

Summary of Workshop Abstracts:

1. DOELAP/MAPEP (Monday, 30 October 2023 from 1:00-3:00, Coral C)

**U.S. DEPARTMENT OF ENERGY LABORATORY ACCREDITATION PROGRAM (DOELAP)
AND THE DOE MIXED-ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
COMBINED WORKSHOP**

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This workshop provides current DOELAP and MAPEP program status updates and technical presentations on topics relevant to radiobioassay and radiochemistry programs. In Session 48, MAPEP produced and distributed a natural urine sample containing chelated plutonium. Participants could choose to receive this sample to test and verify the capability of their radiochemistry procedures. The study results will be discussed during the workshop.

Through this workshop, the DOELAP/MAPEP team encourages communication between program personnel, participants, and stakeholders, and seeks ideas for program improvement. The workshop will conclude with a follow-up question/answer period and informal open forum to encourage communication and feedback from interested parties.

2. Hidex/LabLogic (Monday, 30 October 2023 from 1:00-3:00, Coral D)

3. Isotope Dilution Mass Spec (Monday, 30 October 2023 from 3:15-5:00, Coral C)

**WORKSHOP ON ISOTOPE DILUTION MASS SPECTROMETRY FOR BIOASSAY AND
NUCLEAR FORENSICS**

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Isotope Dilution Mass Spectrometry (ID-MS) is a highly accurate and precise technique for measuring isotope ratios and elemental concentrations by mass spectrometry. The method relies upon 'spiking' the unknown quantity of the element in your sample with a known quantity of spike (it is also often termed tracer), and then determining the isotopic composition of the mixture. With the growth in availability of commercial mass

spectrometry instrumentation such as thermal ionization mass spectrometers (TIMS) and inductively coupled plasma mass spectrometers (ICPMS), ID-MS has seen increasing application in the fields of Bioassay and Nuclear Forensics in recent decades. The ID-MS technique is now used to calculate precise assay values in a wide range of samples including environmental swipes, nuclear debris, soils, bioassay collects, and bulk nuclear materials.

This workshop is intended to provide students and new practitioners with a basic introduction to the ID-MS technique. We will review the fundamental concepts and terminology of the isotope dilution equations, and provide working examples of the application of the technique. We will also discuss practical approaches for the method including; what makes a good spike; best practices for sample spiking and weighing; spike stripping techniques; offline data reduction; and uncertainty propagation. The workshop will include a guide to the principles of isotope dilution in which the commonly used equations and working examples will be outlined.

4. Continuous and Triggered Spectroscopy (Monday, 30 October 2023 from 3:15-5:00, Coral D)

THE DATA ANALYST – A TOOL FOR CONTINUOUS REPEATING GAMMA SPECTRAL ASSAYS OR REMOTELY TRIGGERED ASSAYS, AND HOW IT CAN BE USED FOR ROUTINE SAMPLE ASSAYS

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This workshop will introduce the Gamma Spectroscopy user to the Data Analyst [DA], which is a newly released device. The DA can be connected to Scintillation detectors, CZT detectors, or HPGe detectors. It can be set up to acquire and analyze a continuous sequence of gamma spectra, display those results, and then initiate actions based upon nuclide activity or other parameters.

The workshop format will be a combination of presentations and demonstrations, designed to show the value of this new system and how it enables real-time decision making not previously possible, and how it can enable automated push button spectral assays.

We will start off with a brief explanation of the Data Analyst and how it works, followed by examples of its application. These will be both from applications already delivered and from potential applications of relevance to RRMC attendees. This will be followed by a demonstration of the Data Analyst unit and detector, and a demonstration of a TouchPanel version designed for single sample counting applications by minimally trained users. We will end with a discussion of supporting tools enabling the DA users the ability to display, review, and reanalyze large groups of data.

5. Surveying Techniques for NORM Applications (Tuesday, 31 October 2023 from 1:00-3:00, Coral C)

6. GammaVision & TRACY Detector Selection Tool (Tuesday, 31 October 2023 from 1:00-3:00, Coral D)

ORTEC TECHNICAL WORKSHOP

PART I: Key Elements of Gamma Spectroscopy Libraries and Overview of Energy and Efficiency Calibrations in GammaVision

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GammaVision is an all-inclusive gamma spectroscopy application. In this workshop ORTEC will discuss the key elements of Gamma Spectroscopy software libraries and efficiency calibrations.

Presentations will then be made as to how to perform library editing and both energy and efficiency calibrations in GammaVision software.

PART II: TRACY Selection Tool / Functional Overview and Discussion w/ Q&A

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The TRACY Selection Tool has been developed as an internal tool for ORTEC entities to assist customers in determining the best detector for use in their application(s). The tool utilizes a GUI to input the detector and sample geometry information, and subsequently generates data (such as Full Energy Peak counts and efficiency) for the designated detector/geometry combination. The tool allows for comparison of the generated data between multiple detector types and sample configurations. This assists the user to optimize their counting productivity by targeting the optimal detector for analysis (i.e. MDA achievement, optimal efficiency, etc). Comparison of actual spectral measurements to the TRACY generated data will be presented. The tool also has a virtual spectrum generator that can be useful for training when a user may not have a physical detector and sources to generate such spectra. ORTEC is looking for feedback and interest related to this tool from customers, based on their application needs, as we work to push it into a commercial offering.

7. Internal Dosimetry (Tuesday, 31 October 2023 from 3:15-5:00, Coral C)

INTERNAL DOSIMETRY

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The Internal Dosimetry workshop will be an opportunity for people to discuss internal dosimetry cases, developments in the field and to practice responding to an internal dose accident scenario. The session will start off going over the results of the 2023 Internal Dosimetry Intercomparison Exercise involving two internal dose cases, the first a plutonium-mixture wound and the second an uranium-mixture inhalation.

Participants can present their solutions and there will be an open forum to discuss the cases and their follow-up. Following the internal dosimetry intercomparison, presentations will include methods for routine monitoring of uranium mixtures, a method to demonstrate that an internal dose monitoring program is meeting the compliance dose limits and finally, an interactive table-top exercise.

2023 INTERNAL DOSIMETRY INTERCOMPARISON EXERCISES (DICE) REPORT

In 2020, an internal dosimetry intercomparison (DICE) program was initiated in the U.S. to allow internal dosimetrists an opportunity to see how their methodologies for calculating intakes and doses compare within the internal dosimetry community. The program was modeled off the European Radiation Dosimetry Group's 2017 Intercomparison on Internal Dose. DICE was intended to showcase how dosimetry programs utilize available bioassay data, models, and software to achieve a final dose assessment. While maintaining anonymity, dosimetry programs can learn from other programs and evaluate their approach on scenarios they haven't encountered yet.

Two cases each year were developed in 2020, 2022 and 2023. Participation was individually or as an organization/department. The intercomparison exercises were open to all who wished to participate and initially announced at the Radiobioassay and Radiochemical Measurements Conference in 2019 in Santa Fe, NM. This presentation will go over the results from DICE 2023. The cases in 2023 involved a plutonium-mixture wound intake with no medical follow-up and a depleted uranium intake identified through routine monitoring.

HOW TO DESIGN AND RUN AN INTERNAL DOSE MONITORING PROGRAM

A method for a radiobioassay program to demonstrate compliance with dose limits.

The authorities governing occupational radiation protection (e.g., 10 CFR 835) require internal dose monitoring programs to be able to demonstrate compliance with dose reporting limits. Derived reference levels can help a monitoring program identify the sensitivity needed for bioassay measurements. Ideally, a bioassay minimum detectable amount (MDA) should be below the derived dose reporting

level or a derived screening level. Alternatively, the MDA can be used to calculate a minimum detectable dose for a bioassay program to demonstrate compliance with dose reporting limits. This presentation will focus on establishing the sensitivity of a bioassay program as a basis for selecting appropriate bioassay and optimum bioassay intervals for compliance monitoring.

TABLETOP INTERACTIVE EXERCISE FOR EMERGENCY PREPAREDNESS

Tabletop exercises are a tool to help train key personnel for incident response, practice response plans and identify areas for improvement. They provide a low-cost, low-risk evaluation of emergency response procedures and are an excellent way to train new personnel and coordinate amongst various emergency response groups. This tabletop exercise will be a simulated, interactive exercise going through an accident scenario involving internal contamination. The intent of this tabletop is to illustrate the simplicity and benefits of these types of emergency exercises.

8. Tracking Samples (Tuesday, 31 October 2023 from 3:15-5:00, Coral D)

TRACKING SAMPLES FROM COLLECTION THROUGH DISPOSAL

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Confidence in data quality is eroded when one considers the many human touchpoints that can lead to failures in the chain of custody of samples. The fundamental feature of data integrity cannot be assured if individual samples cannot be identified and tracked through the laboratory analysis process. Even if samples can remain independently identifiable, the possibility of transcription errors still exists. Near Field Communication (NFC) technology has become ubiquitous throughout society, but the use of electronic tags in radiological laboratory environments is still extremely limited. While data standards exist for top level output of sample analysis results into a central repository, a lack of data format standards for collection equipment from manufacturer A to transfer basic sample information to analysis equipment manufacturer B is non-existent. This two-hour technical, non-commercial workshop is intended to provide an overview of what is possible technologically to improve sample chain of custody as well as to discuss what information should be included in a “standard” data format within the constraints of current technology.

9. Eichrom (Wednesday, 1 November 2023 from 1:00-3:00, Coral C)

2023 EICHROM WORKSHOP/USER'S GROUP MEETING

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Eichrom would like to invite attendees of the 2023 RRMC to the Eichrom Workshop and User Group Meeting. The workshop will be a forum to discuss recent developments at Eichrom and the application of extraction chromatography, ion exchange and other radiochemical separations methods to radioanalytical chemistry, isotope production, and nuclear medicine. In addition to the planned agenda, time will be allotted for an open-form discussion of separation issues and questions supplied by the audience.

Workshop presentations will be available after the seminar by request and also be posted to www.eichrom.com following the conference.

10. ISOCS Modeling (Wednesday, 1 November 2023 from 1:00-3:00, Coral D)

PRIMER FOR MATHEMATICAL EFFICIENCY CALIBRATIONS USING ISOCS / LABSOCS FOR GAMMA SPECTROSCOPY APPLICATIONS

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Designed for spectroscopists and other team members who are looking to have a better understanding of how mathematical efficiency calibrations can be used for their gamma counting operations, this workshop provides a brief overview of the Mirion ISOCS and LabSOCS approach. We will introduce the key concepts of an ISOCS/LabSOCS calibration, followed by a review of the portfolio of templates and tools available to help users develop the most accurate calibration for their application. Additionally, we will discuss important considerations for creating high quality efficiency calibrations, including recommendations for implementing and validating a new system.

11. Eichrom (Wednesday, 1 November 2023 from 3:15-5:00, Coral C)

2023 EICHROM WORKSHOP/USER'S GROUP MEETING (CONTINUED)

Daniel McAlister, Ph.D.
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Eichrom would like to invite attendees of the 2023 RRMC to the Eichrom Workshop and User Group Meeting. The workshop will be a forum to discuss recent developments at Eichrom and the application of extraction chromatography, ion exchange and other radiochemical separations methods to radioanalytical chemistry, isotope production, and nuclear medicine. In addition to the planned agenda, time will be allotted for an open-form discussion of separation issues and questions supplied by the audience.

Workshop presentations will be available after the seminar by request and also be posted to www.eichrom.com following the conference.

12. ICLN (Wednesday, 1 November 2023 from 3:15-5:00, Coral D)

**INTEGRATED CONSORTIUM OF LABORATORY NETWORKS (ICLN)
RADIOLOGICAL LABORATORY SUBGROUP (RLS) WORKSHOP**

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This oral presentation/workshop will describe in detail two of the major project accomplishments and products of the Integrated Consortium of Laboratory Networks (ICLN) Radiological Laboratory Subgroup (RLS).

The ICLN is a system of interconnected federal laboratory networks that can quickly respond to high consequence incidents and give decision makers timely, credible, and interpretable data. The ICLN is a partnership of nine federal departments and agencies, including seven national lab networks. The ICLN provides the framework and tools that link these federal departments and agencies, federal lab networks, and lab network members so that they can manage sample analysis, share data, methods, and resources during an emergency.

The ICLN RLS seeks to increase laboratory efficiency across agency network programs and identifies radioanalytical laboratory gaps among the ICLN network radiological laboratories. In addition, this subgroup promotes consistency of analytical performance to ensure quality data supporting homeland security decisions and assessing and filling gaps in radioanalytical laboratory testing.

Over the past year the RLS has embarked on and accomplished the following projects:

- Developed a public facing Radiological Laboratory Hub (Rad Lab Hub); and,
- Development of a “Top 10” list of Gamma Spectroscopy references (reduced down from the original list of 215).

The workshop presentation will cover in detail the projects and products, as described below.

- **Rad Lab Hub:** The ICLN RLS launched a new website to serve the radiochemistry community as a Radiological Laboratory information “Hub.” The Rad Lab Hub provides the first-of-its-kind, centralized collection of analytical methods, guides, and technical information focused specifically for laboratorians, researchers, scientists, incident commanders and other field response personnel in the radiological sciences. The information on the Rad Lab Hub covers radiological laboratory topics related to food, clinical, and environmental samples. The Rad Lab Hub currently includes 150 different resources under the following categories: **Analytical methods, Operational guides, Training, reference, or educational documents, Documentary standards, Calibration, traceability, or physical standards, Laboratory Analytical Tools and Lessons learned.**
- **Gamma Spectroscopy References:** The ICLN RLS approved a proposal by Dr. John Griggs at the EPA NAREL lab to have his contractors develop a list of gamma spectroscopy references. The idea behind this effort was to create a manageable and concise listing of documents for scientists that wish to start in the area of gamma spectroscopy or scientists that wish to expand their knowledge of Gamma spectroscopy. The contractors developed a list of 215 references and then the Rad Lab Subgroup identified 83 references that were selected to be reviewed by the RRMC participants via a survey. The 2022 RRMC survey participants identified a resulting list of the top 10 references. This is part of a larger effort to provide resources and tools to the radiological laboratory community. The Gamma Spec survey and top 10 list will be available on the “public side” of the ICLN web site under the “Rad Lab Hub”. This is available to the radiological community as well as anyone else interested in gamma spectroscopy.

13. Future Challenges - Ken Inn (Thurs, 2 November 2023 from 1:00-5:00, Coral C, D)

FUTURE CHALLENGES FOR ANALYTICAL AND RADIOANALYTICAL CHEMISTRY - SOLUTIONS

Organizers: Colleagues on the Journey

What: Help!! We really need your advice for radioanalytical chemistry solutions for future social/scientific challenges/issues!!

Incentive: Please help create the vision for the future scientific development and R/D lines for the next three generations of radioanalytical chemists

How: Brainstorming - know how you see radioanalytical chemistry growing in the next 60 years.

Questions: How could radioanalytical chemistry participate in solving society/scientific future challenges? At this point of our conversation, how can we address the challenges if finances and time weren't barriers?

- What synergistic R/D are needed?
- What tools need to be developed?
- What collaborations will be needed?
- How will they be integrated?
- How do we build workforce development/ engagement/ recruitment/ retention? And,
- How do we get our recommendations enacted?

Input: The conversation has started and points already made clear include:

- Interactions, collaborations and resource allocation will be needed to encourage DOE National Labs, Industry and Academia to focus on creating a transparent environment to gain public support by creating the citizen scientist, teacher scientist, teach students the wonders of exploring science, and develop communication partners to speak to people, political leaders and funding agencies
- As computational resources advance, now having entered the Exascale era, synergistic R/D efforts involving multidisciplinary efforts will be critical to advance scientific needs

Output: As we gather more input, we hope to develop a long-term blueprint for R/D, and course development to groom future generations of radiochemists.

Organization: Parallel Breakout Discussion Groups

- Security & Consequence Management
- Power [Ocean, Land, Space] & D&D
- Water/Food
- Health/Medical
- Earth Ecology & Space Exploration/Mining
- Exascale computation & AI