35 Ton Membrane Cryostat

Temperature Profiler Proposal

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Phase I Goals

1. Construct a membrane style cryostat – done
2. Install a cryo system
3. Purify the cryostat volume without evacuation
4. Cool the pure Argon gas
5. Fill the cryostat with liquid Argon (Lar)
6. Purify and cool the LAr

I will only discuss Item #4 here

Cool the Pure Argon Gas

Requirements:

The gas needs to be cooled quickly while not exceeding the maximum allowed cooling rates for cryostat walls and detector elements

Monitoring:

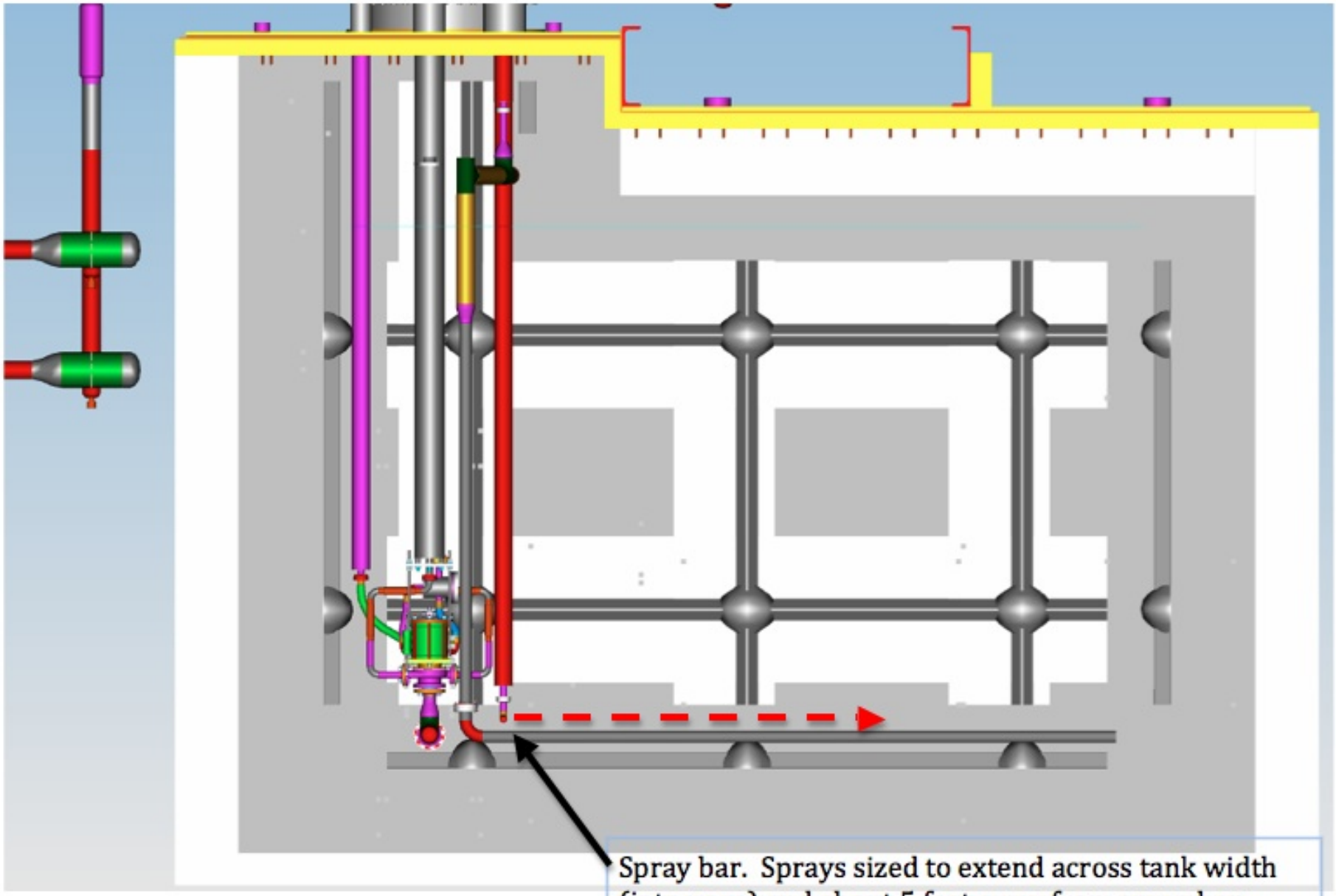
We propose here a system to monitor continuously the vetrical temperature profile in two locations. The rate of rise can be examined for each sensor point.

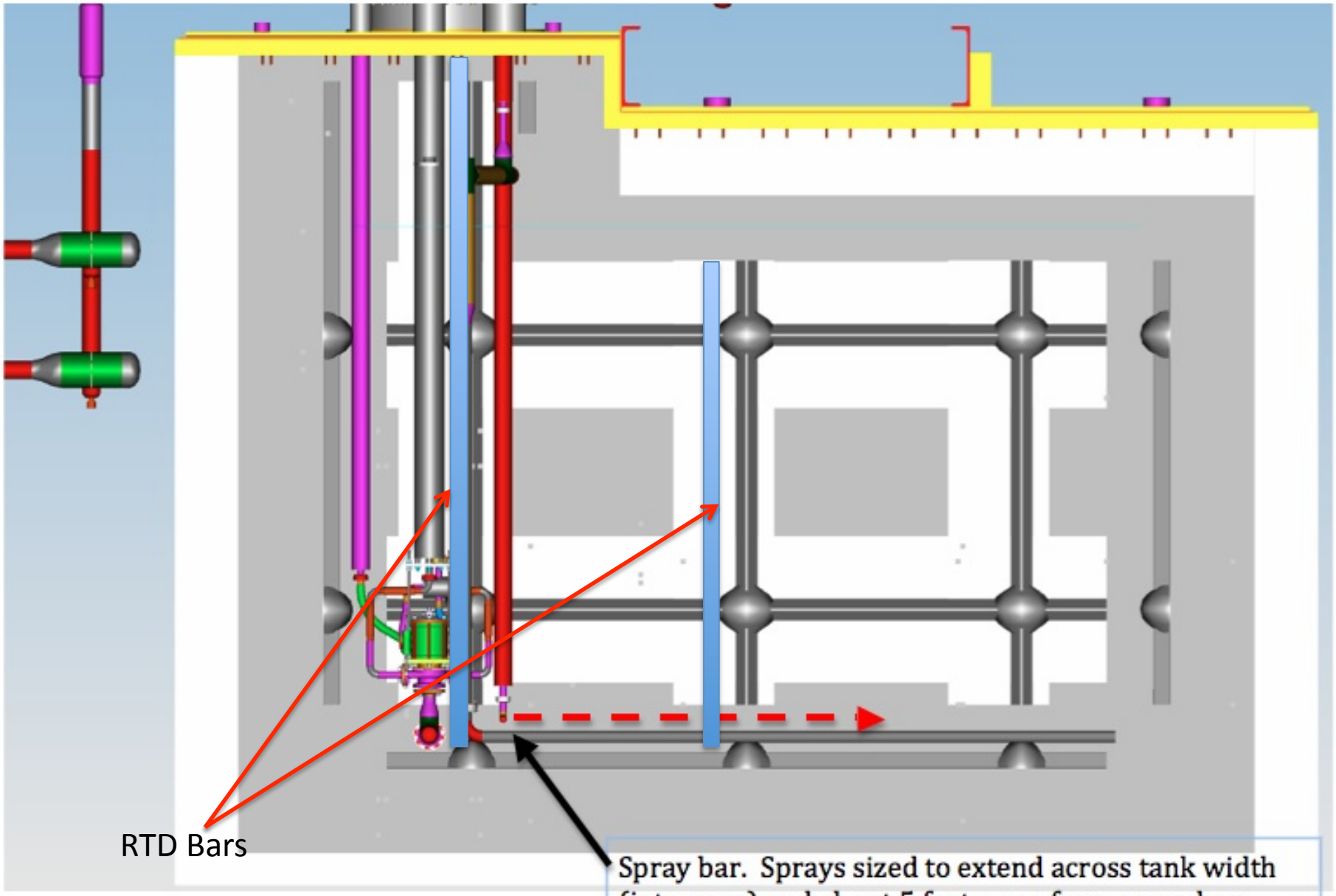
Sensors will be located every six inches from top to bottom.

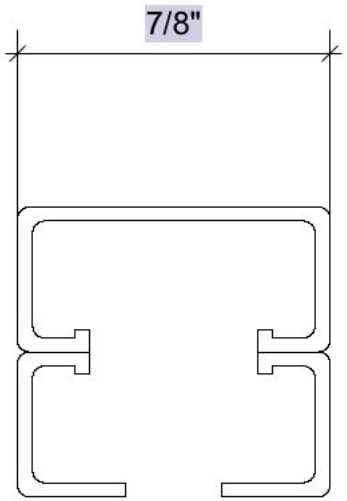
Phase I Configuration

In Phase I the cryostsat is empty,
With no Chambers installed.

The proposed system can readily be adapted and used during Phase II, when detectors will be in the cryostat.


Spray bar. Sprays sized to extend across tank width
(into page) and about 5 feet away from spray bar.


RTD Bars
Spray bar. Sprays sized to extend across tank width (into page) and about 5 feet away from spray bar.

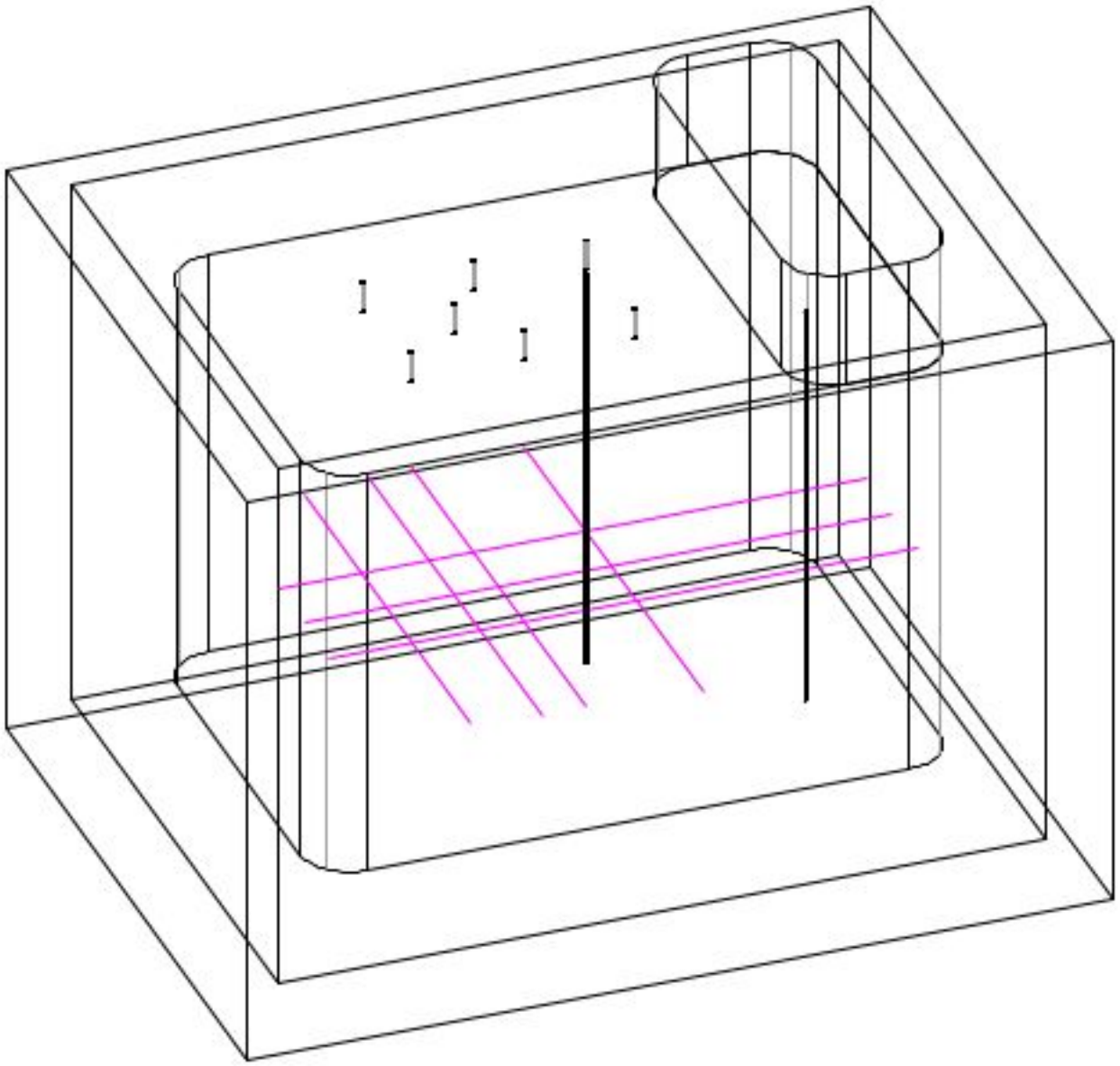

7/8"

Schematic Layout

The two vertical black lines are channels holding RTD sensors every six inches.

Each channel is connected with a flat Teflon cable to a feedthrough on plate B.

An external flat cable takes the connection to an existing Keithly 2700 Scanner/ DVM system (used previously for the sniffer setup)



Temperature profiler during Phase II

The RTD channels hang from the ceiling, a Plate B feature, or an arm attached to the Phase II TPC system.

Thus the cooling of detector elements can be studied in great detail.

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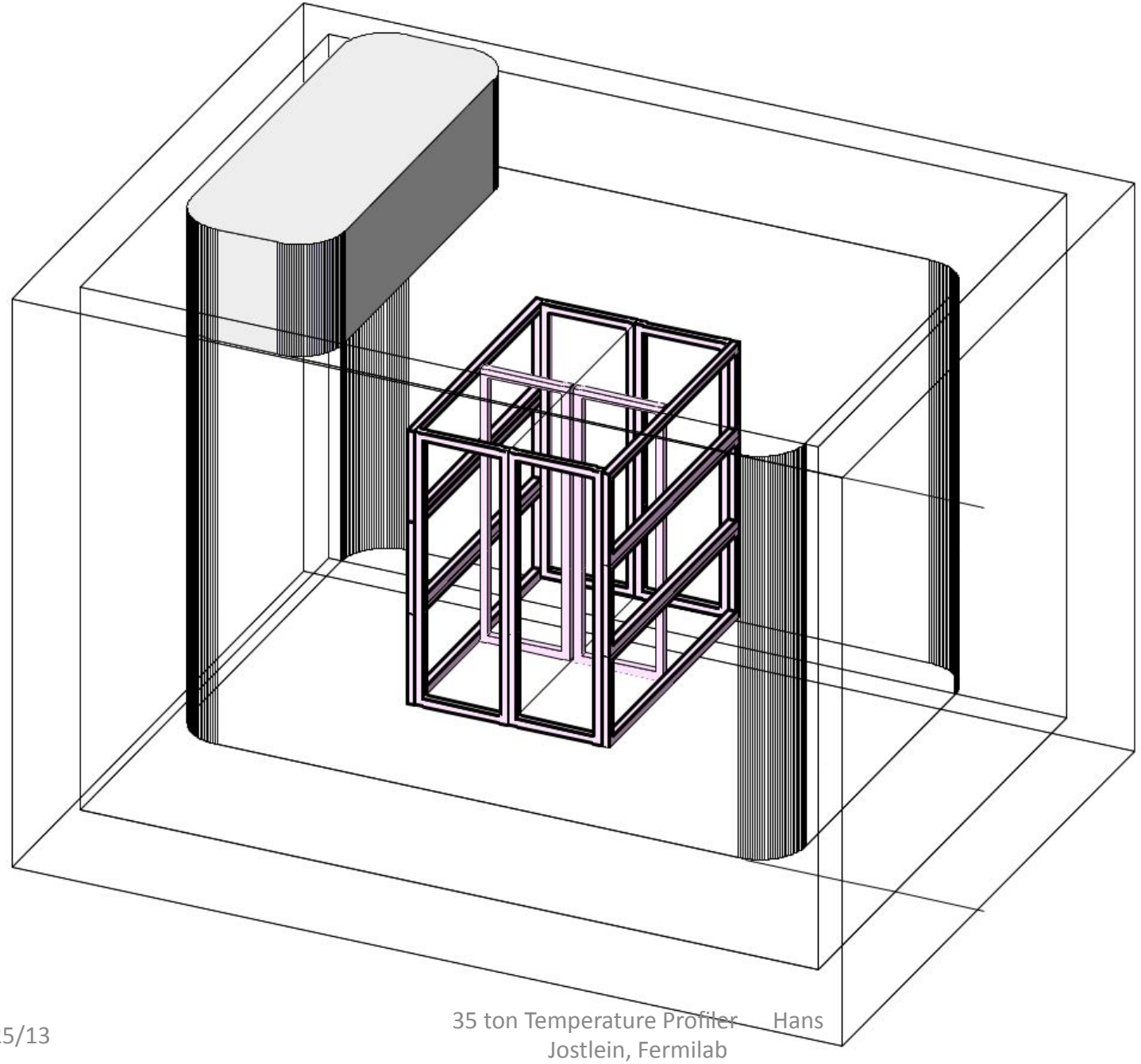

RTD Design

The RTD's are class B3 Platinum coils inside 1/16" diameter x ½" long ceramic shells. They will connect with a 3-wire readout system and would be calibrated to better than 1 K and can be cross-calibrated in situ even better.

They will be mounted inside a SS Unistrut channel.

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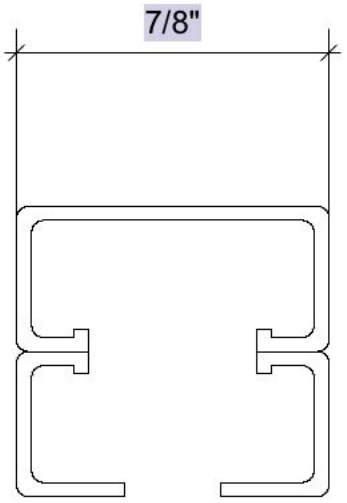
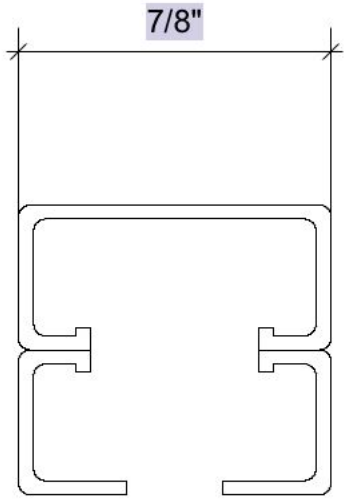


RTD Sensors

The sensor will be spring-pressed against the inside wall of the SS channel, to measure the cool-down of such items as TPC frames and cryostat walls.

Some of the sensors may be installed behind openings in the channel wall for direct exposure to Argon gas or liquid, to be decided based on group advice



RTD Channels

The SS channels are simply hung by their top end.

This makes it easy to adapt to a variety of locations.

The channels are installed during cryostat access.

Their Teflon connecting flat cable is threaded though a 1 ½" nozzle ending in a 2 ¾" CF flange after the channels have been mounted.

An existing 2x50 pin, D-connector, 6"CF, feed-through is all ceramic and welded, and mounts on the 2/ ¾" flange via an adapter section.

Signal Feedthrough

An existing 2x50 pin, D-connector, 6”CF, feed-through is all ceramic and welded, and mounts on the 2/ ¾” flange via an adapter section.

Data Acquisistion

We plan to use the same Keithley 2700 DVM scanner, including two Keithley 7702 scanner cards, that was used for the LAPD sniffer system.

If it is to be used again for that purpose , that can be done, since the two measurement periods do not overlap in time.

Keithley 2700 scanner / DVM

The system is programmed, as before, by an Excel add-in called Excelinx, which is provided by Keithley.

The dwell time per scan step is easily programmed.

Data are stored in a standard Excel sheet for further processing.

We do not plan any direct connection to any other system at this time.

Data Appearance

Data appears as an Excel sheet, with one column for each sensor.

Thus the data can be easily plotted, manipulated, e.g. for calibration, subtraction, or time differentiation.

First Guess at Cost

Some items we know of, or can guess:

Item	Number	Unit	Cost each	Cost total
RTD sensors	40	each	$16	$640
6" CF flange	1	each	$120	$120
2 3/4" CF flange	1	each	$50	$50
Pipe reducer 1 1/2 to 4"	1	each	$150	$150
Welding	2	hr	$70	$140
Teflon flat cable	50	ft	$6	$300
50-pin submin D, ICD connectors	6	each	$35	$210
PVC flat cable	40	ft	$1	$40
IDC 50-pin connectors	4	each	$10	$40
Unistrut P7000 SS	7	10' lengths	$30	$210
Lab 8 G10 cutting	4	hr	$70	$280
My labor	160	hrs	$50	$8,000
(I'll do most of the design and mechanical work, hence no engineering or drafting costs)				
"Free" effort by my scientific colleagues				
Total Cost (no contingency)				**$10,180**