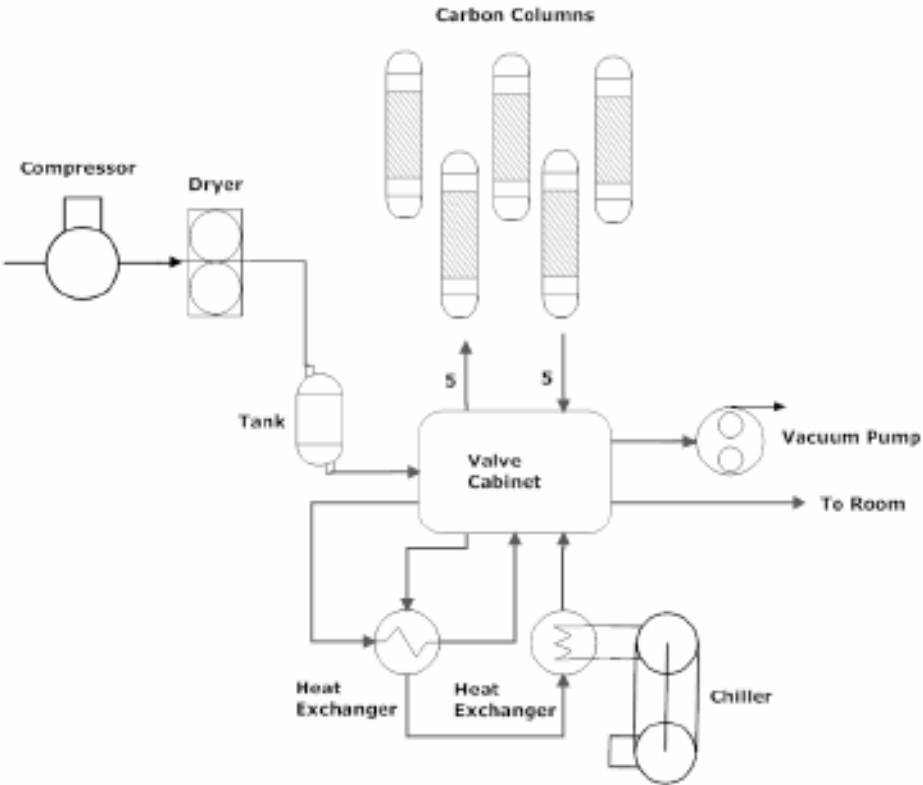


U of A Low Radon Laboratory

Aksel Hallin
July, 2019

Radon Stripping System



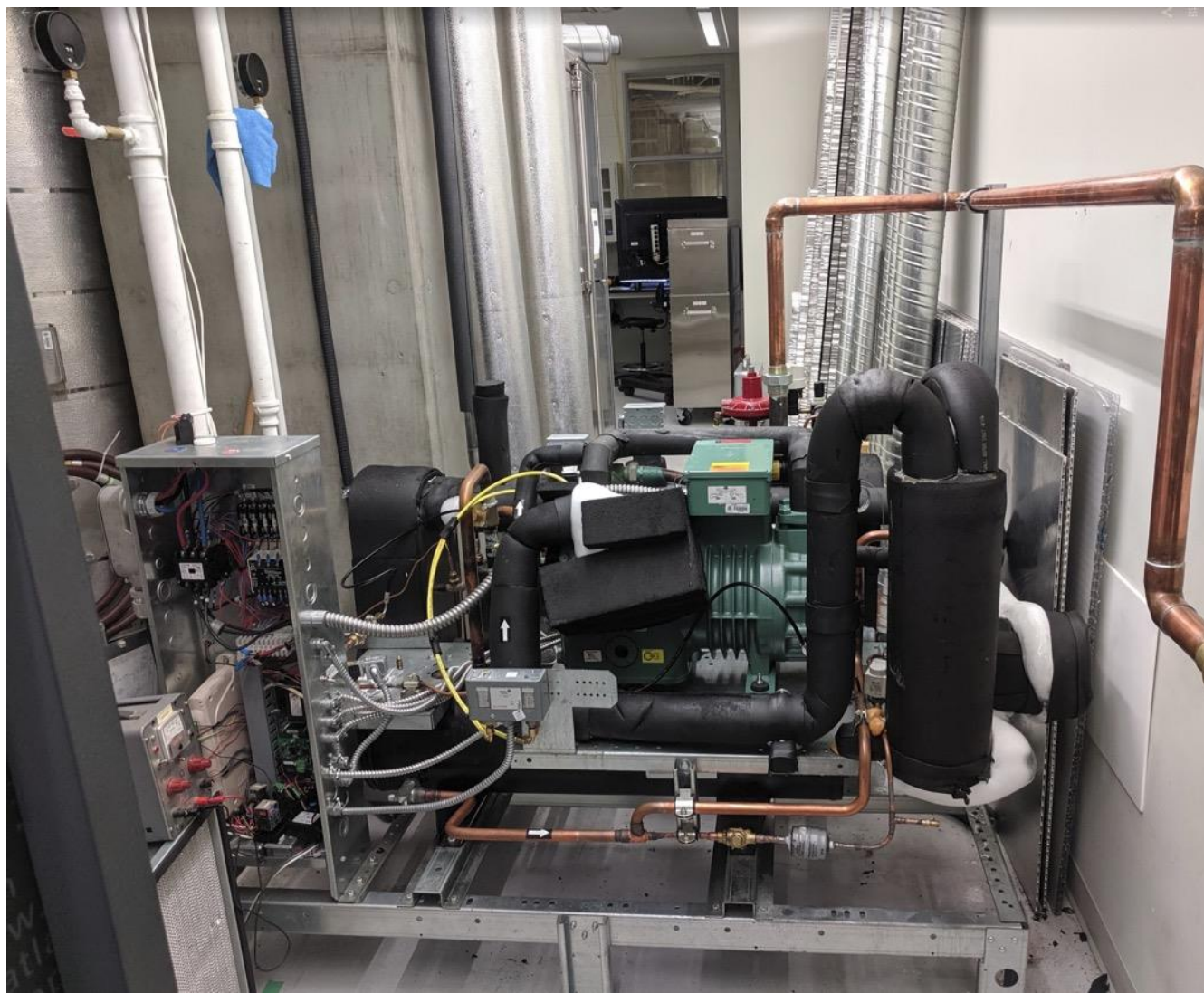
Atlas Copco
30 kW
water cooled
5 m³/min



Drying system: dewpoint:-70C



9 kW process chiller -65C



5 columns, 200 kg coconut carbon



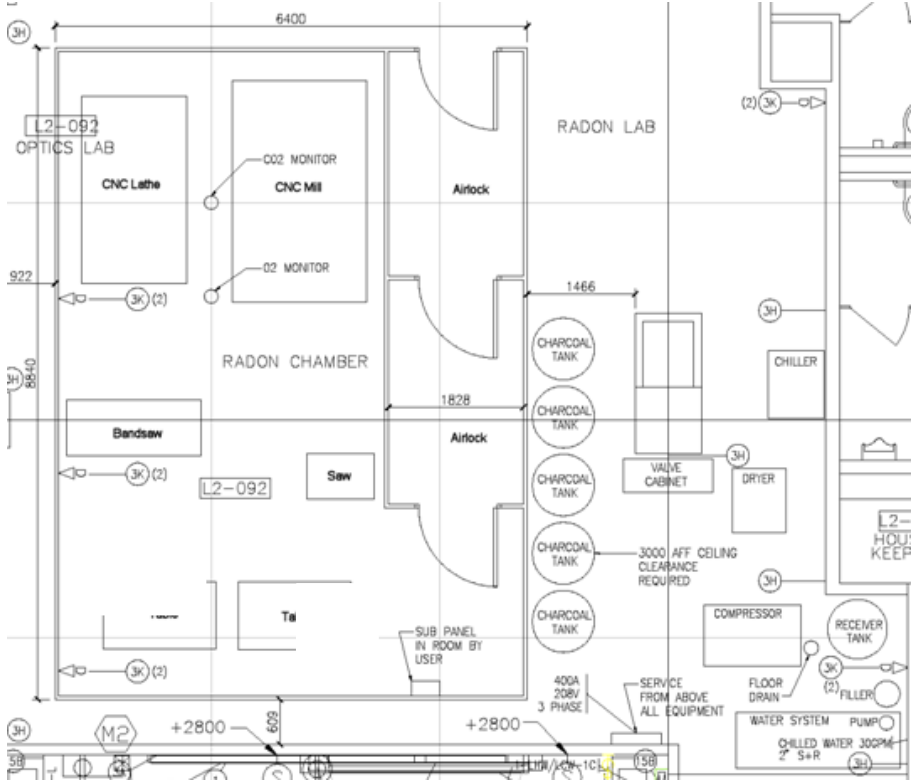
Valve cabinet (has warm and cold sides)

System can operate as continuously cold, pressure swing, temperature swing.



Clean Room

This modular cleanroom was purchased from CleanAir Solutions, and custom sealed with low radon caulking compounds and tape. The ceiling consists of a top plenum cap 10" high which provides the outer air seal and an 8" suspended inner ceiling holding the lights and 17 HEPA filters. The floor of the cleanroom is sealed with a 1cm thick layer of Precidium 550D, a polyurea industrial floor coating. The cleanroom is unique in that it is designed as a small machine shop. Contained within is a CNC mill and a CNC lathe. It also contains its own water purification system that provides low radon water [3].



Construction of walls and doors:



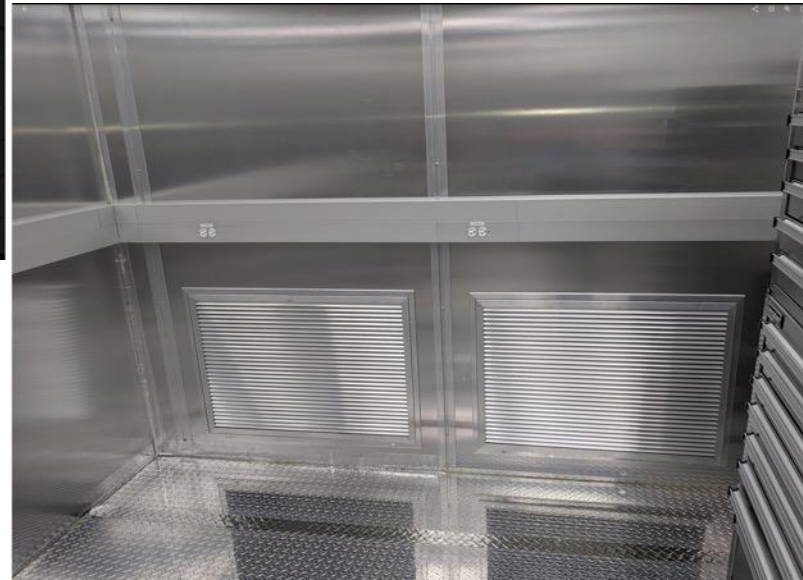
Antechambers



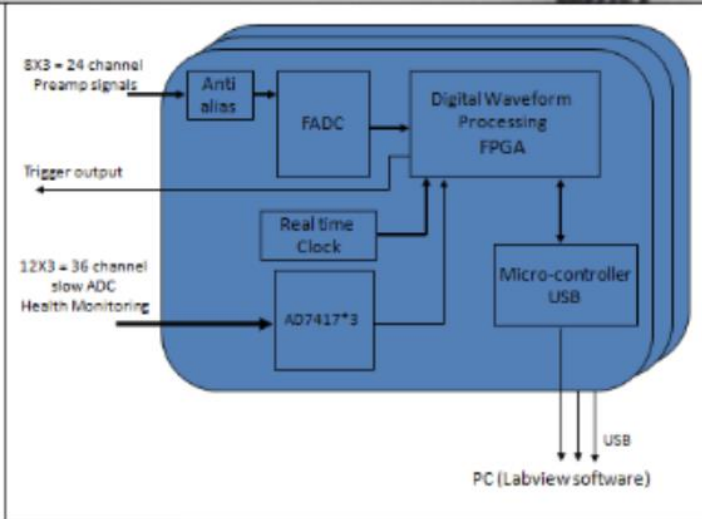
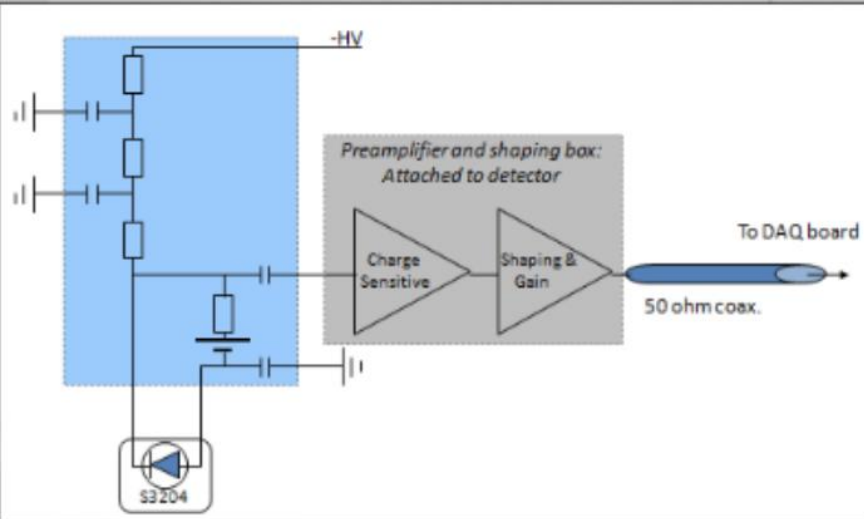
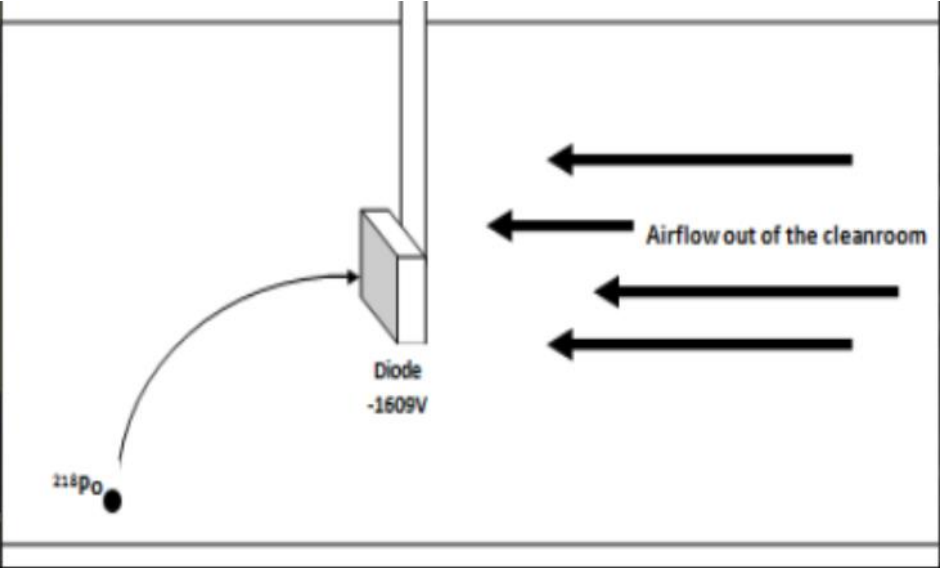
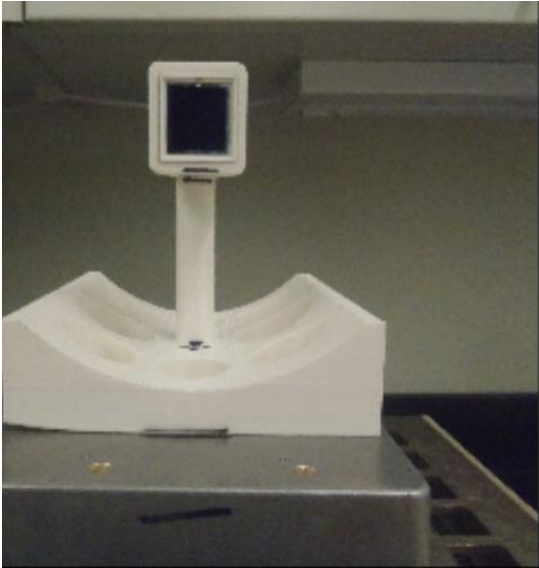
Interior of clean room



Interior



Monitoring system



Radon Monitor DAQ V2.0

(Input signal range: -2 V to 0 V) April 1, 2010

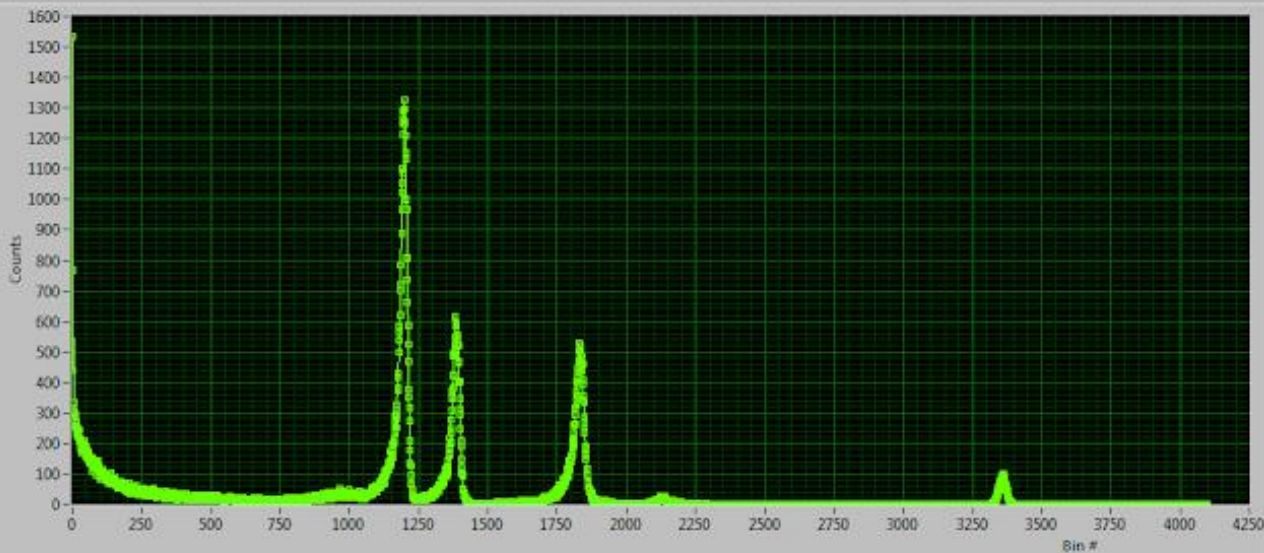
Started at : Thu, Dec 20, 2018, 11:4

Stop Reset FPGA Clear Graph

Events: 4142
 File Path: F:\Radon_DATA\UofA_Rn_run_12075_7_12_2019.root

	Name	Run	Event Rate	Events Log	Threshold	HV	Manual HV
Ch 0		Stop	0.014754	260206	300	0	0
Ch 1		Stop	0.002506	44247	300	0	0
Ch 2		Stop	0.014433	254900	300	0	0
Ch 3		Start	0	0	300	0	0
Ch 4		Stop	0.050253	886158	300	0	0
Ch 5		Start	0	0	300	0	0
Ch 6		Start	0	0	300	0	0
Ch 7		Start	0	0	300	0	0

Ch 0 Ch 1 Ch 2 Ch 3 Ch 4 Ch 5 Ch 6 Ch 7 Slow ADC Setup Gating FPGA Info Errors Testing Page

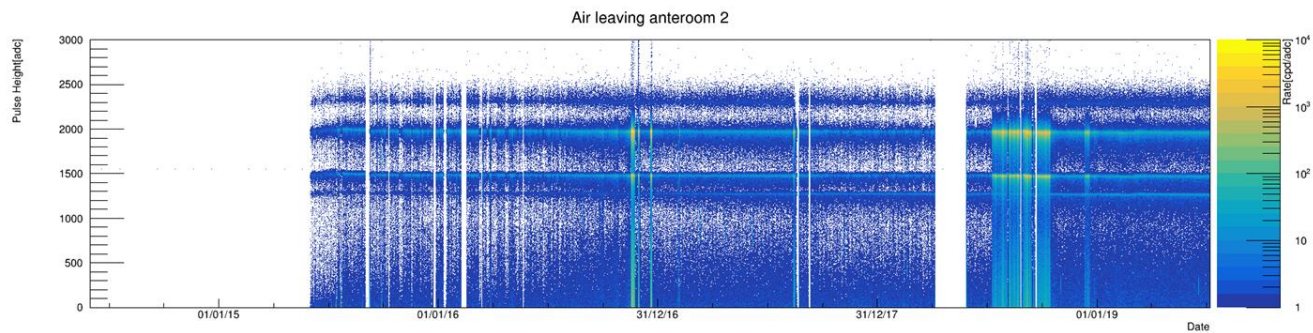
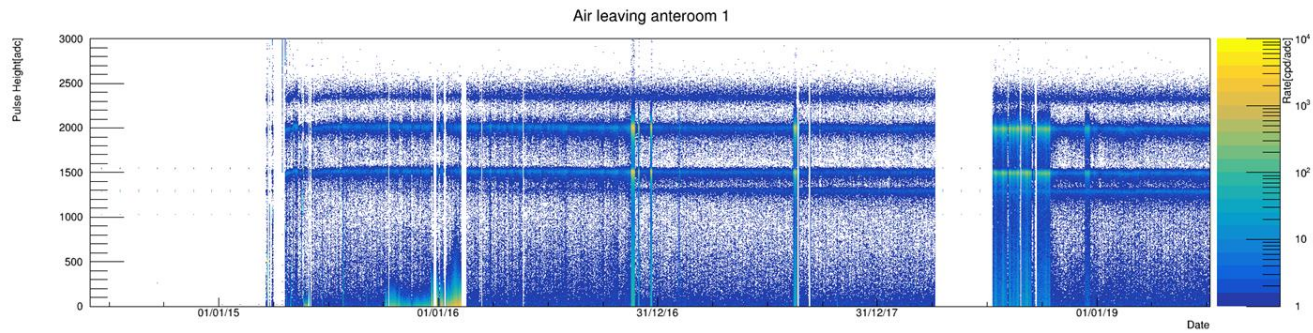
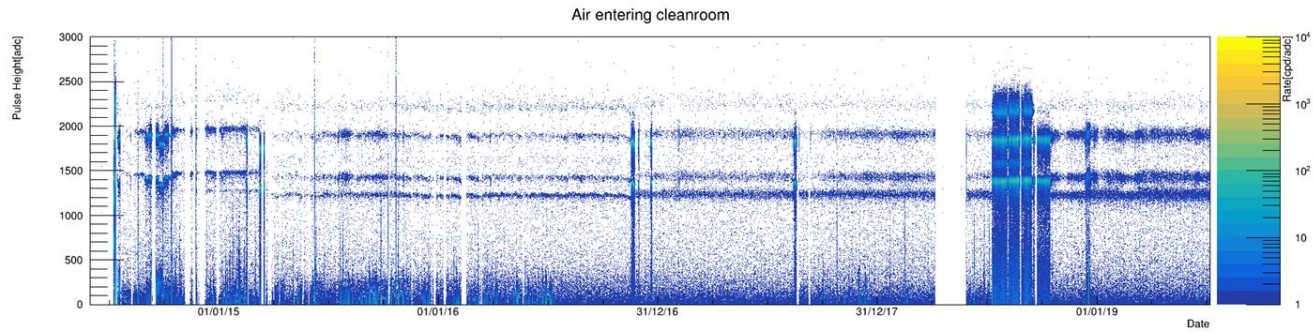
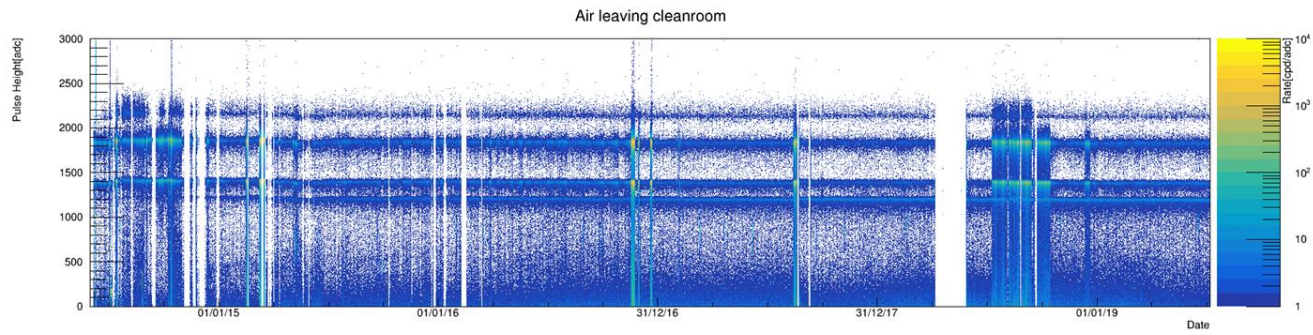


Controls:

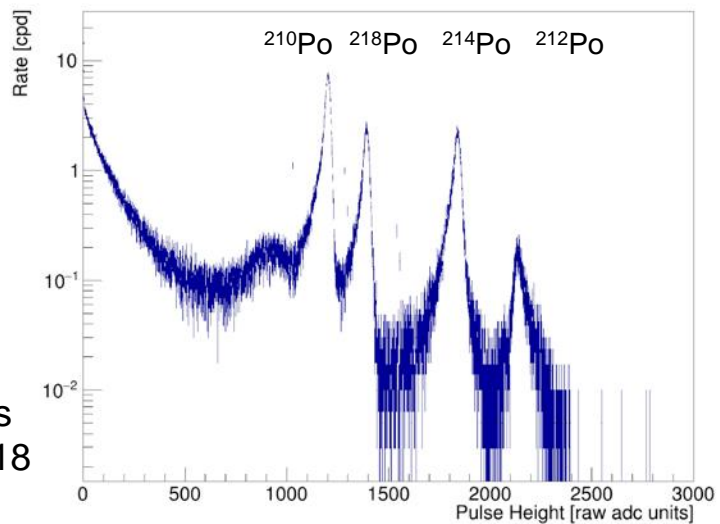
The screenshot displays a comprehensive control interface for a radon system. At the top, a menu bar includes File, Edit, View, Project, Operate, Tools, Window, and Help. The main area is divided into several functional sections:

- Tank Monitors:** Five vertical panels (TANK 1-5) each showing Temp. (C) and Pressure (mBar) for two different stages. TANK 1-3 also show a third Temp. (C) and Pressure (mBar) reading.
- Vacuum Monitor:** A dedicated panel for Vacuum Pressure (mBar).
- Environmental Sensors:** A grid of sensors including RH in/out, Temp in/out, Delta P for Airlock 1 and 2, and various gas levels (CO, CO2, O2, VOC) and room temperatures.
- Control Elements:** Buttons for H2O Solenoid, Vac Solenoid, Compressor Start, and Chiller Start, all currently set to ON. A Valve Master Enable is also ON. Individual tank valves (Input, Output, Exchang, Purge) are currently OFF.
- Log File Status:** A window showing status (checked), code (0), and source.
- System Update:** A notification bubble at the bottom right states "New updates are available" and prompts the user to click to install them using Windows Update.

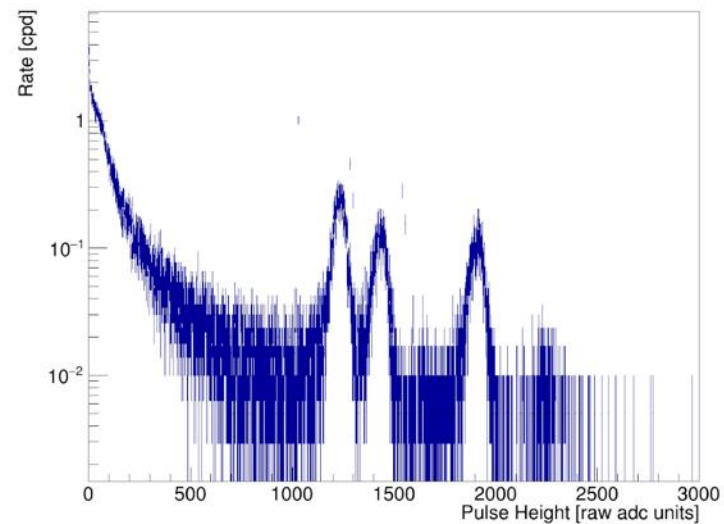
The bottom status bar indicates the system is a "Vacuum Pump" and "Enable Swing System for High Pressure Supply Air". The taskbar shows the file path "radon system readout.lvproj\N:\cRIO9022-016D7996" and the system clock displays "3:01 7/12/2012".



Air leaving cleanroom

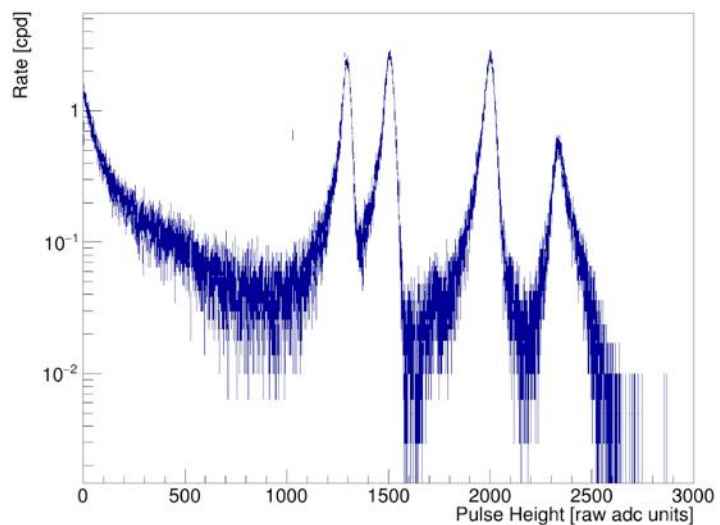


Air entering cleanroom

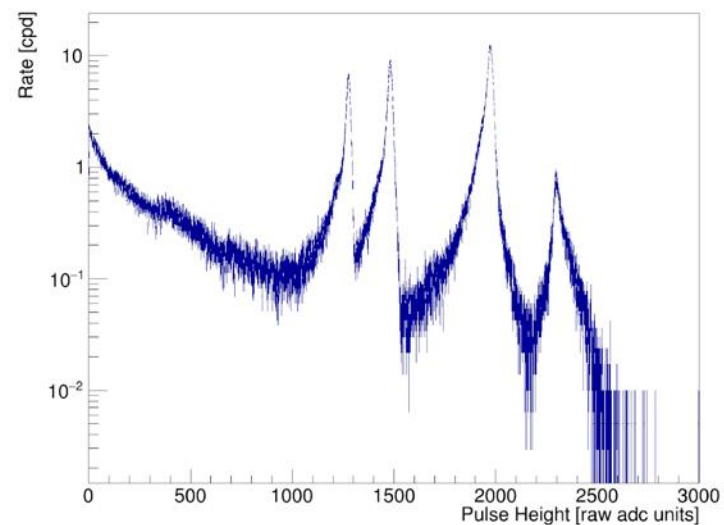


Sum spectra 200 days
Sept, 2017-March 2018

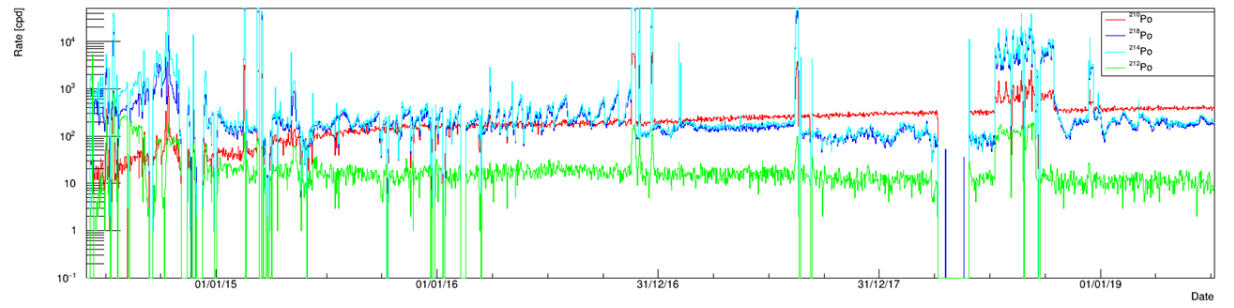
Air leaving anteroom 1



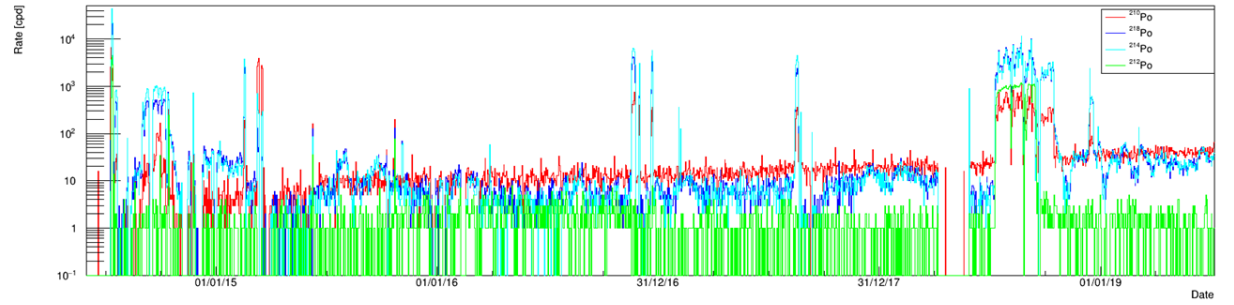
Air leaving anteroom 2



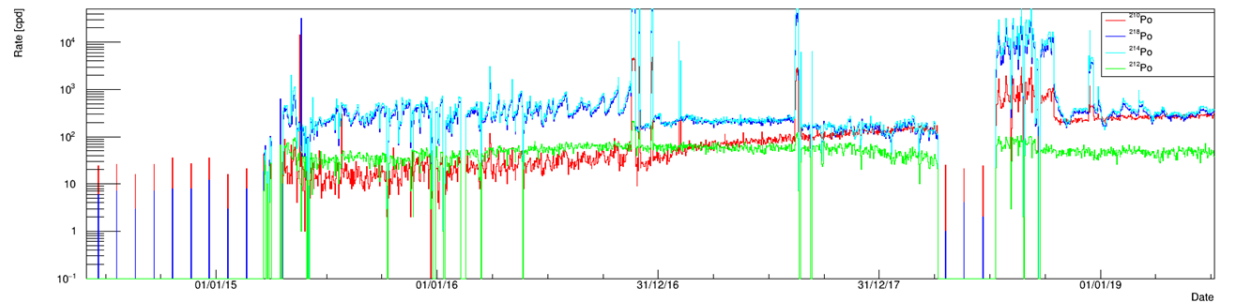
Air leaving cleanroom



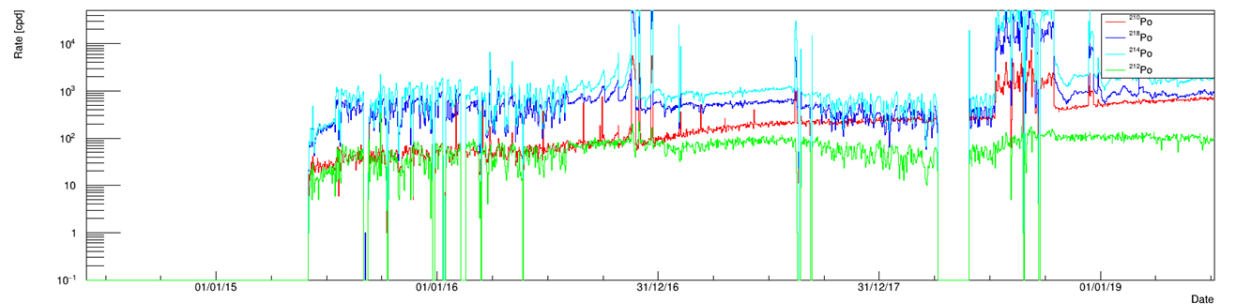
Air entering cleanroom



Air leaving anteroom 1



Air leaving anteroom 2



Summary

Clean room, with radon stripping has been running almost continuously since 2014.

Air entering the room is suppressed in radon by about a factor of 300 over ambient air (in Edmonton $\sim 5\text{-}10 \text{ Bq/m}^3$); leaving the room is about a factor of 60.

Radon in the room is dominated by emanation.

Particle counts are around 10/cf >0.5 micron.