

2025/04/17

Measuring Radon in the SNO+ Experiment

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Supervised by: Christine Kraus



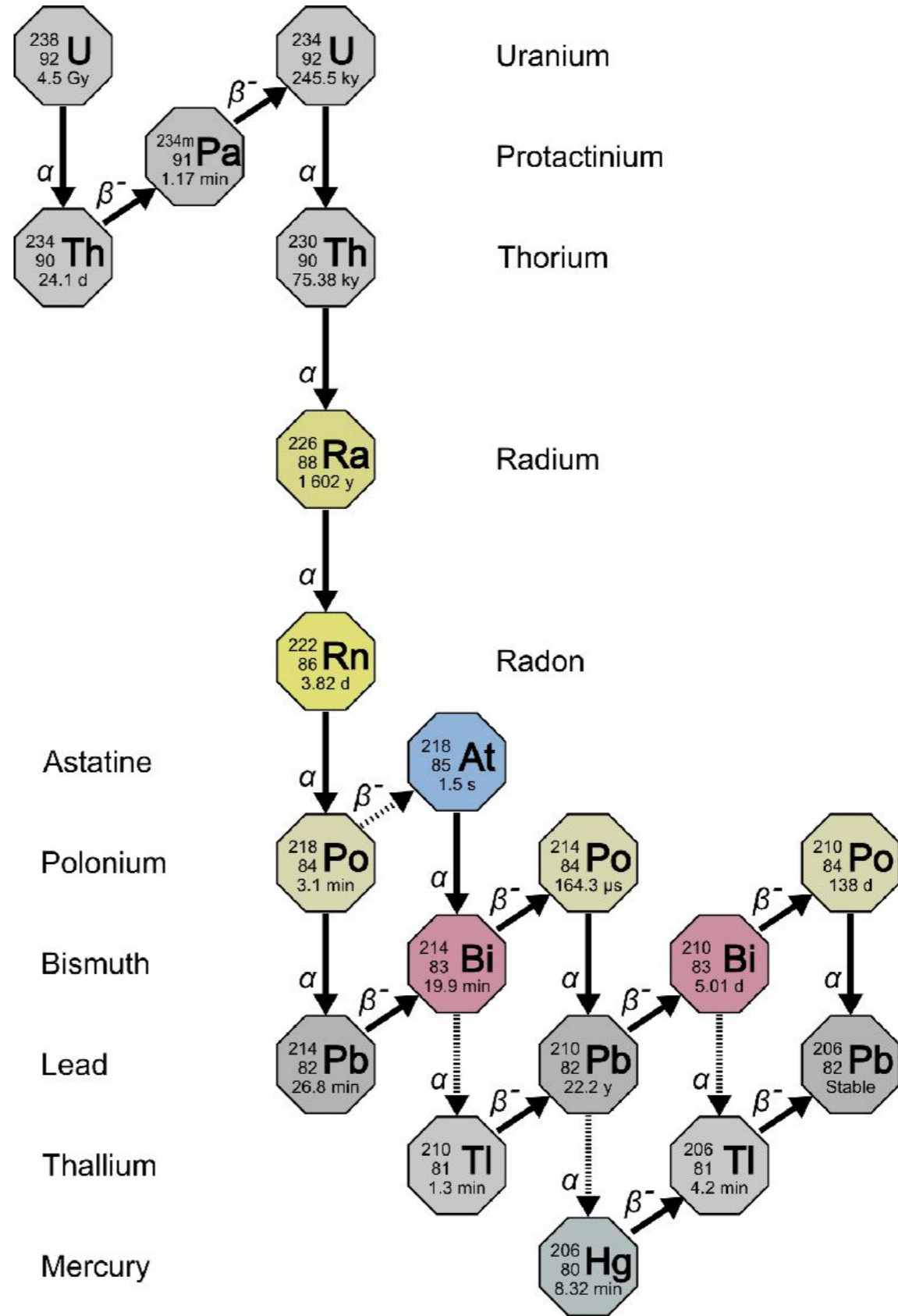
Low Background Physics and Radon



Rock, dust, metal

The Radon family

Pb-210 long lived



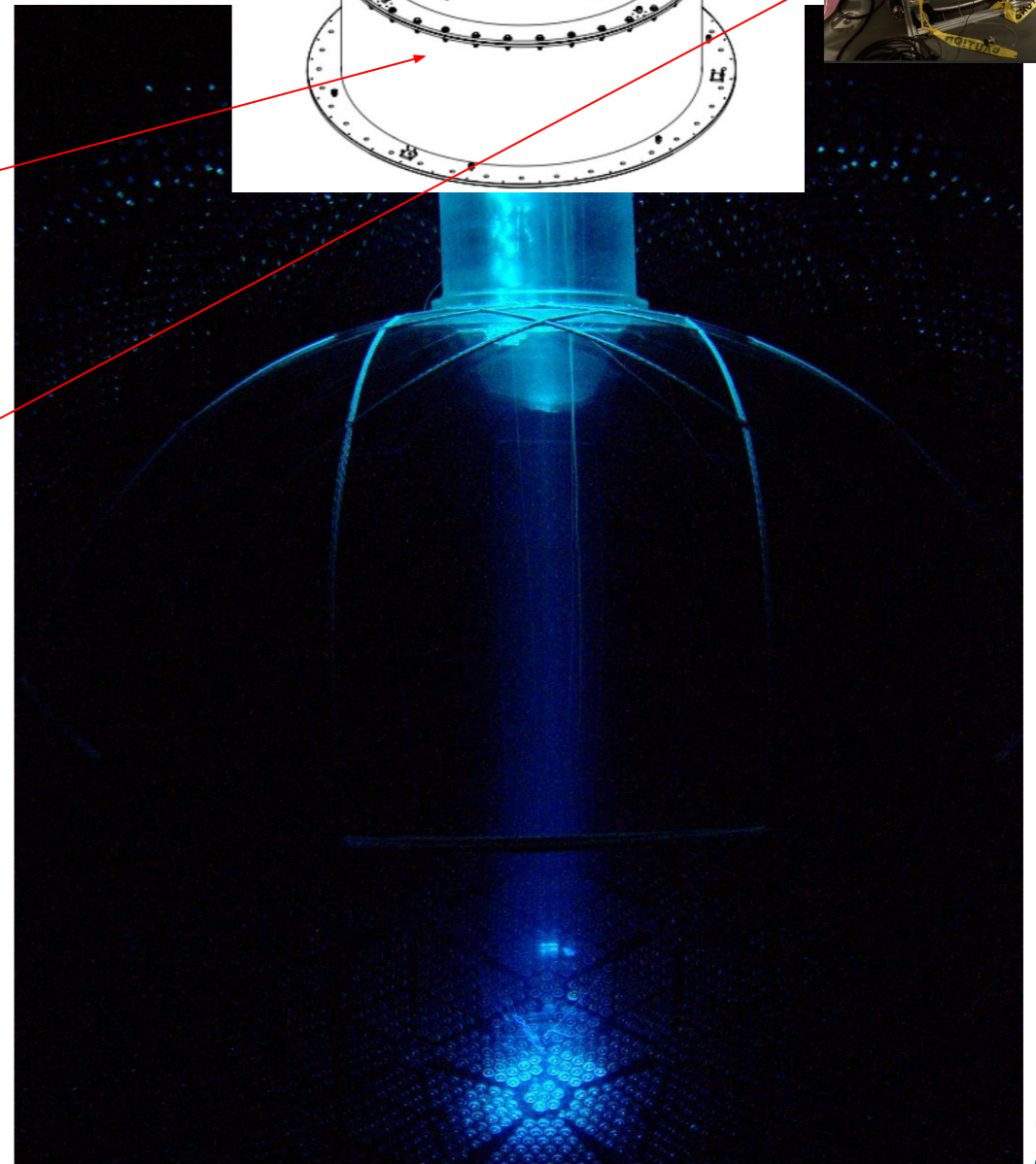
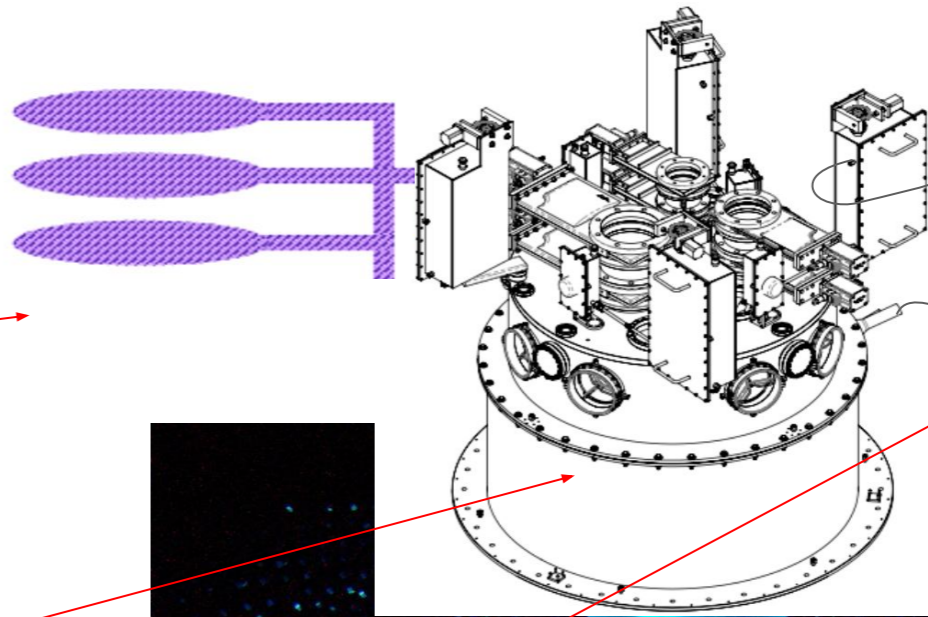
https://www.epa.gov/sites/default/files/styles/medium/public/2015-05/u-238_decay.png?itok=558OwVAJ

SNO+ Radon Mitigation

N2 Cover Gas system

Universal Interface (UI)

Electrostatic Radon Monitor

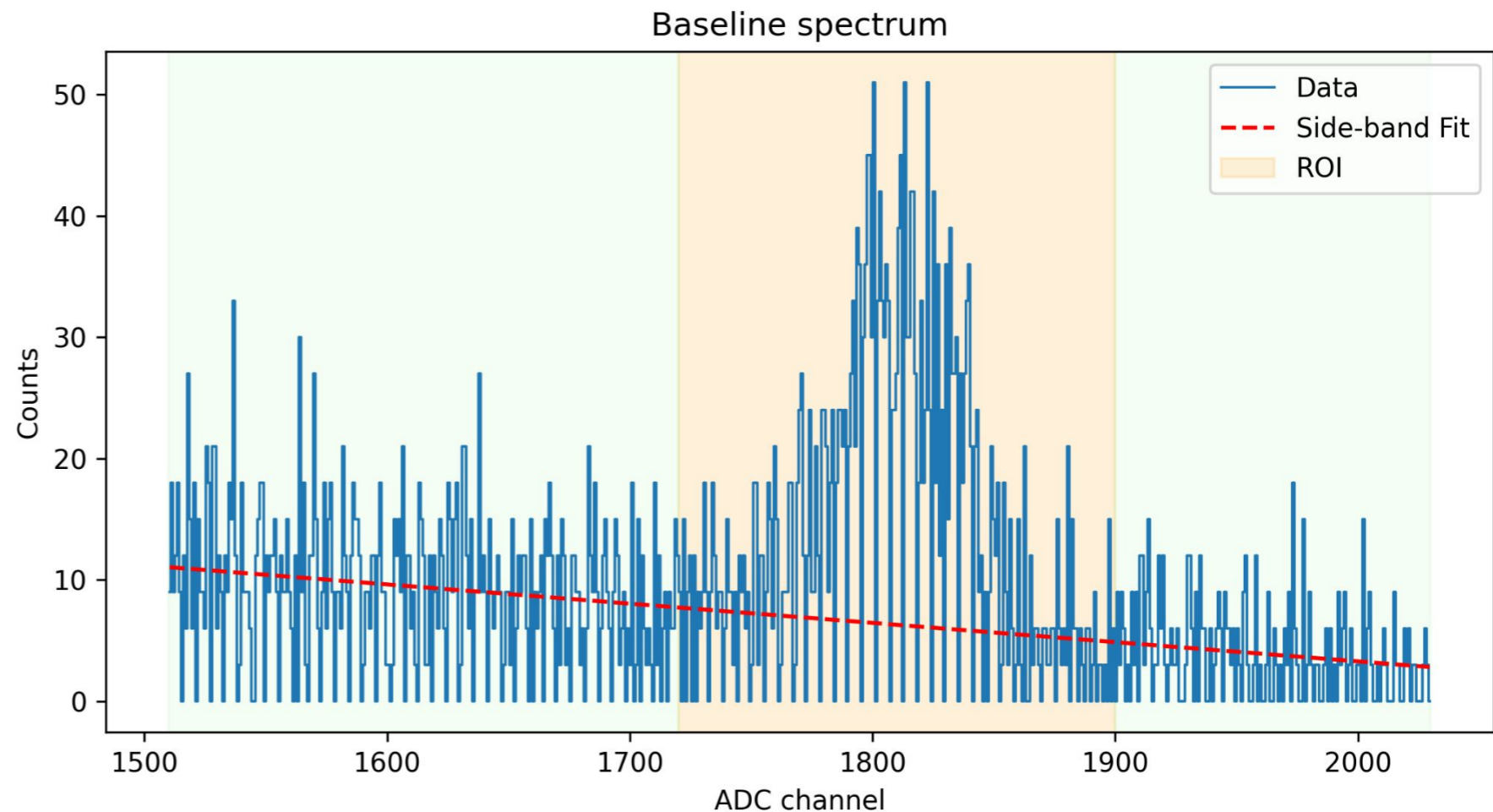


Radon Monitor Data Analysis

Estimate electronics noise
by averaging bins
before/after

Radon emanates from the
detector itself

11 day isolated background
run used to estimate
Radon emanation

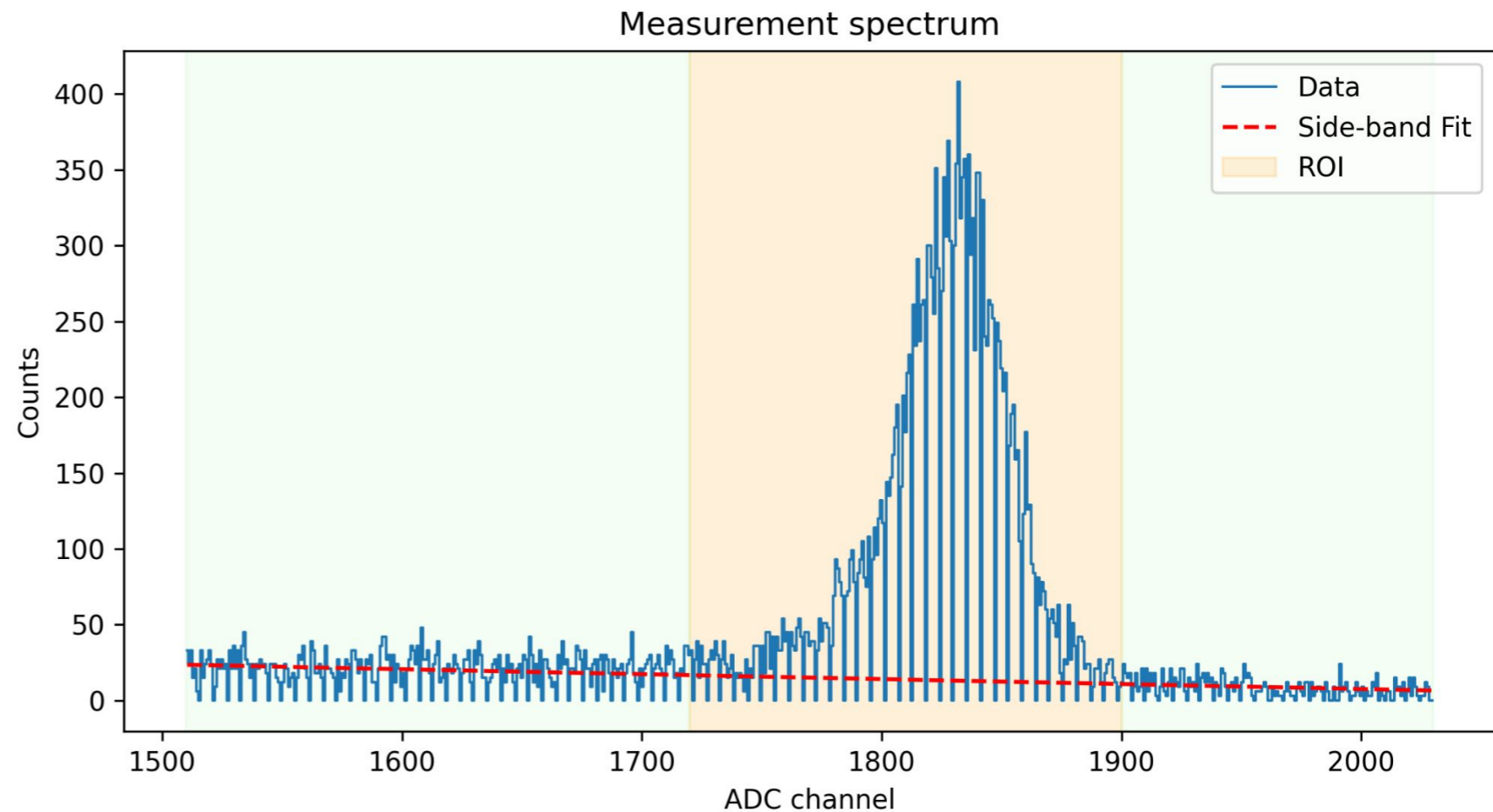


Radon Monitor Data Analysis

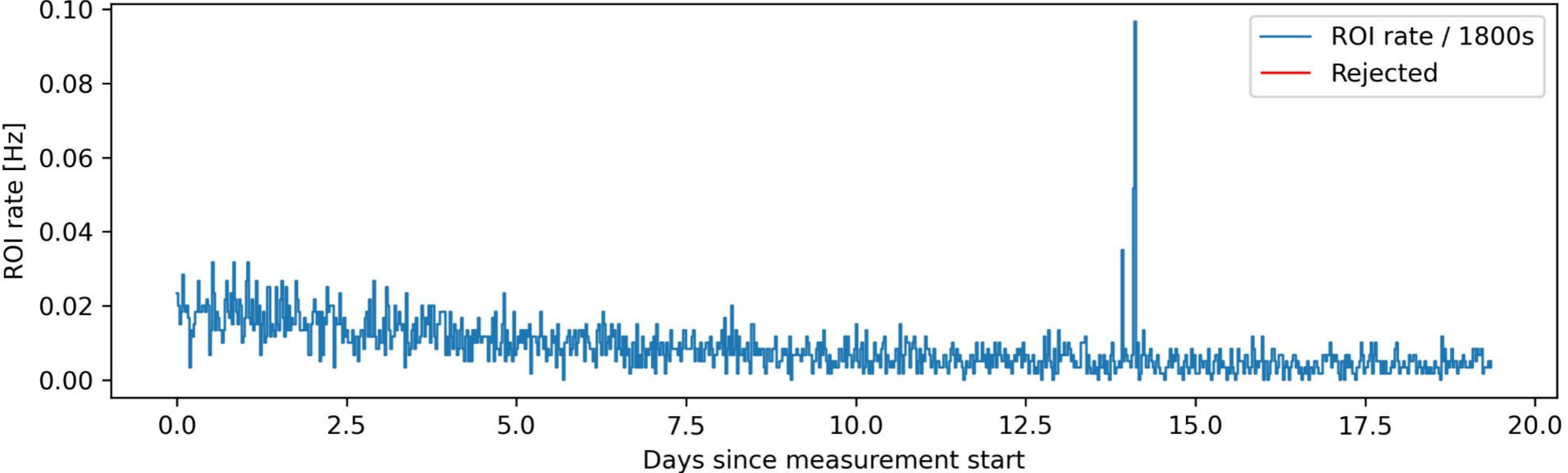
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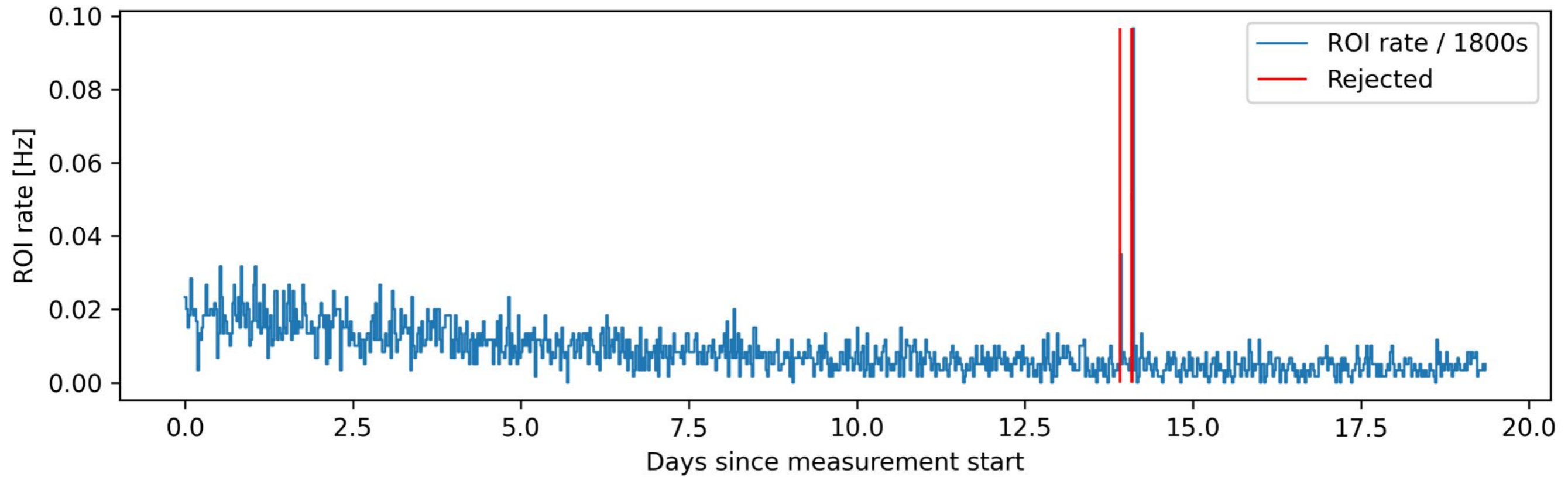
11 day isolated background
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Filtering Data



Filtering Data

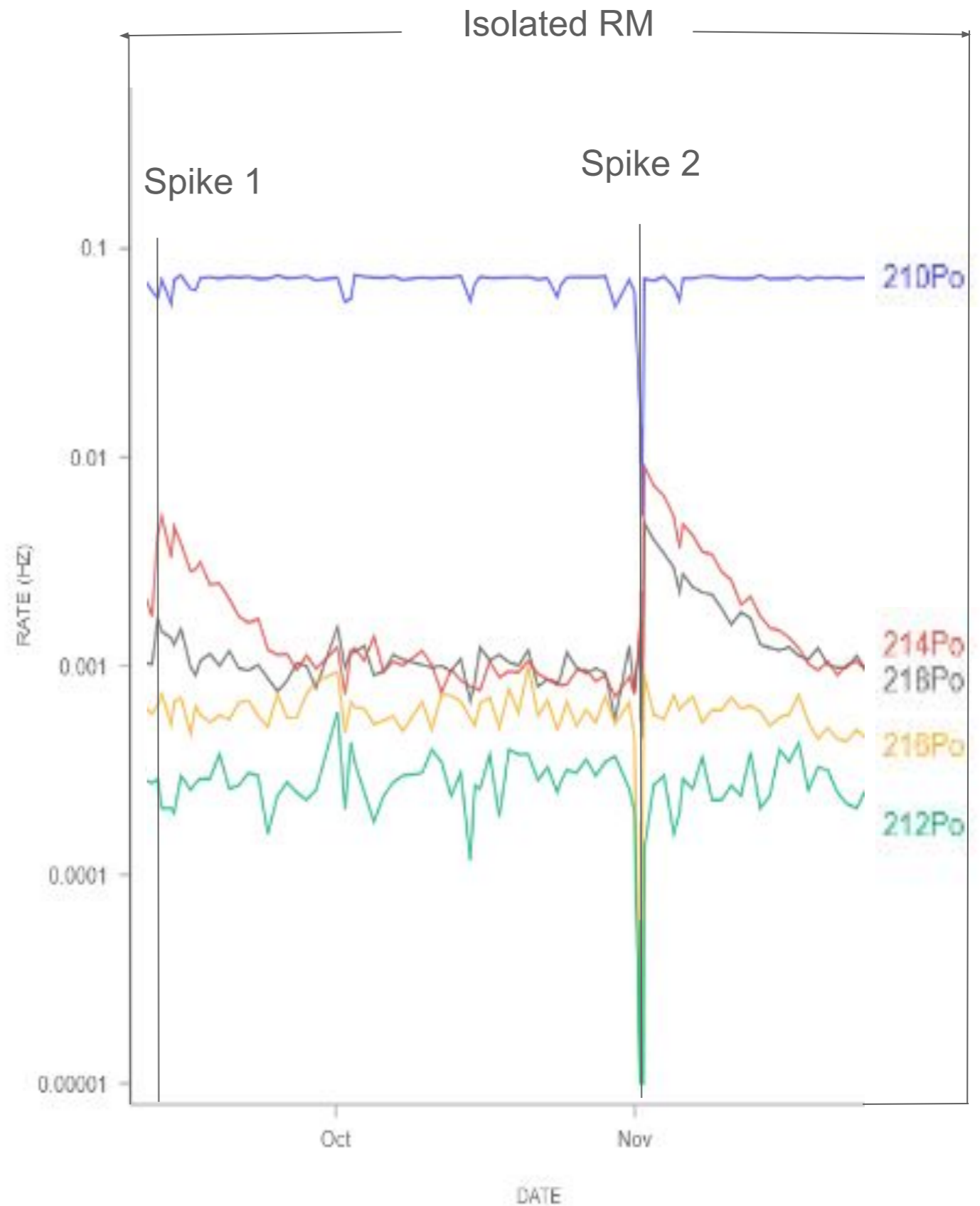


Isolated Radon Monitor

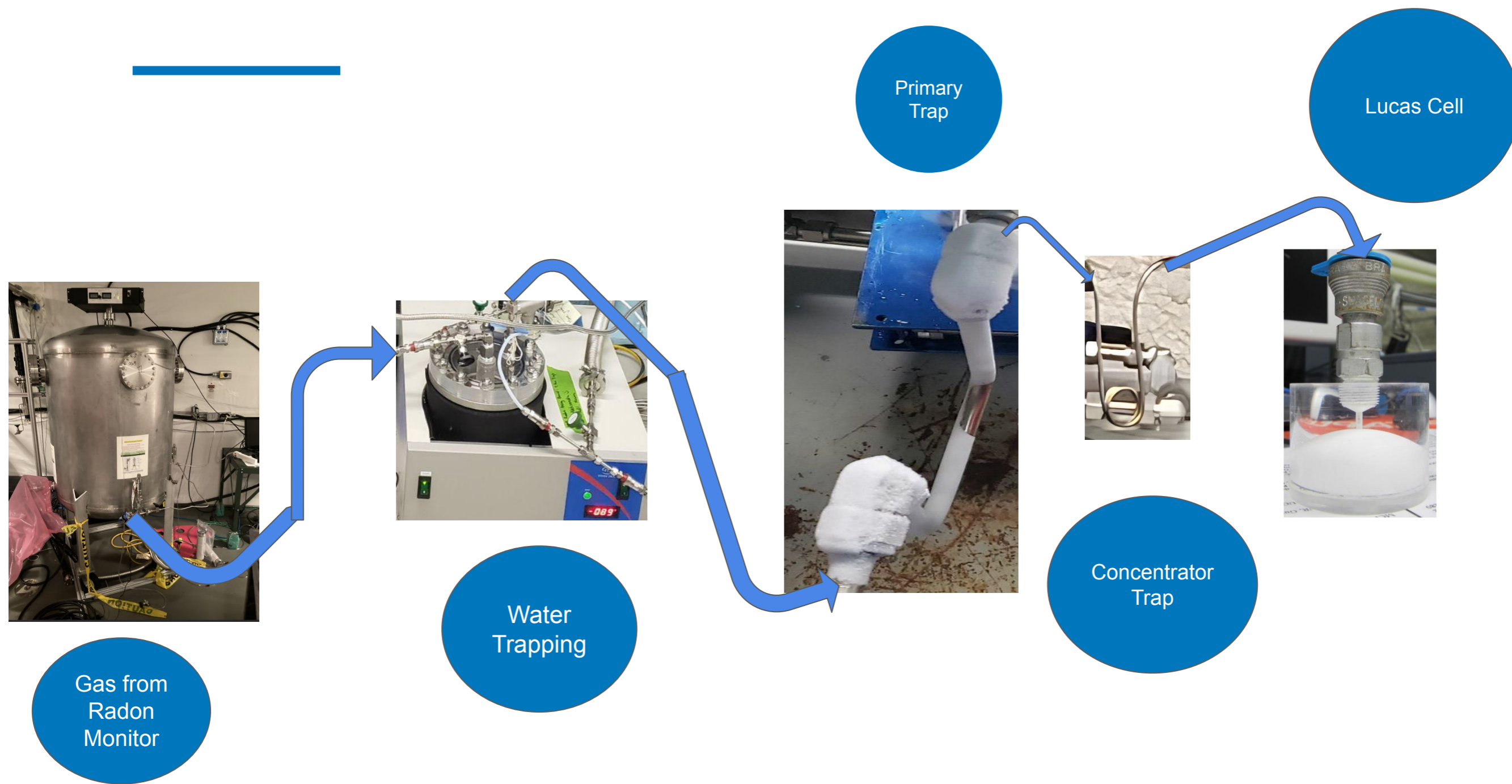
Calibration Source Available

Introduce known spike into radon monitor

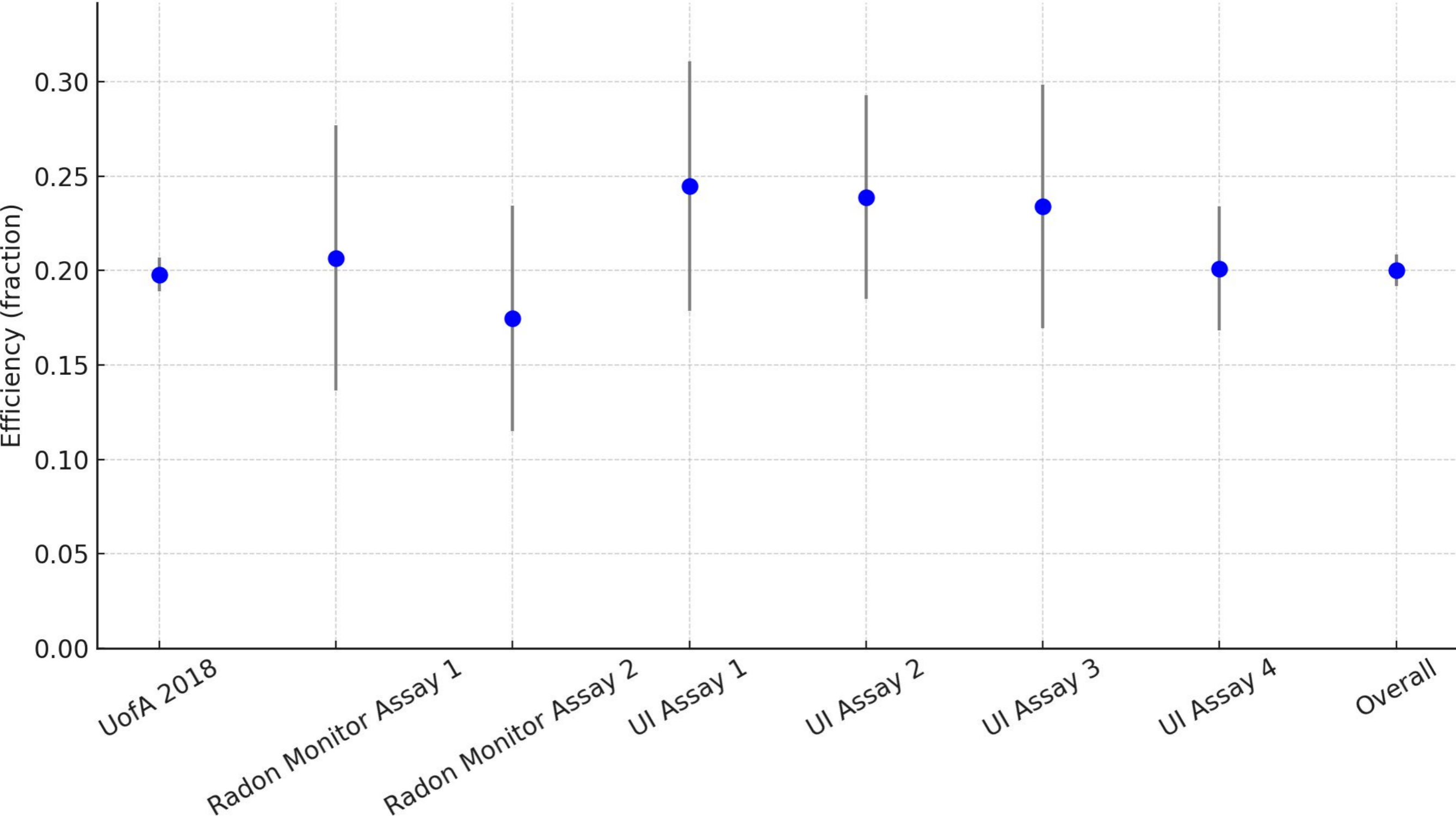
Measure spike in radon monitor after one λ with another system



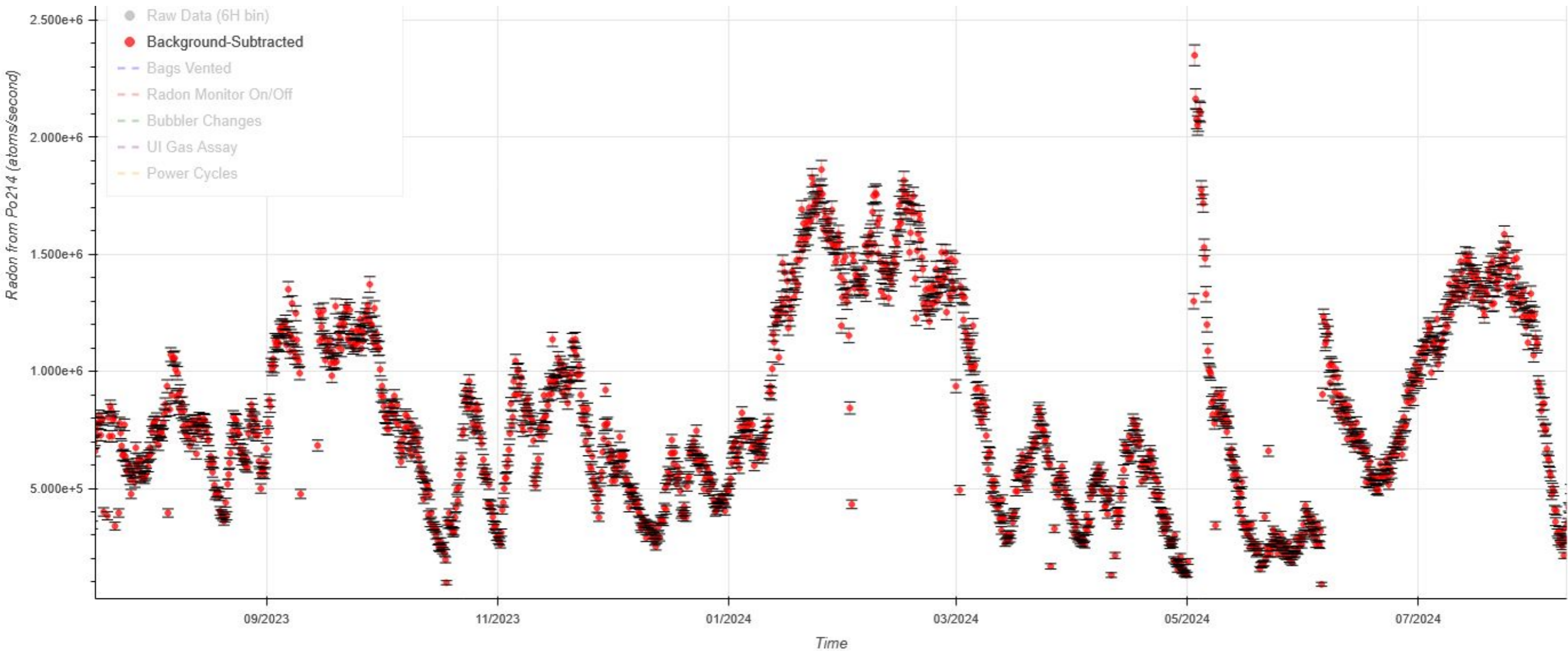
What is a Radon Assay



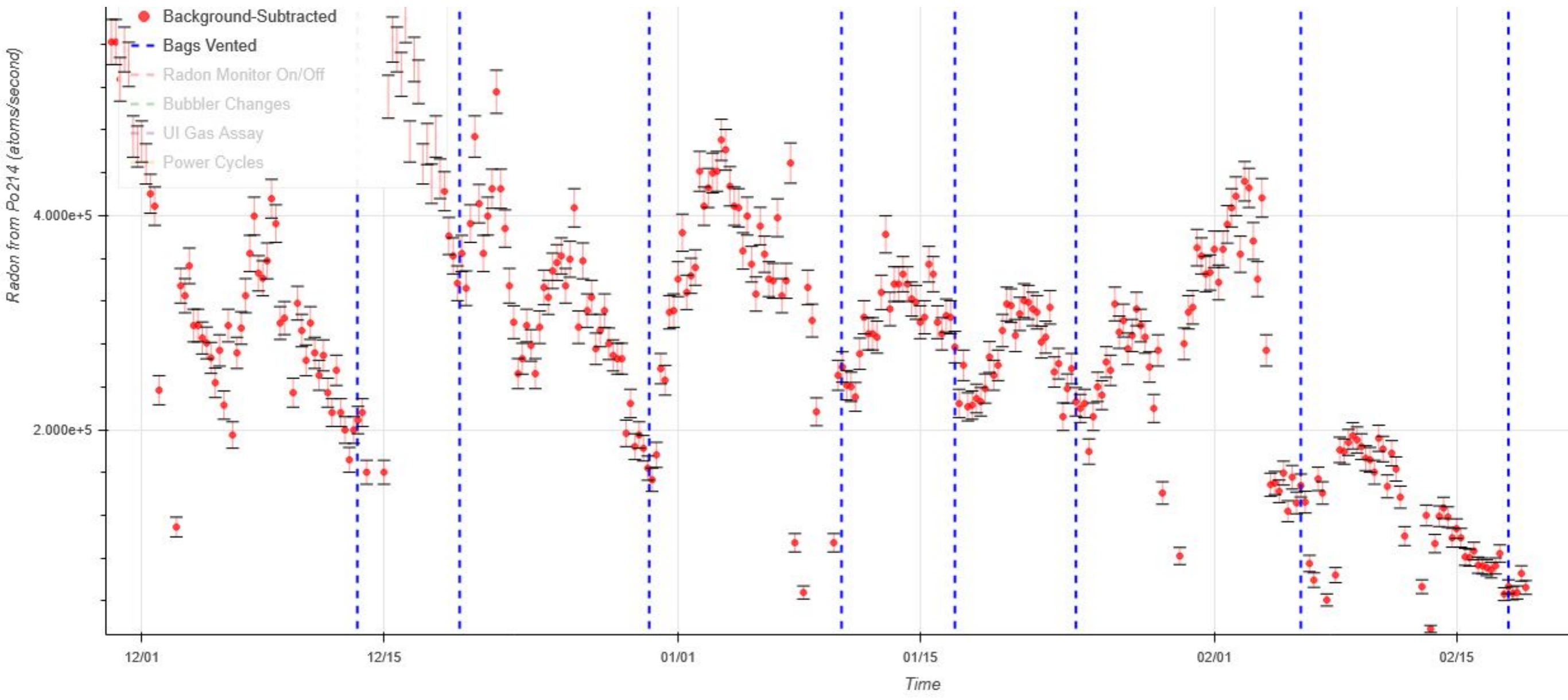
Radon Monitor Efficiency



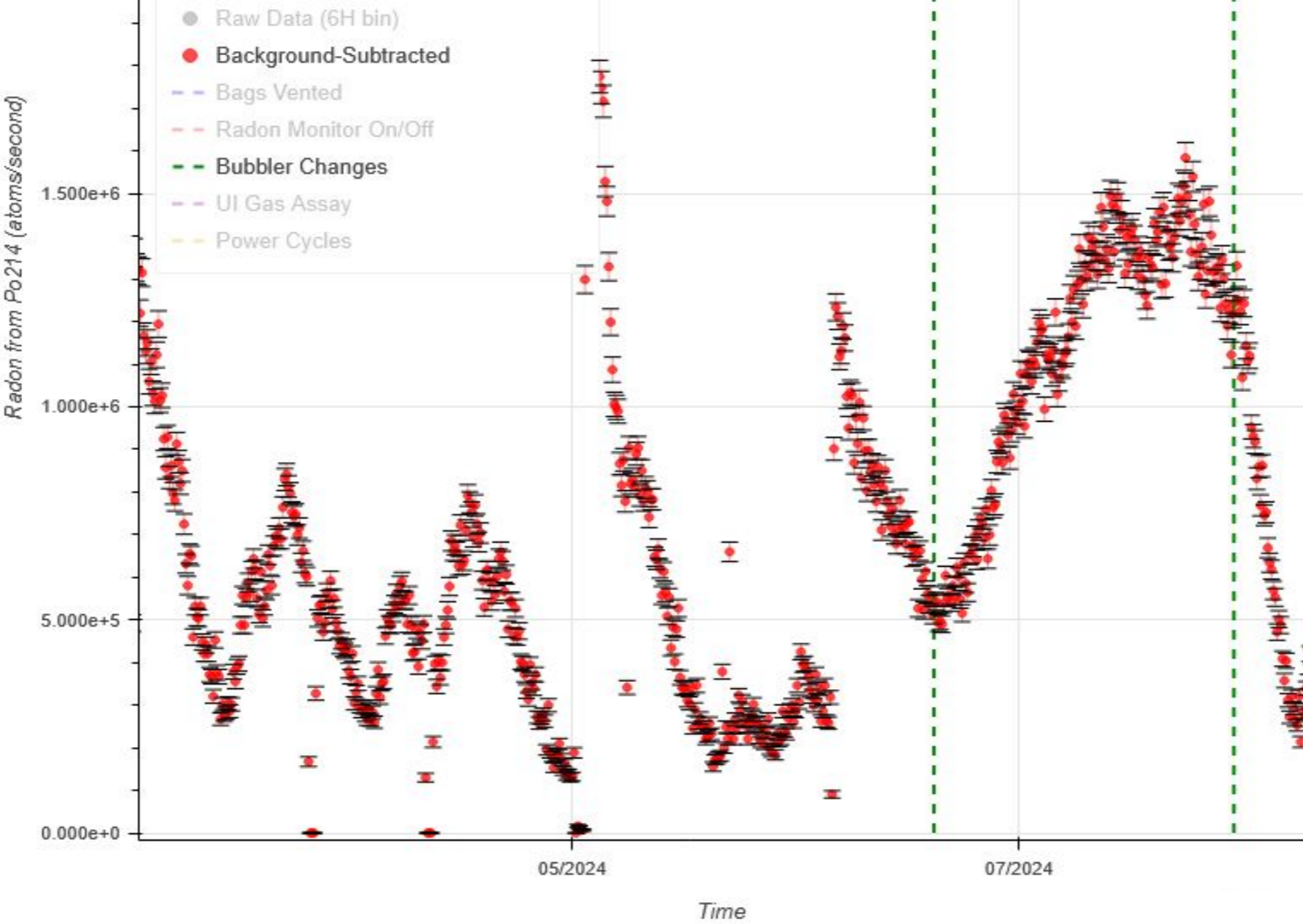
UI Radon Vs Time



UI Radon Vs Time



UI Radon Vs Time



Next Steps

Compare UI spike to detector data in SNO+

Investigate sources of N₂ Gas used in SNO+

Study Relationships between Radon and Detector Conditions in SNO+

Characterize a consistent high activity source



Special Thanks!

Christine Kraus

Aleksandra Bialek

Nasim Fatemighomi

Juliette Deloye

Matt Depatie

Mark Ward

Peter Qin

Other Work

Lucas Cell Calibration with
Gamma Ray Spectroscopy

Lucas Cell R&D

Gas and Water Assays, R&D

Embedded Radon Calibration
Source

Cold Gas Trapping Studies

