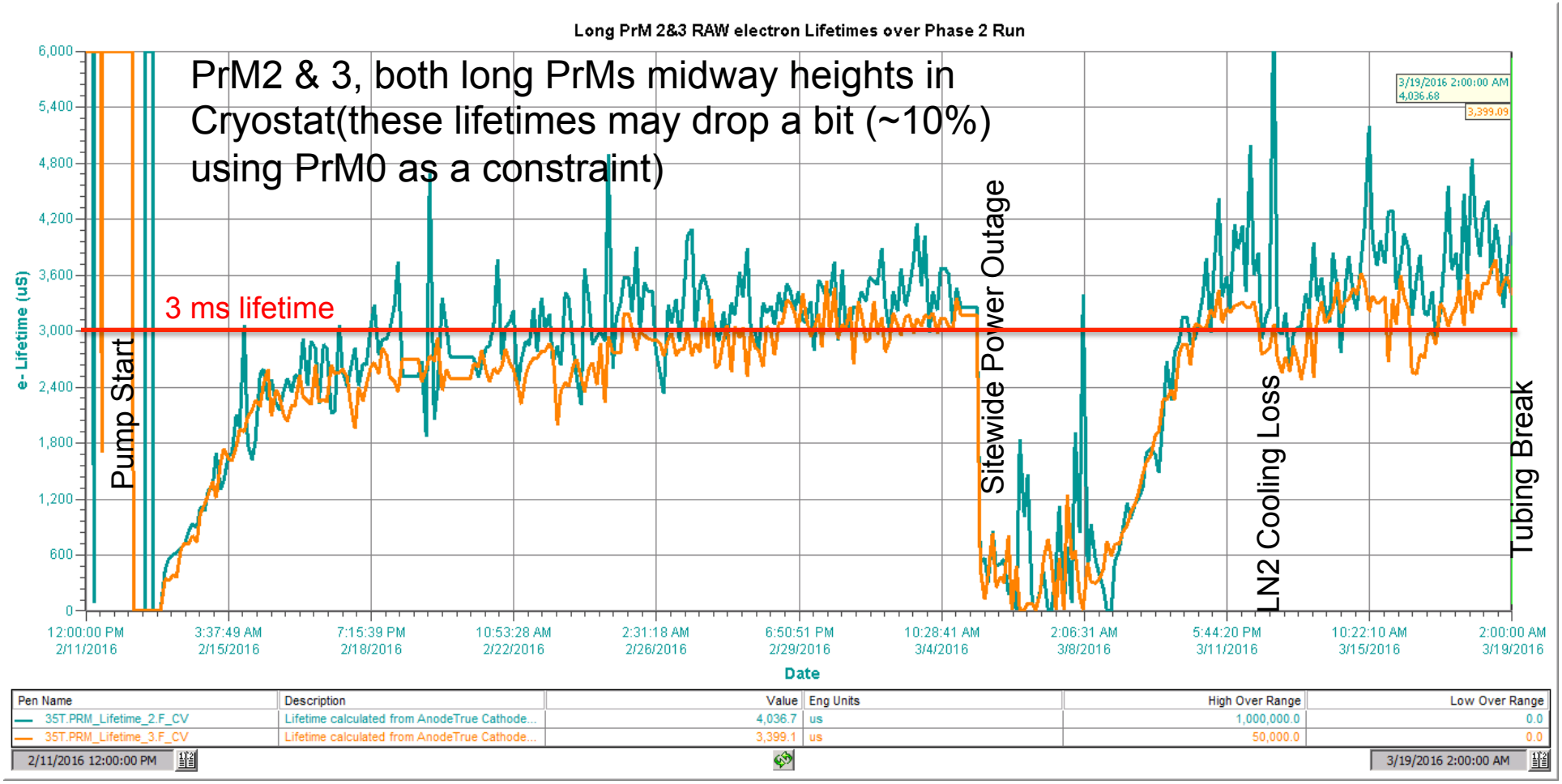
35 Ton Ullage

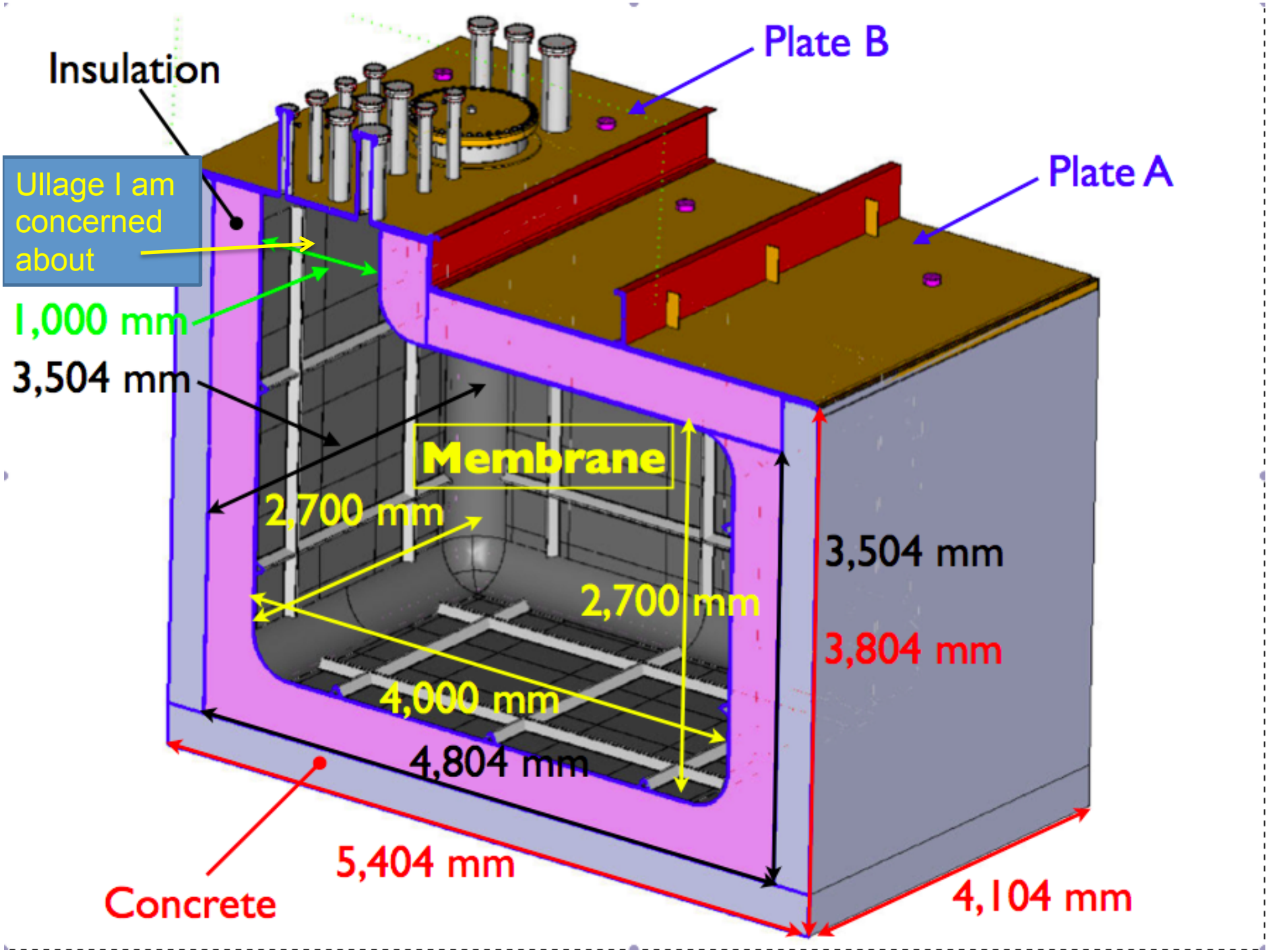
A. Hahn

Motivation for this meeting

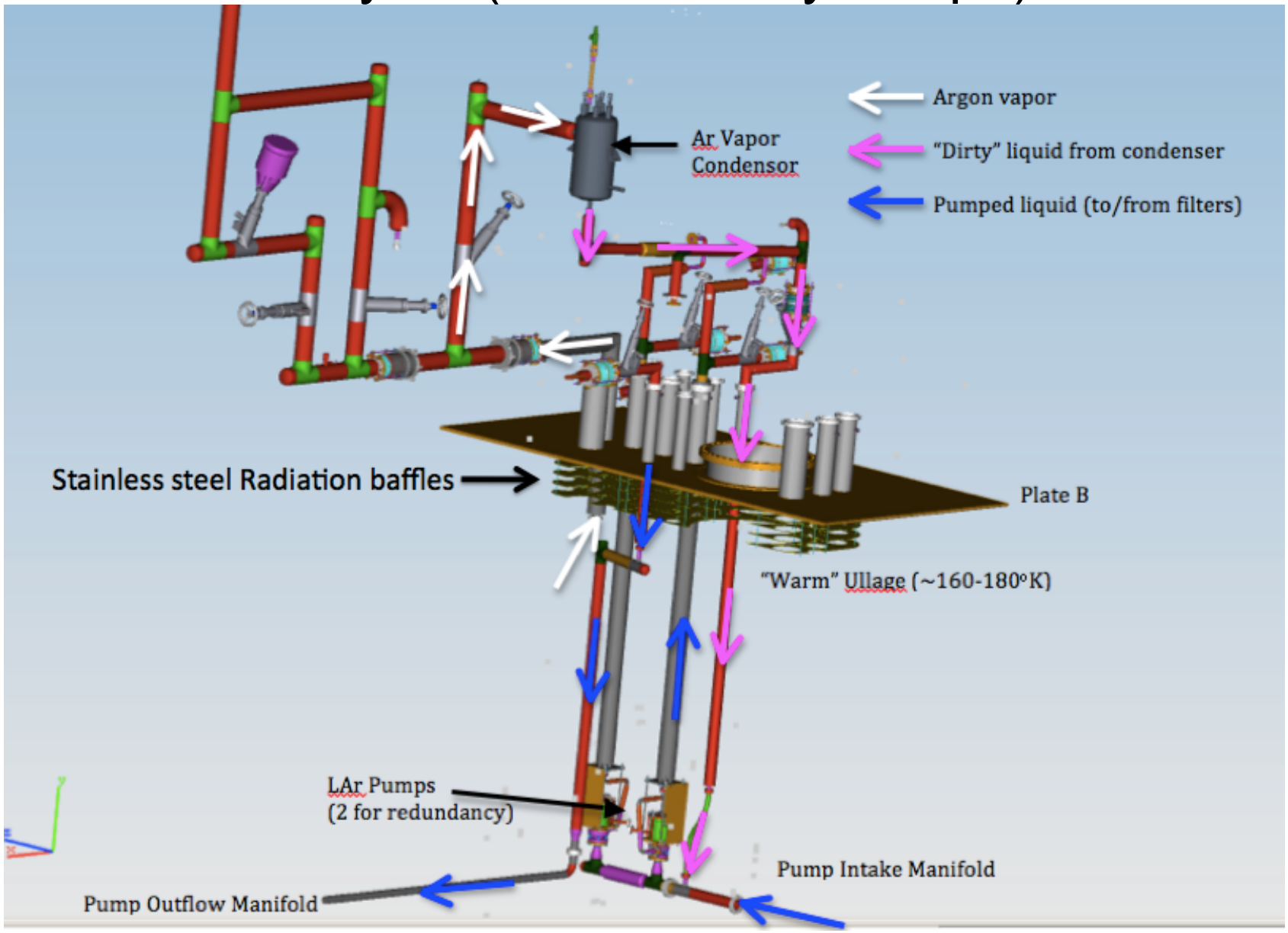
- Email from Jim Stewart about possibility of a cold roof.
  - Thought I should try to understand what is going on in the ullage and how it might pertain to the measured electron lifetimes from the last 2 runs.
- Are we limited by the current 35 T ullage design?
  - Basically under Plate “B” where we have our access and the Cryo Utilities
- Are there things we can do to potentially improve the design?
  - Or are there improvements to the instrumentation that would allow us to understand what is going on to test the calculations?
    - I see the 35T as a test bed that we should try and use to learn if we truly understand what is going on in these LAr TPC Cryostats
- Two questions:
  - Is Vapor Intake Vent “optimally” positioned to remove outgassing impurities?
  - Is Phase Separator Gas Outlet “optimally” positioned to not stir up the ullage?

e^- Lifetime over Phase 2 Run




Insulation
Plate B
Plate A
Ullage I am concerned about
1,000 mm
3,504 mm
Membrane
2,700 mm
2,700 mm
3,504 mm
3,804 mm
4,000 mm
4,804 mm
5,404 mm
Concrete
4,104 mm

Layout (annotated by T.Tope)

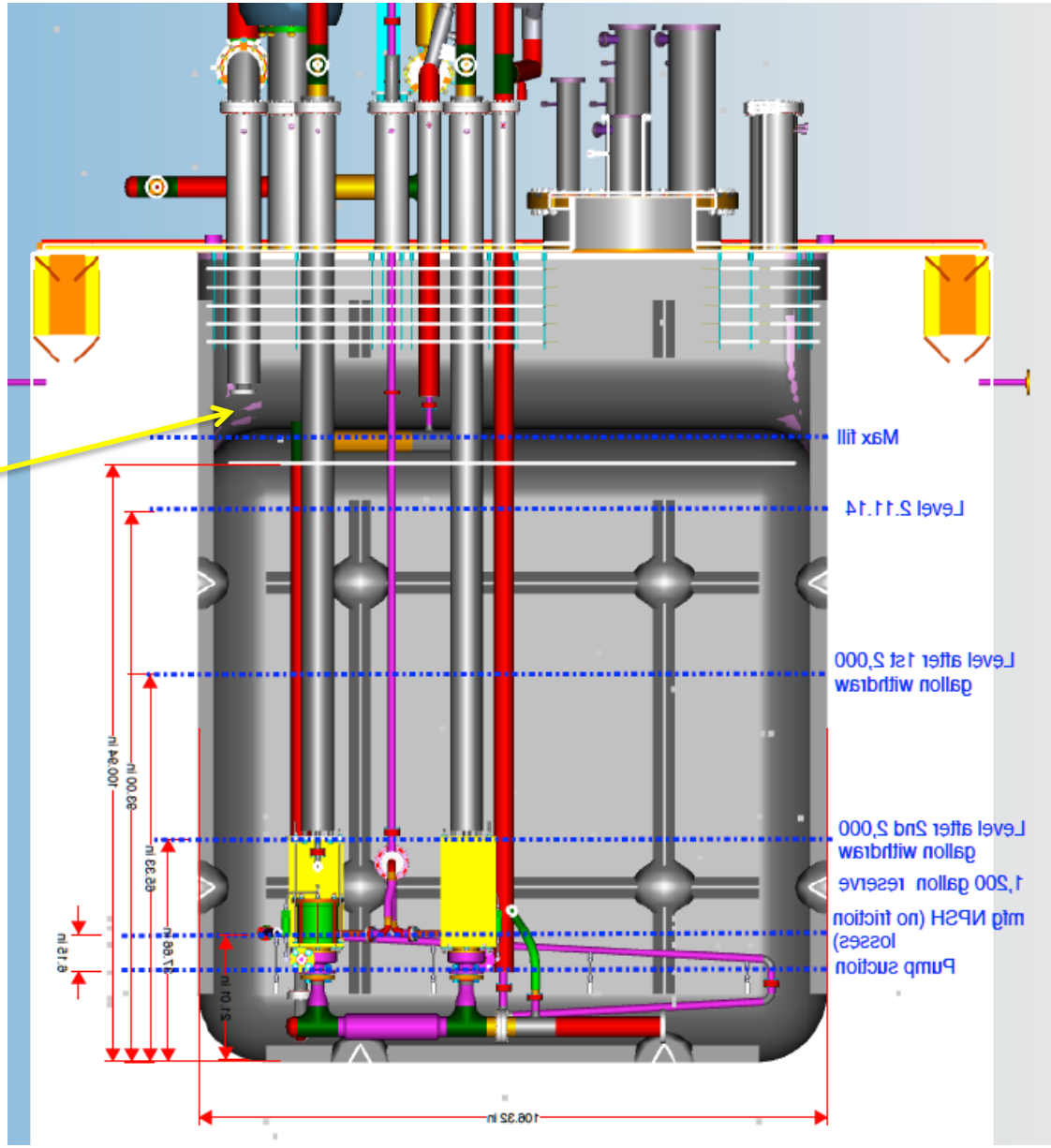


Another View

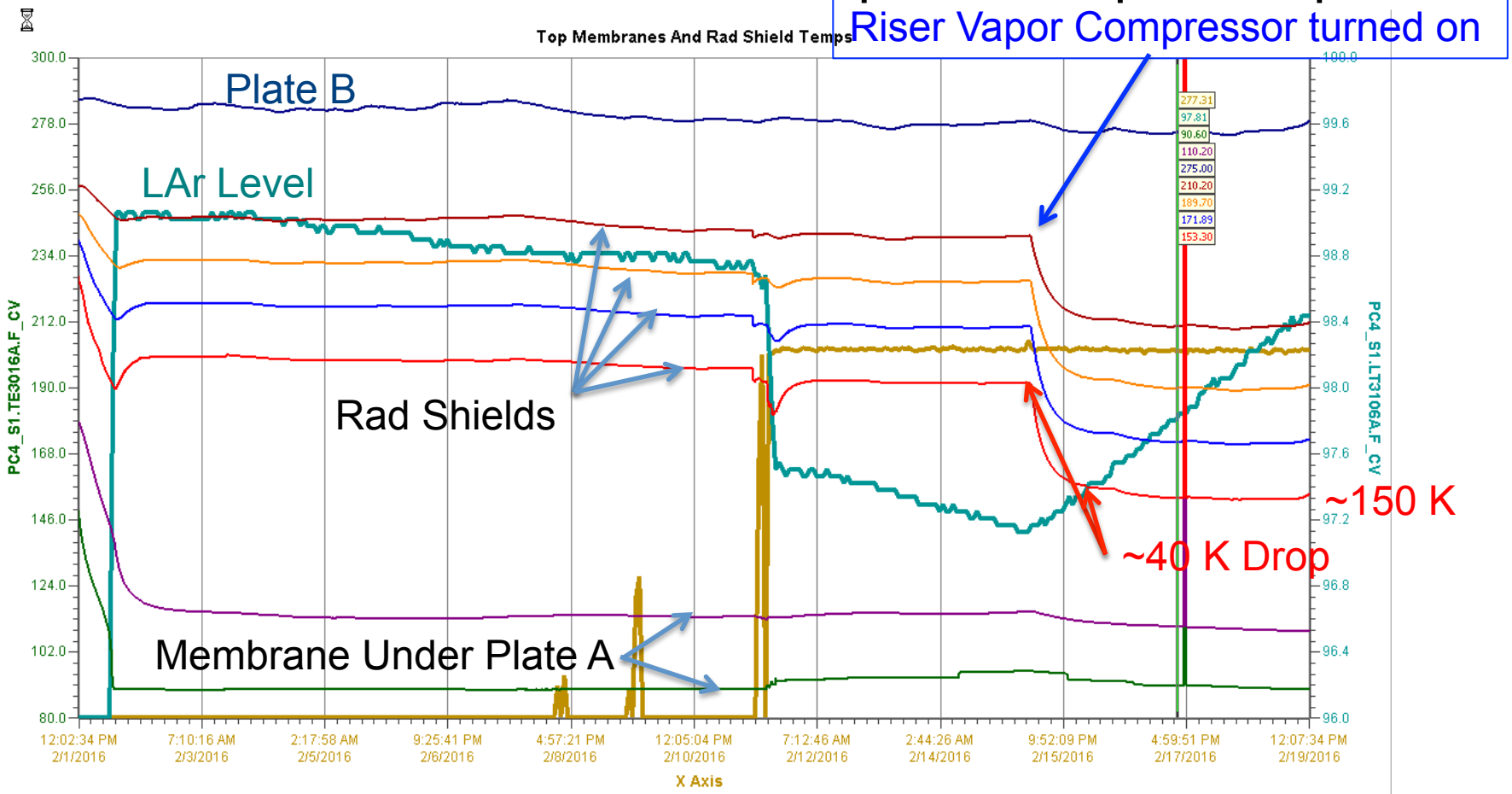
Flipped from original to give same view as previous slide

Vapor Compressor pumps from these risers

Vapor Intake to Condenser



Membrane and Rad Shield Temps at Pump Startup

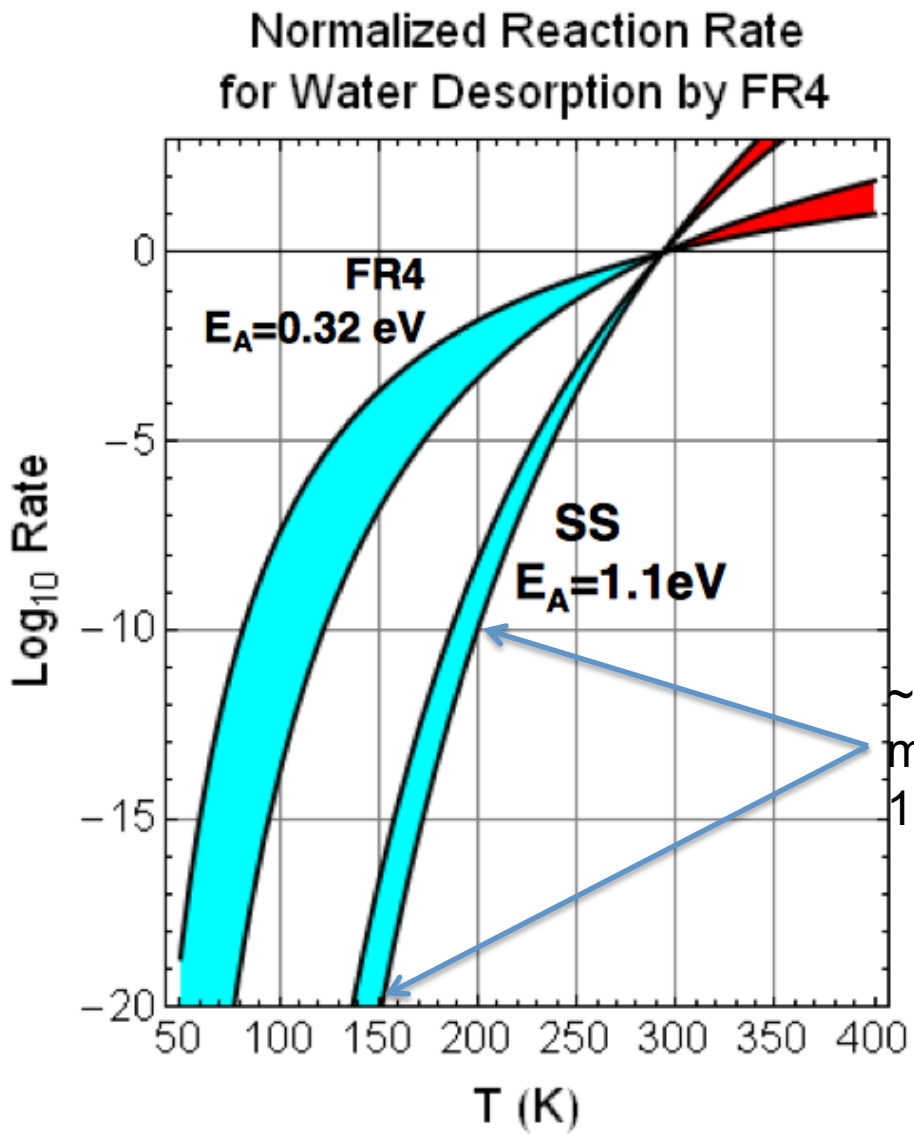


Pen Name	Description	Value	Eng Units	High Over Range	Low Over Range
35T.VFD_TRUE_Power.F_CV	Power Output of the 6000LS AC Power...	277.31	Watts	285.23	0.00
PC4_S1.LT3106A.F_CV	LBNE tank liquid level (F_CV)	97.81	%	99.06	75.65
PC4_S1.TE3016A.F_CV	LAPD tank (top - L) (F_CV)	90.6	C	1,124.1	89.0
PC4_S1.TE3017A.F_CV	LAPD tank (top - E) (F_CV)	110.2	C	1,124.1	108.6
PC4_S1.TE3022A.F_CV	Plate B underside temperature (F_CV)	275.0	C	1,124.1	274.0
PC4_S1.TE3024A.F_CV	Radiation Baffle Temperature (F_CV)	210.2	C	3,473.0	209.4
PC4_S1.TE3025A.F_CV	Radiation Baffle Temperature (F_CV)	189.7	C	3,473.0	188.9
PC4_S1.TE3026A.F_CV	Radiation Baffle Temperature (F_CV)	171.9	C	3,473.0	170.9
PC4_S1.TE3027A.F_CV	Radiation Baffle Temperature (F_CV)	153.3	C	3,473.0	152.5

2/1/2016 12:02:34 PM — 2/19/2016 12:07:34 PM

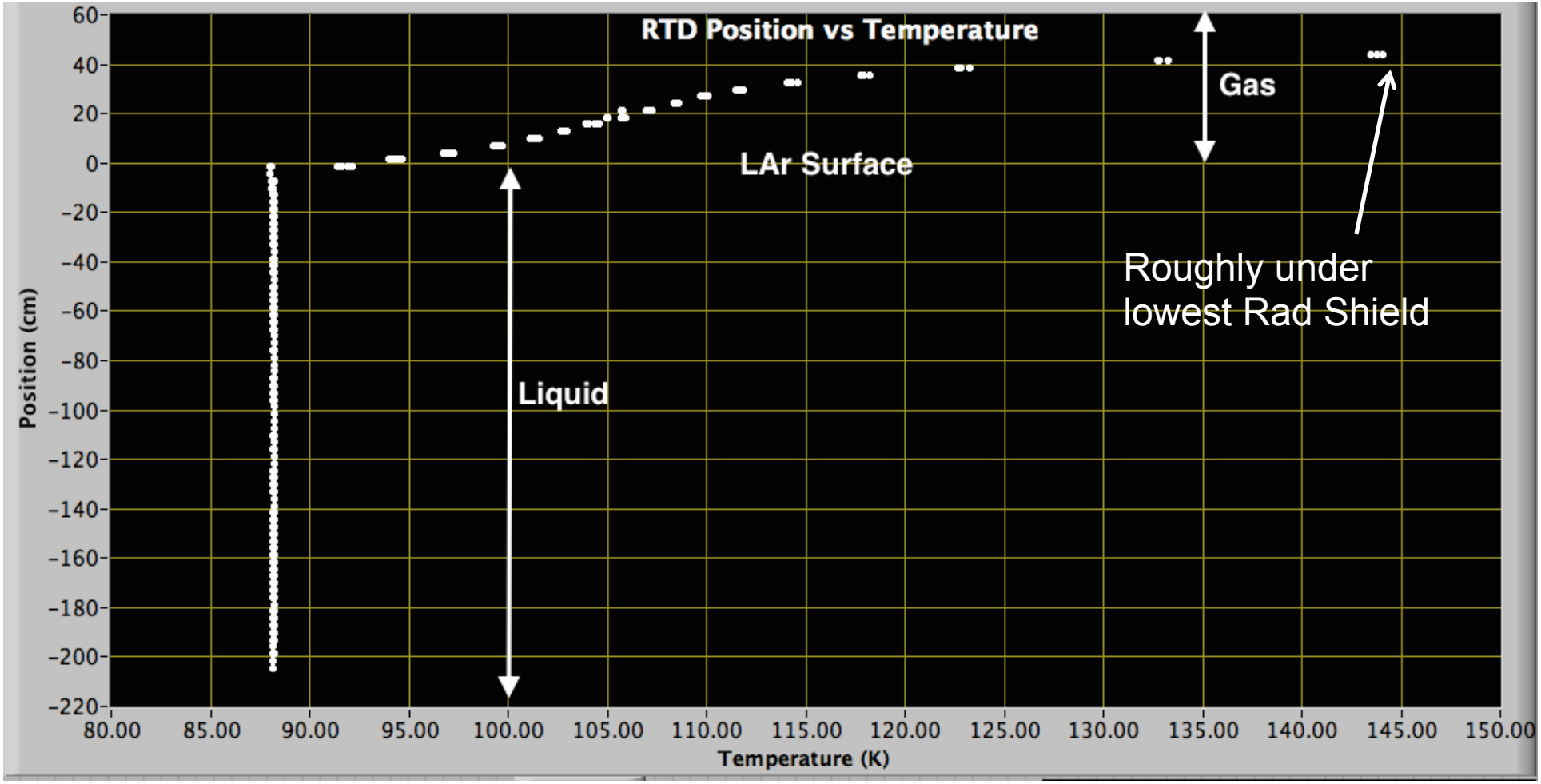
Russ R. says 60% vapor is coming from risers when Vapor Compressor is on

Outgassing in SS vs T
(C. Thorn-LBNE DocDB 9295)

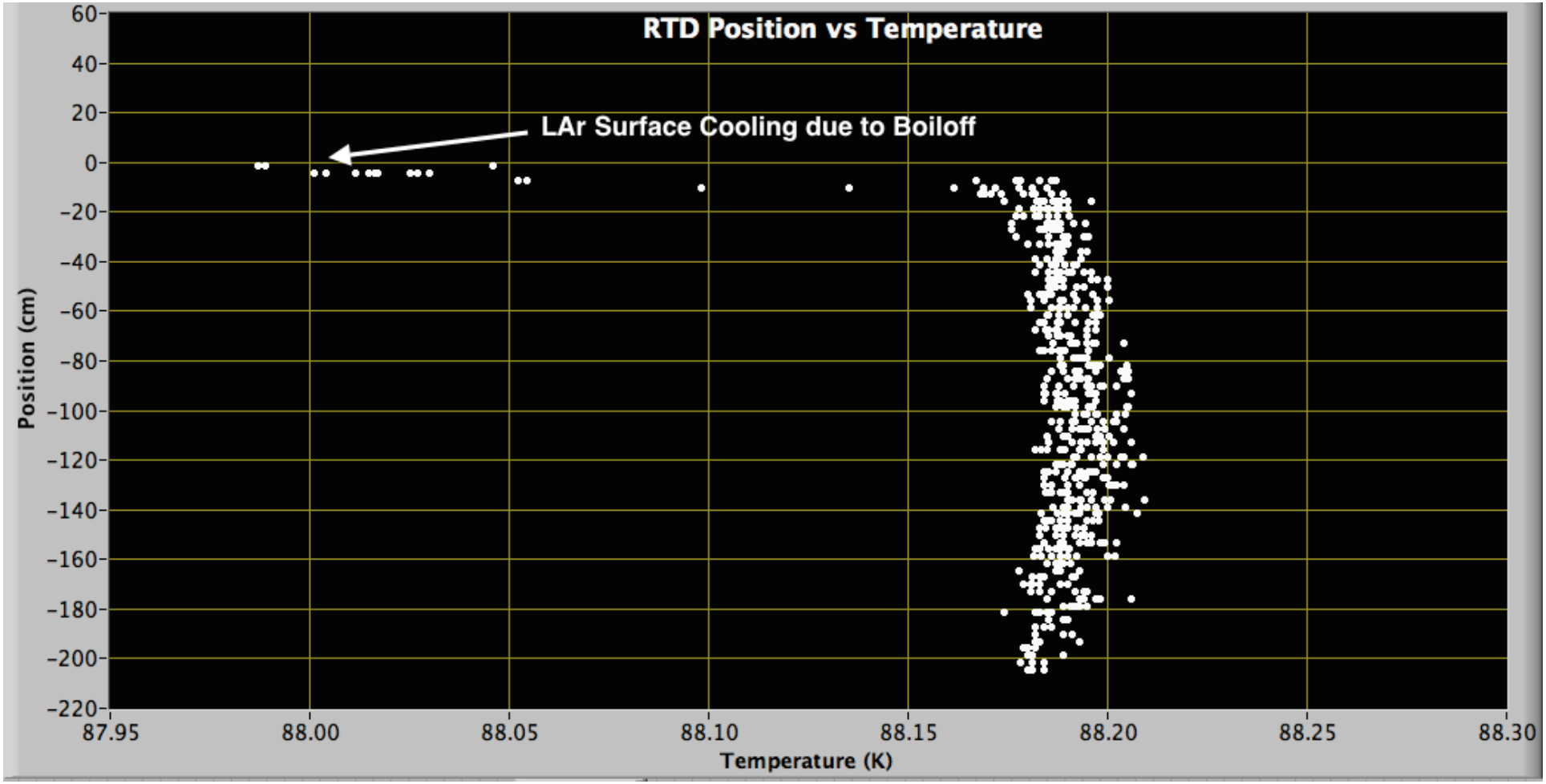
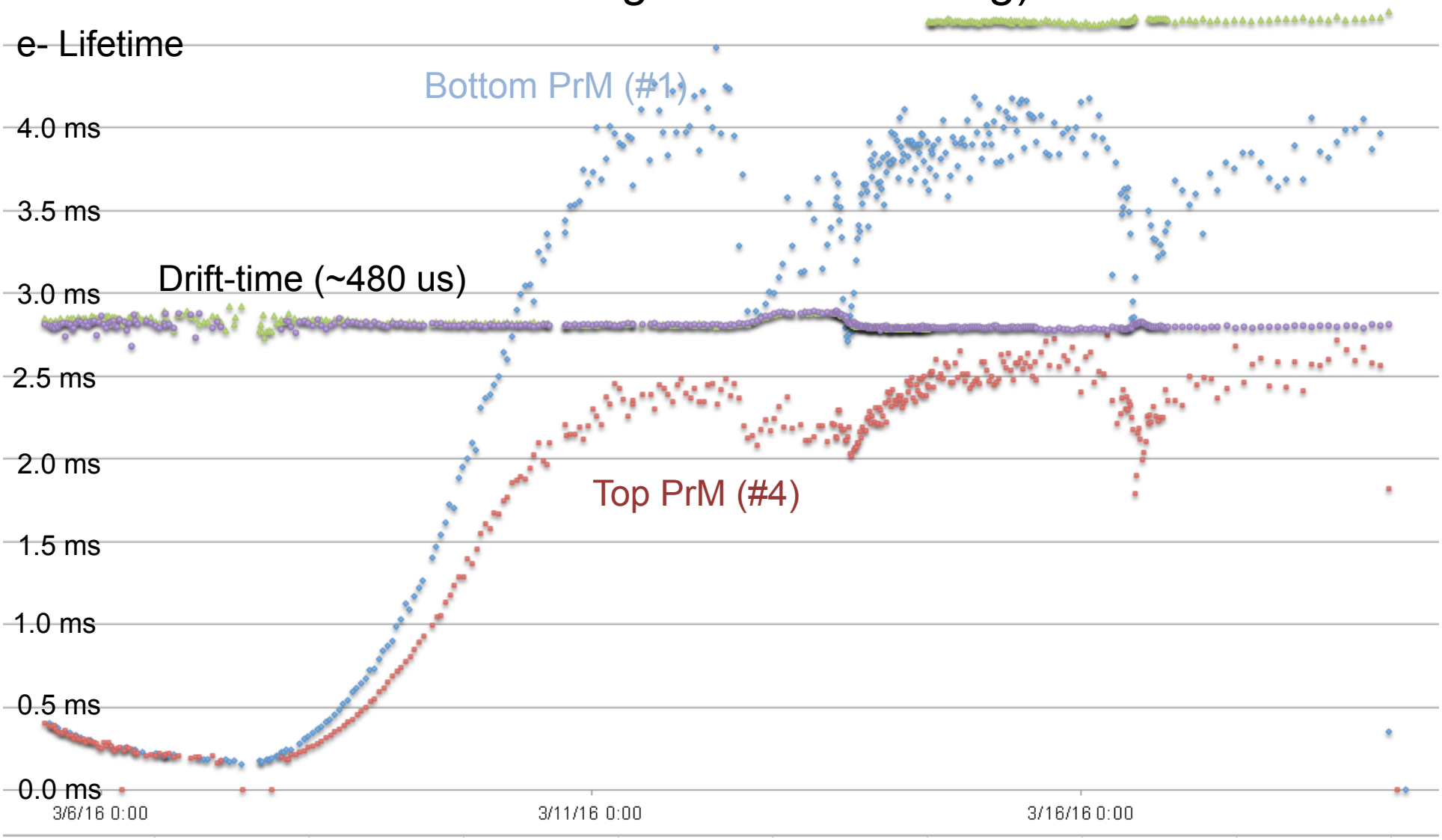


~ 10 orders of magnitude between 150 K and 200 K

Ullage Temperatures from RTD Spooler Measurements (Phase 1)



RTD Spooler Measurements Phase 1 (Expanded scale)



Purity Response wrt Pressure Bump/Temp change (loss of N2 Cooling and then venting)