INTT Cooling System

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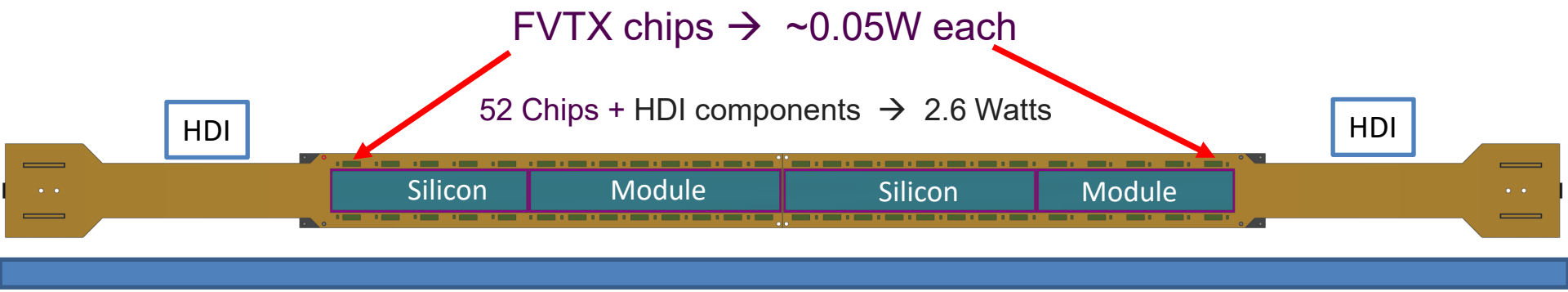
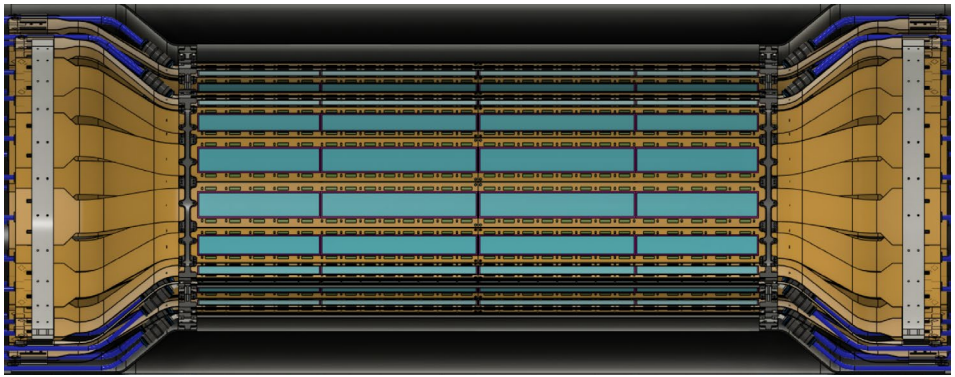
August 16, 2022

Ladder –> Barrel



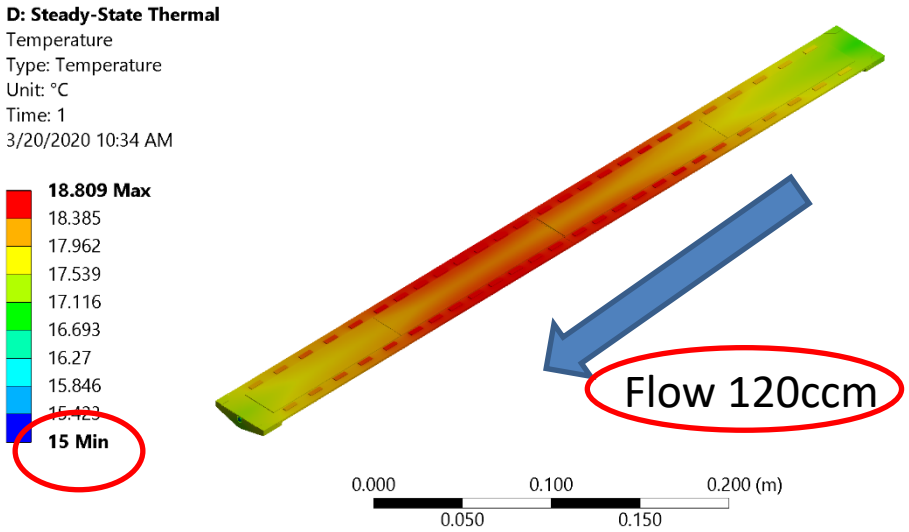


Rounding up to 3Watts per ladder

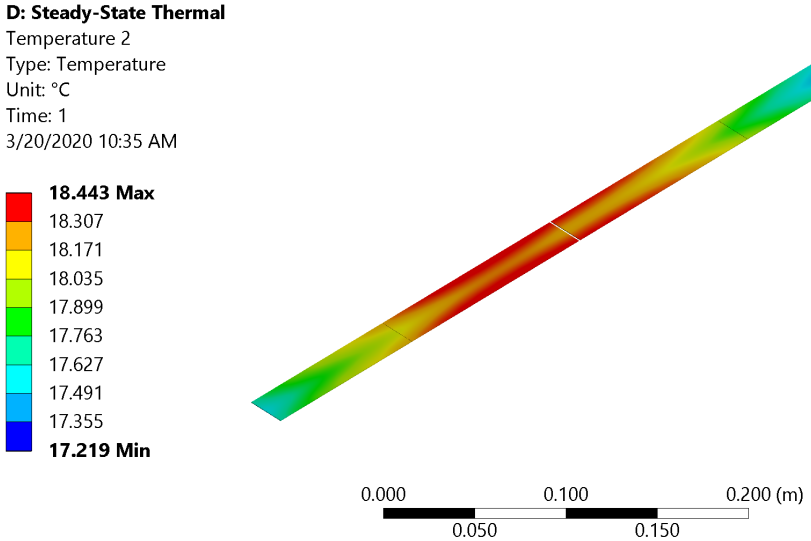
3 W x 56 ladders = 168 W

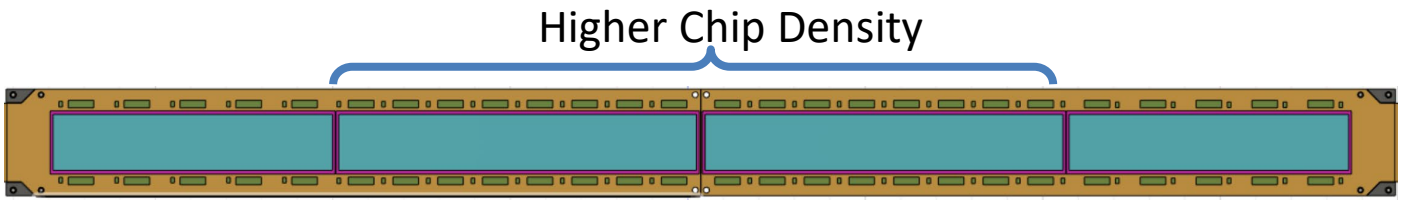
Thermal – Temperatures

Stave ΔT – 3.8 ° C (6.8 ° F)



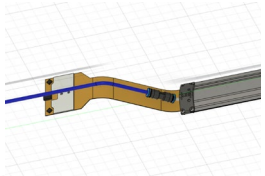
Sensors ΔT – 1.2 ° C (2.2 ° F)



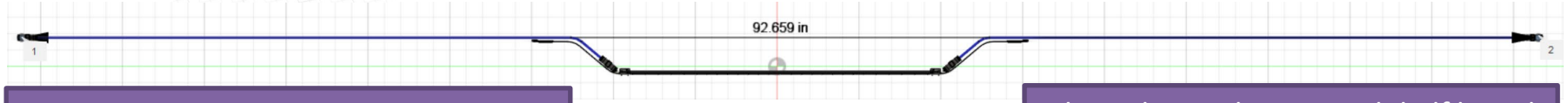


INTT Cooling

Barrel Extension



We will need 3.4 psi to obtain a flow of 150ccm per ladder through the barrel.

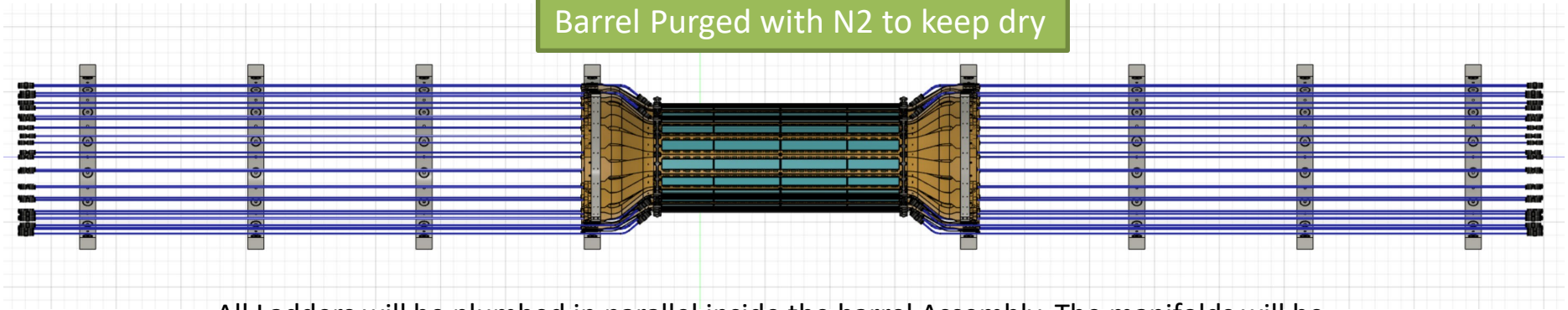


Temp monitored by 4 TC on each ladder

Half barrel with 28 ladders

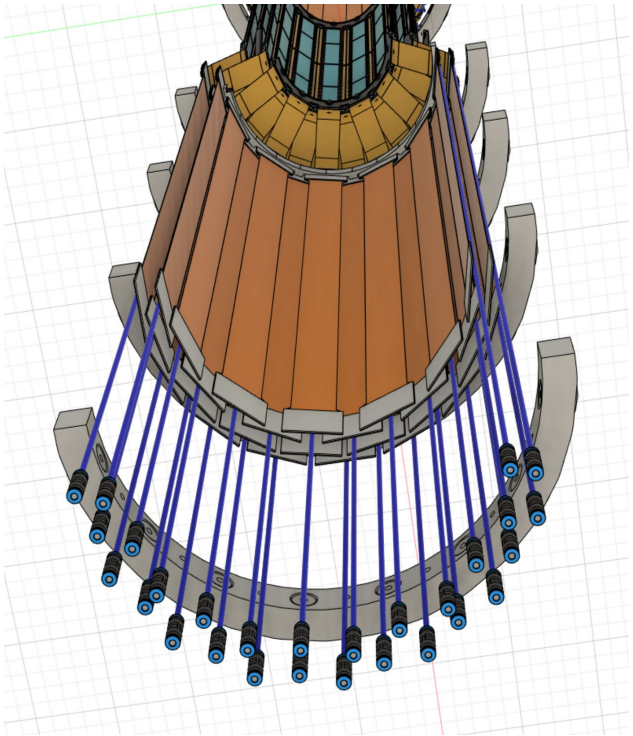
4 humidity probes on each half barrel

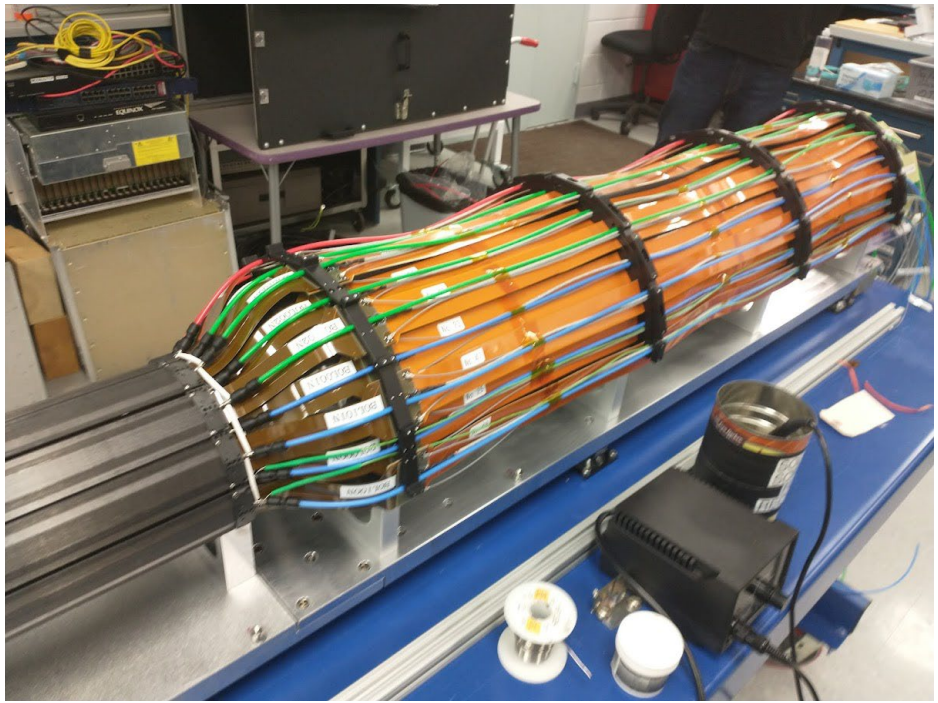
Barrel Purged with N2 to keep dry



All Ladders will be plumbed in parallel inside the barrel Assembly. The manifolds will be external to detector to allow for modifications post installation.

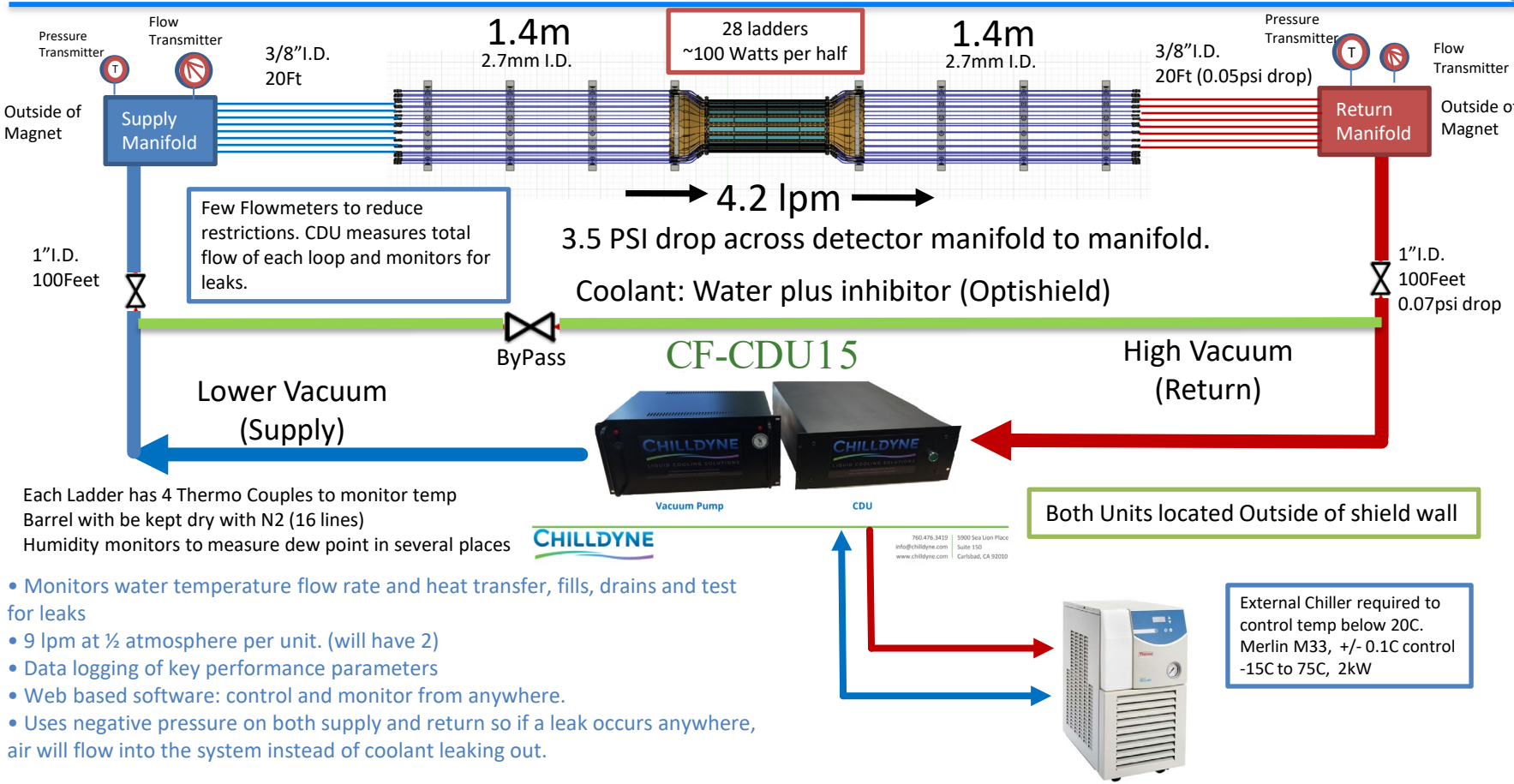
Service Barrel





Service Barrel

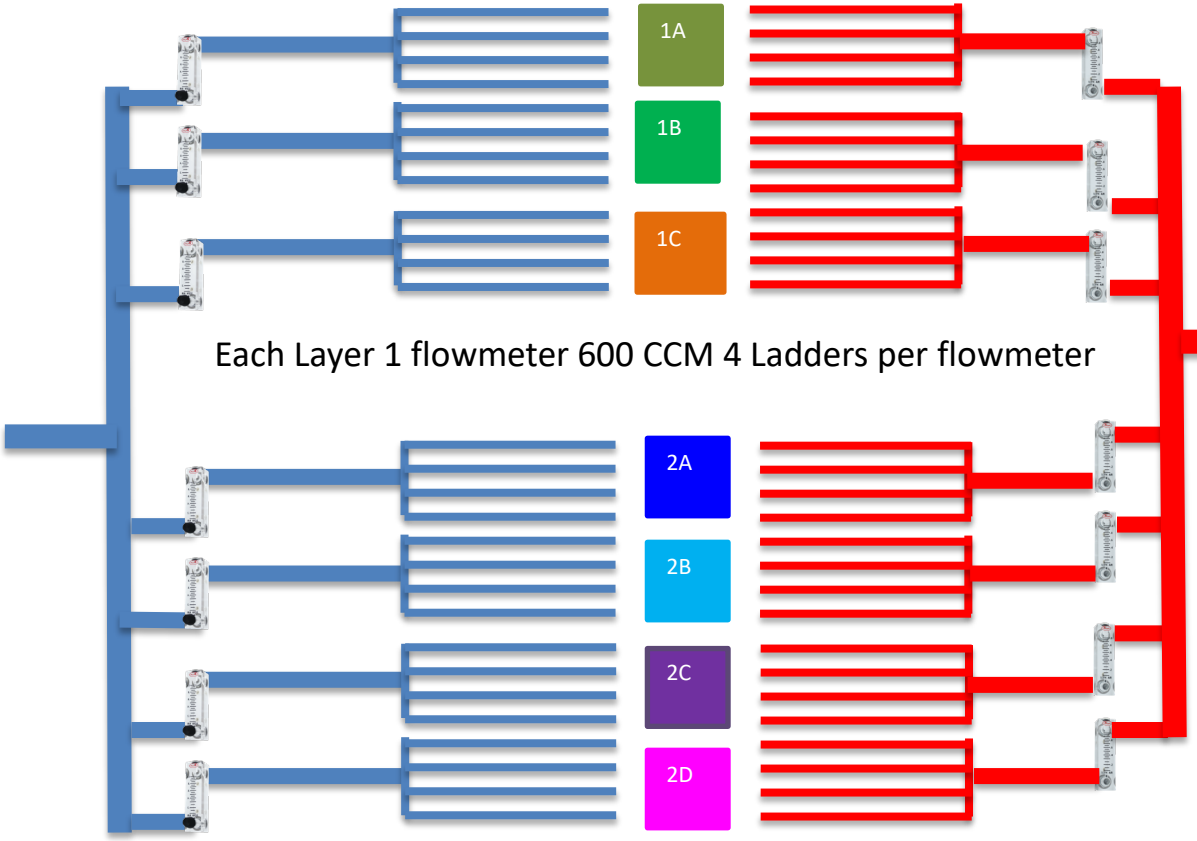
Sub-Atmospheric Cooling System



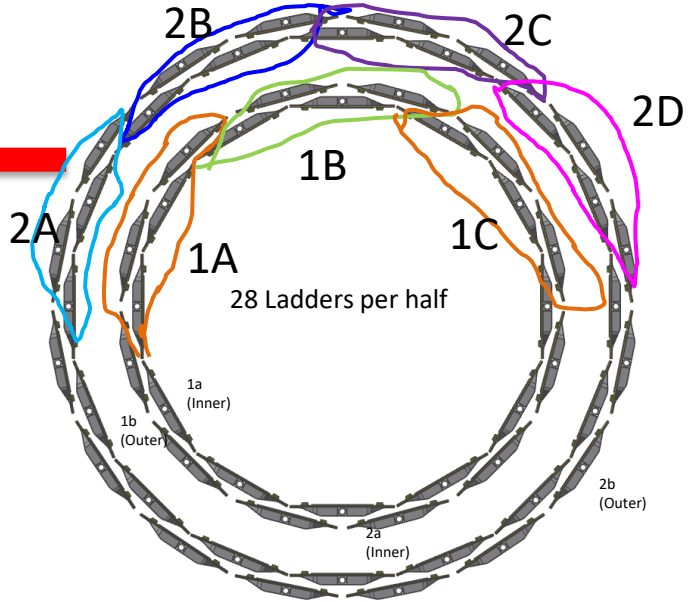
- Monitors water temperature flow rate and heat transfer, fills, drains and test for leaks
- 9 lpm at ½ atmosphere per unit. (will have 2)
- Data logging of key performance parameters
- Web based software: control and monitor from anywhere.
- Uses negative pressure on both supply and return so if a leak occurs anywhere, air will flow into the system instead of coolant leaking out.

Half Barrel Flow Segmentation

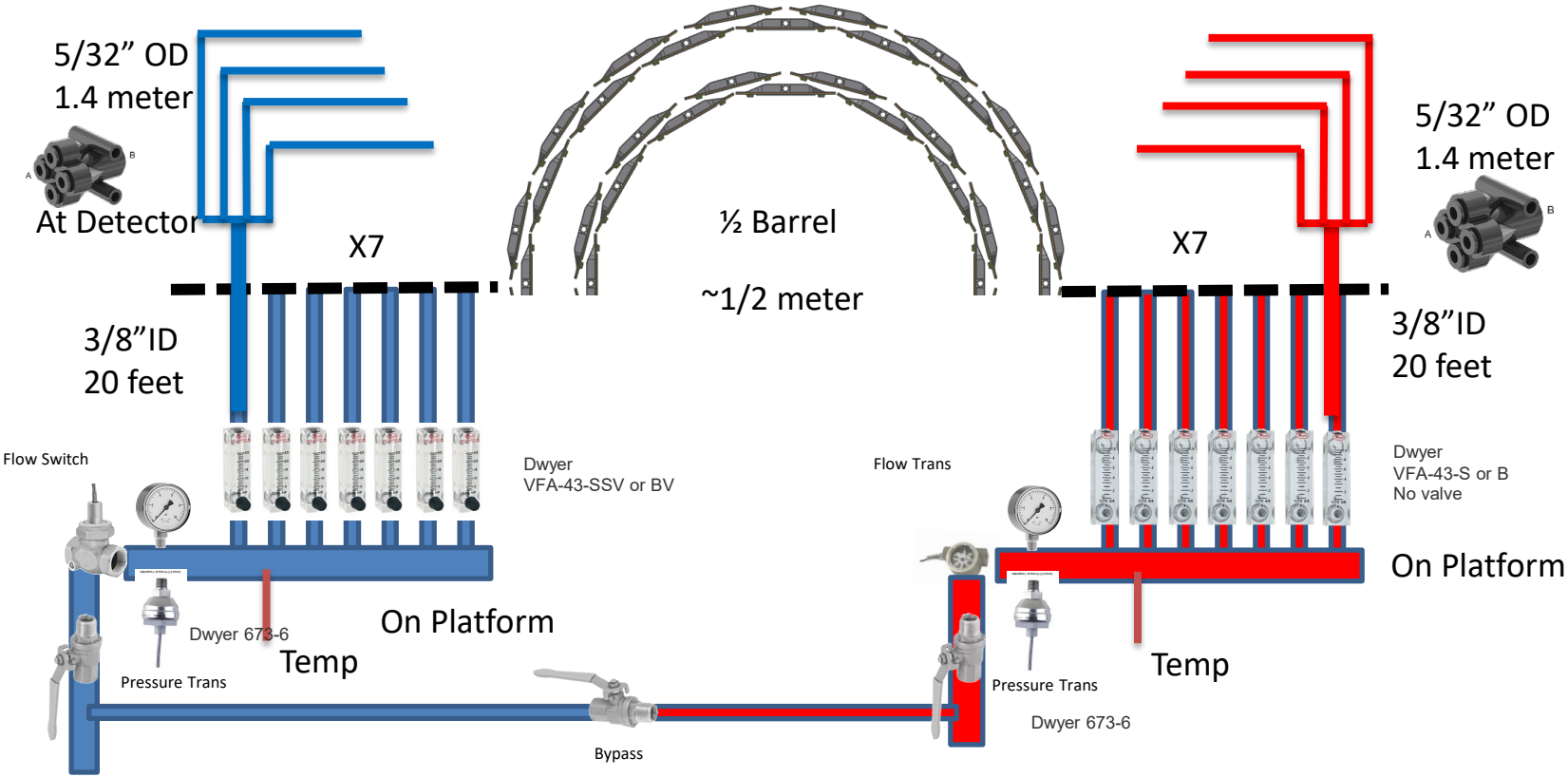
Manifolds (in box on previous s



One ½ Barrel
4.2 lpm total Flow
3.5psi drop



Each ladders flow 150CCM

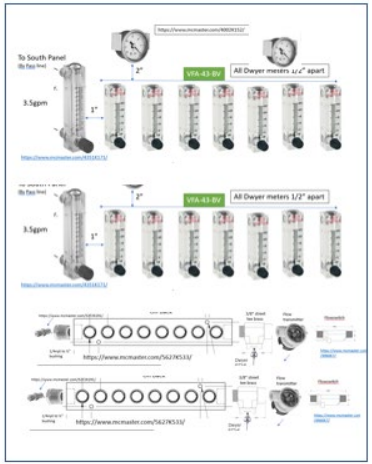

5/32” OD
1.4 meter
At Detector
X7
½ Barrel
~1/2 meter
X7
5/32” OD
1.4 meter
3/8”ID
20 feet
3/8”ID
20 feet
Flow Switch
Dwyer
VFA-43-SSV or BV
Flow Trans
Dwyer
VFA-43-S or B
No valve
On Platform
Dwyer 673-6
Temp
Pressure Trans
On Platform
Temp
Pressure Trans
Dwyer 673-6
Bypass

Status– Have 2

- CF-CDU15 Purchased 2
- System run for several months
- Flow test preformed
- Load testing preformed
- Pressure drops measured
- Compatibility Testing ongoing

Status– Backup unit running in lab

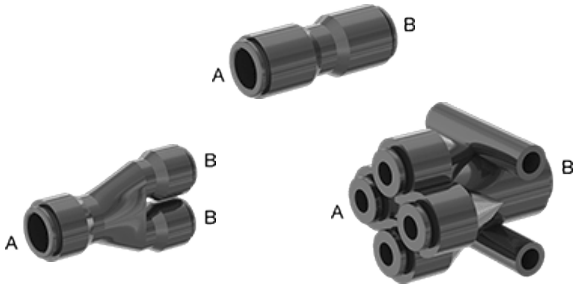
- Built a prototype of the manifolding for use in the Lab
- System is currently running 6 layers. (below)
- In IR, one Unit will cool 4 layers
- Final panels being drawn, parts ordered



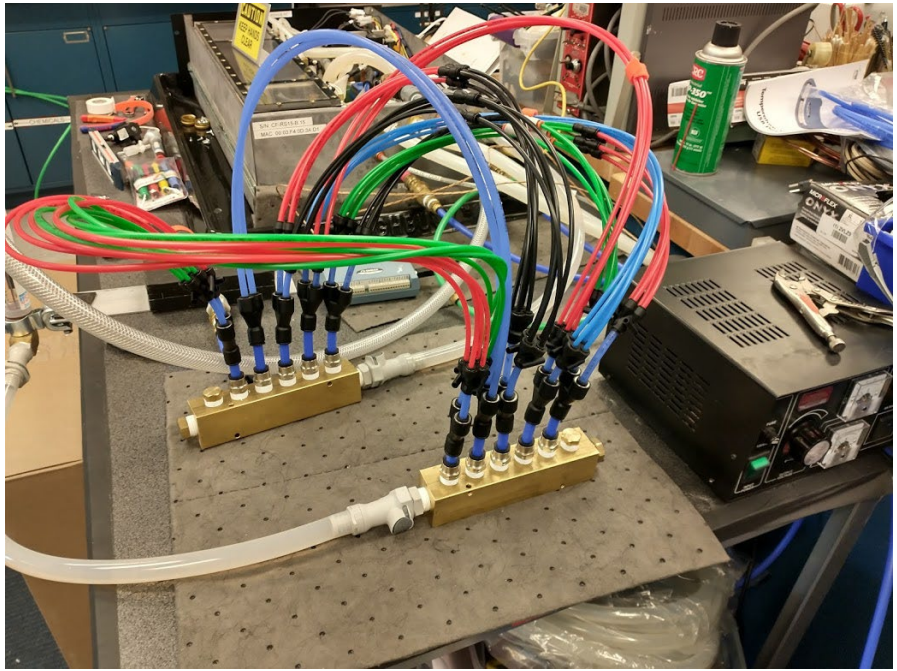
Testing—Connectors and hose

Testing of connectors. Ran for 40 days.

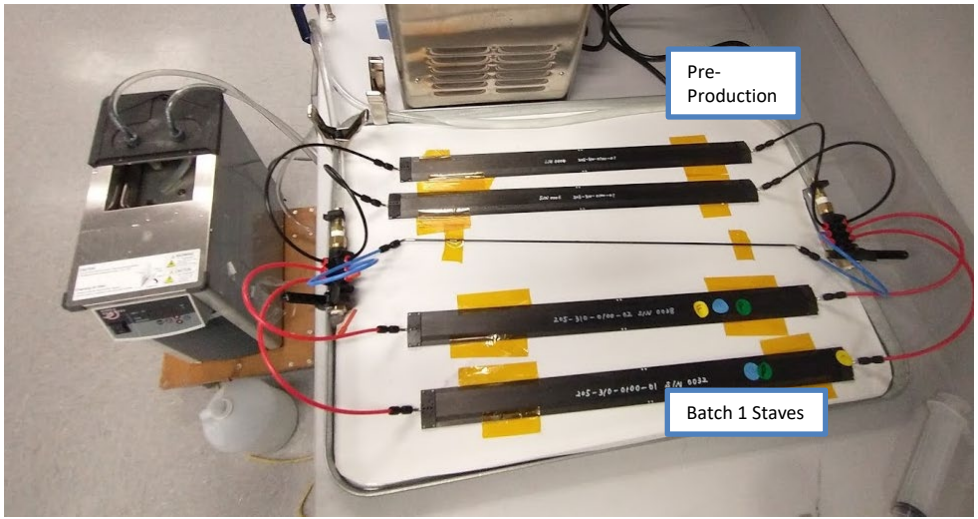
28 channel mockup built and tested.



Various fittings were tested below atmosphere.



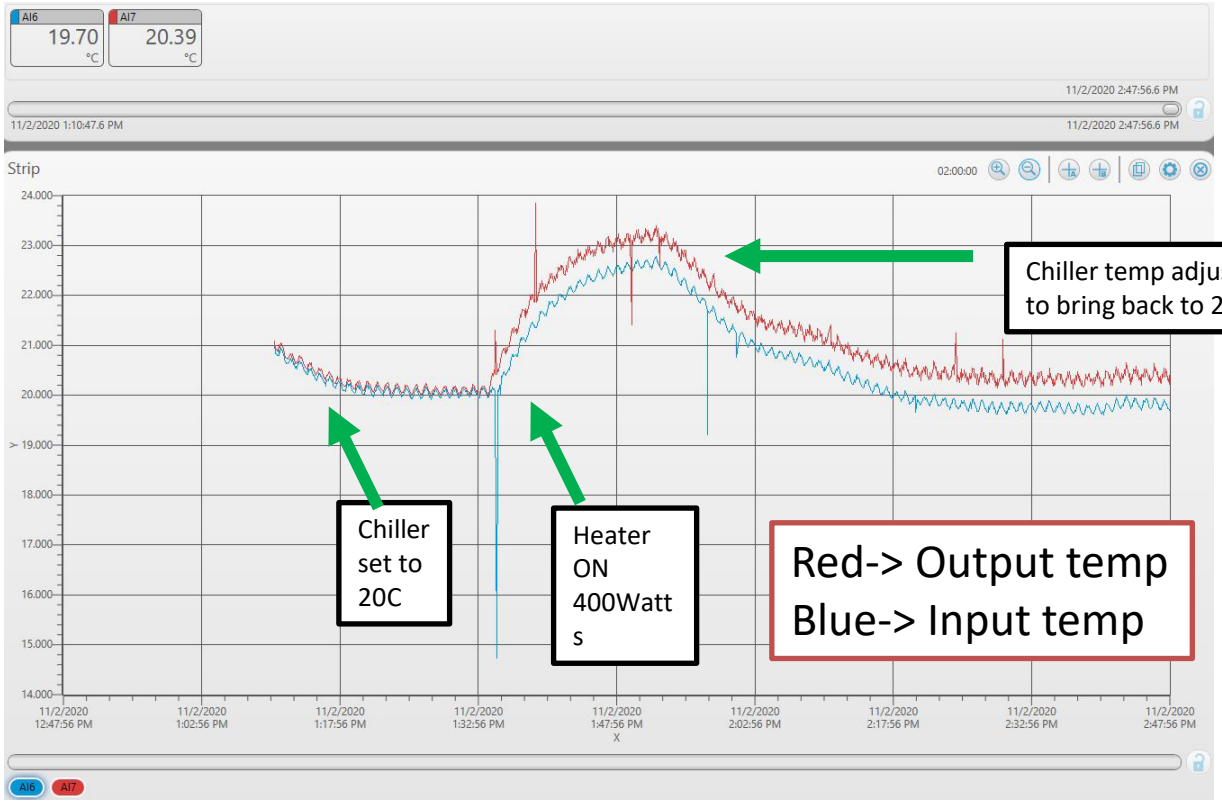
Long Term Flow Testing

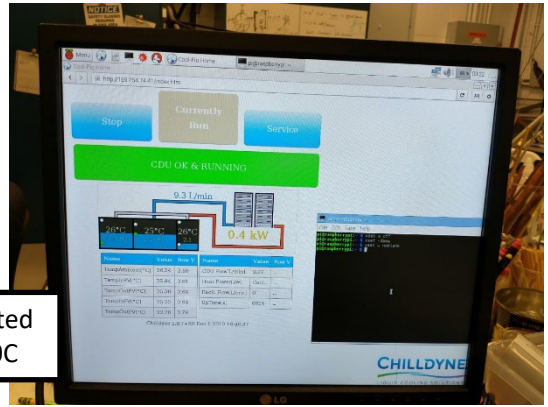


We are preformed a long term flow testing on the staves. We placed 2 pre-production and 2 Batch 1 staves under circulation. The cooling fluid is water plus a corrosion inhibitor.

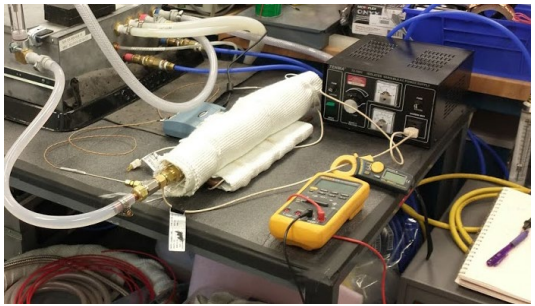
They were run for over a year and have tested fine.

Load Tested the CDU



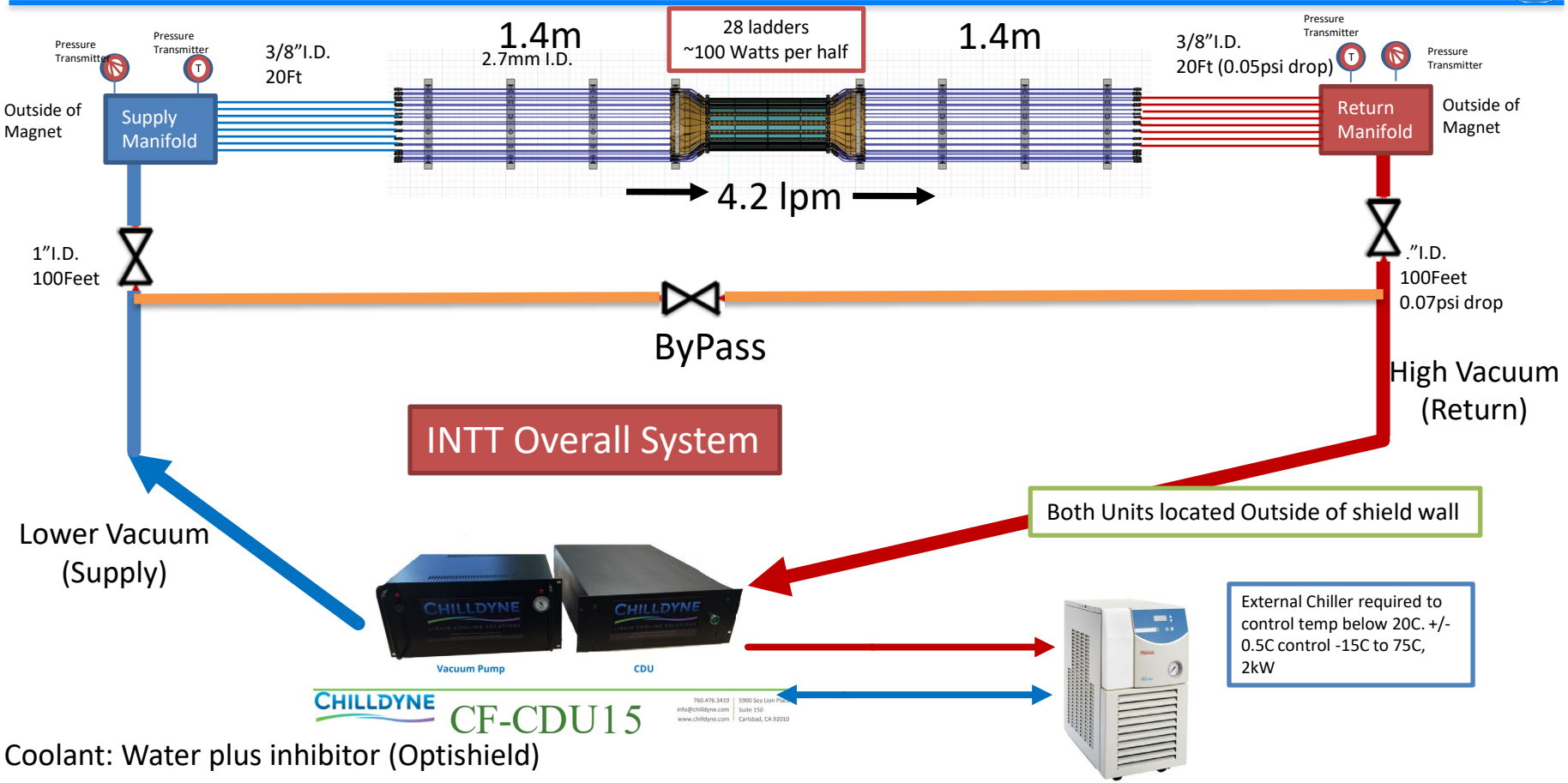


400watt heater



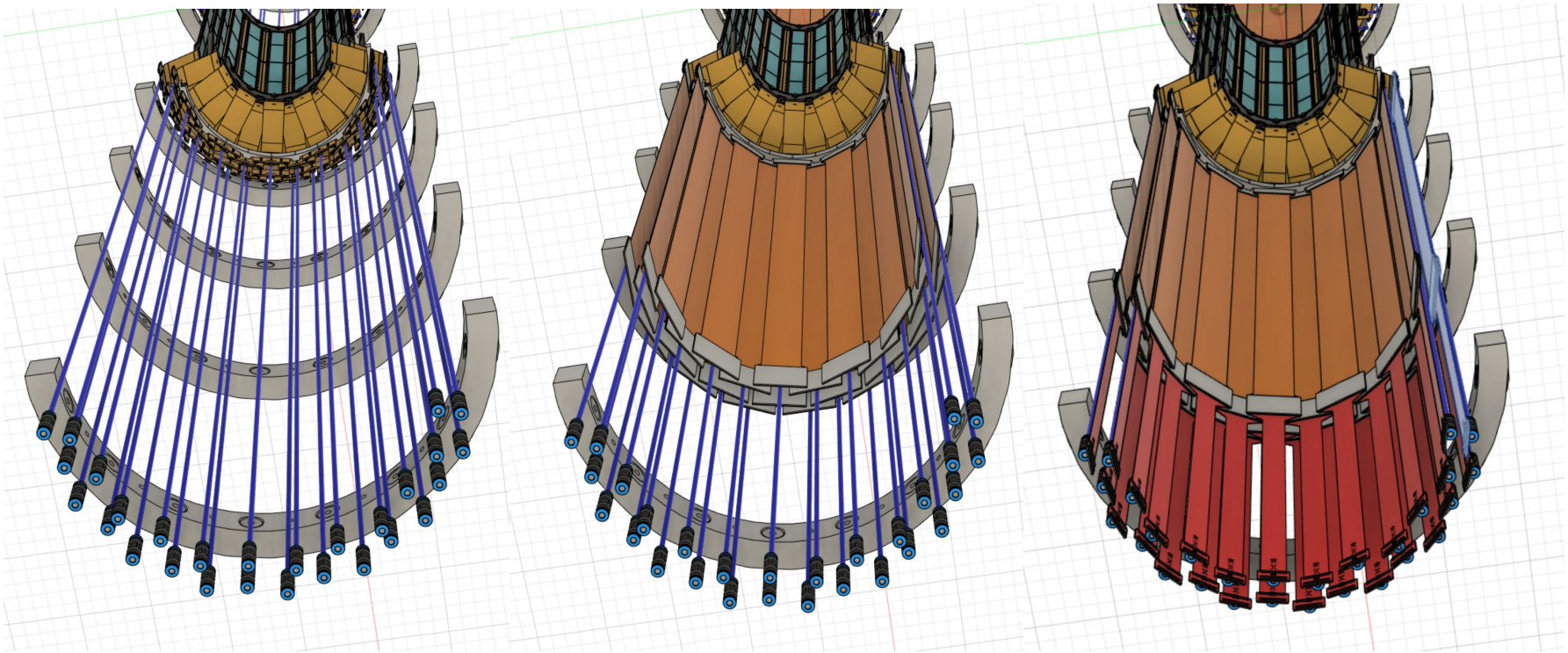
END

Sub-Atmospheric Cooling System Overview ½ Barrel Shown

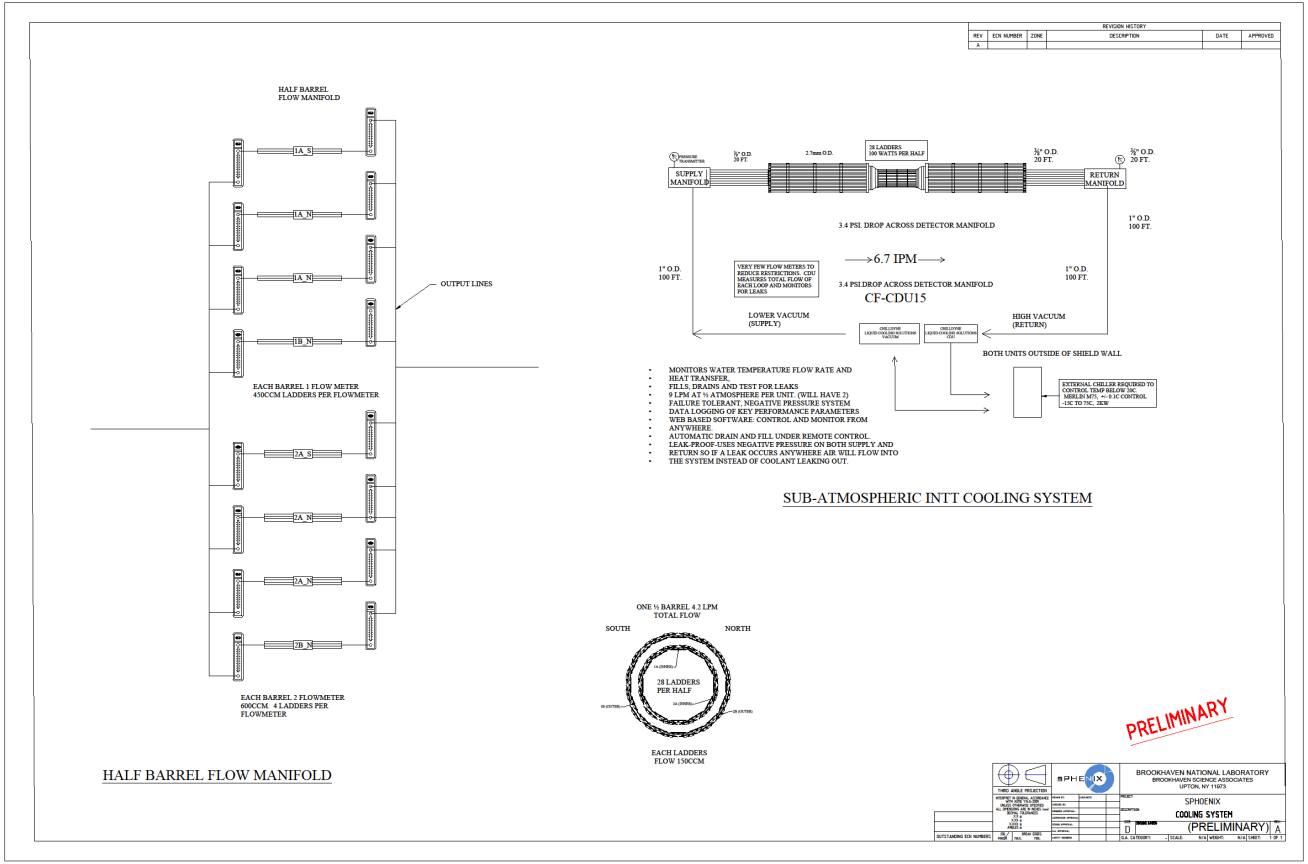


Coolant: Water plus inhibitor (Optishield)

Service



Current Drawing

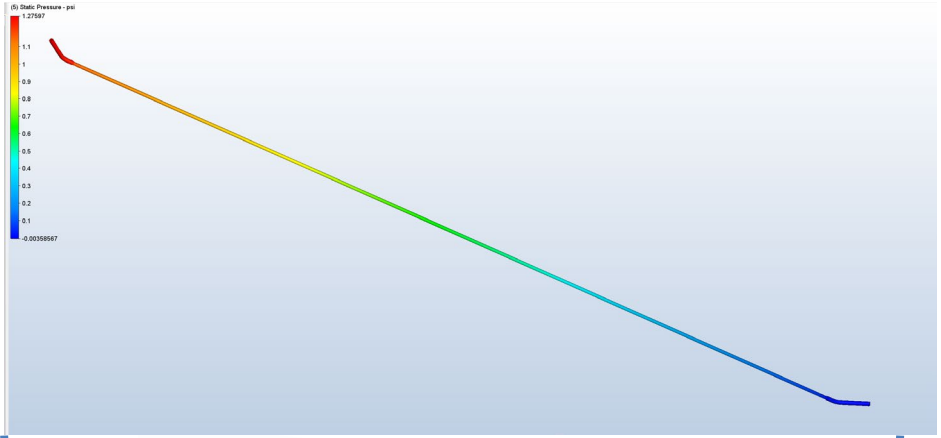


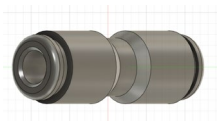
Distance Test

- Built a mockup of a ½ barrel of the INTT (top with 2.7mm ID tubing) with 200 foot of 1” I.D. tubing to test circulator with large tube runs. Ran for 30 days without problem. Flow was 9 lpm.

Pressures and flow analysis

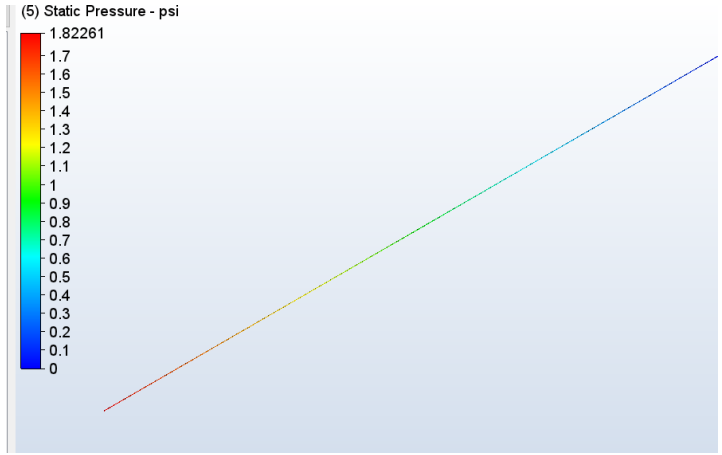
- 1.3psi to obtain a flow of 120ccm through the ladder.
- Additional 1.8psi for the 2.7m I.D. 4 mmOD Poly Tubing
- Measured pressure drop is 3.4psi at 150CCM





Coupling with 3mm bore

2.7mm ID 4mm OD
2.8m Polyethylene
Tubing



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