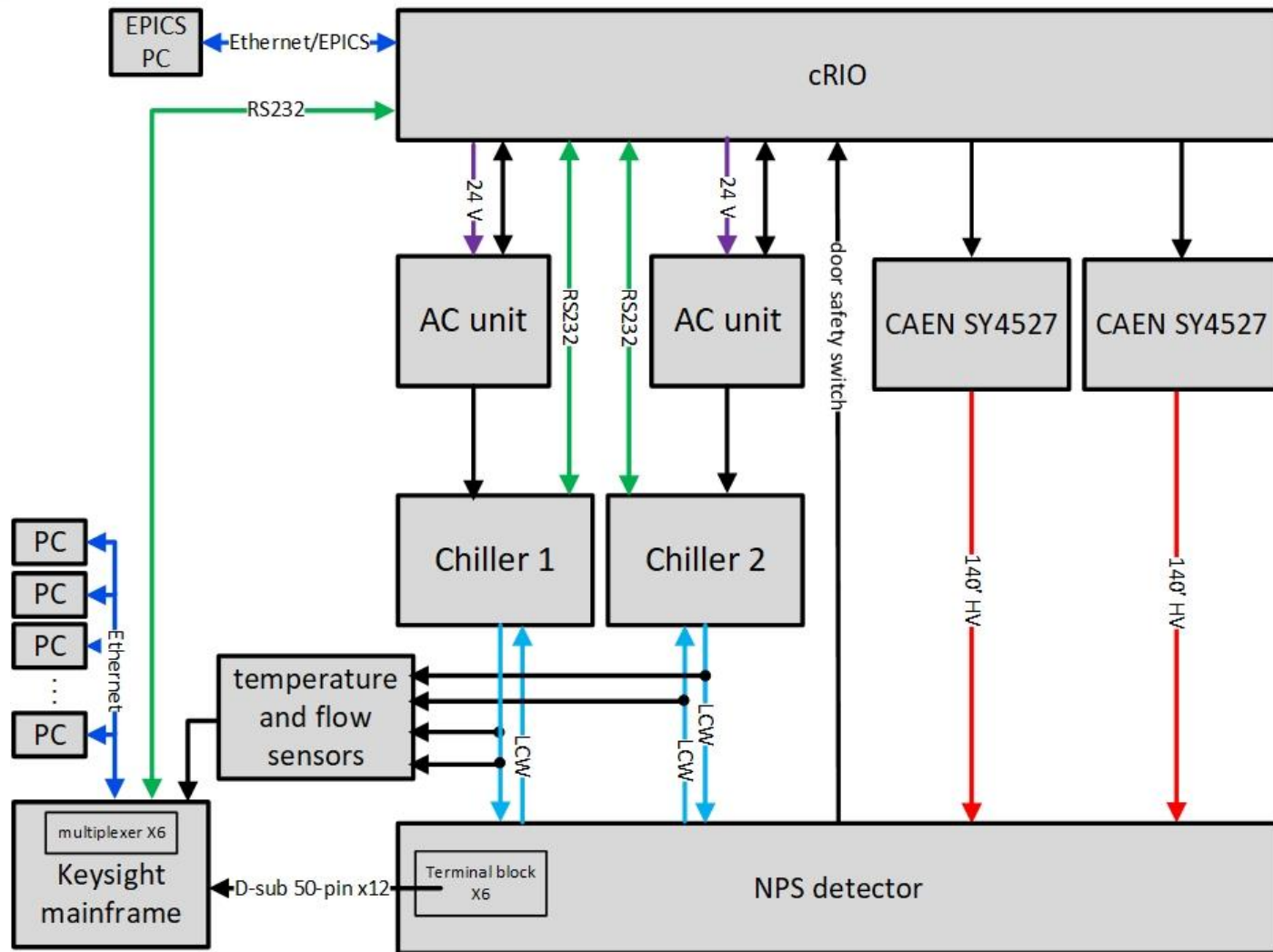
HV Supply Cable test chassis being designed by Marc McMullen

HV Supply Cable: Testing



Safety loop routed through all three SAMTEC connectors to ensure HV turns off on disconnection of any connector from test chassis

Hardware Interlock System – Block Diagram



NPS Hardware Interlock System
M. A. Antonioli
02/26/21, rev. 3/8/21


Hardware Interlock System Development

- Uses NI cRIO-9045, 8-slot controller located in detector hut
- LabVIEW-based interlock program with subroutines common to all DSG interlock systems
 - SVT, FT, RICH-I, RICH-II
- Subroutines have run reliably since 2015 with +10K hours between software updates
 - Two subroutines unique to NPS
 - Keysight measurement unit initialization and scanning
 - Chiller communication

Keysight Sensor Scanning System

- Two communication modes
 - LabVIEW (RS232)
 - Web application
- Programmable scanning sequence
- Ability to scan channels across multiplexers and different sensor types

Keysight Sensor Scanning System

**Agilent Technologies**

Multifunction Switch/Measure Unit

Welcome Page

Browser Web Control

View & Modify Configuration

System Status

Print Display

Help with this Page

Observe Only

Allow Full Control

Scan Control...

Sequences...

System Overview...

Alarms...

Commands...

Update View

Modules in Mainframe

(1) 40-Ch Arm MUX [34921A] (5) Slot 5 empty
(2) 40-Ch Arm MUX [34921A] (6) Slot 6 empty
(3) Slot 3 empty (7) Slot 7 empty
(4) Slot 4 empty (8) Slot 8 empty

Analog Bus Overview

	Slot	1	2	3	4	5	6	7	8
ABus1									
ABus2									
ABus3									
ABus4									

MEAS
SENS

DMM

Configure DMM...

Monitor DMM...

Slot 2: 40-Channel Armature Multiplexer with Low Thermal Offset

Bank 1
Com 1

Analog Buses

ABus 1
2911

ABus 2
2912

ABus 3
2913

ABus 4
2914

2001

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

2018

2019

2020

Bank 2
Com 2

Analog Buses

ABus 1
2921

ABus 2
2922

ABus 3
2923

ABus 4
2924

2021

2022

2023

2024

2025

2026

2027

2028

2029

2030

2031

2032

2033

2034

2035

2036

2037

2038

2039

2040

Module Overview...

Reset Module

Open All

Left-click switch to open/close

Right-click switch to view configuration

S

 = Channel is in a scan list

A<n>

 = Channel has Alarm<n> enabled.

Current Bus

ABus 1
2931

Scan Control

Start Scan

Stop Scan

View Data ...

Scan List

1001

2008

2014

2015

Configure Channel...

Edit Scan List...

Trigger Settings

Trigger Source

Immediate

Trigger Count

Infinite

Sweep Count (Used for Scan with channels)

1

Sample Count

1

Trigger Delay (Used for DMM Meas)

0.001

sec

Auto

OK

Cancel

Apply

Web application with programmable channel scanning

Front Panel for Sensor Scanning

The screenshot shows the front panel of a LabVIEW VI titled "keytest1.vi Front Panel on Untitled Project 2.lvproj/My Computer". The interface includes a menu bar (File, Edit, View, Project, Operate, Tools, Window, Help), a toolbar with icons for running, pausing, and other functions, and a search bar. The main panel features a "stop" button, a "VISA resource name" dropdown menu showing "USB0::0x0957::0x0507:", a "Scan Size" input field set to "4", and two toggle buttons for "Show Channel In Data" (ON) and "Show Units in Data" (OFF). On the right, there is an "Output Results" table and a "VISA/Instrument Errors" section.

Sensor value

Output Results	
+7.55798000E+01	F,1001
+7.42838000E+01	F,2008
+9.90000000E+37	OHM,2014
+9.89429000E+03	OHM,2015

Channel number

Number of channels being scanned

Scan Size: 4

Error buffer

VISA/Instrument Errors

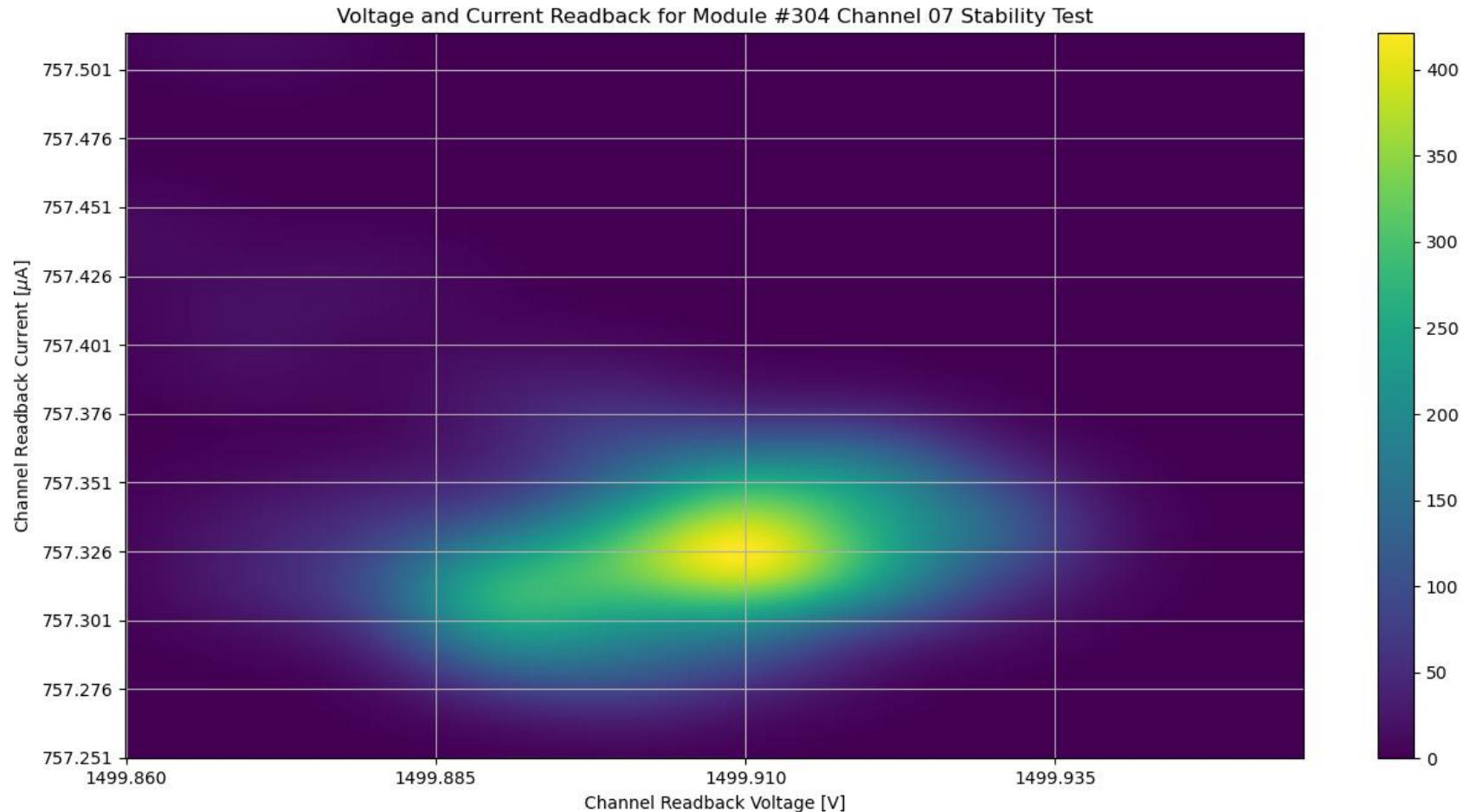
code	status
✓	-1074001665

source

AG34980A Error Query;
instrument reports:
+0,"No error"

Annotations with red arrows point to the "VISA resource name" dropdown, the "Scan Size" input, the "Output Results" table, the "Channel number" label, and the "Error buffer" section.

Density Plot



- Generated with voltage and current stability test data for each channel

CSS-BOY Screen

				All Channels On		All Channels Off					
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
10-35	11-35	12-35	13-35	14-35	15-35	16-35	17-35	18-35	19-35	20-35	21-35
10-34	11-34	12-34	13-34	14-34	15-34	16-34	17-34	18-34	19-34	20-34	21-34
10-33	11-33	12-33	13-33	14-33	15-33	16-33	17-33	18-33	19-33	20-33	21-33
10-32	11-32	12-32	13-32	14-32	15-32	16-32	17-32	18-32	19-32	20-32	21-32
10-31	11-31	12-31	13-31	14-31	15-31	16-31	17-31	18-31	19-31	20-31	21-31
10-30	11-30	12-30	13-30	14-30	15-30	16-30	17-30	18-30	19-30	20-30	21-30
10-29	11-29	12-29	13-29	14-29	15-29	16-29	17-29	18-29	19-29	20-29	21-29
10-28	11-28	12-28	13-28	14-28	15-28	16-28	17-28	18-28	19-28	20-28	21-28

- Buttons to turn ON/OFF all channels in both crates
- Buttons to turn ON/OFF all channels in a slot
- Buttons to turn ON/OFF individual channels

Conclusion

- Good progress

THANK YOU!