ANSI Standard: Performance Specifications for Measurement Systems Designed to Measure Radon Progeny in Atmospheres

David T. (Tom) Kendrick

Two Proposed Standards

- Radon Gas Standard N42.51
  - Title: *Performance Specifications for Measurement Systems Designed to Measure Radon in Atmospheres*
  - Chair - Dr. Phillip Jenkins
- Radon Progeny Standard N42.50
  - Title: *Performance Specifications for Measurement Systems Designed to Measure Radon Progeny in Atmospheres*
  - Co-Chairs – Dr. Robert Hayes & Mr. David Kendrick

Overview of Presentation

- Brief history of the origins of these complementary standards.
- The general organization of this standard as it appears currently
- Brief discussion of some of the issues that we are currently working through
- Turn the discussion over the John Rodgers to talk about one of these issues in more detail

Why Two Standards?

- The scope of radon and radon progeny instrumentation is quite large.
- Diverse environments & users
  - Residential indoor
  - Commercial indoor
  - Occupational indoor
  - Underground
  - Mills & processing facilities (indoor or outdoor?)
  - Outdoor (occupational & environmental)
- Divide and conquer

How Do We Divide It Up?

- Residential vs. occupational
- Indoor vs. underground/outdoor
- Active vs. passive sampling
- By technology (detection/measurement)
- Radon vs. thoron
- We chose gas vs. progeny

Why Gas and Progeny?

- This choice gave us the best separation of users, regulators, manufacturers, measurement technology, and calibration complexity.

- Radon Gas Measurements
  - Generally indoor and non-occupational settings
  - Marketplace includes instrument manufacturers, radon measurement professionals, and public consumption of the measurement product

- Radon Progeny Measurements
  - Generally occupational settings
  - Marketplace includes traditional instrument manufacturers and commercial & industrial users, with little public consumption of the measurement product

Charting the Course

Scope

This standard specifies minimum performance requirements and performance testing requirements for instruments designed to measure radon progeny in atmospheres. This standard addresses the needs of users, manufacturers, and regulators concerned with radon progeny measurements.

Charting the Course (Cont.)

Overview

The objectives of this standard are to provide performance and testing criteria for instruments and instrument systems that have application in radiation dose and/or risk assessment, and corrections and supporting measurements for atmospheric radioactive measurements of other radionuclides.

We specifically included this statement to include instruments that characterize radon progeny for the purposes of background subtraction, including many of the recent alpha CAMs.

Draft Standard Contents

1. **Scope**
2. **Overview**
3. **Normative References**
4. **Definitions and Acronyms**
5. **Units and Conversions**
6. **Metrics of Instrument Performance**
7. **Classification of Instruments and Instrument Systems**
8. **General Performance and Testing Criteria**
   - **Radiation Response – Radon Progeny As Target Analytes**
   - **Radiation Response – Radon Progeny as Interfering Radionucludes**
   - **Sampler Design**
   - **Electronic Criteria**
   - **Interfering Responses**
   - **Mechanical Criteria**
   - **Environmental Criteria**
   - **Calibration and Maintenance**
   - **User Documentation**

Draft Standard Contents (cont.)

9. **Class Specific Performance and Testing Criteria**
    1. Grab Sampling Instruments
    2. Continuously Sampling Instruments
10. **Documentation Requirements**
11. **Bibliography**
12. **Annexes**
    1. Radon Decay Chains
    2. Radon Progeny Equilibrium
    3. Aerosol Sampling Considerations
    4. Filter Media Considerations
    5. More to come…

Current Discussion Topics

- Definition of a procedure blank
  - Presentation by John Rodgers
- Sampling inlet requirements

Sampling Inlet Requirements

- Why are the sampling inlet requirements causing us difficulty?
  - Radon progeny activity covers a wide range in size (~1 nm to >> 10 μm)
  - Not all instruments will be designed to representatively sample the ambient aerosol, especially if the instrument is designed to minimize radon progeny as an interfering agent.
  - A variety of techniques may be used to achieve the desired aerosol sampling characteristics.

Sampling Inlet Requirements

- Many of the conventionally true rules don't apply to all instruments that fall under the scope of this standard.
- The approach adopted by the writing group is to require the manufacturer to:
  - Specify the aerosol size range over which the instrument operates
  - Characterize the collection efficiency over this size range (40 CFR 53.40-44?)
  - Apply as many of the conventional rules as practical without limiting the instrument design unnecessarily

Conventional Aerosol Collection Rules

- Example of a Non-Limiting Requirement:
  - ***Requirements Regarding Location of the Air Moving Device***
  - The air or atmosphere moving device (pump) shall be placed down stream of the collection medium and/or detector.
- This requirement does not limit instrument design with respect to managing radon progeny and other radioactive aerosols, and it does follow good aerosol sampling practice.

Conventional Aerosol Collection Rules

- Example of a Limiting Requirement:
  - ***Requirements Regarding Flow Obstructions***
  - The number and severity of obstructions to air flow between the inlet and collection medium and/or detector shall be minimized to limit losses of aerosols in the sample flow path to a minimum. Flow obstructions are considered to include: bends or elbows, reductions in the cross-sectional area of the flow line and protrusions into the flow path.
- Consider an alpha CAM with a screen to filter unattached radon progeny
- How do we convey the merits of the general rule and still allow instrument designers the freedom to obtain a specific performance objective with respect to managing the activity size distribution?

Near-Term Activities

- Northern New Mexico sub-group,
  - Planning two meetings prior to HPS annual meeting
- Las Vegas sub-group
  - Planning one meeting prior to HPS annual meeting
- Plan to hold a complete writing committee meeting at the HPS annual meeting

Summary

- We have defined the scope for the standard(s).
- We have picked some of the low hanging fruit.
- We are now engaged in the meat of the standard.
- Forward progress is being made, albeit slowly.