

DSG NPS Status Update

Aaron Brown and the Detector Support Group February 16, 2022

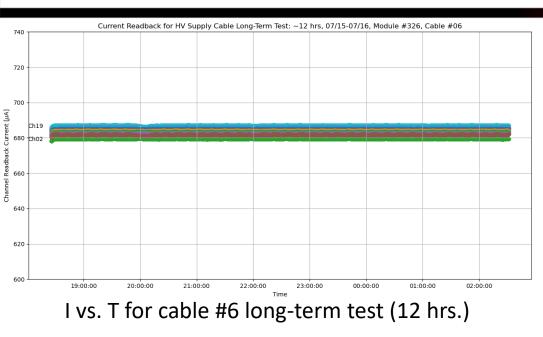


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High Voltage Supply Cable



 Specified, procured, fabricated, and <u>tested</u> 40 high voltage supply cables

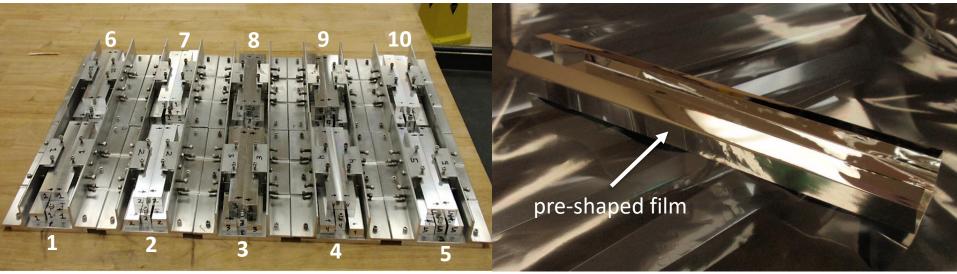




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ESR Film Pre-shaping

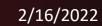


Ten jigs available

Finished product

• Pre-shaped 600+ films







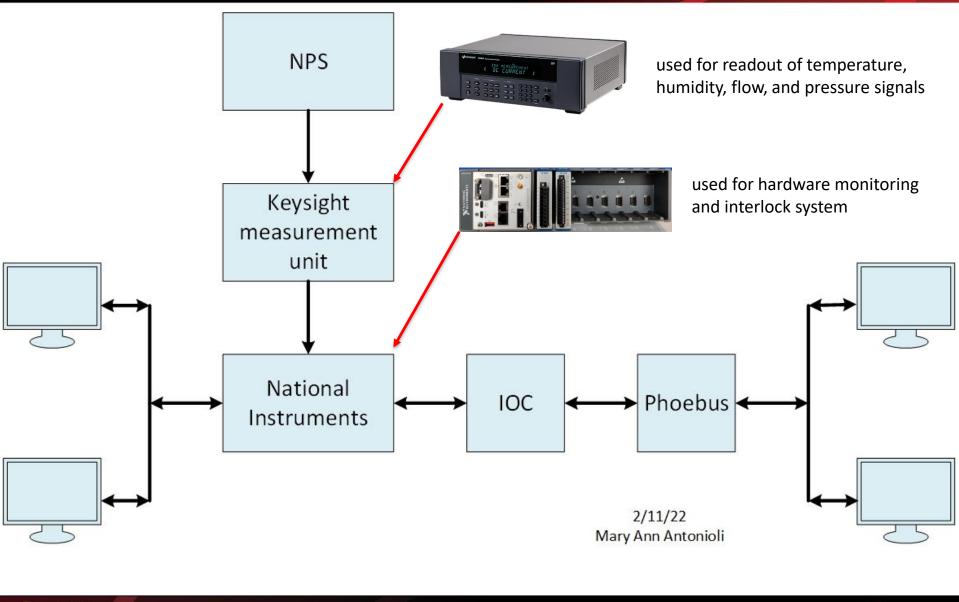
Hardware Monitoring LabVIEW Program

Crystal Zone Electronics	s Zone	Dete	ector F	rame a	nd H	all C	hillers						Crystal Zone Electronics Zo	one Chi	ller							
													average, all electronics 19.4	sensor	low-low	low	high	high-high	temp.	avg. s	td. dev. sta	tus
Main Front Temperatures	Back	Tempe	ratures	Coolin	a Circi	uit Tem	neratur		nneratu	re Mar	Plots Exper	rt Settings	zone temperatures inte	t manifold 1	16.0	18.5	20.0	21.0	15.0	19.2	3.3	
Main Front remperatures	,			Cooling	y circi	are rem	peratur		nperata	ine may	Thors Exper	c sectings	Tomporaturo	manifold 2	16.0 +	18.5	20.0	21.0	15.0	19.7	3.3	
													and the second se	manifold 1	16.0	18.5	20.0	21.0	19.0	18.8	3.4	
average, all back	average, all back Back Crystal Zone Temperatures [°C]									limits	manifold 2 anger top 1	16.0	18.5	20.0	21.0	23.0 23.0	19.4	3.3				
crystal zone temperatures [°C]				а	verage				-	averag	,	l		anger top 1	16.0	18.5	20.0 20.0 20.0	21.0	17.0	19.1	3.4	
3.5E+36	crystal	temp.	avg.	std. dev.			temp.	avg.	std. dev.	status			heat exchang		16.0	18.5	20.0	21.0	17.0	20.2	3.4	5
	0	21.3	21.2	0.1		540	21.6	21.7	0.1				heat exchang	er bottom 2	16.0	18.5	20.0	21.0	21.0	19.7	3.6	
	5	21.7	21.8	0.1	ŏ	550	21.0	20.9	0.1	Ŏ						Ele	ctronics Ze	one Temper	rature Ave	erages		_
	10	21.3	21.3	0.2		560	21.3	21.4	0.0				Senso senso	100 CO	25-							
	15	21.5	21.5	0.2			21.2	21.4	0.1				🖂 senso	r3 📈	24-							
						570							Senso Senso	COLUMN TWO IS NOT	22-							
	20	21.1	21.2	0.0		684	21.2	21.3	0.1				Senso	r6 📉	21-	Am	ma .					
	25	21.6	21.8	0.2		689	21.1	21.1	0.0				⊠ senso ⊡ senso		20-	A MAR	south					
	30	21.4	21.5	0.1		694	20.6	20.7	0.0	\bigcirc				_	d 19-	Ny san	j			~~~~		
	35	21.8	22.0	0.2		699	20.9	20.8	0.1	\bigcirc					18-	Ţ¥.						
	180	21.1	21.5	0.3	\mathbf{O}	704	21.7	21.7	0.0				# of pts. to average		16-	ø						
	185	21.2	21.3	0.0	\mathbf{O}	709	22.3	22.3	0.0				100		15-							
	190	21.3	21.6	0.3	\mathbf{O}	714	20.6	20.6	0.0	\bigcirc			run type		14-						111	
	195	21.5	21.6	0.0		719	22.6	22.0	0.1									Counts				
	200	21.4	21.6	0.1	Š	864	9.9E+37).9E+37	0.0													
	205	21.3	21.3	0.1	ŏ	869	-89.9	-93.3	3.1													
	210	21.7	21.6	0.1		874	-94.8	-95.8	0.9	ŏ												
	215	21.4	21.5	0.1		879	-90.8	-92.3	1.4			Taman										
	360	21.3	21.4	0.1		884	-85.6	-86.2	0.6			Tempe	erature values									
	365	20.5	20.5	0.0		889	-95.1	-96.1	1.0			from t	hermocouples									
	370	21.0	21.1	0.0		894	-95.5	-95.5	0.8				ed in DSG control									
		21.0	21.6									instant										
	375			0.1		899	21.7	21.7	0.1			room										
	380	21.3	21.5	0.1).9E+37).9E+37	0.0													
	385	19.6	19.6	0.0	\bigcirc	1049	-89.9	-90.9	1.1	$\overline{}$												

- Runs in parallel with LabVIEW hardware interlock program
- Uses shared network variables from *Keysight Scanning* hardware interlock LabVIEW subroutine



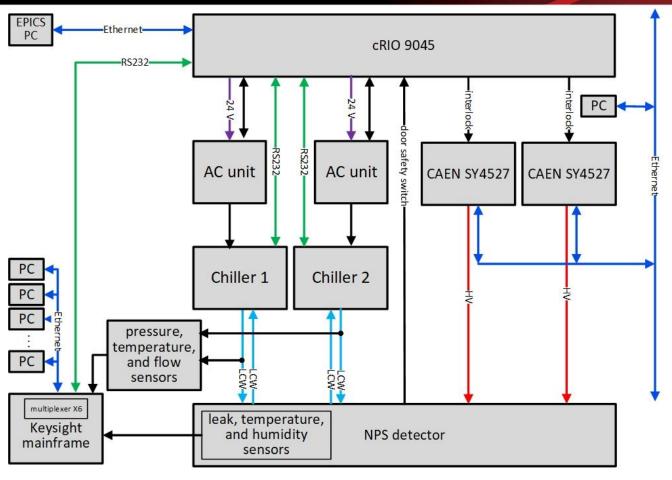
Hardware Interlock System Layout





Jefferson Lab

Hardware Interlock System Layout - Details



NPS Hardware Interlock System M. A. Antonioli 7/21/21

Hardware interlock system layout

DSG Note 2021-15

2/16/2022

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Signal Monitoring

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					
		4		Dual concers on input and output content monifold.					
Electronics zone cooling circuit	Temperature	4	4-wire RTDs	Dual sensors on input and output coolant manifold Dual sensors on top and bottom heat exchangers					
Detector internal frame	Humidity	20	Relative humidity (voltage output)	Dual humidity sensors in 10 locations					
Detector internal frame	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					
Chiller shielded enclosure	Voltage	1	N/A	Monitors humidity sensor power supply (+5V)					
	Temperature	2	4-wire RTDs						
External ambient (Hall)	Humidity	2	Relative humidity (voltage output)						
External to chiller in radiation	Coolant Temperature	1	Temperature (voltage output)						
shielded enclosure	Coolant Pressure	1	Pressure (voltage output)	Monitors electronics zone chiller					
	Coolant Flow	1	Flow (voltage output)						
Estamolita abilitada en 1911	Coolant Temperature	1	Temperature (voltage output)	1					
External to chiller in radiation	Coolant Pressure	1	Pressure (voltage output)	Monitors crystal array zone chiller					
shielded enclosure	Coolant Flow	1	Flow (voltage output)						
		112	Total Type K thermocouples						

112	Total Type K thermocouples
34	Total RTD's
22	Total humidity sensors (voltage)
11	Total flow/pressure/other (voltage)

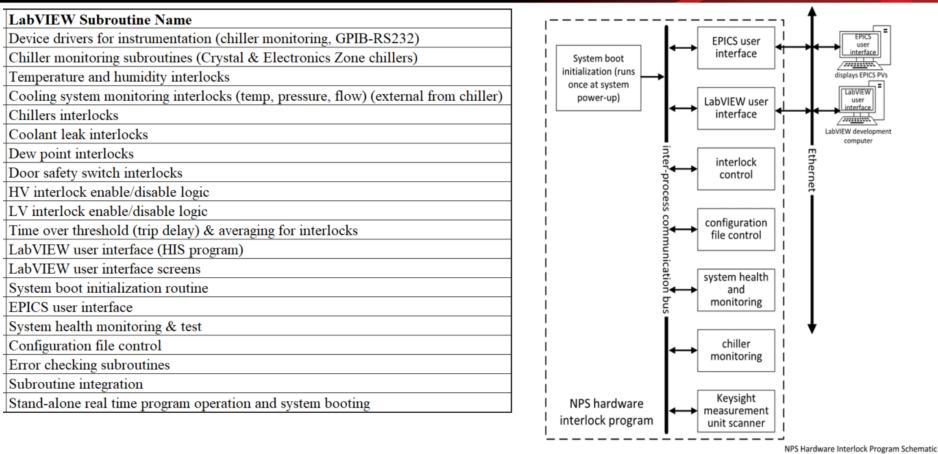
179 Total Signals

• Planned signal monitoring





Software Configuration



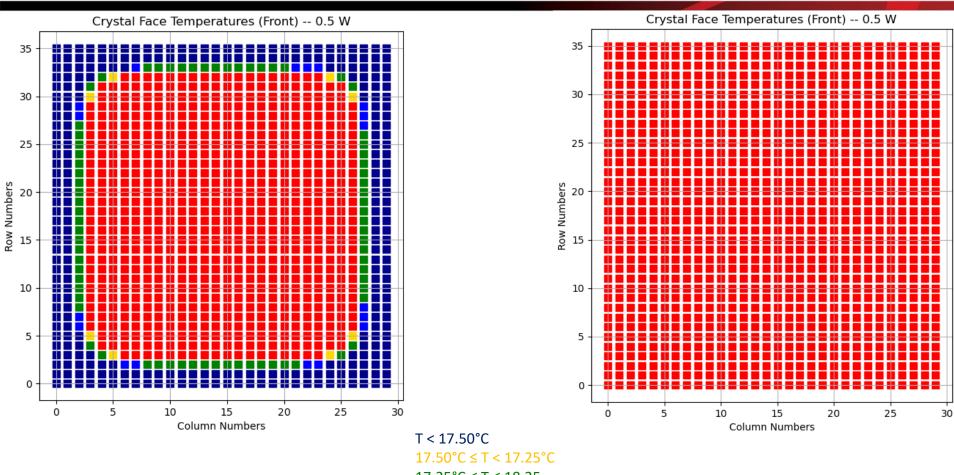
3/30/2021 M. A. Antonioli

- Parallel LabVIEW programs share signal data
- Subroutines check signal data against interlock limits and initiate trips

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Ansys Thermal Simulation



- Ambient temperature = 22°C
- Heat load = 0.5 W
- Cu shell temperature = 10°C
- Python plot of just crystal face temp. probes

2/16/2022

• Central crystal temperature = 21.77°C

17.50°C ≤ T < 17.25°C 17.25°C ≤ T ≤ 18.25 18.25°C < T ≤ 18.50°C T > 18.50°C

- Ambient temperature = 22°C
- Heat load = 0.5 W
- Cu shell temperature = 20°C
- Python plot of just crystal face temp. probes
- Central crystal temperature = 21.98°C



Conclusion

 DSG is contributing to all phases of detector development





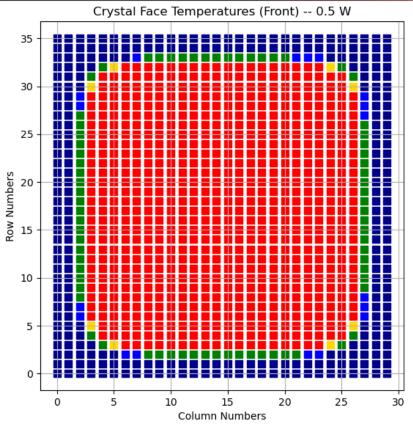
Thank You!







Ansys Full-scale Model Simulation



- Ambient temperature = 22°C
- Heat load = 0.5 W
- Cu shell temperature = 10°C
- Central crystal temperature = 21.77°C
- Python plot of just crystal face temp. probes



