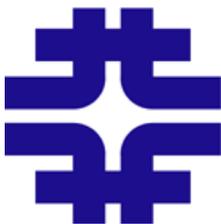


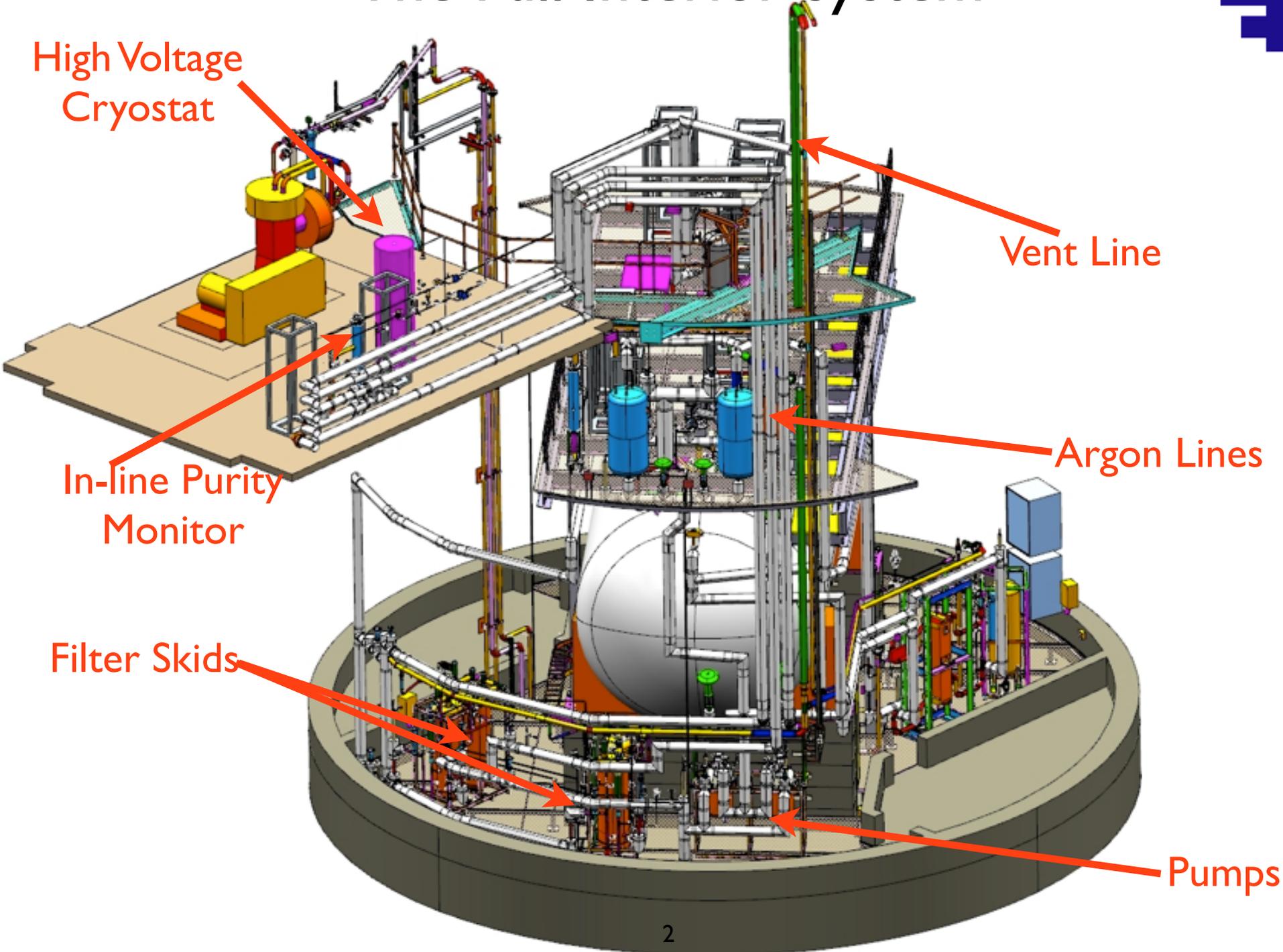


Cryogenics System Phase I Operation

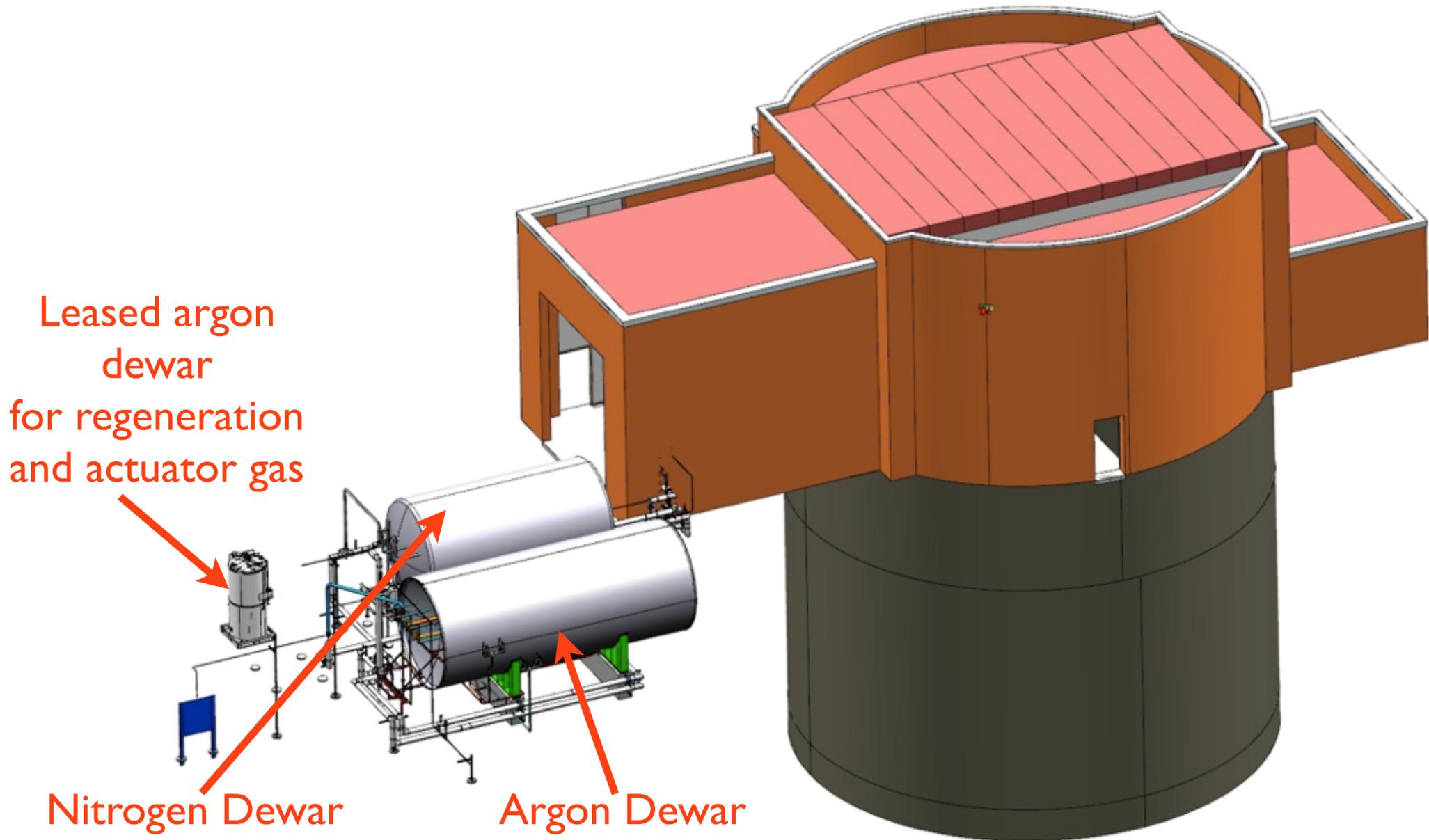
Brian Rebel
March, 2014



The Full Interior System



Exterior Components



Phase I Milestones Accomplished



Evidence of LAr flowing through the system

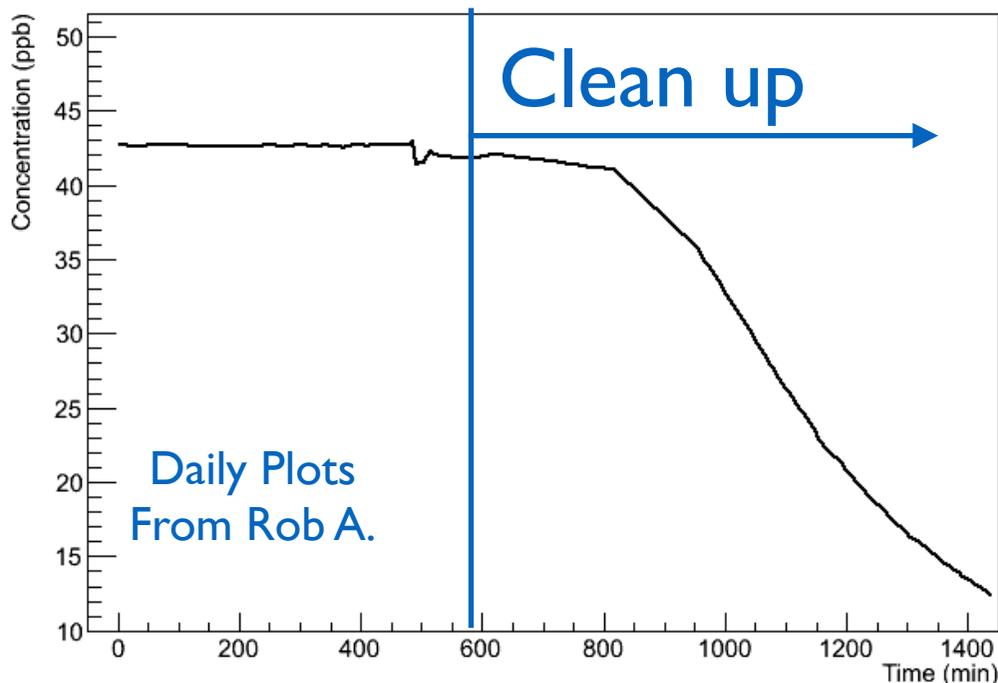


- Filters regenerated
 - Started February 3, finished February 13.
 - Monitored closely and took it slowly for first go
- Pumps started February 18
- Filters brought into flow
 - Started February 19, flow established February 21
 - Delicate operation to ensure the pumps run stably during this step
 - Will not take as long next time
- HVC brought into flow February 26

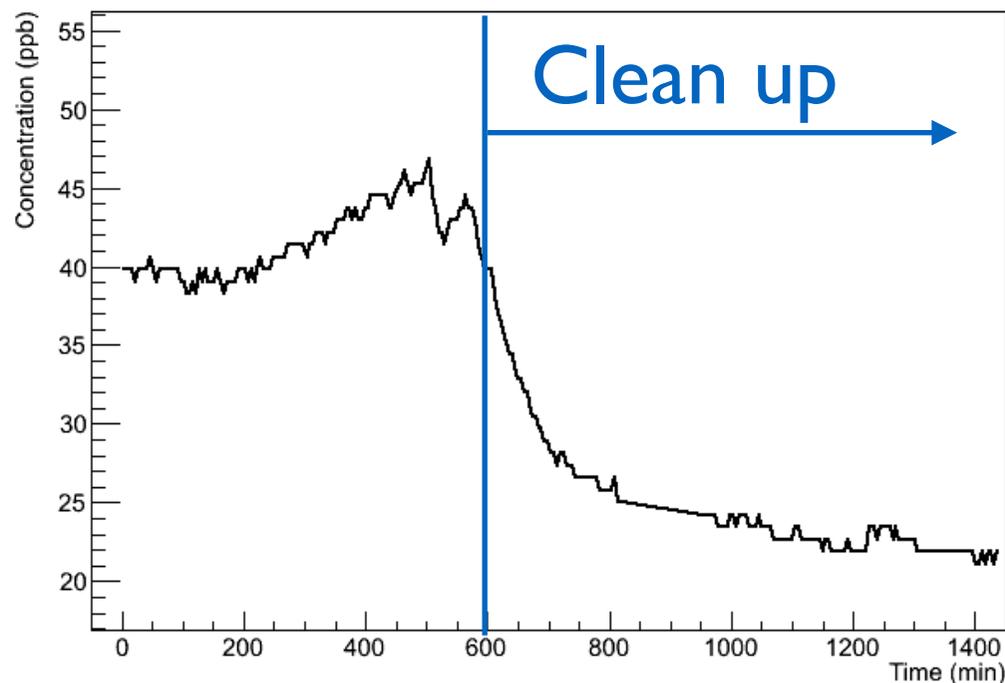


Phase I Argon Cleanup

Oxygen Concentration - High Resolution

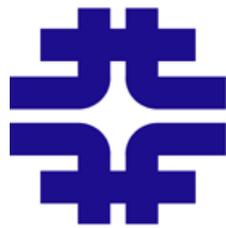


Water Concentration



- Filled buffer dewar with argon from D0 and LBNE 35 ton prototype
 - D0: 180 ppb water, 550 ppb oxygen, 2.5 ppm nitrogen (1700 gal)
 - LBNE 1: 140 ppb water, 9.3 ppb oxygen, 8.8 ppm nitrogen (2300 gal)
 - LBNE 2: 430 ppb water, 10.8 ppb oxygen, 19 ppm nitrogen (2000 gal)
- The plots show the clean up as the liquid flow through the filters was established
- Oxygen contamination currently reading 0.1 ppb

Congratulations to the Cryo Team



Rob Acciarri, John Bell, John Cornele, Ben Carls, Roberto Davila, Bill Gatfield, Tim Griffin, Walter Jaskierny, Bryan Johnson, Jim Kilmer, Dan Knight, Bob Kubinski, Andy Lathrop, Sarah Lockwitz, Ryan Mahoney, Dan Markley, Tim Martin, John Najdzion, Bob Sanders, Mike Sarychev, Anne Schukraft, Mark Shoun, Kourosh Taheri, Justin Tillman, John Voirin and **Mike Zuckerbrot**