# *Active and Passive Radon Measurement: From Data to Better Decisions*

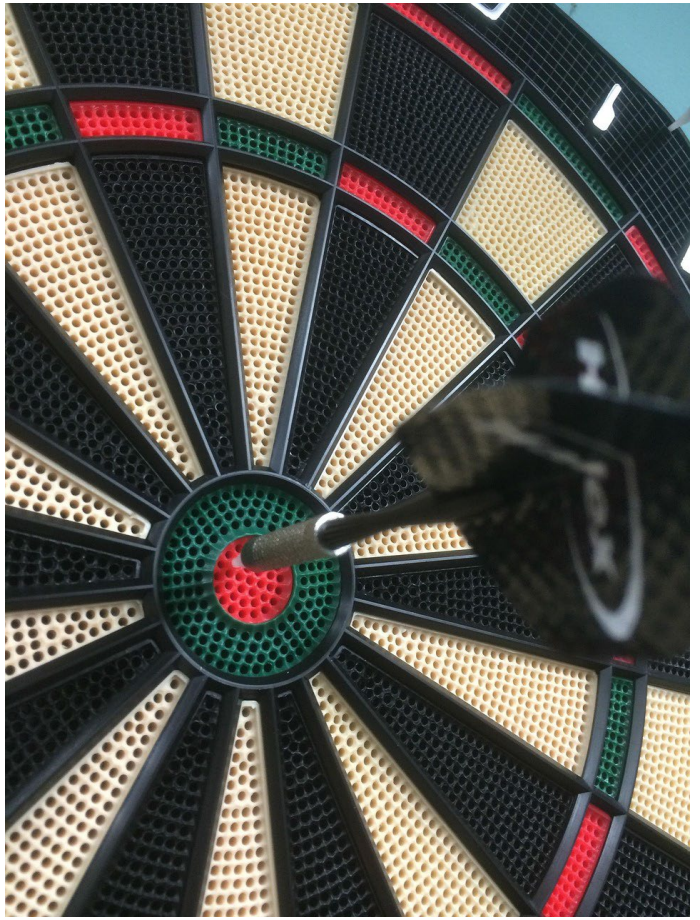
*A European Perspective*

Dr. Michael Westphal, **RadonTracer**

# The Measurement Is Not the Decision

- **Radon measurement is not the final goal.**
- **The goal is a good decision.**

Measurement
↓
Information
↓
Diagnosis
↓
Mitigation decision
↓
Verification



# Passive and Active: Different Information

- **PASSIVE**

  **Time-integrated measurement**

  Simple

  Low cost

  Many rooms simultaneously

  Excellent spatial coverage

  Provides an integrated result



# Passive and Active: Different Information

- **ACTIVE**

  **Time-resolved measurement**

  Continuous or frequent readings

  Shows temporal variability

  Reveals dynamic behavior

  Allows comparison with other parameters

  Provides an average **and** the time series



# Same Average. Different Information.

- **PASSIVE**

  **12,2 pCi/L**

  One integrated result.

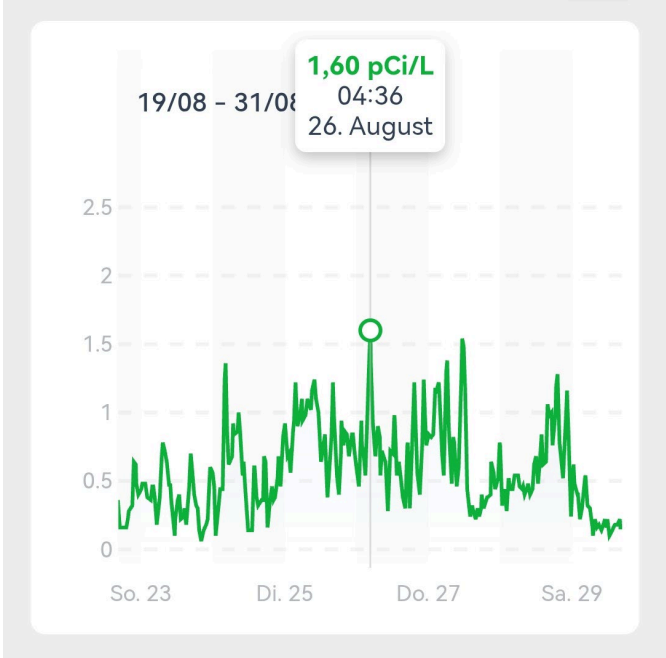
- **ACTIVE**

  [Show a 30–60 day radon time series]

  **Average: 12,2 pCi/L**

# Same Average. Different Information

- But also:
  - When did radon rise?
  - How quickly did it rise?
  - When did it fall?
  - Did ventilation affect it?
  - Did several rooms behave simultaneously?
  - Was there a daily or weekly pattern?



# The Strategic Question

- **Do we need active monitoring everywhere? Probably not.**
- **Use the right tool at the right stage.**

**Many rooms → passive screening**

↓

**Identify priority rooms**

↓

**Selected rooms → active diagnostics**

# A School: 30 Rooms → 5 Priority Rooms

- **Phase 1 — Screening: 30 rooms**

  Passive measurement

  ↓

  **5 rooms with elevated concentrations**

- **Phase 2 — Diagnosis: 5 rooms**

  Active monitoring

  ↓

  **Temporal patterns**

# Five Rooms May Not Mean Five Problems

- **Passive screening:**

  **Room A:** 16.2 pCi/L
  **Room B:** 14.9 pCi/L
  **Room C:** 16.8 pCi/L
  **Room D:** 15.7 pCi/L
  **Room E:** 16.5 pCi/L  At first sight: **“Five problem rooms.”**

- But active monitoring may reveal:

  **A → B → C → D → E**  with correlated changes or time delays.

# A Common Driver

- **Example:**

  **Fan starts**

  **↓**

  **Pressure field changes**

  **↓**

  **Radon increases first in one room**

  **↓**

  **Radon increases in adjacent rooms**



**The key question: One source and transport between rooms — or one pressure field affecting multiple entry points?**

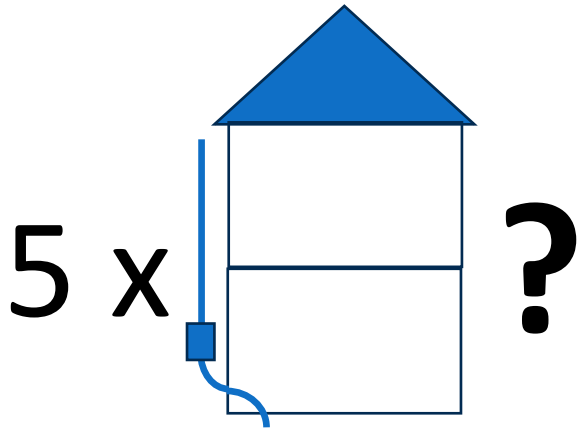
# From Five Problems to One Intervention?

- **Without temporal information:**

  **5 elevated rooms**

  ↓

  Potentially: **multiple mitigation systems**



# From Five Problems to One Intervention?

- **With temporal information:**

  **5 correlated rooms**

  ↓

  **1 common driver?**

  ↓

  Targeted investigation

  ↓

  **Potentially one targeted intervention**

# The Cold-Trap Effect – A Different Mechanism

- Warm outdoor air – cool basement
- Cool air remains trapped in the basement
- Temperature differences alter pressure conditions and airflow
- Radon entry and distribution may change
- Active monitoring can reveal temperature-related patterns




**Key message: Same building. Different conditions. Different radon behavior.**

# The Economics of Information

- **A small diagnostic investment** can prevent **a much larger mitigation mistake.**

- **Conventional pathway**

  Mitigate
  → Measure
  → Problem remains
  → Adjust system
  → Measure again

# The Economics of Information

- **A small diagnostic investment** can prevent **a much larger mitigation mistake.**

- **Diagnostic pathway**

  Screen
  → Diagnose
  → Design
  → Mitigate
  → Verify

# Measure Broadly. Diagnose Selectively.

- **A practical strategy**

  **1 Screen broadly:** Passive measurements

  ↓

  **2 Identify priorities:** Where are the elevated concentrations?

  ↓

  **3 Diagnose selectively:** Active measurements

  ↓

  **4 Understand the building:** Temporal behavior + pressure + ventilation + weather + building use

  ↓

  **5 Mitigate strategically**

# From Data to Better Decisions

- **We don't need to replace experience. We need to support experience with better data where it matters most.**
- **Passive measurement:** → spatial coverage
- **Active measurement:** → temporal information
- **Building diagnostics:** → understanding
- **Targeted mitigation:** → better decisions
- **Final statement:**

**Measure broadly. Diagnose selectively. Mitigate strategically.**