SAND2019-7648C

CASE STUDY: CONFINED AREA MEASUREMENT WITH MULTIPLE SOURCES PRESENT

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Measurements for Nuclear Material Control & Accountability

- Detect theft or diversion of accountable nuclear material
  - Conduct gamma spectroscopy and mass measurements at different locations

Discussion Outline

- Measurement limits
- Material Measured
- Room and measurement geometry
- Measurement factors
- Measurement analysis
- Book energies and spectra
- Measurement concerns
- Questions?

Measurement Statistical Limits

- Historic measurement data
- Using existing baselines and Calculating percent differences
- Like instruments and container type
- Sample set >30 for specific energy's
- If <30, all book energies combined are used
- Acceptance/ Rejection limits indicating tampering or diversion if outside 3 sigma

CONFIRMATION MEASUREMENT OF AmBe SOURCE

ROOM LAYOUT AND DETECTOR GEOMETRY

Measurement Factors

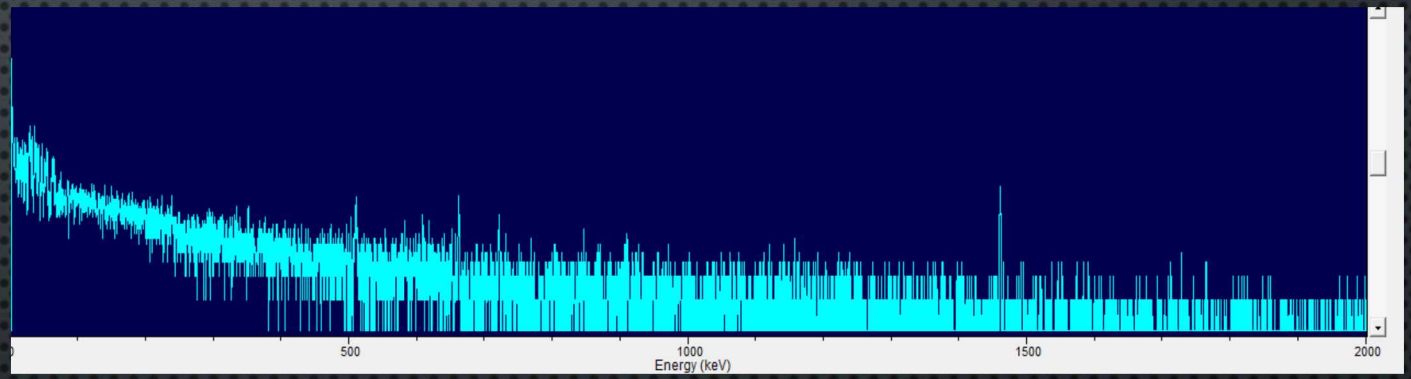
- 4.61m from top of collimator
- ≈ 40% deadtime
- Source set on jig
- High neutron dose from source
- 5 identical sources in room in friocell
- Background taken with all sources in friocell

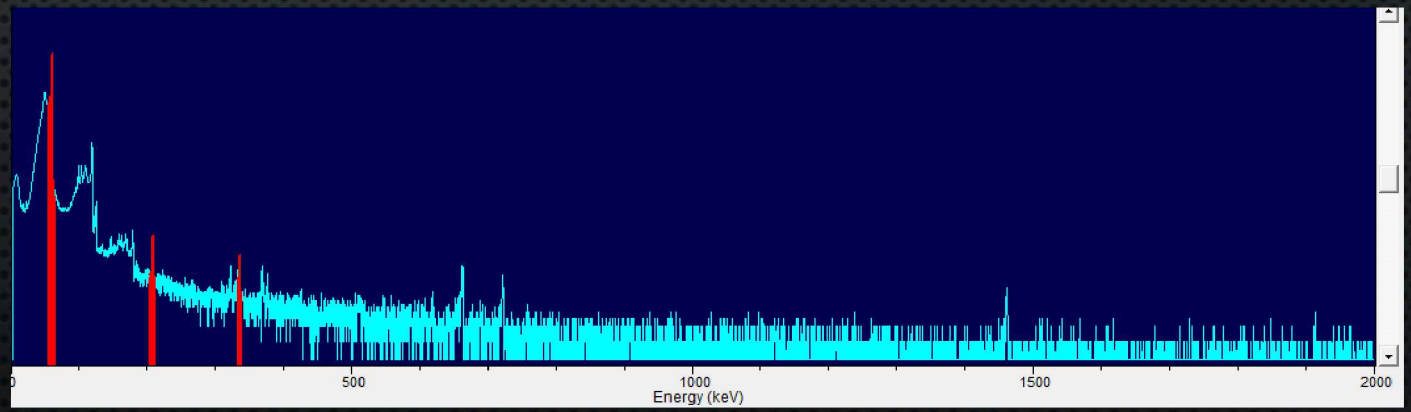
Analysis Information

- Identify material
- Identify 3 strongest peaks coming from Am-241
- Collect peak area counts for each of the 3 peaks
- Normalize peak areas to CPS for each peak
- Set each peaks baseline target value in CPS as a bare source

AM-241BOOK ENERGIES AND SPECTRA

- 59.54 KEV ≈ 18887.19 CPS
- 208.01 KEV ≈ 2.34 CPS
- 335.37 KEV ≈ 1.03 CPS





Future measurement concerns

- Distance from source
- Angle of detector to source
- Background interference
- narrow limits

Mitigation actions

- Pictures taken to replicate measurement geometry for future measurements
- Notes taken
  - Instruments
  - Location
  - Detector orientation
  - Information regarding measurement direction and other factors