

LArFCS Cryogenic System progress

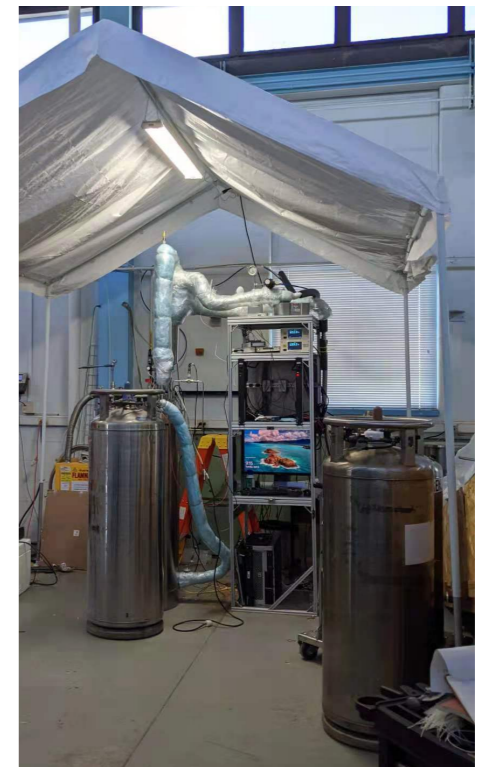
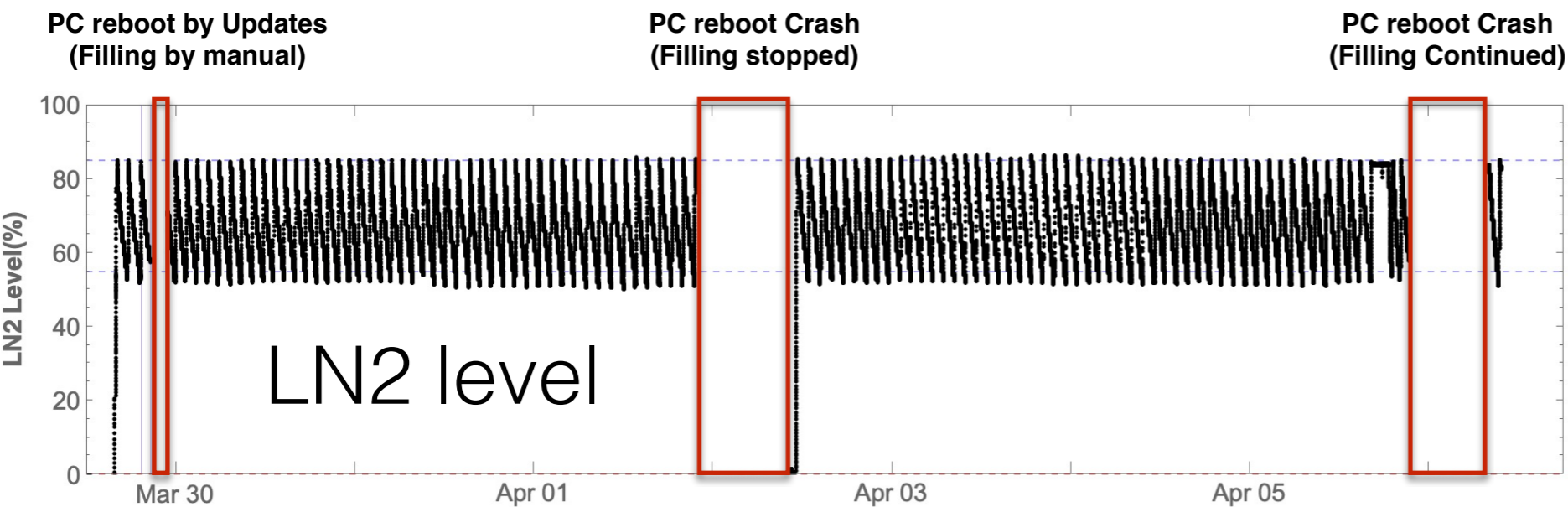
Yichen, Sergey

4/6/21

LArFCS Cryogenic Operation

▶ LArFCS Cryogenic Operation 2nd Run

- We are in the 2nd week of cryogenic operation (starting last Monday)
- A halt of cryogenic operation for ~11 hrs(details on next slide)
- LAr level maintained stable with periodic LN2 filling
- Another halt of cryogenic operation monitoring occurred last night (Cryogenic operation continues)
- Lighting added to the tent for illumination
- Elog in use now for logging the operations: <https://elog-phy.bnl.gov/LArFCS/>

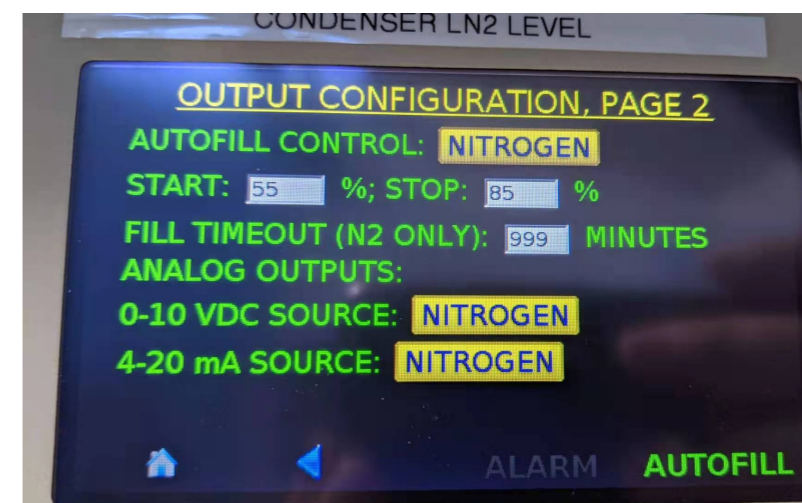


LArFCS Cryogenic Operation

► LArFCS Cryogenic Operation halt incidents

- One incident of controlling PC reboot occurred last Thursday at 9:49pm
 - Resulted in the halt of cryogenic filling for ~11 hours, lost of ~6.5 LAr
 - ITD concluded it is not caused by Windows 10 Updates this time
- Another PC reboot incident occurred last night at 9:19pm
- Given the frequency of such incident disturbing the cryogenic operation
 - LN2 filling mechanism modified to be controlled by level monitor
 - Automatic LN2 filling is independent from PC now
 - The cryogenic operation can be maintained with:
 - 1) LN2 supply
 - 2) 110V AC power supply
 - Performance verified last night

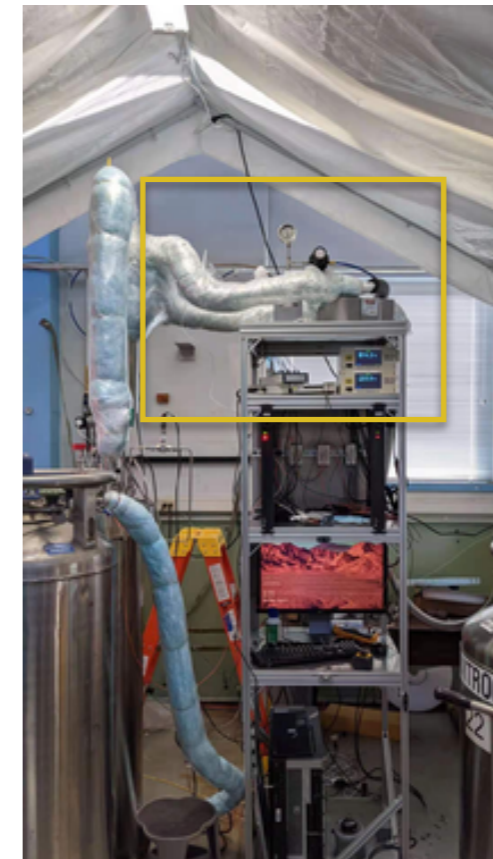
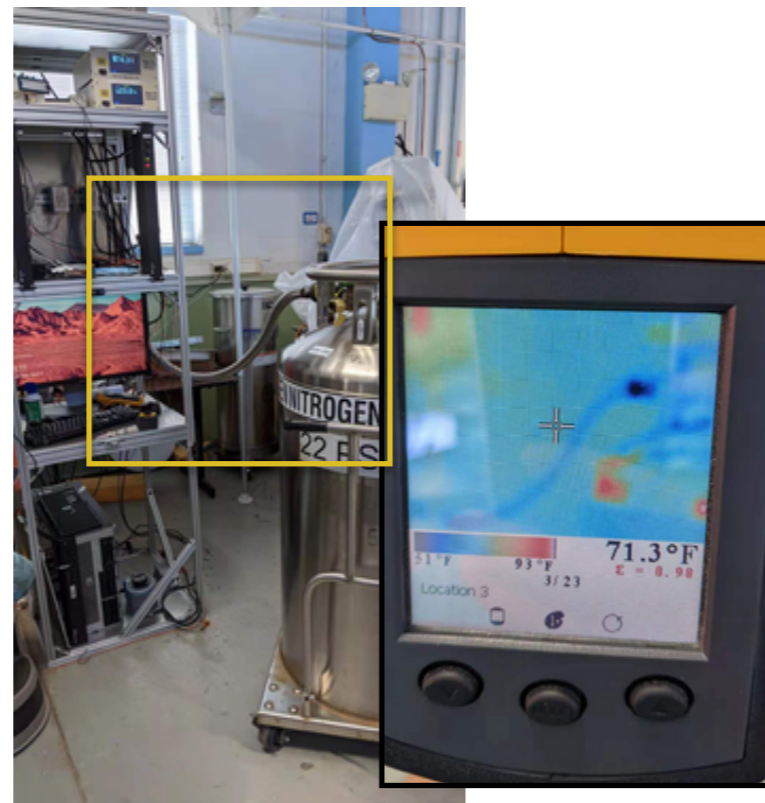
```
TimeGenerated      EventID Message
-----
4/1/2021 9:54:02 PM 6005 The event log service was started.
4/1/2021 9:54:02 PM 6009 Microsoft (R) Windows (R) 10.00.19041 Multiprocessor Free.
4/1/2021 9:50:11 PM 6006 The event log service was stopped.
4/1/2021 9:49:33 PM 1074 The process C:\WINDOWS\system32\wbem\wmiprvse.exe (WPO-150600) has initiated the restart of computer WPO-150600 on behalf of user NT AUTHORITY\SYSTEM for the following reason: No title for this reason could be found
Reason Code: 0x80070015
Shutdown Type: restart
```



LArFCS Cryogenic Operation

► LArFCS Cryogenic Operation 2nd Run

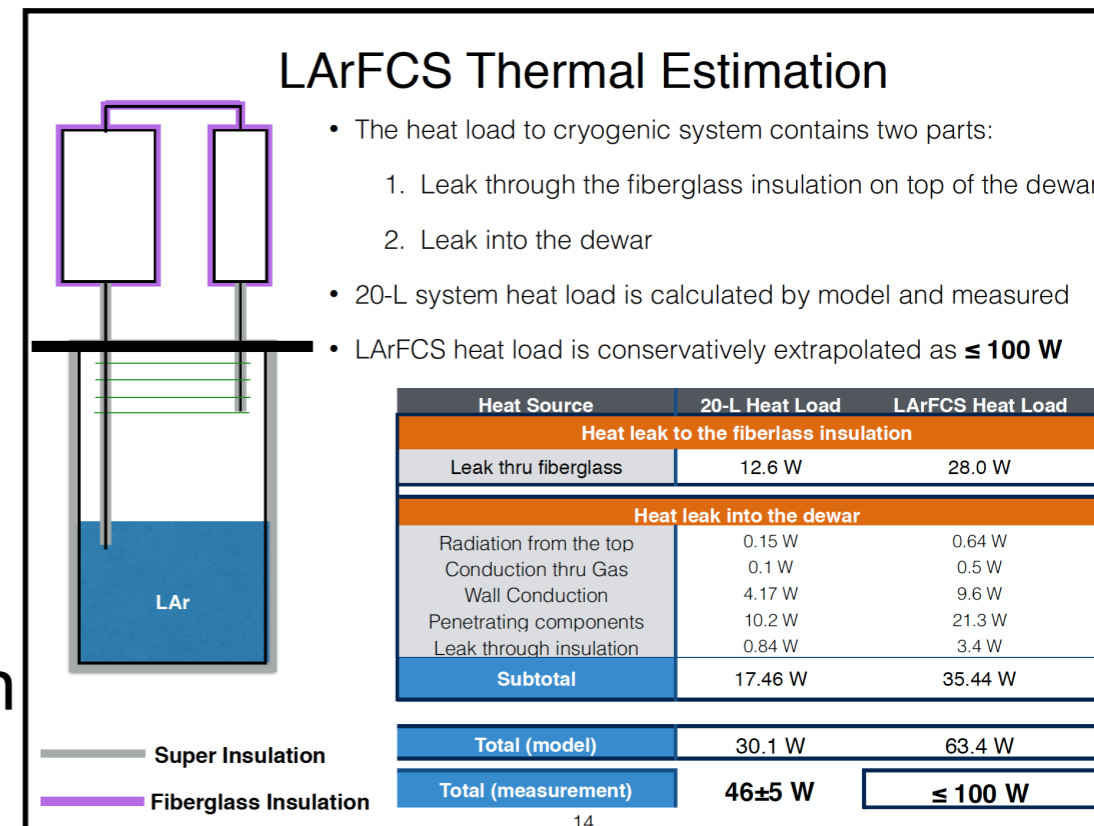
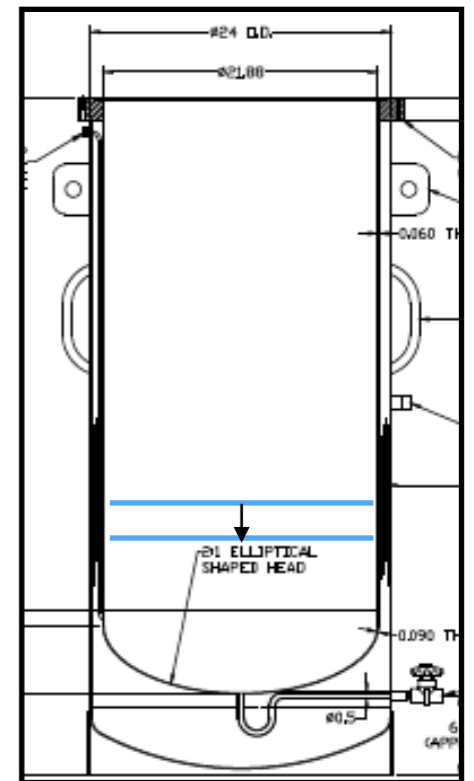
- Surface temperature survey with thermal imager
 - The lowest temperature observed on the condenser is ~16C
 - Cryolite surface temperature at the top is ~12C
 - Cold spots observed on the N2 exhaust line at relief valve, Back Pressure Regulator, and venting line. Some ice accumulation, will add fans to de-frost in the future run



LArFCS Cryogenic Operation

► Findings in slow monitoring data: Heating load budget

- Heat load estimation into the LAr determined by level drop during loss of cooling:
 - LAr Level Drop: ~1 inch after losing cooling for ≈ 8.5 hrs
 - Heat load input into LAr ≈ 45 W
- Total Heat Load of the system estimated by the LN2 consumption for each filling cycle
 - LN2 consumption ≈ 1.88 L
 - Filling cycle ≈ 70 mins
 - Total heat load of the system ≈ 82.8 W
- 30% higher than previous thermal estimation



LArFCS Cryogenic Operation

- ▶ **LArFCS Cryogenic Operation Summary Document**
 - The preliminary draft in progress is available on Google docs:
https://docs.google.com/document/d/14wzoaqSE0m4iNbMxs1TcGjS6576YmXcX_PWPEVeMnCk/edit?usp=sharing
 - Some contents need to wait until the end of the run
 - Refill LAr back to supply dewar
 - Warm up
 - All comments and suggestions welcomed.
 - Plan to stop the cryogenic operation and warm up on Friday.

LArFCS Purity Monitor

► PrM Parts

- Jianming provided the most recent parts list for assembly, total is \$2124 including the electronics and feedthru parts

- Putting orders starting from NIM and connectors
- Currently using D0 Calorimeter pre-Amp from Fermilab
- Probably need to find a way to get more spares

• Light source

- No information found for the Xeon lamp found in the lab
- Milind pointed to an Edmund Xeon lamp with cost of \$1595, waiting for the quote
- Hamamatsu Xeon system cost is ~\$3000
- According to Jianming, there are many options for Xeon lamp, Hamamatsu was chosen due to noise consideration
- 1000um fiber secured in front of the Xeon lamp filament for light input

• Flange interface

- 2x 2-3/4" Conflat flange is sufficient: 1) Fiber 2) HV+readout
- Mechanical model available for modeling

Number	Product #	Description	Unit Price	Qty	Total Price (\$)
Digikey	J125-ND	BLK Jack tip	1.70	10	17.04
	J124-ND	Red Jack tip	1.79	10	17.92
	J333-ND	Yellow Jack tip	1.57	10	15.73
	450-1306-ND	Switch	0.56	10	5.55
	45F100E-ND	100Q5W Res	0.04	20	0.73
	A1661 CT-ND	Pins NIM 50	48.00	1	48.00
	A1648CT-ND	Pins NIM 50	40.89	1	40.89
	A1329-ND	PIN tool	17.85	1	17.85
	LM317TNS/NOPB-ND	IC V Reg	0.37	5	1.85
	KA7906TU-ND	IC V Reg	0.15	5	0.74
	100KYBK-ND	.05720/100k Res	0.07	10	0.66
	1.33KYBK-ND	1.33k Res	0.07	10	0.66
	1.00KYBK-ND	1k Res	0.07	10	0.66
	499XBK-ND	499 Res	0.07	10	0.66
	249XBK-ND	249 Res	0.07	10	0.66
	49.9XBK-ND	49.9 Res	0.07	10	0.66
	1124-1360-ND	LEMO PM	13.11	10	131.13
	SM104JE-100M-ND	100M Res	4.49	10	44.91
	SM104JE-10M-ND	10M Res	1.12	15	16.84
	MC102JE-50M-ND	50M Res	4.43	10	44.28
	490-10086-ND	10*1000pF 15KV	2.38	15	35.69
	240-2146-ND	FERRITE CORE	0.26	10	2.64
	240-2297-ND	FERRITE CORE	0.14	10	1.44
Newark	35F3001	Building Post White	12.87	5	64.34
	67K1758	Fuse Holder	1.32	10	13.23
	26K8474	Fuse	0.84	25	20.99
	66K6817	1 Gohm Res	7.14	10	71.42
	40K5833	.01mF 3kV	1.28	25	31.91
	69K4917	100 pF 1kV	1.54	5	7.71
	35K3935	1000pF 1kV	0.75	25	18.69
	96Y2408	.1mF 100V	0.27	50	13.34
	83K9283	.01mF 1000V	0.38	10	3.80
	42K2816	Diode	0.19	10	1.87
	58K9578	Diode	0.18	5	0.92
	91B6527	K TAPE	57.82	1	57.82
	70K8762	22uF 15V	3.75	5	18.75
	70K8874	220uF 10V	10.66	10	106.61
	37N1582	TFE Tubing spool 100ft, 0.97mm	145.79	1.5	218.68
	37N1594	TFE Tubing spool 100ft, 3.53mm	145.79	1.5	218.68
	02F7522	Wire, Hook Up, PTFE, White, 26 AWG, sp	120.93	1	120.93
Mouser	588-MDX-40023500F-E	500M Res	7.66	10	76.59
	598-CD10CD020D03F	2pF 500V Cap	2.62	10	26.22
	736-GRAD0269GB	White Lemo Washer	1.28	10	12.77
	736-GRAD0269GN	Black Lemo Washer	1.28	10	12.77
	736-GRAD0269GV	Green Lemo Washer	1.28	10	12.77
	736-GRAD0269GA	Blue Lemo Washer	1.28	10	12.77
Jaguarind	JM17-930	500hm Cable, Min 100Ft	1.15	1	1.15
Allied	70088907	Connector SHV	8.49	12	101.84
	70125548	Dope	11.21	1	11.21
	70159796	Brush + Tip	8.67	1	8.67
	70003207	Wire 22	78.44	1	78.44
McMaster	89675K41	Copper	68.97	1	68.97
	8521K35	G-10-Cu	48.48	1	48.48
	K112	G-10	4.60	1	4.60
Precision Metal Fabricator	01-010R	module, NIM, 2 wide	91.50	1	91.50
AMP	204186-S	connector kit, NIM	119.00	1	119.00
Total					2124.59

