



Preliminary Performance Testing of Ukrainian SBM-20 Geiger-Muller Tubes

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Introduction and Motivation

Tube Characterization

- Operational parameters of SBM-20 tubes is questionable
- Validity of tubes or data credibility is unknown
- No current acceptance criterion or set of parameters
- Testing procedure for mass quantities of like Geiger tubes

Mission Relevance

Nuclear Awareness and Teaching

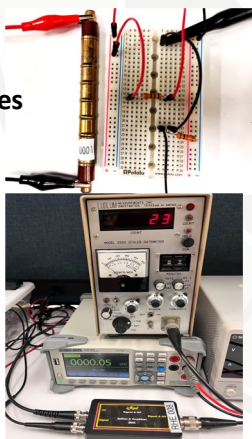
- Classroom or outreach application
(*layman's introduction to radiological sciences*)
- Combat the effects of deep-rooted nuclear terror
- Statistical justification of older detection equipment

Technical Approach

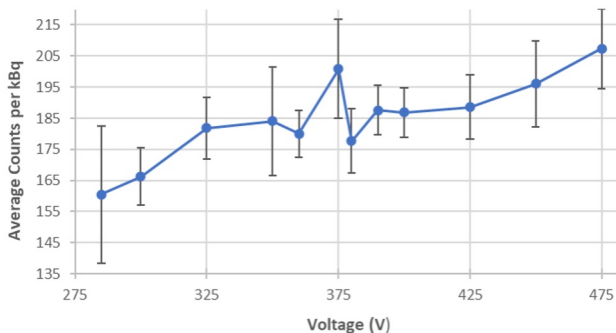
Repeated 1 min source measurement
3 cm away from Geiger tube using
185 kBq Cs-137 and 370 kBq Co-60 sources

- Ukrainian SBM-20 Geiger tubes
- Ludlum Model 2200 Scaler-Ratemeter
- iRad splitter box for Ludlum C cable
- Bread-boarded Geiger circuit
(*tube to ratemeter connection*)
- Testing at five longitudinal locations

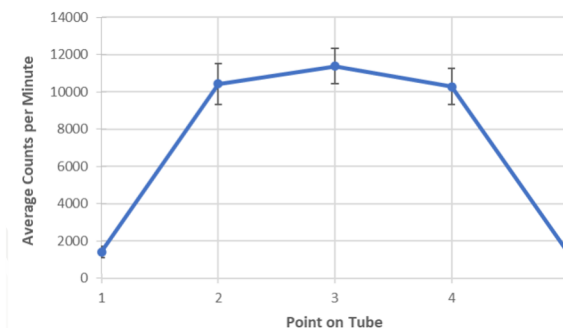
*Geiger circuit (top), and
testing system (bottom)*



Results



Experiment: voltage counting curve
Purpose: optimize sensitivity



Experiment: longitudinal sensitivity
Purpose: study anode non-uniformity

Expected Impact

Ease of Detector Use and Access

- Optimization metric for various types of tubes
- Better implementation of Geiger tubes
- Applicable in the future development of homemade radiation detectors

MTV Impact

Research and Experimentation Experience

- Real world applications of the research cycle and scientific method to undergraduate students
- Introductory experiment formulation
- Professional development and networking opportunities through MTV events

Conclusion

Tube Optimization and Validity

- Acceptance criterion: (200.8 ± 15.9) (cpm/kBq)
- Sensitivity apex: ~ 200 (cpm/kBq)
- Optimal operating voltage: 375 V
- Maximum angular dependency at tube center

Next Steps

Further testing

- Effects of varying current and resistance
- Determine reasonable workable ranges
- Create a reproducible testing protocol
- Implement similar protocol for other tubes

