LA-UR-21-21858
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Title: C-NR Countroom Overview

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Intended for: Web

Issued: 2021-02-24

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Los Alamos
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C-NR Countroom Overview

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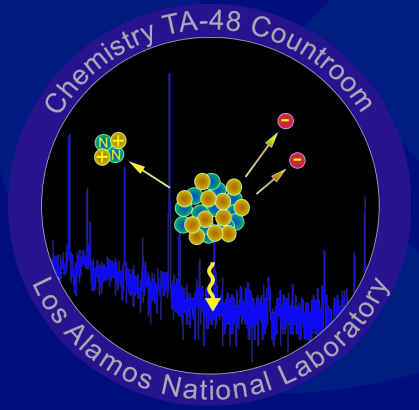
February 2021



What We Do

- Perform qualitative and quantitative assay of gamma, beta, and alpha-emitting radionuclides in a variety of matrices and over a wide range of activity levels.
  - ~1×10^7 atoms to 100 mR/hour
  - Focus on fission product measurements
  - Expertise in alpha spectrometry
  - Ability to develop custom measurement system and methods

We work closely with, and rely on, fellow C-NR teams:

Clean Chemistry, Radiochemistry, Nuclear Chemistry, and Assessment

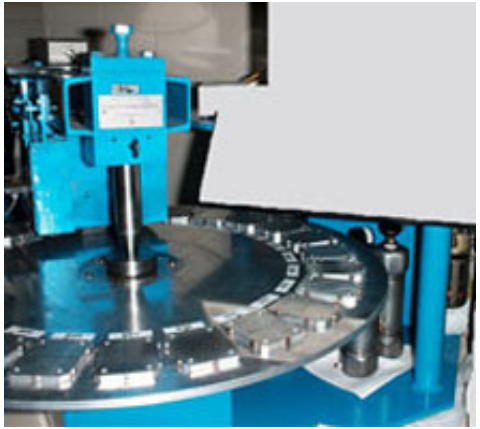
Who We Are

- Michael James – Team Leader
- Mitzi Boswell - Detector development
- Donald Dry – Gamma Spectroscopy, Field Measurements
- Sarah Chong – UGS Student
- Donnie Cox - Electronics
- Malcolm Fowler - Team Member Emeritus; Historical Knowledge
- Tom Gamble – Computer Support
- Lisa Hudston - Sample Management; Alpha Spectrometry; Liquid Scintillation
- Camilla Lance – Countroom Manager
- Randy Rendon - Mechanical
- Jennifer Romero - Alpha counting, Bioassay and Sample Management support
- Dillon Soenke – UGS Student
- Joshua Williams - Counting Systems Upgrade Engineer
- Ben Zimmerman - Computer Support

Countroom Programs

- Founded in support of the US Nuclear Testing program
  - We have a long, proud history and heritage
  - Counter 6 development memo (dated May 1951 has Oppenheimer's name on the distribution list)

- Currently supported by a number of programs
  - ~70% National Security programs
  - ~20% Internally funded (e.g. Pu & H3 Bioassay)
  - ~10% Other programs
  - Medical Radioisotopes
  - Separations Chemistry
  - Advanced methods development
  - *In-Vitro* Bioassay Program (DOELAP accredited)



Automated Beta Counter

- Customers include other LANL programs as well as DOE and DOD sponsors

Bioassay

- *In-Vitro* Analysis from LANL workers
- Alpha Spectrometry for Pu-238 & Pu-239/240
  - ~3000 routine and priority samples year
    - Samples prepared for alpha counting by Clean Chemistry Team
  - R&D efforts for dosimetric studies

- Liquid Scintillation Counting for Tritium
  - ~2000 routine samples per year

C-NR's Bioassay program also includes Am and U analysis performed by Clean Chemistry Team.

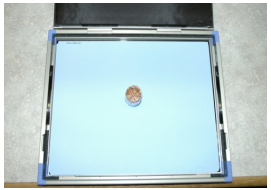
NDC&A + NTNF

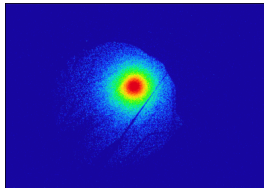
- Nuclear Debris Collection and Analysis Program
  - Support National Test Ban Treaty verification program by analyzing air particulate samples.
  - Expand analytical capabilities with R&D and exercise efforts with partner laboratories.
- National Technical Nuclear Forensics
  - Maintain preparedness to provide full suite of radiometric analyses of samples collected from a domestic nuclear detonation. Data expediency and accuracy are key factors in responding to this national emergency.

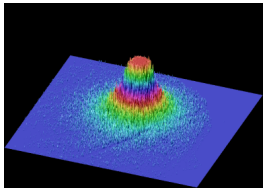
Countroom Operations

- Since ~1950, occupies >7000 sq ft at LANL Tech Area 48
  - Most of the 200 wing
  - 4 rooms in the basement of RC-1
  - TA-41 Tunnel
- Operates 24x7x365.24 with parts of 13 people
- Makes ~55,000 measurements annually
- Operational systems
  - 60+ HPGe Detectors (8 automated, 7 well detectors)
    - Calibrated for multiple sample geometries and source-to-detector distances
  - One GeLi gamma detector in continuous use since 1978
  - 15 Beta counters (6 Automated)
  - Approximately 100 alpha counters.
  - Autoradiography activity mapping
  - Liquid Scintillation Counters
  - Compton Suppression Counter

Automated “racetrack” HPGe detector



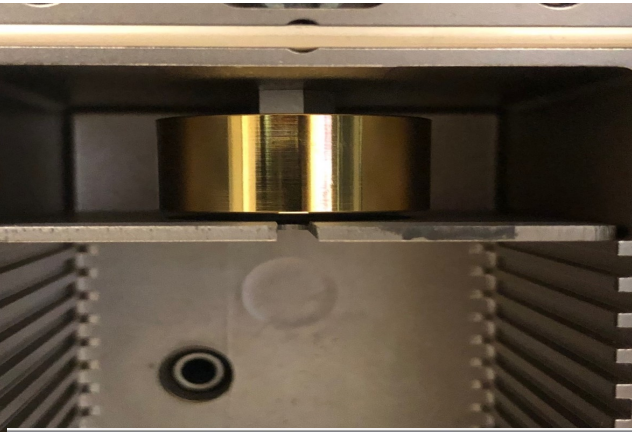


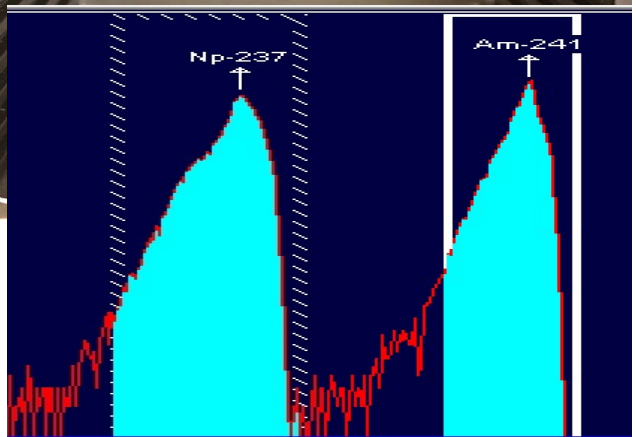


Effects of Geometry and Distance

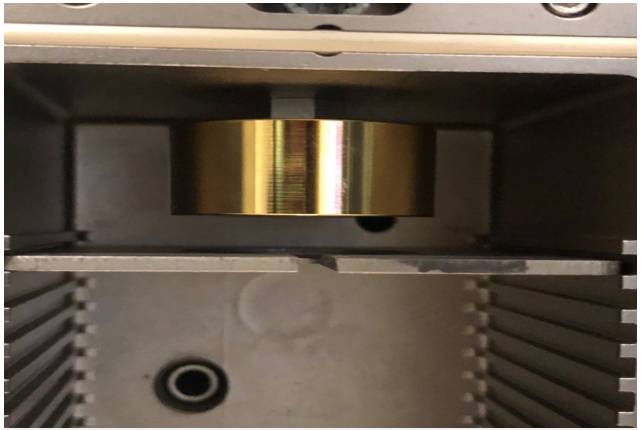
Alpha Spectrometry Example

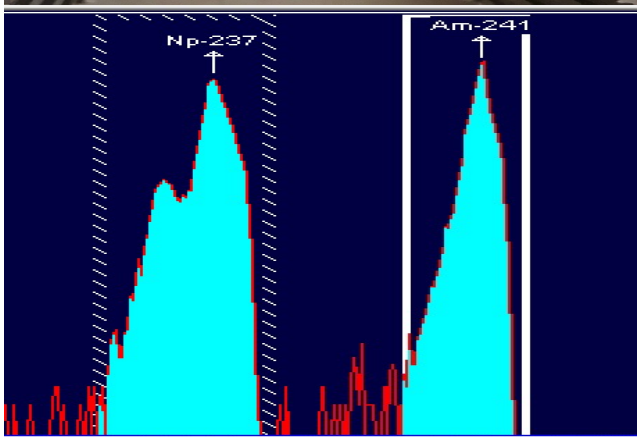
Shelf 1



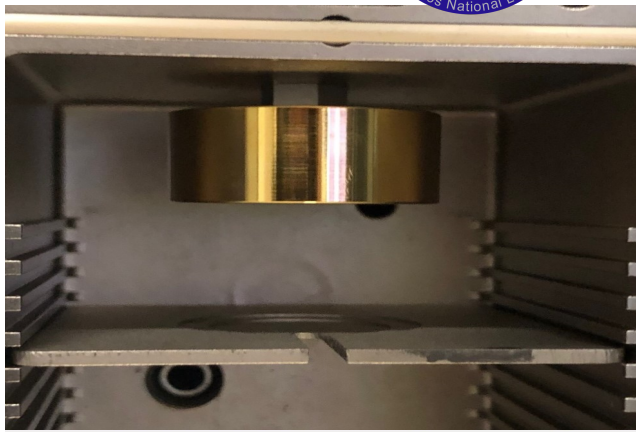


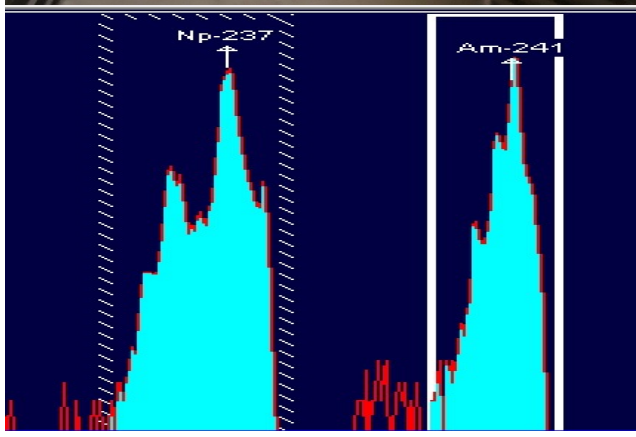
Shelf 2





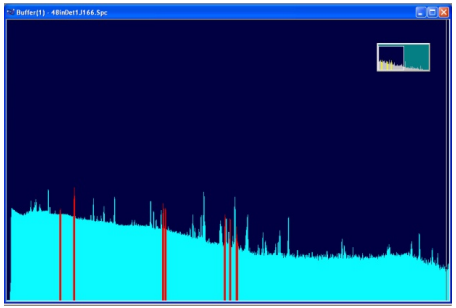
Shelf 5

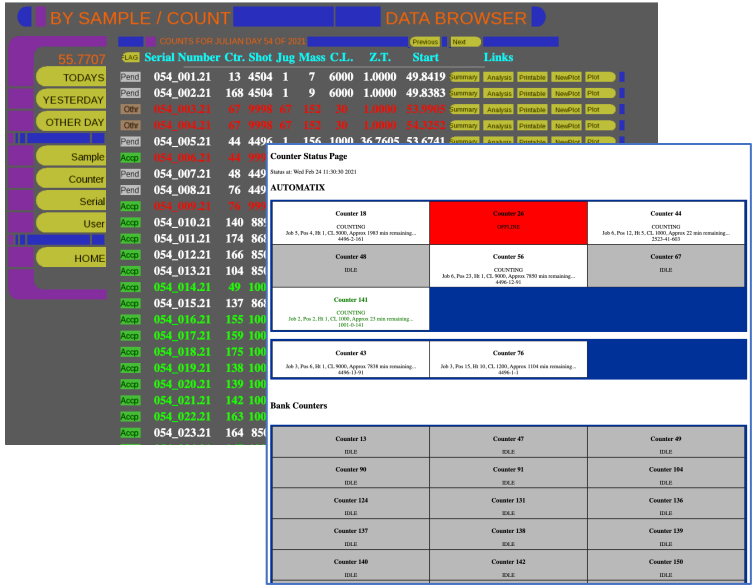




Countroom Data

- Beta counting data from mid 1950s to present
- Gamma spectra from mid 1970s to present
- Database-backed Web visualization tools
  - Web-based data for the past 15+ years
  - Grows at ~10,000 rows and 1.5Mb per day
  - View, analyze, extract, QA and report data
  - Efficiency calibration support
  - New tools added regularly





Development Areas

- The team is consistently working modernization efforts
- The team is actively involved in new instrument and methods development
- Areas of interest include:
  - Low background counting and spectroscopy systems
  - Modernization of data systems and analysis tools
  - Data acquisition hardware and techniques
  - Specialized spectrometry systems (e.g., HPGe Clover system)