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Overview of Consumer Digital Radon Measurement Devices

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What do these devices look like?

EcoQube

EcoBlu

RadonEye

Lüft

View Radon

Wave Radon

Corentium Home

Device Output- EID/CRM

- Single Data Point (Daily, 7 day, long term)
  - Detector A
  - EcoBlu
  - Corentium Home
- Online Interface with Hourly Data
  - Ecosense EcoQube
  - Ecosense Radon Eye
  - SunRadon Lüft
  - Airthings View Radon
  - Airthings Wave Radon

Issue #1

Calibration

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Device Specifications

Manufacturer/Brand	Accuracy/Precision Specifications

Detector A	• Electronic integrating device
	• 48 h needed before an accurate reading can be displayed with recommendation of a longer timespan to give more accurate year-round average radon level
	• Accuracy/precision at 25 pCi/L
	  • For 7 d ± 12% pCi/L
	  • For 1 month ± 5%

Ecosense EcoQube	• Continuous radon monitor
	  • Uses app for hourly data collection
	• First reliable results in 1 hour
	• Accuracy/precision at 10 pCi/L
	  • < ± 10% after 10 h

Ecosense EcoBlu	• Electronic integrating device • First radon reading displayed after 10 min • Radon accuracy/precision at 10 pCi/L • < ± 14% after 10 h

Ecosense RadonEye	• Continuous radon monitor
	  • Uses app for hourly data collection
	• First reliable result within 1 h
	• Accuracy/precision at 10 pCi/L
	  • < ± 10% after 10 h

Device Specifications

Manufacturer/Brand	Accuracy/Precision Specifications
SunRadon Lüft	• Continuous radon monitor • Uses ap for data collection (used OneRadon database to collect hourly data) • Self calibrates in the first three hours and then continues to optimize over the following 7 d • Intended for long-term radon monitoring • 10% (7 d @ 4 pCi/L)

Airthings View Radon	• Continuous radon monitor
	  • Uses app for hourly data collection
	• Radon sensor is built for long-term monitoring
	• Typical accuracy after more than 30 d of continuous measuring at 5.4 pCi/L
	  • 7 d average: ±10%
	  • 2 month average: ±5%

Airthings Wave Radon	• Continuous radon monitor
	  • Uses app for hourly data collection
	• To obtain the most accurate readings, the radon sensor requires an initial 1 month period of data collection
	• Accuracy/precision at 5.4 pCi/L after 30 d continuous monitoring
	  • After 7 d ~ 10 %
	  • After 2 months ~ 5%

Airthings Corentium Home	• Electronic integrating device
	• First results in 24 h
	• Accuracy/precision at 5.4 pCi/L
	  • After 7 d ~ 10%
	  • After 2 months ~ 5%

Non-Calibrated Devices

- Shipped out with initial accuracy/precision
  - How long does this last?
  - Is this updated/monitored through software and how often?

- What are we telling consumers who call the hotline?
  - These devices are useful for actively monitoring your radon levels in your home, however, an approved device still needs to be used to make mitigation decisions. These consumer digital radon measurement devices have not gone through the same process as a similar looking professional versions and when making the decision to mitigate it is best to use the single use kits or professional level digital machines.

Issue #2

Ramp Up/Ramp Down Time

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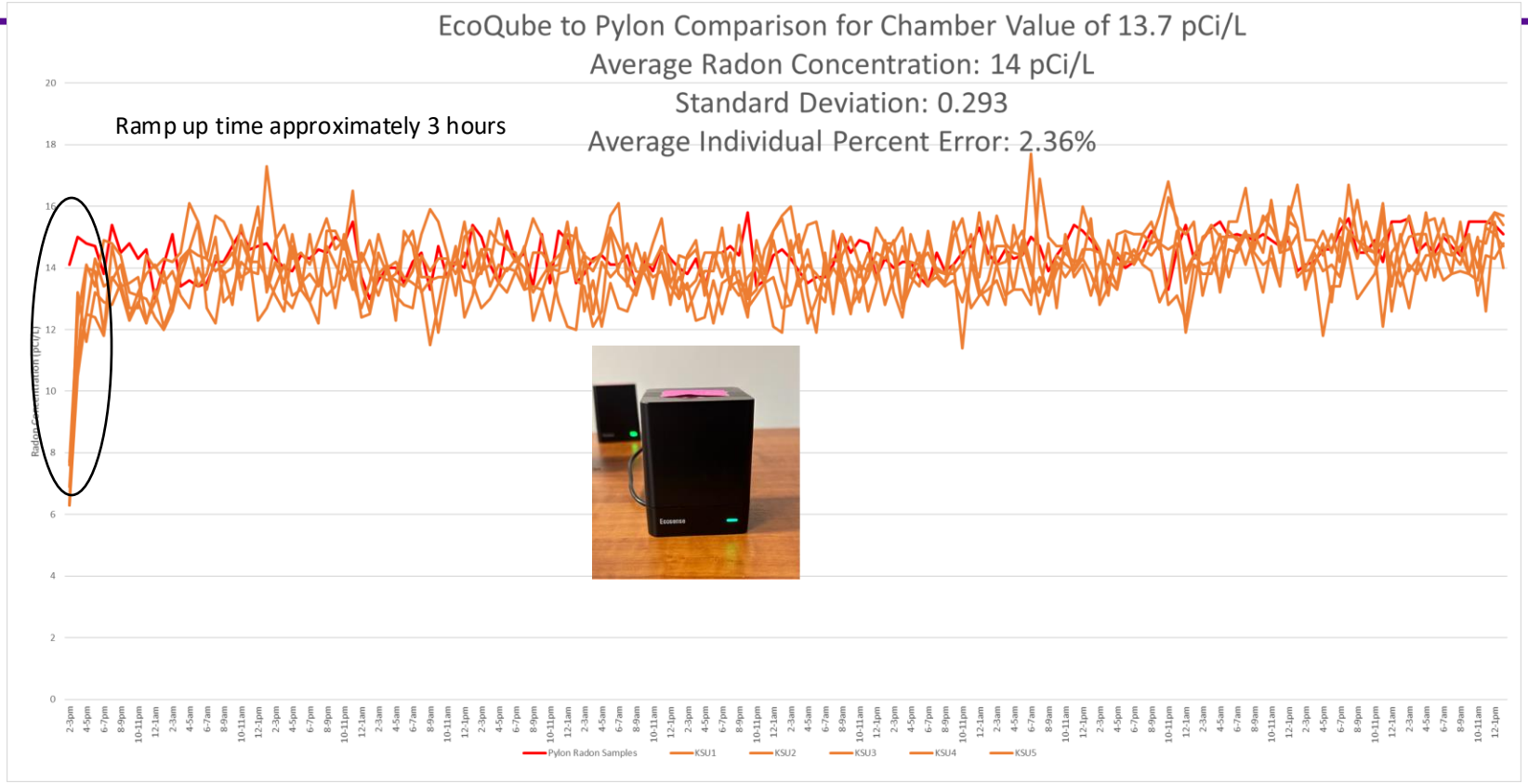
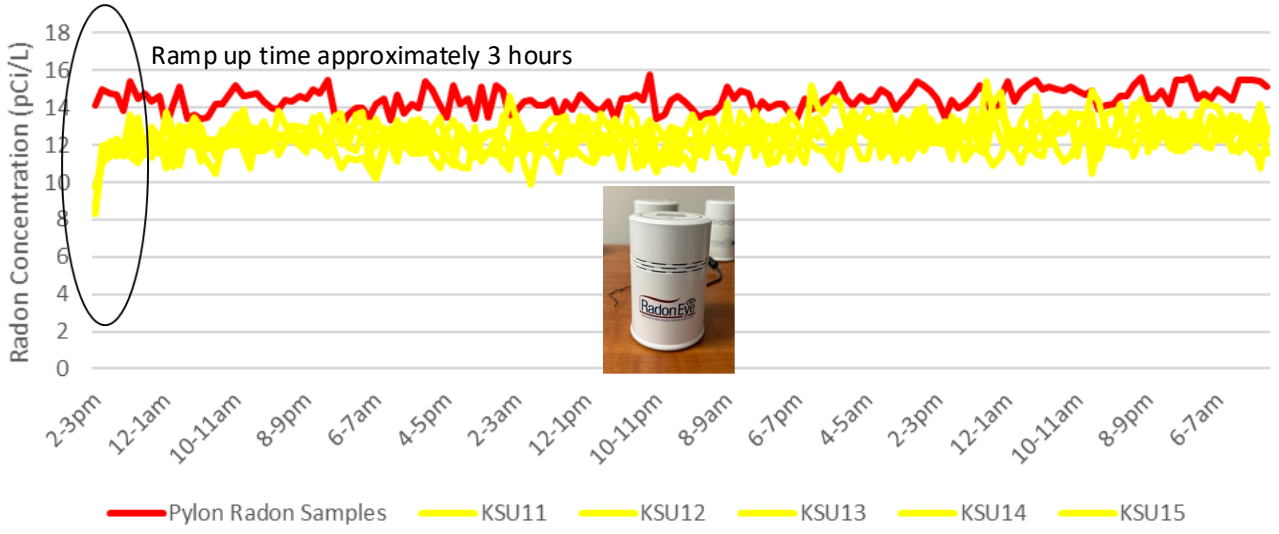


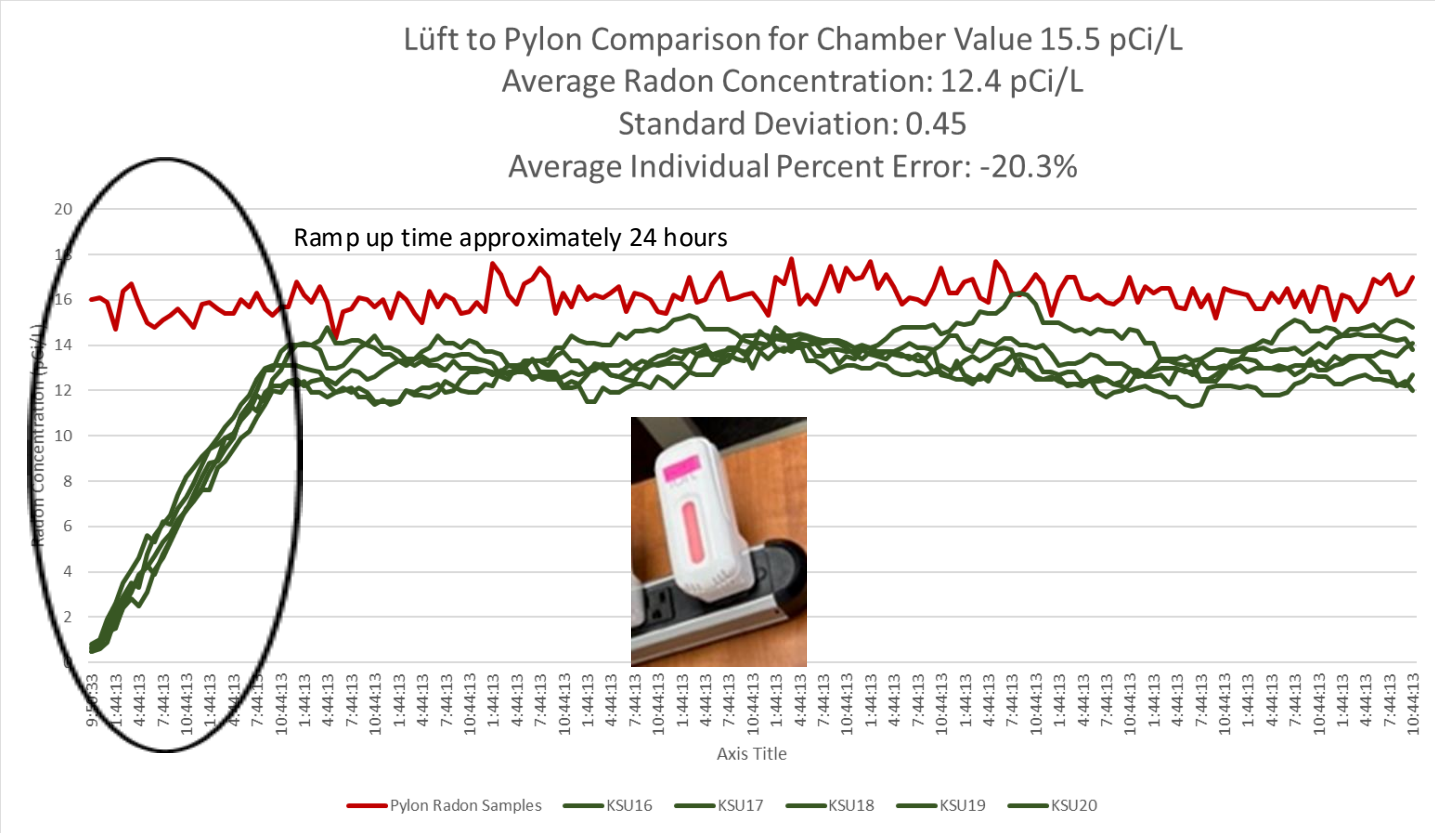
RadonEye to Pylon Comparison for Chamber Value 13.7 pCi/L

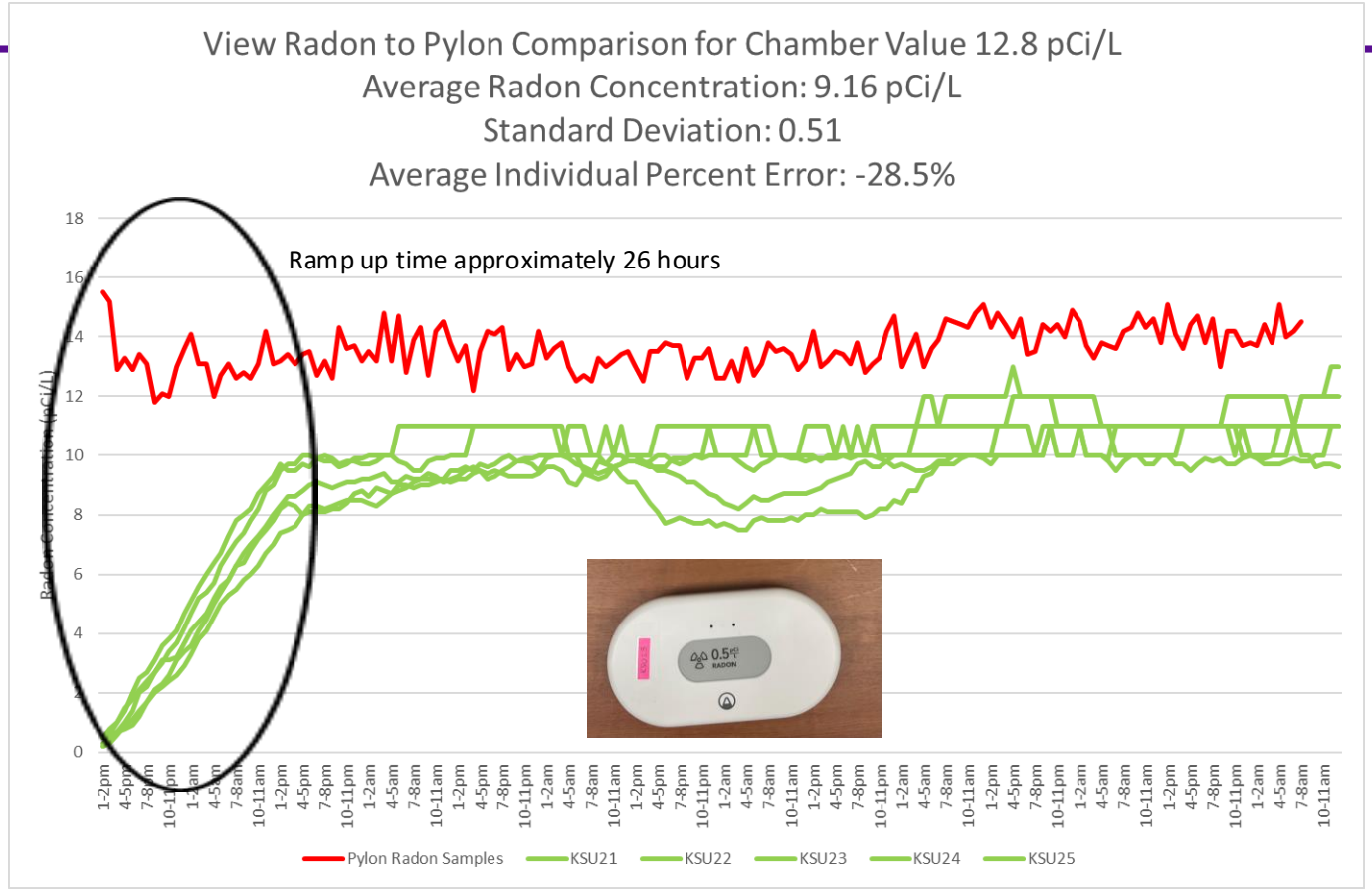
Average Radon Concentration: 12.4 pCi/L

Standard Deviation: 0.300

Average Individual Percent Error: -9.6%




Lüft to Pylon Comparison for Chamber Value 15.5 pCi/L
Average Radon Concentration: 12.4 pCi/L
Standard Deviation: 0.45
Average Individual Percent Error: -20.3%
Ramp up time approximately 24 hours
Radon Concentration (pCi/L)
Axis Title
Pylon Radon Samples
KSU16
KSU17
KSU18
KSU19
KSU20


View Radon to Pylon Comparison for Chamber Value 12.8 pCi/L
Average Radon Concentration: 9.16 pCi/L
Standard Deviation: 0.51
Average Individual Percent Error: -28.5%
Ramp up time approximately 26 hours
Radon Concentration (pCi/L)
0
4
6
8
10
12
14
16
18
Pylon Radon Samples
KSU21
KSU22
KSU23
KSU24
KSU25

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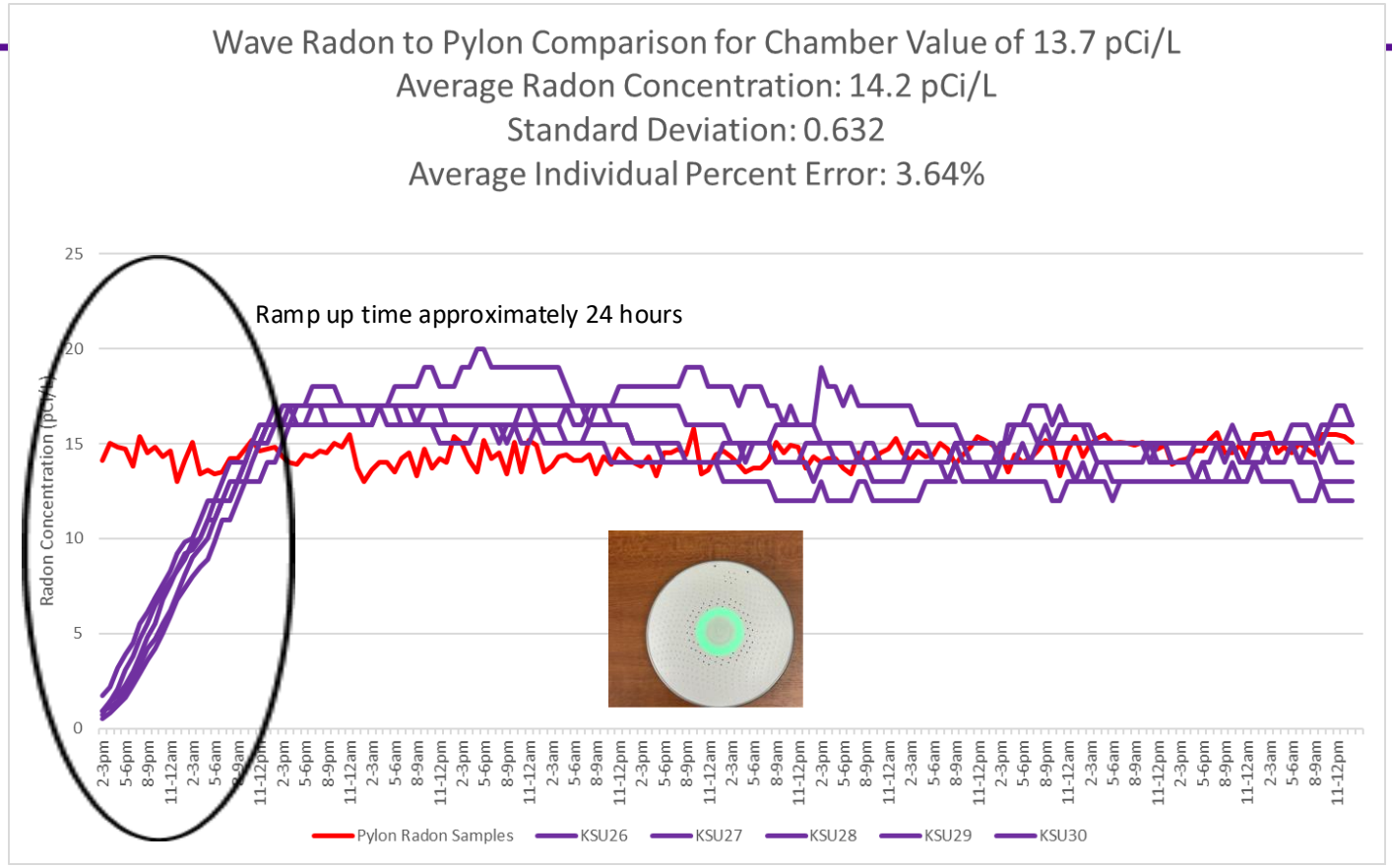

Why is this an issue?

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- Ramp up/ramp down times vary per device but can range from 3 hours to 36 hours
- Devices are still reporting 24-48 hour data averages without removing ramp up/ramp down times

- What are we telling consumers?
  - Most of the consumer digital devices require they be left in the same location for a minimum of 7 days to provide an accurate long term estimate.

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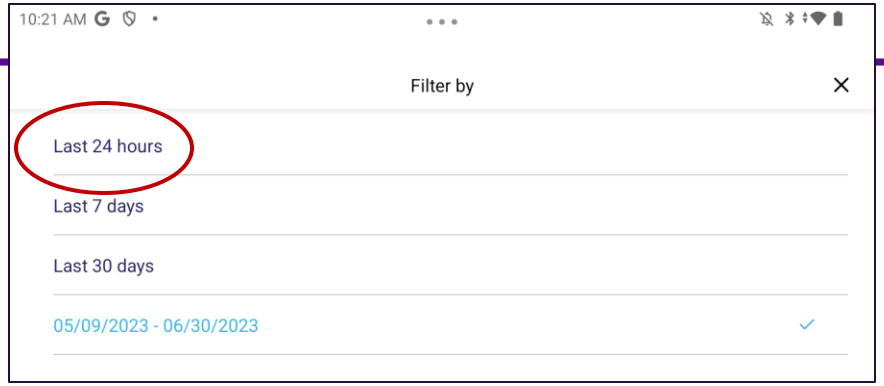
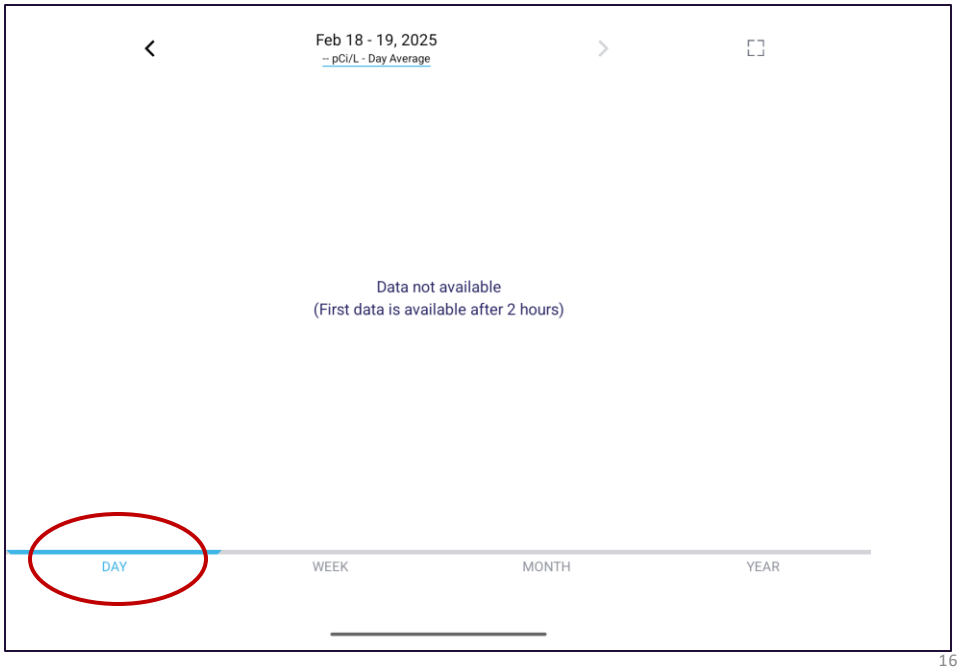
Issue #3

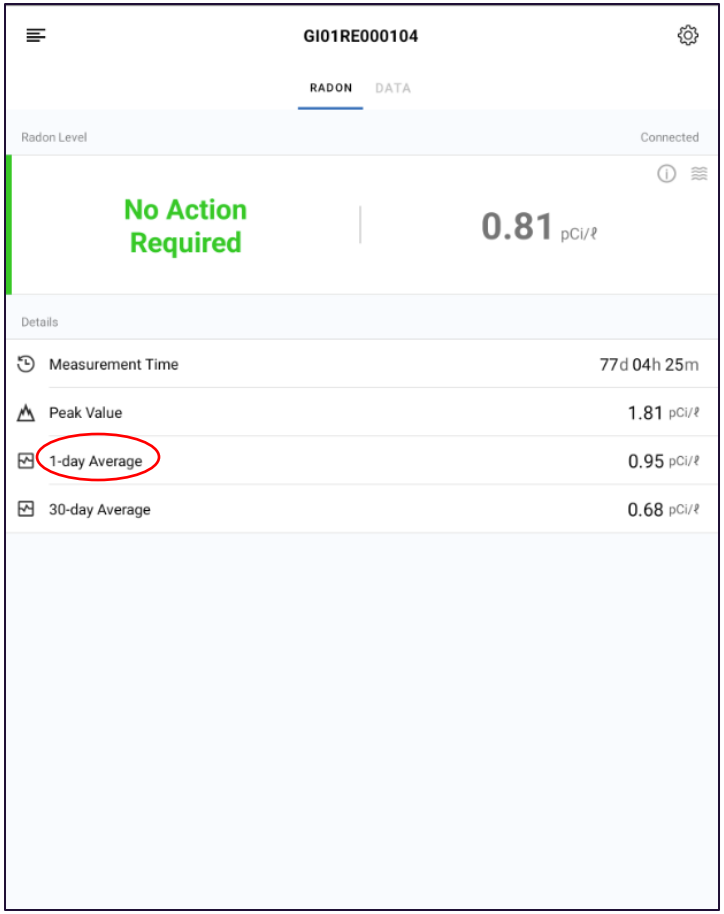
Measurement Period/Closed Building Conditions

EcoQube


10:21 AM
Filter by
Last 24 hours
Last 7 days
Last 30 days
05/09/2023 - 06/30/2023

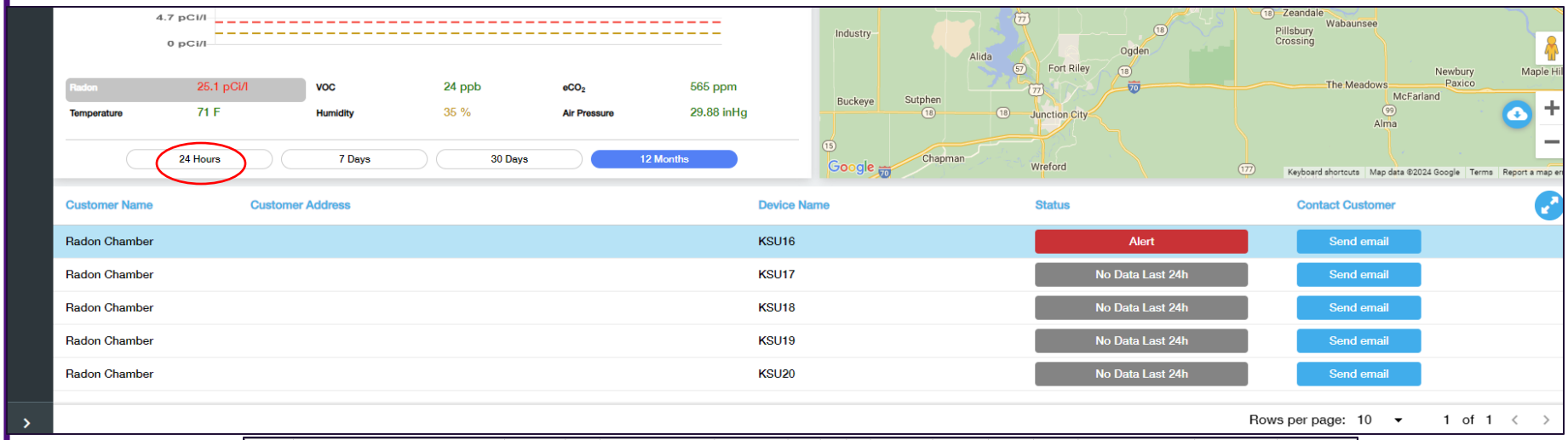

Feb 18 - 19, 2025
-- pCi/L - Day Average
Data not available
(First data is available after 2 hours)
DAY
WEEK
MONTH
YEAR

RadonEye



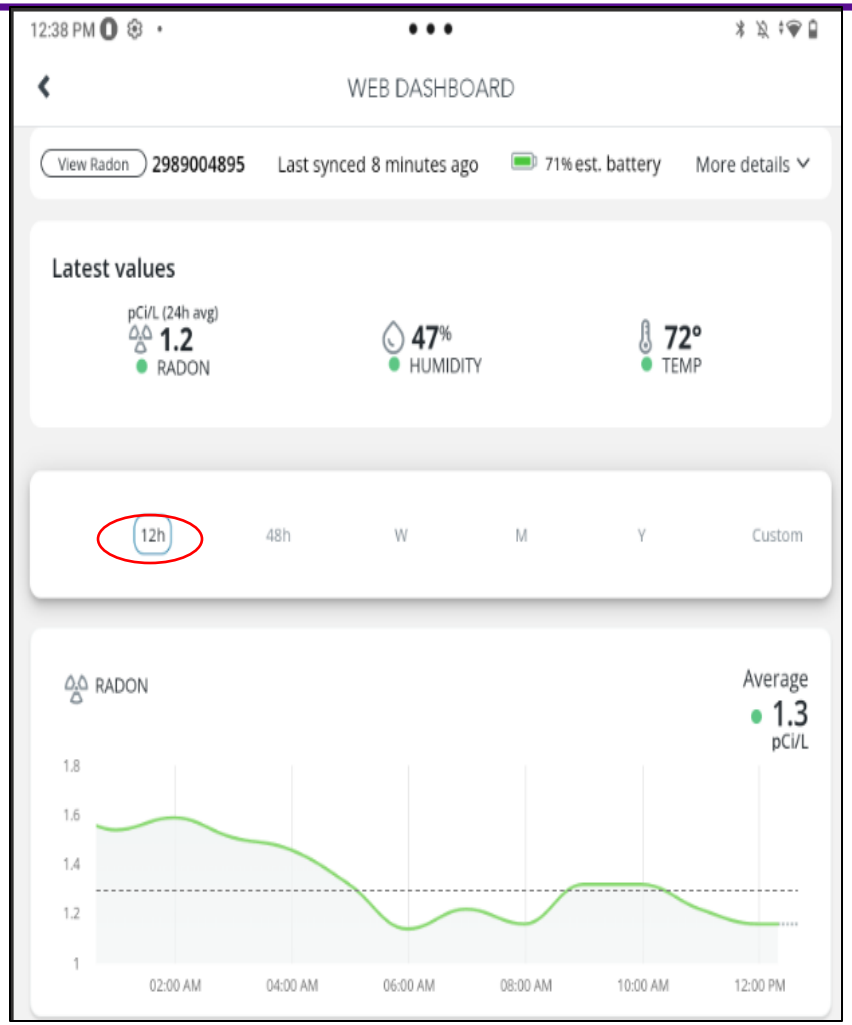

```
FTLAB RADON DATA FILE
MODEL NAME:     RD200
S/N:    GI01RE000104
Unit:   pCi/l
Time step:      1hour
Data No :       5225
1)      15.38
2)      19.41
3)      20.38
4)      21.43
5)      21.89
6)      23.24
7)      22.70
8)      25.24
9)      22.30
10)     21.70
11)     23.84
12)     23.65
13)     23.65
14)     24.43
15)     25.65
16)     28.59
17)     24.73
18)     26.14
19)     26.95
20)     25.16
21)     25.08
22)     26.16
23)     25.27
24)     24.73
25)     24.38
26)     24.27
27)     25.16
28)     25.14
29)     25.95
30)     24.46
31)     25.38
32)     25.65
33)     26.68
34)     24.95
35)     26.14
36)     25.32
37)     25.46
38)     25.03
39)     25.65
40)     26.03
```

SunRadon Lüft



Serialid	Location	DeviceName	Owner	Email	SyncDate	Radon	eC02	VOC	Temperature	AirPressure	Humidity	LogIndex	BuildingType	MitigationSystem	DeviceTimeZone
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 14:43	0	403	0	71	30.01	29	616	Residential Single Family	None	CDT
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 15:43	2.1	405	0	73	29.99	27	617	Residential Single Family	None	CDT
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 16:43	10.1	407	0	73	29.97	26	618	Residential Single Family	None	CDT
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 17:43	12.2	415	1	73	29.96	26	619	Residential Single Family	None	CDT
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 18:43	15.1	425	3	73	29.95	25	620	Residential Single Family	None	CDT
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 19:43	17	437	5	73	29.95	25	621	Residential Single Family	None	CDT
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 20:43	19.6	451	7	73	29.94	25	622	Residential Single Family	None	CDT
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 21:43	20.4	462	9	73	29.95	25	623	Residential Single Family	None	CDT
Luft_5E3A	2323 Anderson Ave, Manhattan, KS 66502, USA	KSU16		radonchamber@ksu.edu	8/7/2023 22:43	20.9	467	9	72	29.97	25	624	Residential Single Family	None	CDT

View/Wave Radon



Measurement Period/Closed Building Conditions

- All these devices have different minimum measurement periods, but the app allows them to filter for shorter time periods leading to confusion for consumer
- Closed building conditions are confusing for consumer's even when using a short term kit. More language to clarify closed building conditions and that they are necessary for entire measurement period less than 90 days.

What are we telling consumer's?

- Place device in same location for 7 days and check with manufacturer to determine the minimum length of time necessary for a test
- If you are allowed to test less than 3 days, establish closed building conditions before starting test and throughout test.
- If test is longer than 3 days maintain closed building conditions during test.

Issue #4

Detector Placement

Detector Placement

- Many consumer's want to move device from room to room, floor to floor etc. especially the devices that are battery operated
- What are we telling consumer's?
  - It may be tempting to move your device from room to room, but you need to make sure that you've collected enough data in each location before you move on to the next. Additionally, once you start a test, you must leave the device there for the minimum amount of time as recommended by the manufacturer. Again, please always follow up with an approved at home short term test kit before you make any sort of mitigation decision

Evaluation of consumer digital radon measurement devices: a comparative analysis

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- Evaluation of 8 devices published recently in the Journal of Radiological Protection:
  - https://iopscience.iop.org/article/10.1088/1361-6498/ad4bf1

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