# DSG NPS Collaborators' Meeting Update

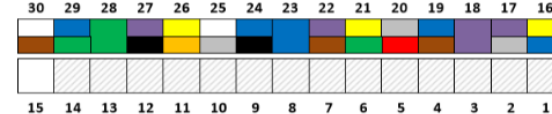Aaron Brown and the Detector Support Group

02/25/2021

Contents

- Radiall-to-SAMTEC High Voltage (HV) Cables
  - Fabrication
  - Testing

- HV Schematic

- Hardware Interlock System Development
  - Tentative signal list
  - Dew point interlock

- CSS-BOY Screen Development

- Conclusion
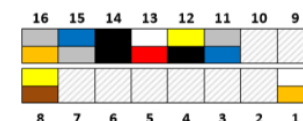
Radiall-to-SAMTEC HV Cables: Fabrication

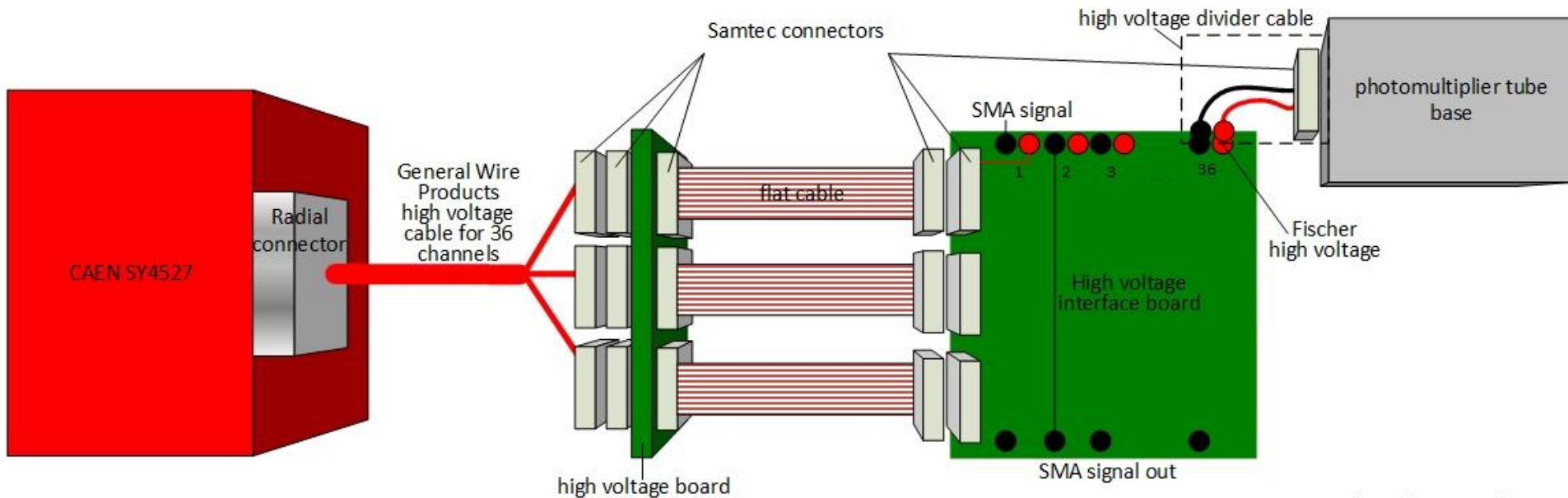| Channel	Radiall 52 Pin Number	Wire color	Samtec 1 (30pin) Pin Number	Samtec 2 (30 pin) Pin Number	Samtec 3 (16 pin) Pin Number
HV00	43		30		
HV01	22		29		
HV02	1		28		
HV03	33		27		
HV04	12		26		
HV05	44		25		
HV06	23		24		
HV07	2		23		
HV08	34		22		
HV09	13		21		
HV10	45		20		
HV11	24		19		
HV12	3		18		
HV13	35		17		
HV14	14		16		
HV15	46			30	
HV16	25			29	
HV17	4			28	
HV18	36			27	
HV19	15			26	
HV20	47			25	
HV21	26			24	
HV22	5			23	
HV23	37			22	
HV24	16			21	
HV25	48			20	
HV26	27			19	
HV27	6			18	
HV28	38			17	
HV29	17			16	
HV30	49				16
HV31	28				15
HV32	7				14
HV33	39				13
HV34	18				12
HV35	50				11
Return	11			15	
Return	21				8
Return	32		15		
Safety Loop	42				1
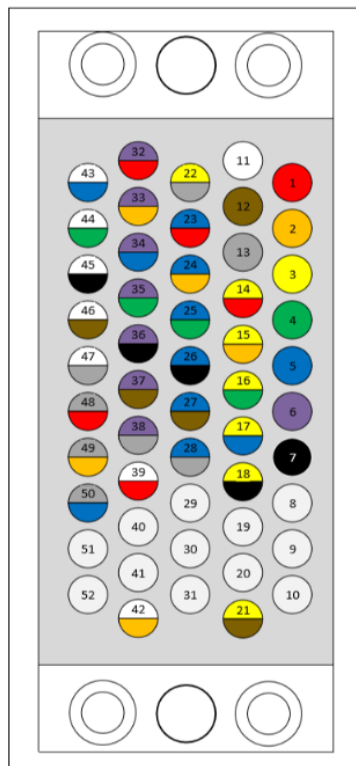
NPS Samtec Connectors Wire Colors
M. A. Antonioli
01/28/21
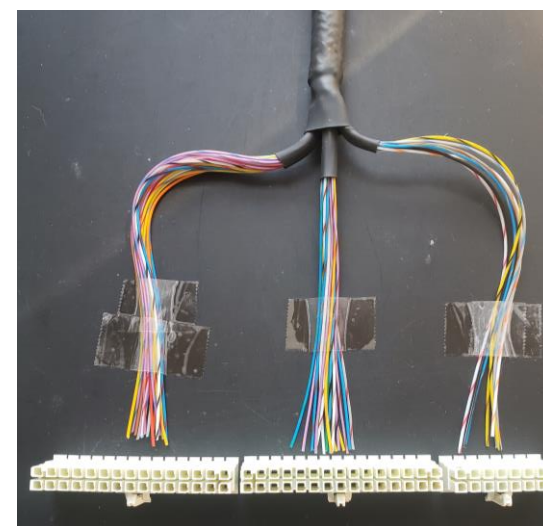
- Cables being fabricated by Mindy Leffel – five of 40 complete
- Grounding wire connected to each braided shield at Radiall connector end
- SAMTEC connectors (labeled 1,2, and 3) have 15, 15, and 6 HV channels, respectively

JSA   Jefferson Lab

HV Schematic

Samtec connectors

high voltage divider cable

photomultiplier tube base

SMA signal

General Wire Products high voltage cable for 36 channels

Radial connector

CAEN SY4527

flat cable

1   2   3   ...   36

Fischer high voltage

High voltage interface board

high voltage board

SMA signal out

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

- Mindy Leffel is fabricating the high voltage cables

Radiall-to-SAMTEC HV Cables: Testing
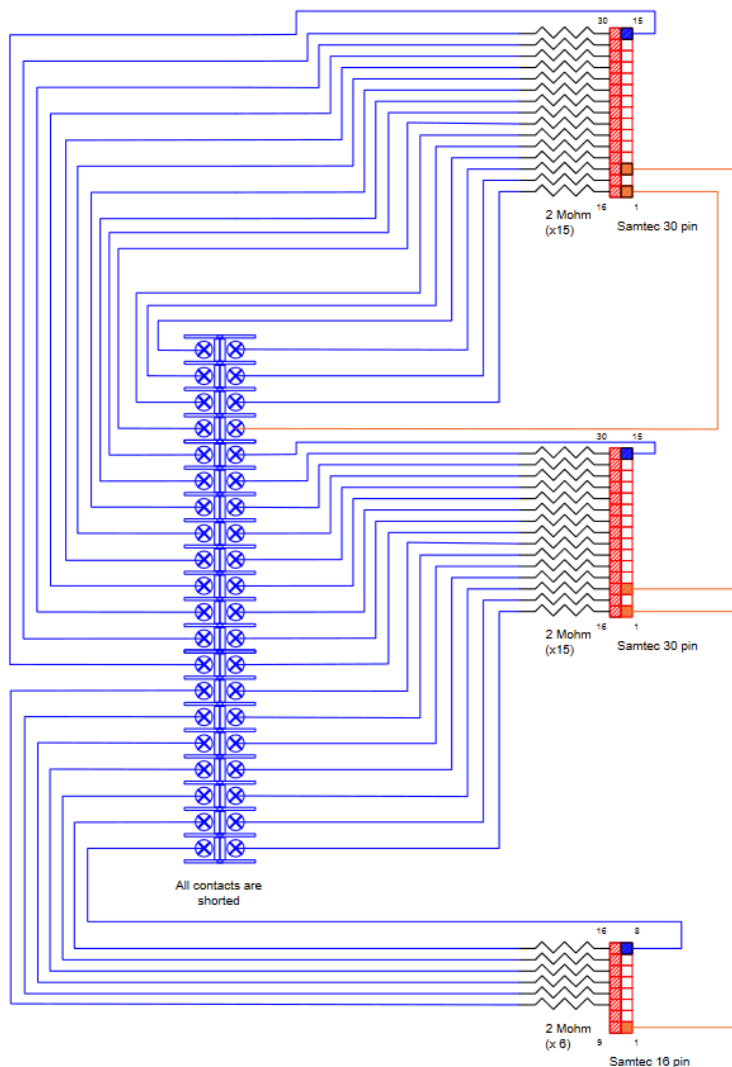
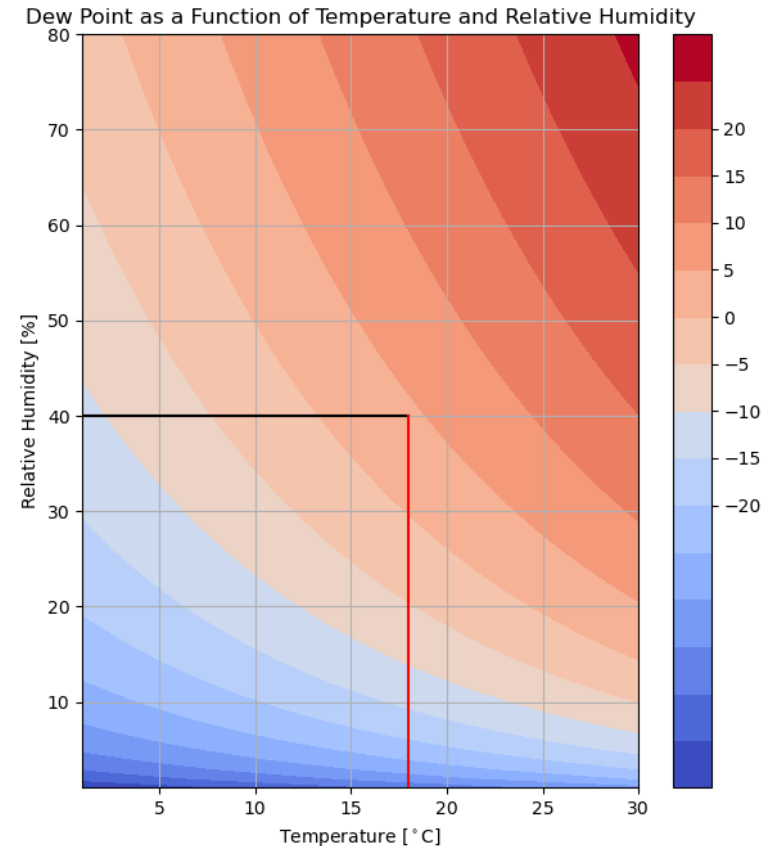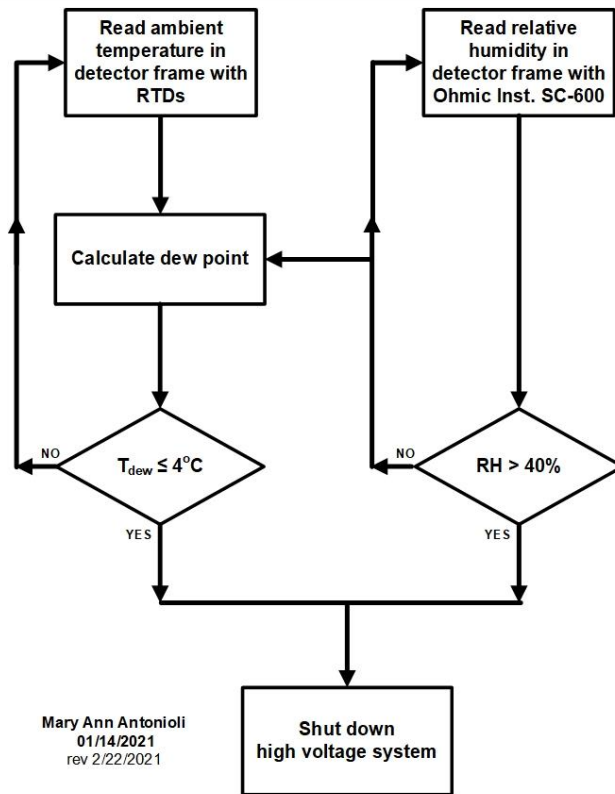Test chassis internal schematic developed in AutoCAD

- Testing goals
  - Observe cables' SAMTEC connectors at 1100 V

  - Verify neighboring channels don't change voltage or current if a channel, or adjacent channel, is turned off

- Marc McMullen is developing the Test Chassis

Hardware Interlock System Development

Location	Signal Type	Qty	Sensor	Comments
Crystal array	Temperature	112	Type K thermocouples	Within NPS crystal array (56 front - 56 rear)
Crystal zone cooling circuit	Temperature	4	4-wire RTDs	Dual sensors on input and output coolant manifolds
Electronics zone cooling circuit	Temperature	4	4-wire RTDs	Dual sensors on input and output coolant manifolds
		4		Dual sensors on top and bottom heat exchangers
Detector internal frame	Humidity	20	Resistive RH	Dual humidity sensors in 10 locations
	Temperature	20	4-wire RTDs	Dual temperature sensors in 10 locations
In NPS frame	Switch on/off	2	Coolant leak sensor	Monitors for leaks in the cooling circuits
On frame access panel	Switch on/off	2	Contact micro switch	Protects personnel from HV when servicing
External ambient (Hall)	Temperature	2	4-wire RTDs	
	Humidity	2	Resistive RH	
Crystal zone chiller	Pressure	1	Crystal array zone chiller	All parameters are read from the chiller's RS232 communication port
	Set readback temperature	1		
	Coolant temperature	1		
	Status	1		
Electronics zone chiller	Pressure	1	Electronics zone chiller	All parameters are read from the chiller's RS232 communication port
	Set readback temperature	1		
	Coolant temperature	1		
	Status	1		

- Tentative signal list: ~180 monitored signals
- Signal readout from sensors
  - To Keysight → cRIO → EPICS
  - To cRIO → EPICS

Flow chart (left)

Read ambient temperature in detector frame with RTDs

Read relative humidity in detector frame with Ohmic Inst. SC-600

Calculate dew point

$T_{dew} \leq 4°C$ — NO / YES

RH > 40% — NO / YES

Shut down high voltage system

Mary Ann Antonioli
01/14/2021
rev 2/22/2021

NPS Hardware Interlock System Fault Chart
Frame Humidity and Dew Point

Dew Point as a Function of Temperature and Relative Humidity

- Minimum coolant temperature of chiller is 5°C
- → Dew point should be interlocked at ≤ 4°C
- → For operational temperature of 18°C, max RH ≤ 40%
  - Providing margins for humidity and temperature sensors accuracies

Jefferson Lab

CSS-BOY Screens Development

Snippet of Module/Channel Power CSS-BOY screen

- Screen enables user to turn off channels individually

- Buttons to be added:
  - Turn off slot
  - Turn off crate
  - Turn off both crates

Conclusion

Work is progressing smoothly

Thank You