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Laboratories new to the ICRM

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ABSTRACT

The Scientific Committee of the ICRM decided, for the 2011 Conference, to present laboratories that are at a key developmental stage in establishing, expanding or applying radionuclide metrology capabilities. The expansion of radionuclide metrology capabilities is crucial to meet evolving and emerging needs in health care, environmental monitoring, and nuclear energy. Five laboratories (from Greece, Lithuania, Indonesia, Norway and Turkey) agreed to participate. Each laboratory is briefly introduced, and examples of their capabilities and standardization activities are discussed.

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1. Introduction:

The concept behind the International Committee for Radionuclide Metrology (ICRM) was suggested during the 1972 Herceg Novi Summer School on Radionuclide Metrology as a mechanism to "bring together specialists in the field of Nuclear Metrology and adjacent disciplines in order to review and intensively discuss their present status and possible future development" (Proceedings of the First International Summer School on Radionuclide Metrology, 1973). The follow-up meeting in Paris in 1974 formalized this effort, and the ICRM was established to facilitate interactions and cooperation among the international community of radionuclide metrologists and to further the use of metrology in the variety of applications where radioactivity measurements play a key role. Every two years, the community gathers to discuss and disseminate information on advances in this specialized field of metrology as well as to explore opportunities for collaboration, cooperation and future activities. In preparation for, and during, the biennial plenary meeting in Bratislava, Slovakia (September 2009), it became apparent to the Scientific Committee that several laboratories, while not yet very active in ICRM activities, were nevertheless expanding their efforts in radionuclide metrology. In planning for the 18th (2011) "International Conference on Radionuclide Metrology and its Applications," hosted by the National Metrology Institute of Japan, Advanced Industrial Science and Technology in Tsukuba, the Committee considered the abstracts submitted for presentation, and noted those submitted by laboratories which had either not previously participated in an ICRM plenary meeting or which were otherwise at a key developmental stage in establishing or applying radionuclide metrology capabilities.

A laboratory's decision to establish or expand capabilities in radioactivity measurements can be a complicated one, with implications for resource utilization (specialized analytical equipment can be expensive or difficult to acquire, staff with relevant technical expertise may not be available, etc.) as well as regulatory and safety concerns. However, a complex and varied user community necessitates an expansion of the metrological community. Radioactivity measurements supporting health care are complicated by source impurities and often very short half-lives; extremely low level measurements for environmental monitoring are confounded by spurious contributions from the ever-present radioactive background; and waste management from the nuclear power industry (including from plant decommissioning) requires measurements in complicated matrices and systems.

Of the several laboratories which had submitted abstracts for the 2011 Conference and which were invited to contribute in this effort, five [the National Technical University of Athens (Greece),

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the Center for Physical Sciences and Technology (Lithuania), the Center for Technology of Radiation Safety and Metrology—National Nuclear Energy Agency (Indonesia), the Norwegian Radiation Protection Authority (Norway) and the Turkish Atomic Energy Authority-Sarayköy Nuclear Research and Training Center (TAEK-SANAEM)] agreed to participate. Co-authors were asked to present a brief summary of the respective laboratory and its capabilities in radionuclide metrology and absolute standardization, as well as to cover possible future plans in the field, but not to include the work to be reflected in the Proceedings of the Conference itself (see papers 04, 77, 79, 81, 85, 86, 107, 111, 112 and 113); authors represent their respective participating laboratories. This approach presents an opportunity for the ICRM to meet its goal to widen the metrological infrastructure supporting radioactivity measurements and their applications by expanding participation in the field.

2. Laboratories

2.1. National Technical University of Athens (NTUA)

The Nuclear Engineering Laboratory (NEL) is part of the Nuclear Engineering Department of the NTUA, under the School of Mechanical Engineering in Athens, Greece. The Department focuses on education and research in the fields of nuclear engineering (mainly thermal hydraulics of nuclear reactors) and radioactivity metrology. In the field of radioactivity metrology, several techniques are being used and the instrumentation available is in many cases state of the art. The NEL-NTUA is also a member of the IAEA ALMERA (Analytical Laboratories for the Measurement of Environmental Radioactivity) Network, and systematically participates in ALMERA intercomparisons and proficiency tests as part of its Quality Assurance/Quality Control (QA/QC) program. In addition, the lab is a member of the ICRM Gamma Spectrometry Working Group and has regularly participated in a variety of international comparisons, the results of which have been presented at previous ICRM meetings. Besides radioactivity measurements, the NEL-NTUA is active in the field of nuclear related analytical techniques, applying x-ray fluorescence (XRF) and instrumental neutron activation analysis (INAA) for the determination of trace elements in environmental samples. Current research in the field is focused on the improvement of detection limits and the determination of trace elements on size-fractionated fly ash (Peppas et al., 2010).

2.2. Center for Physical Sciences and Technology (CPST)

The newly established ionizing radiation metrology laboratory of the CPST in Vilnius, Lithuania, maintains national standards in the field of radionuclide activity measurements, ensures metrological traceability, and provides calibration and verification services for a variety of users. It also deals with radioactive waste management as well as with the various applications of environmental radioactivity such as in the decommissioning of the Ignalina nuclear power plant (NPP), evaluation of impact on the population and the environment by near-surface radioactive waste repositories, and dose assessments.

2.3. Center for Technology of Radiation Safety and Metrology National Nuclear Energy Agency (Pusat Teknologi Keselamatan dan Metrologi Radiasi-Badan Tenaga Nuklir Nasional; PTKMR-BATAN)

The Radionuclide Standardization Laboratory, part of the Center for Technology of Radiation Safety and Metrology (PTKMR) of the National Nuclear Energy Agency (BATAN) in Jakarta, Indonesia, is a national reference laboratory for radioactivity measurements, serving the needs for standard sources in Indonesia for both private and government (including BATAN) institutions. In addition to participating in Regional Metrology Organization (RMO) comparisons, the laboratory maintains and standardizes sources (liquid and point) of the national radioactivity standards (using standards from other NMIs as reference) and maintains traceability of radiation standards in Indonesia to the International System (SI) of Units. The laboratory has an active program supporting health care and radiation protection applications, providing routine certification for medical activity instruments, stack/noble gas monitors, and surface contamination instruments. Its training and research programs for undergraduate, graduate and technician level students and the annual national radionuclide source comparisons (^{131}I in 2009, ^{60}Co in 2010 and ^{133}Ba in 2011), run among more than 10 local laboratories, expand the awareness and use of radionuclide metrology to the larger community.

2.4. Norwegian Radiation Protection Authority (NRPA Østerås)

The Norwegian Radiation Protection Authority (NRPA) is the competent authority on radiation protection and nuclear safety in Norway. The NRPA has three environmental laboratories located at the main office in Østerås (near Oslo), Tromsø and Svanhovd. Measured samples are mainly related to projects concerning air, marine and terrestrial monitoring, in addition to independent research projects from internal or external clients. The low background gamma-ray spectrometry laboratory at the Østerås office performs accredited high-purity germanium detector (HPGe) measurements of both natural and anthropogenic radionuclides in a wide range of different sample matrices such as water, filters, soil and biota.

2.5. Turkish Atomic Energy Authority-Sarayköy Nuclear Research and Training Center (Türkiye Atom Enerjisi Kurumu—Sarayköy Nükleer Araştırma ve Eğitim Merkezi; TAEK-SANAEM)

The TAEK-SANAEM is a government institution which focuses on nuclear research. The radioactivity measurements at the SANAEM are performed in gamma-ray spectrometry, alpha-particle spectrometry, liquid scintillation counting (LSC), and gross alpha/beta-counting laboratories. The radioactivity analyses of environmental, foodstuff, drinking water and industrial samples coming from different parts of Turkey are routinely being carried out. Specifically, TAEK research centers are the sole authorized institutions to prepare radiation certificates for import/export products. All of the laboratories are accredited according to ISO 17025 in several test methods. The QC system is maintained through regular international proficiency testing exercises. The TAEK-SANAEM is a member of several international organizations such as the ALMERA network of the IAEA and EURAMET as the designated metrology institute for ionizing radiation of Turkey.

3. Laboratory research and capabilities

As in any field of measurement science, radionuclide metrology depends on both direct and indirect methods to optimize the dissemination of measurement standards (primary and secondary, respectively) to address the needs of the community. The working distinction between "primary" and "secondary" in radionuclide metrology is that, to be considered "primary," a method can rely on only the count-rate data arising from radioactive decay (supported by information of the mode of decay); historically, however, the CIEMAT/NIST method of LSC is considered