Quality Control Program for High Precision Radiation Dose Delivery

Jordan D. Noey, Colin J. Stewart
Radiological Health Engineering Lab, University of Michigan
Kimberlee J. Kearfott, kearfottk@umich.edu
Consortium for Monitoring, Technology, and Verification (MTV)

Introduction and Motivation

Verification and monitoring of calibration source

- Precision measurements in radiation detection
- Differentiate between stochastic and situational
- System for establishing statistical confidence

Mission Relevance

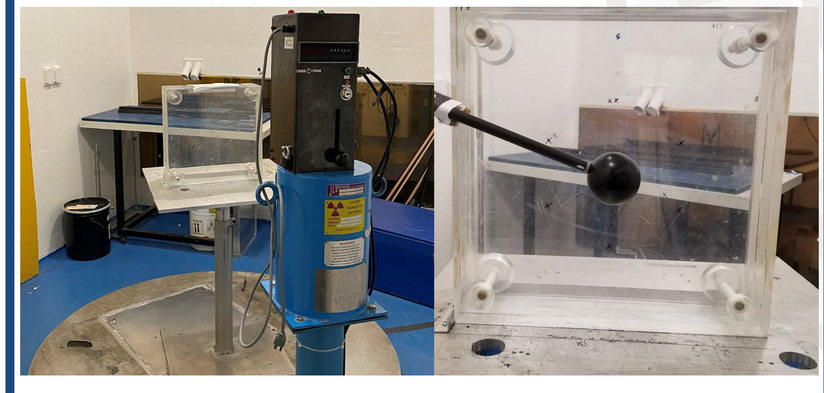
Reliance in nuclear safeguard measurements

- Better determination of radiation background
- Properties of certain sources and detectors
- Knowledge of measurement environments

Technical Approach

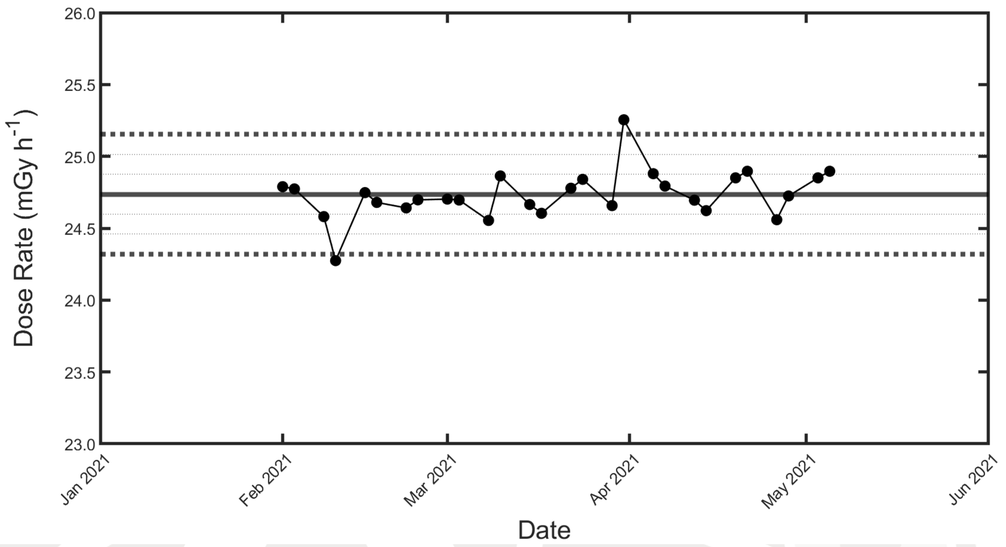
Weekly/monthly measurements at eight positions

- 240 GBq Cs-137 Irradiator
- Exradin A5 100 cc spherical ion chamber
- Keithley 6517A electrometer



Irradiator (left) and ion chamber with phantom (right)

Results



Control chart (left) and irradiator malfunction error 04/05/2021 (right)

Expected Impact

Awareness in effects of measurement process

- Effects from source, equipment, and operator
- Possible patterns from data collection
- Statistical anomalies outside stratification

Conclusion

Statistical monitoring techniques improve precision

- Reduces measurement uncertainty
- Provides statistical basis for acceptability
- Identifies assignable cause errors

MTV Impact

Connections through statistics in scientific community

- Projects with national labs in nuclear technology
- Industry applications
- Graduate-level laboratory courses

Next Steps

Implement phase II quality control techniques

- Test and refine control limits
- Implement designed experiment to test limits
- Use other process monitoring techniques

Contact email: noeyjd@umich.edu

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