

Mass Spectrometry for Radionuclide Measurements Survey Results



SUMMARY

In December 2023 a survey was sent to a list of identified National Metrology Institutes (NMIs), Designated Institutes (DIs), and relevant stakeholders to assess the current and planned activities across laboratories using mass spectrometry for radionuclide measurements. The intention of this survey was to inform the content of future webinars, workshops, and CCRI(II) activities in mass spectrometry, and will benefit the mass spectrometry community through building new networks.

Contact



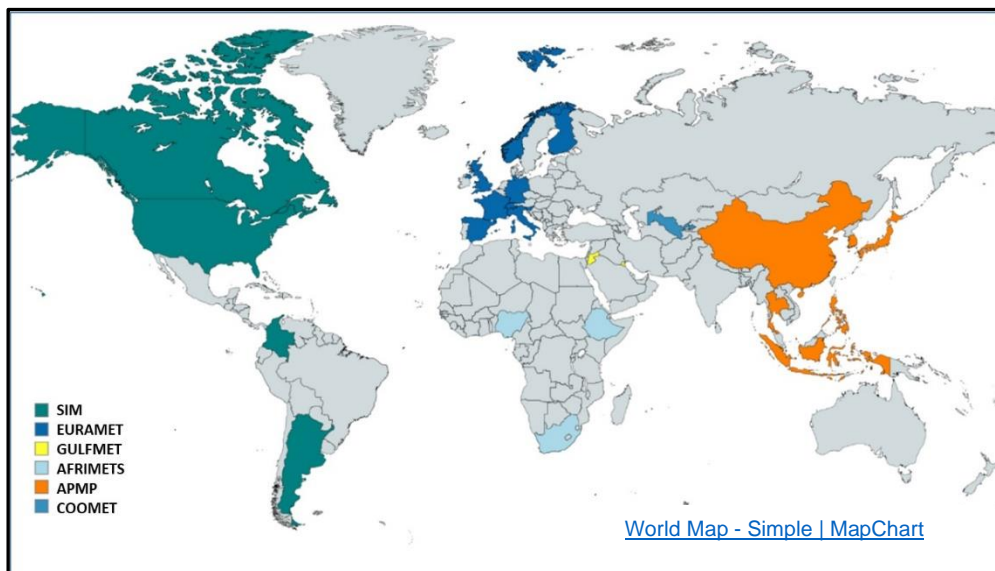
CCRI(II) Task Group
on Mass Spectrometry
(CCRI(II)-MS-TG)



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INTRODUCTION

The recently formed Task Group on Mass Spectrometry of the CCRI(II) (Measurement of Radionuclides) distributed a survey to 257 laboratories to assess current and planned use of mass spectrometry to support the measurement of radionuclides. The survey also aimed to identify the needs and possible solutions to enhance these capabilities. Fifty-four responses were received for a 20 % response rate. Survey respondents represent countries from all



SIM: Sistema Interamericano de Metrología, **EURAMET:** European Association of National Metrology Institutes, **GULFMET:** Gulf Association for Metrology, **AFRIMETS:** Intra-Africa Metrology System/Système Intra-Africain de Métrologie, **APMP:** Asia Pacific Metrology Programme, **COOMET:** Euro-Asian Cooperation of National Metrological Institutions

over the world (Canada, United States, Colombia, Argentina, Spain, Norway, Finland, Italy, Switzerland, Germany, France, United Kingdom, Slovenia, Ethiopia, Nigeria, South Africa, Jordan, Kuwait, Uzbekistan, Indonesia, South Korea, Thailand, Philippines, Japan, P.R. China) who are actively using mass spectrometry techniques for radionuclide analysis. This document summarises the principal findings from the surveys submitted by the respondents.

PRINCIPAL FINDINGS

On Current and Future Use of Mass Spectrometry

- The range of instrument designs being used (the most common being Quadrupole ICP-MS).
- The number of instruments being used (most commonly a single instrument with a maximum of three staff working in this area).
- Multiple areas of interest regarding broad areas of effort (environmental science, emergency response, geosciences) (Figure 1) versus specific isotopes and radionuclides being measured (Figure 2).
- Areas that labs would like to expand into include nuclear fuel cycle and fission and activation products, as well as chronometry/chronology and medical isotopes (stable and long-lived impurities, toxic isotopes linked to radiolabelling, starting materials assessment for by products) (Figure 3).

On Metrology

Identified focus areas for mass spectrometry in radionuclide metrology (Figure 4) and what areas they feel are being neglected (Figure 5).

- Amount content and low-activity measurements are the primary use of mass spectrometry (Figure 4).

- Interference issues is an area thought to be neglected and needing to be addressed (Figure 5)
- Institutes have challenges regarding metrology- e.g., lack of reference materials, a need for calibration and QC materials, traditional challenges of having mass spec capability like cost, internal support (Figure 6)
- Interlaboratory comparisons would be useful and are practical.

On Workshops and interlaboratory comparisons

- 92 % would participate in a workshop, meeting or webinar focused on radionuclide measurement by mass spectrometry. Specific topic areas of interest included Certified Reference Materials, traceability, databases, and method development (Figure 7).
- 80 % of participants are interested in taking part in interlaboratory comparison exercises.

RECOMMENDATIONS/PATH FORWARD

It is clear from the survey that there is significant interest in using mass spectrometry in radionuclide metrology and a range of instrument designs are being used for measurements across multiple applications. However, there are also several significant limitations (including lack of funding and the availability of suitable QC sources and reference materials) that are preventing further application.

The current use and likely increasing use of mass spectrometry in radionuclide metrology by laboratories across the world necessitates a coordinated path forward to facilitate high precision and accuracy radionuclide measurements. Recommendations to this end include:

- Running of regular workshops for users of mass spectrometry for radionuclide metrology.
- Development of infrastructure for joint reference material and QC source development.
- Facilitate efforts between laboratories to reduce costs associated with the employing mass spectrometry.

GRAPHICS OF SELECTED RESULTS

Figure 1. What are the dominant application areas in which your organization is employing mass spectrometry of radionuclides?

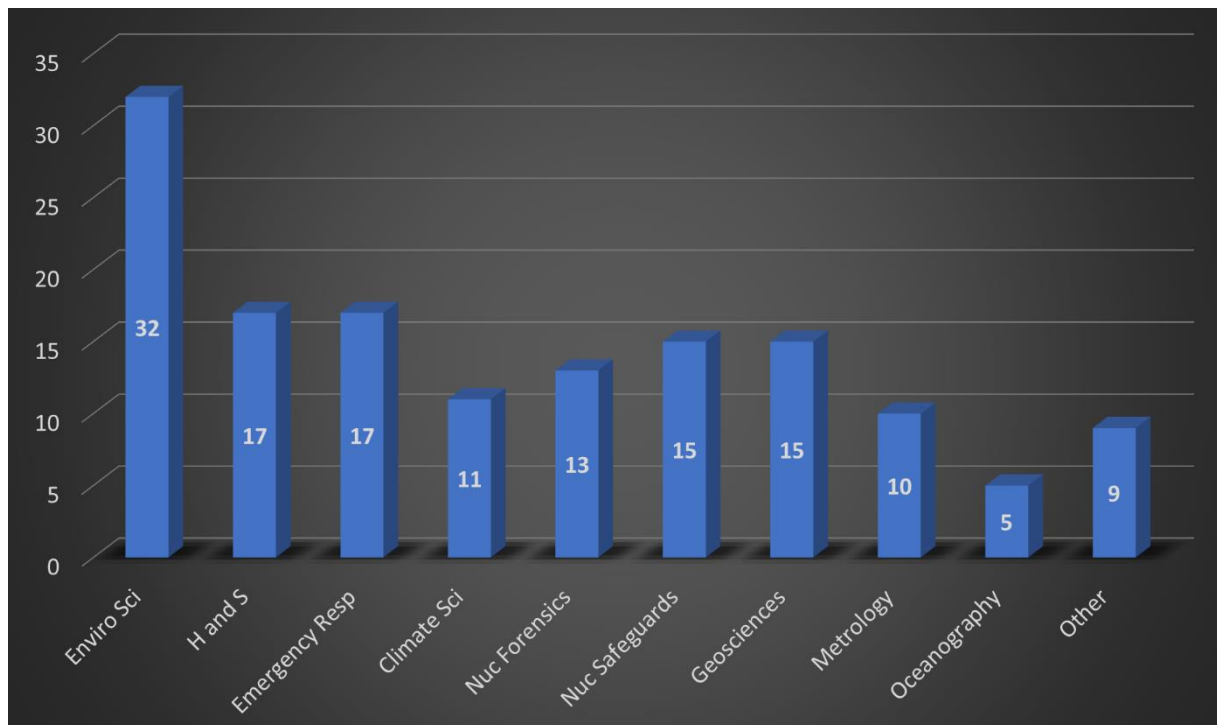


Figure 2. What are the typical nuclides/isotope systems your organization measures using mass spectrometry?

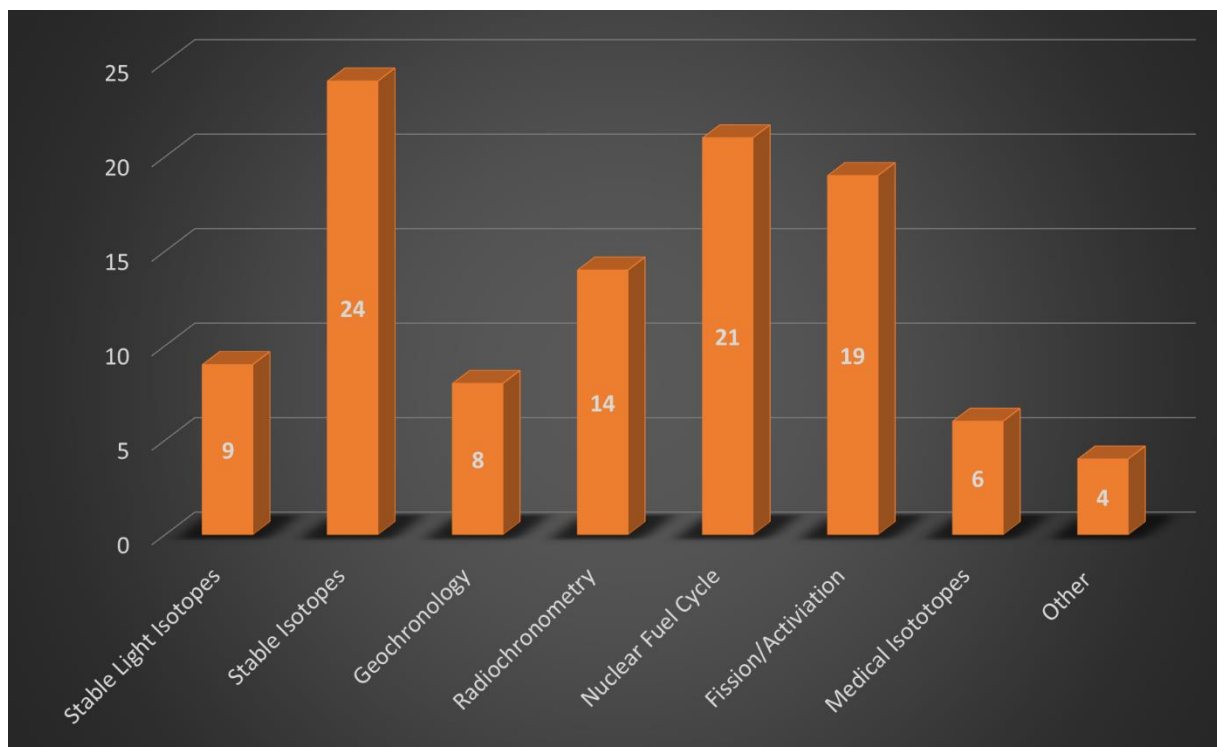


Figure 3. What nuclides, isotope systems, and/or application areas is your organization interested in expanding into?

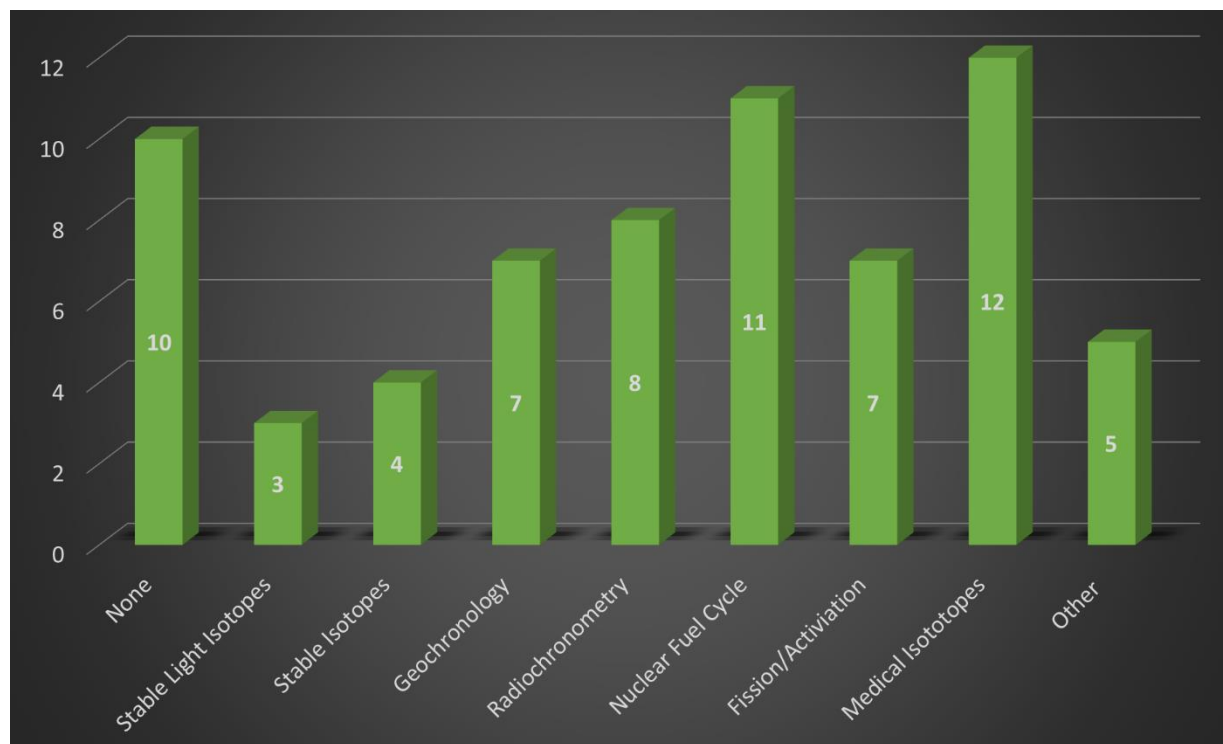


Figure 4. What do you feel are the major focus areas of radionuclide metrology where mass spectrometry could provide the most benefit?

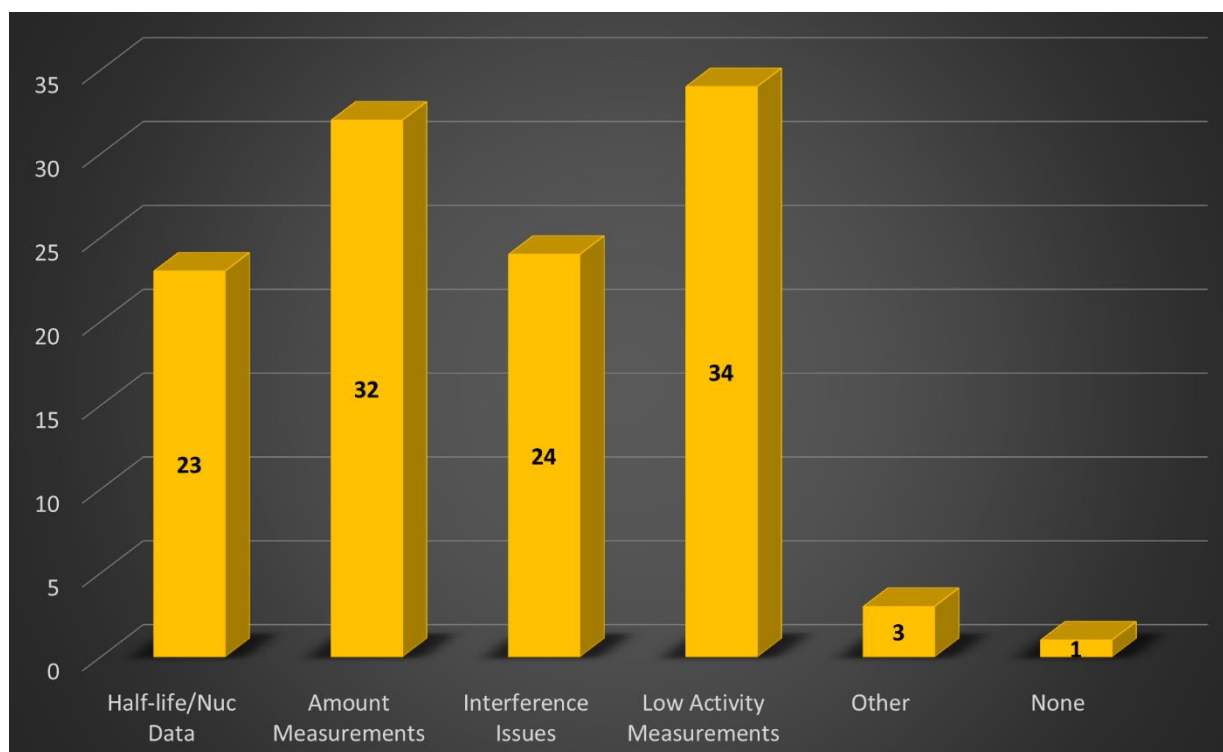


Figure 5. What areas are currently not represented that should be included as a focus area?

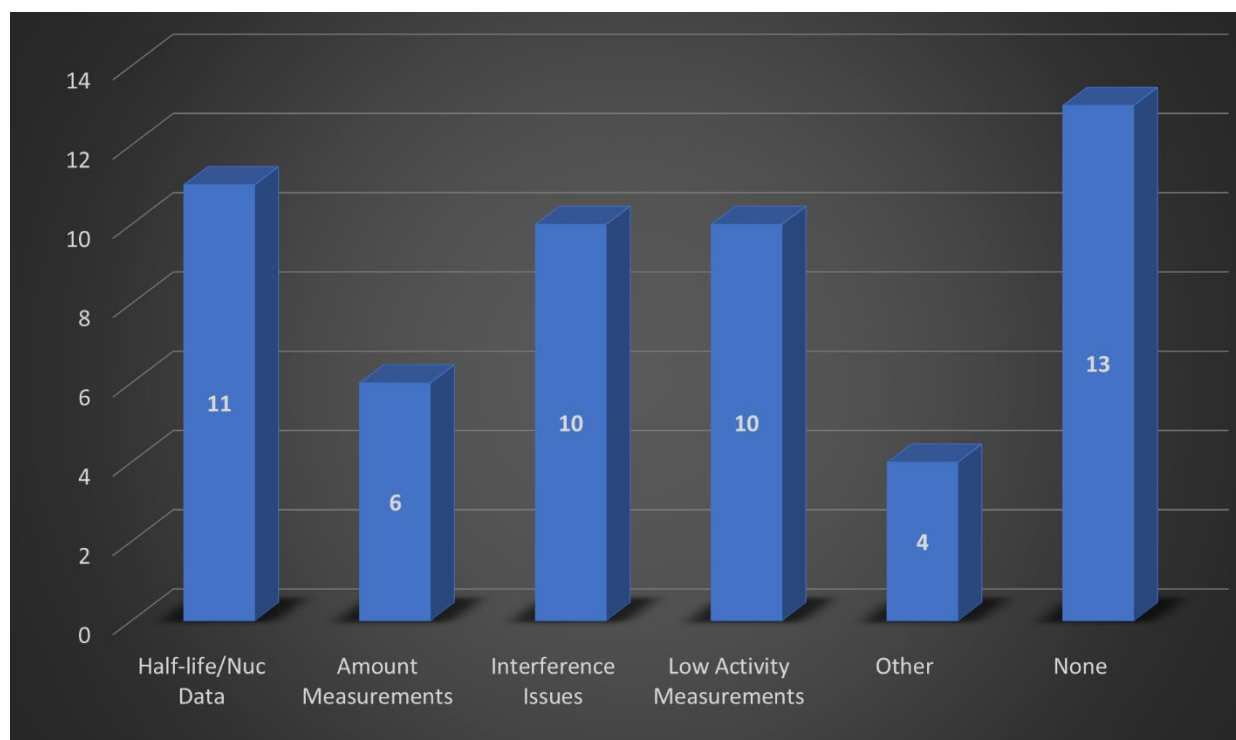


Figure 6. What challenges does your organization face using mass spectrometry?

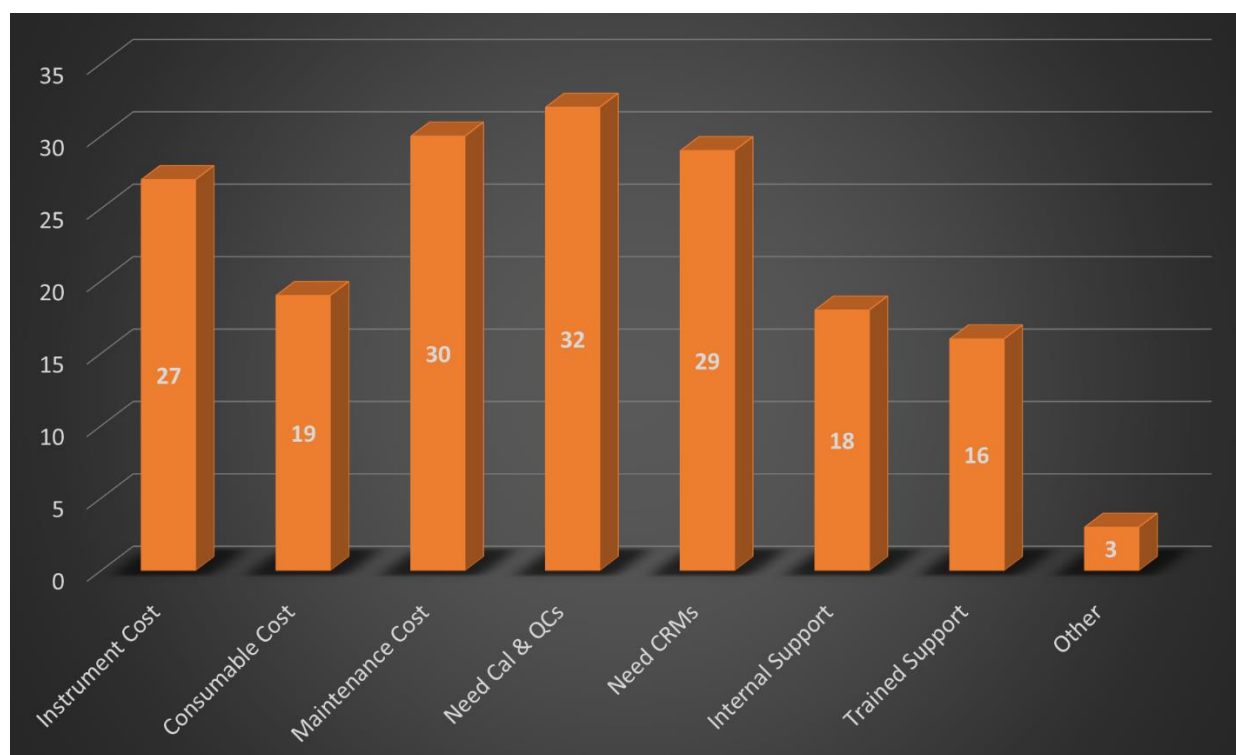


Figure 7. For a workshop/meetings/webinars, are there any specific topics areas your organization would like to see covered/addressed area?

