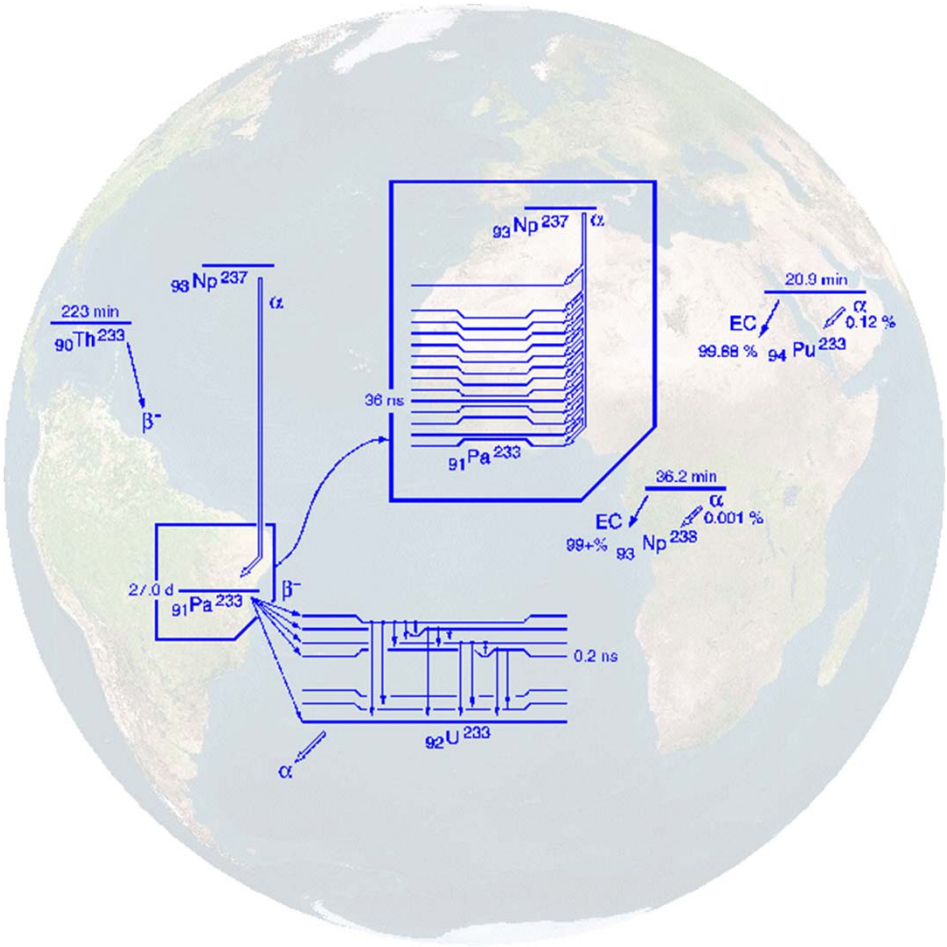
ICRM NEWSLETTER

Issue 25 – April 2011



International Committee for Radionuclide Metrology

Editor : Marie-Martine Bé

LABORATOIRE NATIONAL
HENRI BECQUEREL

International Committee for Radionuclide Metrology ICRM

ICRM NEWSLETTER
Issue 25

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April 2011

CONTENTS

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  - National Institute of Standards and Technology, NIST, Teddington

EDITORIAL

This newsletter was established in response to a recommendation of the International Committee for Radionuclide Metrology made during its General Meeting in Grenoble 1985. It is meant to serve as a medium for informal exchange of information between workers active in the field of Radionuclide Metrology.

The scope of the Radionuclide Metrology Newsletter is to describe briefly current activities in the following topics:

- foil and source preparation;
- α-, β- and γ-ray spectrometry including spectrum evaluation;
- improvement and development of radionuclide measurement techniques;
- measurement and evaluation of radionuclide data;
- low-level radioactivity measurement techniques;
- life-sciences;
- quality assurance and traceability.

In order to ensure that the Newsletter is as comprehensive and informative as possible, contributions are sought from all laboratories known to be engaged in measurements and data evaluation techniques relevant to Radionuclide Metrology.

All previous contributors will be informed concerning the deadline for the next issue. New contributing Radionuclide Metrology laboratories are welcome. Please contact the editor.

Any comments on this issue or suggestions for improvement will be welcome.

At the ICRM General Meeting in Paris 1995, it was decided that the ICRM Newsletter would also allow for the distribution of Progress/Planning Reports SA1 and SA2.

From the experience of this issue, we have the following situation: laboratories regard their normal Newsletter contribution as the fulfilment of SA1/SA2. In this case this is indicated on the contribution by “SA1/SA2”. Or laboratories provide (additionally) the traditional SA1/SA2 reports which should not be longer than 2 pages. In the latter case it should be mentioned in the accompanying letter, that the SA1/SA2 contributions be intended for publication in the Newsletter.

For economy reasons, at the ICRM General Meeting in Dublin 2003, it was agreed that the ICRM Newsletter would be put in the LNE-LNHB (former BNM-LNHB) web site (http://www.nucleide.org/Publications/icrm_newsletter.htm) distributed in hard copy , or CD-rom only to those whom have asked for it.

- Contributions may be sent by E-mail as an attachment in MS Word or as plain text file.

INSTRUCTIONS TO CONTRIBUTORS

This Newsletter is realised with no alterations by the editor. To ensure readability and avoid unnecessary work by the editor, it is suggested that:

- Contributions should be typed on plain white A4 paper (21 cm x 29,7 cm)**,** please use the **"contribution.doc**" file.
- Contributions should contain **no** page number, date, signature, or any correspondence references typed on this sheet. Correspondence to the editor must be on a separate sheet.
- Contributions should be in English and carefully proofread by the authors.
- References to publications or reprints should be completed as required by the Physical Review.
- Complete mailing address and the name of a person who can be contacted for additional information by those desiring it should be given at the end.
- Please note that only files on "Word" format will be accepted.

Contribution Format

LABORATORY	Name of laboratory
NAMES	If more than one laboratory is involved identify affiliation through abbreviations (ORNL, LASL, etc.). Visitors can also be identified with asterisks.
KEYWORDS	Alpha spectrometry, beta spectrometry, calorimetry, (anti) coincidence method, cryogenic detector, data evaluation, data measurement, Euromet, gamma-ray spectrometry, gas proportional counter, ionisation chamber, life sciences, liquid scintillation, low-level, NaI well counter, neutron measurement, radioactive gas, radiochemistry, simulation code, SIR, source preparation, X-ray spectrometry, radionuclide by name (e.g. 55Fe or Fe-55). Choose the good ones
APPARATUS ACTIVITY	Choose one; the former for experiments and the latter for compilations, calculations, or theory.
RESULTS	Use this for experimental results.
PUBLICATIONS	Use Physical Review style. **Include only materials published during the referred year.**
IN PROGRESS	Use this for description of the current work.
INFORMATION SOURCE	Use this for evaluations or compilations.
IN PREPARATION	Use this to also indicate papers submitted for publication.
OTHER RELATED PUBLICATIONS	Optional.
ADDRESS	Mailing address. Give also telephone, telex, fax numbers and E-mail.
CONTACT	Single contact person.

General information on ICRM (President's Message)

The International Committee for Radionuclide Metrology (ICRM) is an association of radionuclide metrology laboratories whose membership is composed of delegates of these laboratories together with other scientists (associate members) actively engaged in the study and applications of radioactivity. It explicitly aims at being an international forum for the dissemination of information on techniques, applications and data in the field of radionuclide metrology. This discipline provides a range of tools for tackling a wide variety of problems in numerous other fields, for both basic research and industrial applications.

There are 39 institutions now represented by delegates in the ICRM. The ICRM has no membership fee and no paid secretariat or other staff. Its overall direction is determined by the delegates in General Meetings, which convene usually every two years, where organizational guidelines and directions for the working programs are agreed upon. The following officers of ICRM are presently serving on the Executive Board:

President	Pierino De Felice[1]	pierino.defelice@enea.it
Vice-President	Uwe Wätjen[2]	uwe.waetjen@ec.europa.eu
	Dirk Arnold[3]	dirk.arnold@ptb.de
	Marie-Martine Bé[4]	mmbe@cea.fr
Past-President	Yoshio Hino[5]	y.hino@aist.go.jp
Secretary	Franz Josef Maringer[6]	Franz-Josef.Maringer@bev.gv.at

The Executive Board relies heavily on the Nominating Committee which has the objective of ensuring the continuity of purpose and vigour of ICRM. It does this by soliciting from the membership, and by itself proposing, the names of eligible candidates to fill vacancies about to occur on the Executive Board and the Nominating Committee. The current membership of this committee is:

Chairperson	Guy Ratel[7]	gratel@bipm.org
Members	Mike Woods[8]	mike.woods@blueyonder.co.uk
	Eduardo García-Toraño[9]	E.garciatorano@ciemat.es

Plenary meetings of the ICRM are held biennially, and have developed into a successful instrument of communication among various specialists, thus encouraging international co-operation. The most recent series of ICRM meetings was at the 17th International Conference on Radionuclide Metrology and its Applications (ICRM 2009), which took place on 7 - 11 September 2009 at the Slovak Institute of Metrology (SMU) in Bratislava, Slovak Republic. The local organization was undertaken by the Centre for Ionizing Radiation of SMU.

Our appreciation and thanks go to all who contributed to this very successful and busy meeting. In particular we recognize the great contributions made by Dr. Anton Švec and his local organizing team Saskia Mikičová, Jozef Martinkovič and a number of other SMU colleagues, the Scientific Programme Committee, the referees and session chairmen and to the authors of papers.

ICRM activities are largely the responsibility of its working groups. Each group is guided by a co-ordinator who acts as a centre for ideas and communications and may organize conferences and workshops. There are now seven working groups with the following fields of interest:

(1) Radionuclide Metrology Techniques	http://users.skynet.be/icrmrmt/
John Keightley[10]	John.Keightley@npl.co.uk,
Mike Unterweger[11]	michael.unterweger@nist.gov
(2) Life Sciences	
Jeffrey T. Cessna[11]	jeffrey.cessna@nist.gov
(3) Alpha-Particle Spectrometry	
Stefaan Pommé[2]	stefaan.pomme@ec.europa.eu
(4) Gamma-Ray Spectrometry	http://www.nucleide.org/ICRM_GSWG.htm
Marie-Christine Lépy[4]	marie-christine.lepy@cea.fr
(5) Liquid Scintillation Techniques	http://www.nucleide.org/icrm.htm
Brian Zimmerman[11]	bez@nist.gov
(6) Low-Level Measurement Techniques	
Dirk Arnold[3]	dirk.arnold@ptb.de
(7) Non-Neutron Nuclear Data	http://www.nucleide.org/3NDWG.htm
Marie-Martine Bé[4]	mmbe@cea.fr

We all thank above co-ordinators and also special thank Dr. Eduardo García-Toraño[9] for his great contributions as the chair of Alpha-Particle Spectrometry Working Group, until the last 17th ICRM meeting.

The next 18th international conference of ICRM 2011 will be held in September 19-23, 2011 in Tsukuba, Japan organized by the National Metrology Institute of Japan, Advanced Industrial Science and Technology (NMIJ/AIST). The contact person of the local organizing committee is Dr. Yoshio HINO[5] (y.hino@aist.go.jp). The conference will include oral and poster presentations and business meetings of the ICRM Working Groups, in plenary format. In addition to these plenary meetings, each WG may have specific meetings in the form of international conferences or more restricted workshops. In this frame, a LLRMT working group Conference will be organized in 2012 (4 years after the last conference) in Korea (KRISS).

All ICRM meetings are announced on the ICRM home page “http://physics.nist.gov/icrm” or in this Newsletter. Anyone wishing to participate in these ICRM's activities or to receive further information is encouraged to contact one of the officers or Working Group co-ordinators, and also to visit the ICRM home page.

Finally, we express our heartfelt thanks to Dr. Marie-Martine Bé[4] for compiling and upload this ICRM Newsletter, and also thanks to Dr. Lisa Karam[11] for maintaining our ICRM home page.

January 2011

Pierino De Felice
President of ICRM

References

1. Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile, C.R. Casaccia, P.O. Box 2400, I-00100 Rome, Italy.
2. European Commission, Joint Reseach Centre, Institute for Reference Materials and Measurements, Retiesweg 111, B-2440 Geel, Belgium.
3. Physikalisch-Technische Bundesanstalt, Bundesalle 100, D-38116 Braunschweig, Germany.
4. Laboratoire National Henri Becquerel, CEA Saclay, PC 111, F-91191 Gif-sur-Yvette Cedex, France.
5. National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, Tsukuba Central 2, 1-1-1, Umezono, Tsukuba, Ibaraki, 305-8568, Japan.
6. Bundesamt für Eich- und Vermessungswesen, Arltgasse 35, 1160 Wien, Austria.
7. Bureau International des Poids et Mesures, Pavillon de Breteuil (BIPM), F-92312 Sèvres CEDEX, France.
8. Ionizing Radiation Metrology Consultants Ltd, 152 Broom Road, Teddington, Middlesex TWll 9PQ, U.K.
9. Metrología de Radiaciones Ionizantes, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), Avenida Complutense 22, E-28040 Madrid, Spain.
10. National Physical Laboratory (NPL), Hampton Road, Teddington, Middlesex, TW11 0LW, UK.
11. National Institute of Standards and Technology (NIST), Gaithersburg, Maryland, 20899-8462, U.S.A.

ANNOUNCEMENTS

1) Conferences

- ICRM 2011 will take place in Tsukuba, Japan, from 19 to 23 September.
- Conference on Low-Level Radioactivity Measurement Techniques will be held in Daejeon, Korea, September 17 – 21, 2012.
- The seventh Radionuclide Calibrator User's forum is planned for June 2011 at NPL.

2) Proposals:

IRMM (EC-JRC, Belgium) is searching for post-docs for research work on:

- Development of liquid scintillation counting techniques and measurement of nuclear decay data;
- Gamma-ray spectrometry of very low levels of radioactivity.

LRE (Croatia) is interested for collaboration in projects based on "development of radiochemical methods for determination of alpha emitters in natural samples".

Conference Secretariat

(registrations, fees, accommodation)
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Scientific Secretariat

(abstracts, manuscripts, proceedings)
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Fax: +81 29 861 5673
e-mail: y.hino@aist.go.jp

Deadlines and Dates

2010-Sep-30 Submission of pre-registration form to receive 2nd announcement
2011-Feb-28 Deadline for submission of abstracts
2011-Apr-18 Notification of acceptance/rejection of abstracts
2011-Apr-25 Second announcement
2011-Jun-30 Deadline for early registration
2011-Jul-31 Deadline for submission of accepted papers
2011-Sep-19 Start of conference
2011-Sep-22 End of conference
2011-Sep-23 General Meeting of ICRM
2011-Nov-11 Submission of final version of papers

Pre-Registration Form

In order to receive the next announcement, please complete and send back this form to the Conference Secretariat (preferably by e-mail: icrm2011@m.aist.go.jp) by September 30, 2010.

Last name: .....

First name: .....

Title: .....

Organisation: .....
.....

Address: .....
.....
.....
.....

Country: .....

Telephone: .....

Telefax: .....

E-mail: .....

I intend to submit a paper: ☐ yes ☐ no

Topic: .....
.....
.....

Accompanying person(s): ☐ yes ☐ no

I need a hard copy of the second announcement:
☐ yes ☐ no

ICRM 2011

NMIJ AIST

FIRST ANNOUNCEMENT
&
CALL FOR PAPERS

18th International Conference on Radionuclide Metrology and its Applications

ICRM 2011

September 19th - 23rd, 2011
Tsukuba
Japan

Organized by
The International Committee for Radionuclide Metrology (ICRM)
and
National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology (NMIJ/AIST)

Tsukuba International Congress Center
EPOCHAL TSUKUBA

Conference Description

The International Committee for Radionuclide Metrology is pleased to announce that its next conference will be held at the National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology (NMIJ/AIST) in September 19-23, 2011.

The goal of ICRM 2011 is to provide an opportunity for the exchange of information on the development of techniques and new applications of radionuclide metrology, and to encourage international co-operation in this field. This biennial conference was recently held in September 2009 in Bratislava, Slovak Republic.

The conference will include oral and poster presentations and business meetings of the ICRM Working Groups.

Conference topics

- Aspects of international metrology
- Intercomparisons
- Measurement standards and reference materials
- Radionuclide metrology techniques
- Alpha-particle and beta-particle spectrometry
- Gamma-ray spectrometry
- Liquid scintillation counting techniques
- Nuclear decay data
- Low level measurement techniques
- Radionuclide metrology in life sciences
- Source preparation techniques
- Quality assurance and uncertainty evaluation in radioactivity measurements

Additional activities during the conference will be the meeting of the ICRM Executive Board, the General Meeting of ICRM members, a visit to the laboratory facilities of the NMIJ/AIST and social events.

Conference Venue

Tsukuba International Congress Center (Epochal)
2-20-3 Takezono, Tsukuba, Ibaraki 305-0032
Japan (http://www.epochal.or.jp/eng/)

Conference web page

http://www.icrm2011.nmij.jp

Conference Language

The official language of the conference is English. All abstracts and presentations must be in English.

Participation

All those interested in participating in the conference are asked to return the overleaf Pre-Registration Form, duly completed as soon as possible to the Conference Secretariat (preferably by e-mail: icrm2011@m.aist.go.jp), but not later than the end of September, 2010.

Call for Papers

Contributed papers on the topics listed above are welcome. Authors wishing to submit a paper should send an Abstract to the Scientific Secretariat by February 28, 2011.

The abstracts should be sufficiently detailed and informative to allow the Scientific Committee to judge the scientific merit of the papers and their suitability for the conference programme. An abstract submission form will be available soon at the conference web page.

Notification of acceptance will be sent to authors until April 18, 2011. Authors are requested to submit the final text of accepted papers to the Scientific Secretariat by July 31, 2011. Authors should anticipate discussing their papers with the Scientific Committee during the conference, and making editorial and/or technical modifications resulting from those discussions, and send it to the Scientific Secretariat by November 11, 2011.

Proceedings

Conference proceedings will be published in the journal APPLIED RADIATION AND ISOTOPES. Manuscripts in English must comply with guidelines which will be sent to the authors together with the information on acceptance of the paper.

Acceptance of a paper for presentation at the conference does not automatically imply that it will be published in the proceedings. This is subject to actual presentation at the conference and to the result of a refereeing procedure.

Scientific Committee

Dirk Arnold, PTB, Germany
Marie-Martine Bé, LNE-LNHB, France
Philippe Casette, LNE-LNHB, France
Jeffrey Cessna, NIST, USA
Pierino De Felice, ENEA, Italy
Eduardo Garcia-Toraño, CIEMAT, Spain
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Mike Unterweger, NIST, USA
Uwe Wätjen, EC-JRC-IRMM, EU
Mike Woods, IRMC, UK
Freda van Wyngaardt, NMISA, South Africa
Brian Zimmerman, NIST, USA

Registration Fees and Accomodations

Details will be available at the conference web page and will be distributed with the second announcement.

Coordinator's Report

ICRM Life Science Working Group

The purpose of the Life Sciences Working Group is to provide a forum for ICRM members to address radionuclide metrology issues as they relate to the life sciences. Issues may include, but are not limited to: development of methodologies to calibrate short-lived radionuclides of interest in nuclear medicine, measurement of decay properties (half-lives, decay energies and probabilities, etc.) of radionuclides used in nuclear medicine and biological research, and development of measurement methodologies for transferring National Measurement Standards to the clinic and research laboratory. The Working Group will facilitate finding solutions to these problems through workshops, publications, electronic communications (i.e., email), and collaborative work.

The most recent meeting of the Life Sciences Working Group (LSWG) was held at the Slovak Institute of Metrology, Bratislava, Slovak Republic on 8 September 2009, as part of the 17th International Conference on Radionuclide Metrology and its Applications.

Status of action items from that meeting:

- Comparison of the measurement of ^{90}Sr as an impurity in ^{90}Y: A pilot laboratory has not yet been identified.
- Proposed ^{90}Y microsphere activity comparison: This comparison, subsequently announced as a CCRI(II)-S9, has been abandoned due to legal issues encountered by ANSTO

Status of action items from previous meetings:

- Collecting activity calibrator factors for medical radionuclides in different ionization chambers: This action is ongoing; updates will be posted to the LSWG web page.

The next meeting of the LSWG will be held in Tsukuba, Japan in September 2011 as part of ICRM 2011. Topics of discussion being considered include standards and measurements required to support quantitative imaging in nuclear medicine. Those laboratories working in this area are requested to contact the coordinator.

The LSWG web page may be found here:

http://physics.nist.gov/Divisions/Div846/ICRM/working_groups.html#LS

J.T. Cessna, Coordinator

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Non-Neutron Nuclear Data Working Group (3NDWG): Report, January 2011

Coordinator: Marie-Martine Bé

Key words: decay data; evaluations; nuclear decay data requirements

1. The primary aim of the 3NDWG is to provide the worldwide scientific community with an appropriate environment for communications between specialists in the field of non-neutron nuclear data measurements and evaluations so that they can learn more about each others' work, liaise and combine forces to undertake research programmes of mutual interest, and organise multinational efforts to produce recommended sets of non-neutron nuclear data.

2. 3NDWG members continue to be involved in the evaluation efforts of the Decay Data Evaluation Project (DDEP). Communications between decay data evaluators are encouraged through this project (co-ordinator: F.G. Kondev, kondev@anl.gov). Details of this work and the recommended decay data can be found on the Internet: http://www.nucleide.org/DDEP_WG/DDEPdata.htm. A third working meeting of the DDEP was organized in June 2010 by CIEMAT in Madrid. http://www.ciemat.es/portal.do?TR=C&IDR=1524. This three days meeting was very fruitful with several new participants.

3. 3NDWG members continue to evaluate decay schemes for specific actinides and their decay products as part of an agreed IAEA Coordinated Research Project on "Updated decay data library for actinides" (2005-09). Last meeting was held in October, 2008. Contact: M. A. Kellett (e-mail: m.kellett@iaea.org). Summary Report 2nd coordination meeting, INDC(NDS)-0508. A status of the CRP was given by M.A. Kellett during the WG conference meeting.

4. 25 new nuclides have been evaluated or updated and published in the last Monographie 5-5 issue, a new issue is planned for 2011, all volumes can be downloaded from: http://www.bipm.org/en/publications/monographies-ri.html

5. A dedicated 3NDWG web site is available on: http://www.nucleide.org/3NDWG.htm
Members of the 3NDWG are encouraged to use the Working Group to communicate experimental and theoretical work, relevant evaluation procedures and their decay data problems.

6. **At the General Meeting (Oxford, September 2005) of the *International Committee for Radionuclide Metrology* (ICRM) the Delegates formally approved the recommendation made by the Nuclear Data Working Group of using the DDEP evaluated decay data in all future nuclear data studies.**
The 2009 ICRM Executive Board has renewed this recommendation, particularly in view of the drafting and refereeing work for the ICRM 2011 Conference.
The work of the 3NDWG was re-endorsed at the 2009 ICRM General Meeting (11 September 2009, Bratislava, Slovakia).

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10 January 2011

Coordinator's Report
ICRM Liquid Scintillation Counting Working Group

The Liquid Scintillation Counting Working Group (LSCWG) was formed in order to attack important issues dealing with the application of liquid scintillation counting (LSC) techniques to radionuclide metrology. This includes development and improvement of the two most dominant LSC-based techniques, the CIEMAT-NIST efficiency tracing (CNET) method and the Triple-to-Double Coincidence Ratio (TDCR) method, as well as development in acquisition hardware and analysis software. The WG also supports fundamental investigations of the properties of commercial LSC cocktails as they affect radionuclide metrology, as well as studies involving new cocktails and scintillators.

Based on reports of research being conducted by ICRM member institutions, much of the work that is currently being done is focused on the following areas:

- Development of FPGA or other alternative hardware based acquisition systems for TDCR
- Improvements to CNET and TDCR models to include higher-order effects such as photoelectric and Cerenkov effects and optical photon scattering
- Application of TDCR and CNET to radionuclides with more complex decay schemes
- Testing of new commercial TDCR counters for suitability in metrology

In the case of the latter topic, it should be noted that a commercial company (Hidex) has recently released a "metrology" version of its commercially-produced TDCR spectrometer. To date, at least two national metrology institutes (NMIs) have acquired these instruments and are testing them. The Coordinator has also been informed that at least one other NMI and a commercial calibration laboratory are also considering purchasing these systems. The availability of this counter and the further development of FPGA acquisition systems could hopefully be viable replacements for the now-unavailable MAC3 unit.

Although it was originally proposed to have an interim meeting of the LSCWG at the PTB prior to the ICRM2011 meeting in Japan, budgetary constraints at many of the non-European laboratories made travelling to such a meeting impossible. There was, however, an important LSC meeting (LSC2010) held in Paris in September 2010 that was organized by LNHB. Although metrological applications traditionally represent a small part of the program for this conference series, two entire sessions were dedicated to LSC applications in metrology and included presentations from PTB, the BIPM, CENTIS, CNEA, NIM (China), VNIIM, NPL, LNHB, NMISA, IFIN-HH, the University of Barcelona, and NIST. The topics discussed in these presentations were:

- Comparison of TDCR and CNET methods for activity measurements of beta-emitting radionuclides,
- Variance components in LSC standardization,
- Beta shape factor and standardizations for Pu-241,
- Potential use of the TDCR method as an international reference system for beta-emitting radionuclides,
- Wall effect in LSC for alpha emitting radionuclides,
- LSC standardization/calibration of Th-228, Cu-64, C-11, F-18, Cs-137, Cs-134, H-3 and Cl-36,
- Measurements made using new instrumentation and scintillators.

Congratulations and thanks go to Dr. Philippe Cassette and his colleagues for organizing such a successful and informative meeting.

The next meeting of the LSCWG will take place during the ICRM2011 meeting, to be held 19-23 September 2011 in Tsukuba, Japan. The specific date and time will be announced in the final program for the conference.

B. E. Zimmerman, Coordinator
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Report on the Activities of the Low-Level Measurement Techniques Working Group

In the period since the last report (i.e. from 1st January 2010-31st December 2010) the proceeding of the most recent ICRM conference were published in Applied Radiation and Isotopes 68 No.7-8 (July/August 2010) including contributions in the field of radiochemical analyses and low-level gamma-ray spectrometry.

Several members of the working group participated in the action of the Gamma Spectrometry Working Group concerning coincidence summing corrections for measurements at volume sources which is also a major task for the measurements of environmental samples (see report of the GS working group).

A larger subgroup of European laboratories has successfully prepared two joint projects in the framework of the European Metrology Research Program (EMRP). The projects “Metrology for Radioactive Waste Management” coordinated by CMI and “Ionizing Radiation Metrology for Metallurgical Industry” coordinated by CIEMAT were both selected for funding by EURAMET. Both projects will cover research in the field of measurement of radionuclides in waste, environmental and industrial samples. New analyses and calibration methods will be developed in the 3 years programs.

In the tradition of the LLMT-WG conferences in Monaco 1991, Seville 1995, Mol 1999, Vienna 2003 and Braunschweig 2008 the next conference on Low-Level Radioactivity Measurement Techniques will be held in 2012. Our colleagues from KRISS volunteer to hold the conference in Daejeon, Korea, September 17 – 21, 2012.

Dirk Arnold, Coordinator

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2010 Report of the ICRM Gamma-Ray Spectrometry Working Group

The Gamma-Ray Spectrometry Working Group is devoted to the development of the metrological aspects of gamma-ray spectrometry and its applications. This includes, but is not restricted to: measurement techniques and equipment, determination of photon emission intensities, detector efficiency calibrations, coincidence-summing corrections, uncertainties, correlations, new instrumentation and X-ray spectrometry.

1. Completed action

Comparison of Monte Carlo codes for efficiency calibration

The action to compare the Monte Carlo codes for efficiency calibration was leaded by Tim Vidmar and involved 18 participating laboratories (28 people involved). The results of the comparison was orally presented at ICRM2007 ant the relevant paper "An intercomparison of Monte Carlo codes used in gamma-ray spectrometry".is published in Applied Radiation and Isotopes (T. Vidmar et al., ARI 66, 2008, 764-768). Two related papers derived from this action were also published (O. Sima and D. Arnold, ARI 67(5), 701-705; K.L. Karfopoulos and M.J. Anagnostakis ICRM-21010 to be published in ARI).
No further developments are presently planned and this action is now completed.

2. On-going actions

Coincidence summing corrections

The main study recently undertaken by the ICRM GSWG focused on the coincidence summing corrections. Different methods (numerical computation, Monte Carlo simulation, empirical methods…) are used to compute these corrective factors and could be compared through this action. The goal of this exercise was to calculate the corrective factors for ^{152}Eu and ^{134}Cs, for several energies. The first part concerned point sources at 3 source-to detector distances (10, 5 and 2 cm). Eighteen laboratories participated in this part and provided about 26 series of results, using 12 different methods. A relevant paper "Intercomparison of methods for coincidence summing corrections in gamma-ray spectrometry", by M.-C. Lépy and all the participants of the intercomparison, has been published (Applied Radiation and Isotopes 68 (2010) 1407-1412).

The next step of the coincidence summing action is dedicated to coincidence summing corrections for volume samples. Experimental data obtained with ^{152}Eu and ^{134}Cs solutions in three different containers were provided to the participants. The goal of this exercise was again to calculate the corrective factors for several energies characteristic of the two radionuclides, for different geometrical arrangements. Sixteen laboratories participated in this second part and provided 23 series of results that were discussed during a dedicated workshop. These results for volume sources will be presented at ICRM2011, and an exhaustive report including results of both steps of the exercise will be published at the end of the action.

Working Group meetings

2-days workshop
The meeting of the ICRM Gamma Spectrometry Working Group was hosted by ENEA Casaccia (Italy) on October 18-19, 2010. Twenty one participants attended this workshop that was mainly

dedicated to the coincidence summing action, and gave also the opportunity to discuss different topics that could be of interest for future actions.

Business meeting

The Gamma Spectrometry Working Group business meeting was held during ICRM2009, on September 9th, 2009. About 50 participants attended the meeting and the agenda included the WG activity report, some short presentations, information and discussions.

GS WG Web site

The web page dedicated to the Gamma Spectrometry WG is hosted by LNHB at the address: http://www.nucleide.org/ICRM_GSWG.htm with a link on the ICRM main site hosted by NIST: (http://physics.nist.gov/Divisions/Div846/ICRM/working_groups.html#GSWG).
Detailed information concerning the working group actions is available there.

GS WG forum

The GSWG forum (address: http://laraweb.free.fr/GRS_forum/) has been created to facilitate exchanges among the working group members.

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CONTRIBUTIONS

LABORATORY	RADIOISOTOPE METROLOGY LABORATORY - CNEA, ARGENTINA
NAMES	P. ARENILLAS, R. BIANCHINI, C. BALPARDO, D. RODRIGUES, S. CONSORTI, M. ROLDAN, R. LLOVERA, M. LOBO
ACTIVITY	1. Absolute activity measurements 2. Participation in international comparisons 3. Operation of a Tandem FN accelerator mainly for AMS (in progress)
KEYWORDS	Alpha spectrometry, beta spectrometry, coincidence method, data evaluation, data measurement, gas proportional counter, liquid scintillation, NaI well counter, simulation code, TDCR counter
RESULTS	1. Standardization of Co-60, Eu-152 and Am-241 by 4π (HPPC) β-γ digital coincidences counting 2. Standardization of F-18, Ga-68, Co-60, Mo-99 and Am-241 by TDCR with efficiency variation with grey filters. 3. Calibration of ionization chambers for F-18, Cs-137, Co-60, Eu-152, Am-241 and Mo-99 4. Standardization of F-18, and Cs-134 by 4π γ counting 5. Determination of Sr-90 / Y-90 by CIEMAT/NIST method 6. Maintenance of the auxiliary devices and main transport line of the Tandem FN accelerator.
PUBLICATIONS	"Standardization of ^{241}Am by Digital Coincidence Counting, liquid scintillation counting and Defined Solid Angle counting" C. Balpardo, M. E. Capoulat, D. Rodrigues and P. Arenillas. Applied Radiation and Isotopes, Volume 68, Issues 7-8, July-August 2010, pages 1358-1361 "Uncertainty Assessment in the Application of the Triple-to-Double Coincidence Ratio (TDCR) Method" B.E. Zimmerman, T. Altzitzoglou, D. Rodrigues, R. Broda, P. Cassette, L. Mo, G. Ratel, B. Simpson, W. van Wyngaardt, C. Wätjen Applied Radiation and Isotopes, Volume 68, Issues 7-8, July-August 2010, Pages 1477-1481
IN PROGRESS	1. Improvement of source preparation and characterization for the defined solid angle system for alpha counting. 2. Application of the Anticoincidence Counting and Correlations Technique. 3. Standardization of several radionuclides 4. Efficiency Monte – Carlo calculations of a (HP)Ge detector and a 4π-gamma detector. 5. Participation in the SIR.
SOURCE IN PREPARATION	"Standardization of 67Ga by Digital Coincidence Counting" C. Balpardo, D. Rodrigues, P. Arenillas and M. Roteta "Standardization of ^{18}F by Digital beta(LS)-gamma Coincidence Counting" Rodrigues D., Balpardo C., Cassete P., Arenillas P., Capoulat M. E., Cerutti G., García-Toraño E..
OTHER RELATED PUBLICATIONS	
ADDRESS	Comisión Nacional de Energía Atómica, Centro Atómico Ezeiza. Av. del Libertador 8250 (C.P.1429) - Buenos Aires - ARGENTINA Telephone/Fax: (54-11) 6779-8279/8554 e-mail: arenilla@cae.cnea.gov.ar
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LABORATORY	RADIOISOTOPE METROLOGY LABORATORY - CNEA, ARGENTINA
NAMES	G.L. CERUTTI, C. GUARDO, E. CIRELLO, L. RAMÍREZ.
ACTIVITY	Measurement of natural and artificial radionuclides in environmental samples and others
KEYWORDS	Gross alpha determination, gross beta determination, liquid scintillation, low-level, radiochemistry, gamma spectrometry
RESULTS	1. Participation in the IAEA/ALMERA environmental activity comparison (IAEA-CU-2009-03 World-wide open proficiency test) 2. Participation in activity comparison in ash from food organized by CONSEJO DE SEGURIDAD NUCLEAR (CSN), Spain. 3. Activity determinations of ^{90}Sr in 120 samples of milk powder, maize, soybean meal, wheat, cheese, fish and meat. 4. Activity determinations of ^{241}Am and ^{239}Pu in 120 milk powder, maize, soybean meal, wheat and fish samples. 5. Analysis in samples of water by high resolution gamma spectrometry 6. Analysis of ^{60}Co and ^{137}Cs by NaI(Tl) detector for surface contamination testing 7. Routine measurements and certifications of non radioactive contamination in exported foodstuffs by high resolution gamma spectrometry (about 2600 samples)
PUBLICATIONS	
IN PROGRESS	Implementation of a quality system based on Guide ISO 17025.
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	Comisión Nacional de Energía Atómica, Centro Atómico Ezeiza. Presbítero Juan González y Aragón N°15 (B1802AYA) - Ezeiza - Buenos Aires – ARGENTINA
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LABORATORY	RADIOISOTOPE METROLOGY LABORATORY - CNEA, ARGENTINA
NAMES	G.L. CERUTTI, F.A. IGLICKI, C. GUARDO.
ACTIVITY	1. Preparation, quality control, standardisation and issue of: - Standard point gamma sources and solutions of several radionuclides of alpha, beta and gamma emitters. - Large area standard sources of alpha, beta and gamma emitters. 2. Development of standard sources.
KEYWORDS	Gamma-ray spectrometry, source preparation, radioactive standards
RESULTS	1. Preparation and calibration of about 70 radioactive sources. 2. Maintenance of "Preparation and calibration of radioactive standards" by the Argentinean Accreditation Body (OAA) 3. Participation in comparisons organised by BIPM for gamma emitters
PUBLICATIONS	
IN PROGRESS	1. Development of simulated water standards. 2. Development of reference materials for gamma emitters 3. GeHP measurement by Monte Carlo simulation
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	Comisión Nacional de Energía Atómica, Centro Atómico Ezeiza. Presbítero Juan González y Aragón N°15 (B1802AYA) - Ezeiza - Buenos Aires – ARGENTINA
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LABORATORY	RADIOISOTOPE METROLOGY LABORATORY - CNEA, ARGENTINA
NAMES	M.I. MILA, M. ROLDAN, M. LOBO
ACTIVITY	1. Routine metrological assessment of radionuclide calibrators used in Nuclear Medicine. 2. Preparation, quality control and standardisation of standard sources for Nuclear Medicine. 3. Organisation of comparisons for activity measurements among Nuclear Medicine Centres in Argentina
KEYWORDS	Ionisation chamber, life sciences
RESULTS	1. Assessment of 25 Nuclear Medicine Centre calibrators for ^{18}F, ^{32}P, ^{67}Ga, ^{90}Y, ^{99m}Tc, ^{99}Mo, ^{131}I and ^{153}Sm. 2. Assessment of 66 commercial calibrators for ^{67}Ga, ^{99m}Tc, ^{111}In, ^{131}I, ^{153}Sm and ^{32}P. 3. Preparation and calibration of 13 radioactive solutions to perform the assessment of calibrators. 4. Maintenance of the accreditation of “Activimeters calibration” by the Argentinean Accreditation Body 5. Development of a new method for the calibration of ionization chambers (^{68}Ga and ^{11}C)
PUBLICATIONS	
IN PROGRESS	Re-calibration of the LMR’s Reference Ionization Chamber. Calibration of the LMR’s Reference Ionization Chamber for ^{64}Cu
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	BEV – Bundesamt für Eich- und Vermessungswesen, Austria
NAMES	Franz Josef Maringer, Robert Brettner-Messler, Peter Michai, Michael Kreuziger (till June 2010), Markus Henien (since Oct 2010)
ACTIVITY	Metrological research, development and applications Participation in international comparison - EURAMET, CCRI(II) and bilateral comparisons Joint research projects in radionuclide metrology, applications and measurements Type approval and legal verification of medical activity meter, surface contamination monitors, hand-foot monitors, clearance monitors Internal dosimetry inter-comparison exercises and proficiency tests Calibration services
KEYWORDS	National Metrology Institute Radioactivity laboratory with low-level facilities Calibrated $4\pi\gamma$ ionisation chambers HPGe detectors for gamma-ray spectrometry Low-level anti-compton HPGe gamma-ray spectrometer Multiwire proportional chamber Radon ionisation chambers
RESULTS	BIPM-RI(II)-K2.Cs-137 Calibration and verification of contamination monitors Calibration of thyroid monitors Setting-up a primary standard large-area source detector
PUBLICATIONS	D Stanga, FJ Maringer, E Ionescu. A new method for determining the efficiency of a large-area beta sources constructed from anodized aluminium foils. Appl Rad Isot 69 (2011) 227-230 C Michotte, S Courte, G Ratel, M Sahagia, AC Wätjen, R Fitzgerald & FJ Maringer. Update of the ongoing comparison BIPM-RI(II)-K1.Co-60 including activity measurments of the radionuclide ^{60}Co for the IFIN-HH (Romania), NIST (USA) and the BEV (Austria). Metrologia 47 (2010)
IN PROGRESS	Radon in soil-gas measurement calibration facilities Joint research co-operations: • IAEA – International Atomic Energy Agency • BOKU - University of Natural Resources and Life Science Vienna • TU VIE - Technical University of Vienna • AIT - Austrian Institute of Technology • SEIB – Seibersdorf Laboratories GmbH *1 thesis and 1 joint research projects in the field of applied radionuclide metrology in progress*

INFORMATION	82 CMCs for radioactivity measurement calibration services
SOURCE IN PREPARATION	Planned radionuclide comparisons in SIR / CCRI(II).K: Tl-201, Lu-177, Pb-210
OTHER RELATED PUBLICATIONS	C Seidel, A Baumgartner, W Ringer, J Gräser, H Friedmann, H Kaineder, FJ Maringer. Soil gas radon measurements in a region of the Bohemian Massif: investigations in the framework of an Austrian pilot study. Rad Prot Dos (submitted 2010) A Baumgartner, A Steurer, W. Teifenböck, F Gabris, FJ Maringer, RP Kapsch, G Stucki. Re-evaluation of correction factors of a primary standard graphite calorimeter in ^{60}Co gamma ray beams as a basis for the appointment of the BEV absorbed dose rate to water reference value. Rad Prot Dos doi:10.1093/rpd/ncq376 (2010) Advanced Tools and Models to Improve River Basin Management in Europe in the Context of Global Change – AquaTerra. ed. M Finkel, P. Grathwohl, J Barth; contrib. FJ Maringer et al. IWA Publishing London (submitted 2010)
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LABORATORY	European Commission - Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Radionuclide Metrology Sector
NAMES	T. Altzitzoglou
ACTIVITY	* Liquid Scintillation Counting and TDCR * Gamma-ray spectrometry * Nuclear decay data measurement
KEYWORDS	Alpha spectrometry, beta spectrometry, coincidence method, data measurement, environmental control, Euramet, gamma-ray spectrometry, life sciences, liquid scintillation, low-level, simulation code, SIR, ESIR, source preparation, traceability, X-ray spectrometry
RESULTS	* The half-life of ^{177}Lu. * CCRI(II) Supplementary Comparison of the activity of ^{241}Pu. * Intercomparison of Methods for Coincidence Summing Corrections in Gamma-Ray Spectrometry; Phase 2: Volume sources.
PUBLICATIONS	* Lépy M, Altzitzoglou T, Anagnostakis M, Arnold D, Capogni M, Ceccatelli A, De Felice P, Dersch R, Dryak P, Fazio A, Ferreux L, Guardati M, Han J, Hurtado S, Karfopoulos K, Klemola S, Kovar P, Lee K, Ocone R, Ott O, Sima O, Sudar S, Svec A, Chau V, Tran T, Vidmar T. *Intercomparison of Methods for Coincidence Summing Corrections in Gamma-Ray Spectrometry*. In: The 17th International Conference on Radionuclide Metrology and its Applications (ICRM 2009); 07 September 2009; Bratislava (Slovakia). APPLIED RADIATION AND ISOTOPES 68 (2010) 1407-1412. * Bé M, Chauvenet B, Amiot M, Bobin C, Lepy M, Branger T, Laniece I, Luca A, Sahagia M, Waetjen A, Kossert K, Ott O, Naehle O, Dryak P, Sochorova J, Kovar P, Auerbach P, Altzitzoglou T, Pomme S, Sibbens G, Van Ammel R, Paepen J, Iwahara A, Delgado J, Poledna R. *International Exercise on 124Sb Photon Emission Intensities Determination*. In: The 17th International Conference on Radionuclide Metrology and its Applications (ICRM 2009); 07 September 2009; Bratislava (Slovakia). APPLIED RADIATION AND ISOTOPES 68 (2010) 2026-2030. * Sibbens G, Pomme S, Altzitzoglou T, Garcia-Torano E, Janssen H, Dersch R, Ott O, Martin Sanchez A, Rubio Montero M, Loidl M, Coron N, De Marcillac P, Semkow T. *Alpha-Particle Emission Probabilities in the Decay of 240Pu*. In: The 17th International Conference on Radionuclide Metrology and its Applications (ICRM 2009); 07 September 2009; Bratislava (Slovak Republic). APPLIED RADIATION AND ISOTOPES 68 (2010) 1459-1466. * Wätjen U, Benedik L, Spasova Y, Vasile M, Altzitzoglou T, Beyermann M. *EC Comparison on the Determination of 226Ra, 228Ra, 234U and 238U in Water among European Monitoring Laboratories*. In: The 17th International Conference on Radionuclide Metrology and its Applications (ICRM 2009); 07 September 2009; Bratislava (Slovakia). APPLIED RADIATION AND ISOTOPES 68 (2010) 1200-1206.
IN PROGRESS	* Determination of the half-lives of ^{238}U and ^{230}U. * ESIR: Trial operation exercise. * Development of a new TDCR Liquid Scintillation Counter.

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LABORATORY	European Commission - Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Radionuclide Metrology Sector
NAMES	M. Hult, G. Marissens, R. Gonzalez de Orduña, N. Sahin, E. Andreotti
ACTIVITY APPARATUS	Low-level gamma-ray spectrometry, secondary standardisation of activity, determination of nuclear data, detector development. Eight HPGe-detectors for ultra low level gamma-ray spectrometry in the underground laboratory HADES. Two low-background HPGe-detectors above ground. One low-background NaI well (+ plug) for Compton suppression.
KEYWORDS	Underground gamma-ray spectrometry, anti-coincidence method, low-level, neutron measurement, simulation code, muon shield
RESULTS	* Measurement of the $^{50}Cr(n,t)^{48}V$ cross section. * Results from experiment at JET aiming at quantifying the ratio of 3 MeV and 14 MeV protons. * Improved determination of the half-life of the decay with Nature's lowest Q-value: $^{115}In(\beta^-)$ ^{115}Sn* * Radiopurity measurements of materials for the GERDA experiment and measurement of GERDA calibration sources. * Ultra low-background detector development in HADES.
PUBLICATIONS	* Wieslander et al. "Validation of a method for neutron dosimetry and spectrometry using neutron activation of metal discs", Radiation Protection Dosimetry 138 (2010) 205-212. * Vidmar et al. "Testing efficiency transfer codes for equivalence ", Appl. Radiat. and Isot . 68 (2010) 355-359. * González de Orduña et al. "Angular Distribution of Proton Leakage from a Fusion Plasma using Ultra Low-level γ-ray Spectrometry", Appl. Radiat. and Isot . 68 (2010) 1226–1230. * Vasile et al. "^{226}Ra and ^{228}Ra determination in mineral waters — Comparison of methods ", Appl. Radiat. and Isot . 68 (2010) 1236-1239. * Vermaercke et al. "Measurement of the Isotopic Composition of Germanium by k_0-NAA and INAA", Nucl. Instr. Meth. A622 (2010) 433-437. * Bonheure et al. "Charged fusion product loss measurements using nuclear activation analysis", Review of Scientific Instruments 81 (2010) 10D331. * M. K. Pham et al. "A new reference material for radionuclides in the mussel sample from the Mediterranean Sea (IAEA-437)", J. Radioanal. Nucl. Chem. 283 (2010) 851-859. * Raquel Gonzalez de Orduna et al. "Monitoring the leakage of 3.0 and 14.7 MeV protons from a fusion plasma", Nucl. Instr. and Meth. A (2010) doi:10.1016/j.nima.2010.12.151 * Raquel Gonzalez de Orduna et al. "Pulse shape analysis to reduce the background of BEGe detectors ", J Radioanal Nucl Chem 286 (2010) 477–482.

	* Hoshi et al. "Atomic bomb radiation dosimetry in Hiroshima and Nagasaki and its meanings", Proceedings of the 52nd Annual Meeting of the Japan Radiation Research Association, 2010, p.62. * Budjas et al. "Procurement, production and testing of BEGe detectors depleted in Ge-76", Nuclear Physics B Proceedings Supplement (2010). * Bonheure et al. "Charged Fusion Product Loss Measurements Using Nuclear Activation Analysis", Report EFDA–JET–CP(10)03/16.
IN PROGRESS	* Decay data for long-lived radionuclides * Neutron cross sections of Cr, Re, In and Bi * 4th experiment for fusion plasma characterisation using activation of metal discs * Intercomparisons, reference materials and metrology * Ultra-low background detector developments
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LABORATORY	European Commission - Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Radionuclide Metrology Sector
NAMES	S. Pommé, T. Altzitzoglou, R. Van Ammel, J. Paepen, M. Marouli, G. Suliman, H. Stroh, U. Wätjen
ACTIVITY	Primary standardisation of activity and determination of nuclear decay data
KEYWORDS	Alpha-particle spectrometry, coincidence counting, 4πCsI(Tl)-sandwich spectrometer, defined solid angle (alpha-particle and X-ray) counting, gamma-ray spectrometry, gas proportional counting (atmospheric, pressurised), ionisation chamber, liquid scintillation counting, NaI well-type counters, X-ray spectrometry, simulation code, SIR, source preparation (quantitative drop deposition, IRMM source drying device, vacuum evaporation and electrodeposition), traceability, data evaluation, data measurement, Euramet projects, life sciences
RESULTS	* Primary standardisation of ^{3}H, ^{241}Pu * Measurement of half-lives of ^{109}Cd, ^{177}Lu, ^{124}Sb * Construction of "irradiators" for testing of portal monitors * Installation of a new NaI well-type detector for 4πγ-counting * Proposal of new method to calculate KCRV
PUBLICATIONS	* T. Vidmar, N. Çelik, N. Cornejo Díaz, A. Dlabac, I.O.B. Ewa, J.A. Carrazana González, M. Hult, S. Jovanović, M.-C. Lépy, N. Mihaljević, O. Sima, F. Tzika, M. Jurado Vargas, T. Vasilopoulou and G. Vidmar, Testing efficiency transfer codes for equivalence, Appl. Radiat. Isot. 68 (2010) 355-359. * J. Paepen, T. Altzitzoglou, R. Van Ammel, G. Sibbens and S. Pommé, Half-life measurement of ^{124}Sb, Appl. Radiat. Isot. 68 (2010) 1555-1560 * G. Sibbens, S. Pommé, T. Altzitzoglou, E. García-Toraño, H. Janssen, R. Dersch, O. Ott, A. Martín Sánchez, M.P. Rubio Montero, M. Loidl, N. Coron, P. De Marcillac, T.M. Semkow, Alpha-particle emission probabilities in the decay of ^{240}Pu, Appl. Radiat. Isot. 68 (2010) 1459-1466. * Marie-Martine Bé, B. Chauvenet, M.-N. Amiot, C. Bobin, M.-C. Lépy, T. Branger, I. Lanièce, A. Luca, M. Sahagia, A.C. Wätjen, K. Kossert, O. Ott, O. Nähle, P. Dryák, J. Sochorovà, P. Kovar, P. Auerbach, T. Altzitzoglou, S. Pommé, G. Sibbens, R. Van Ammel, J. Paepen, A. Iwahara, J.U. Delgado and R. Poledna, International exercise on ^{124}Sb photon emission intensities determination, Appl. Radiat. Isot. 68 (2010) 2026-2030 * B. Chauvenet, Marie-Martine Bé, M.-N. Amiot, C. Bobin, M.-C. Lépy, T. Branger, I. Lanièce, A. Luca, M. Sahagia, A.C. Wätjen, K. Kossert, O. Ott, O. Nähle, P. Dryák, J. Sochorovà, P. Kovar, P. Auerbach, T. Altzitzoglou, S. Pommé, G. Sibbens, R. Van Ammel, J. Paepen, A. Iwahara, J.U. Delgado, R. Poledna, L. Johansson, A. Stroak, C. Bailat, Y. Nedjadi and P. String, International exercise on ^{124}Sb activity measurements, Appl. Radiat. Isot. 68 (2010) 1207-1210 * R. Van Ammel, J. Paepen, S. Pommé and G. Sibbens, Measurement of the ^{54}Mn half-life, Appl. Radiat. Isot. 68 (2010) 2387-2392

	* T. Semkow, A. J. Khan, D.K. Haines, A. Bari, G. Sibbens, S. Pommé, S. Beach, I. AlMahamid and G. Beach, Alpha Spectrometry of Thick Samples for Environmental and Bioassay Monitoring, American Chemical Society Press (2010), Nuclear energy and the environment (ACS Symposium Series; 1046), 169-177 * R. Van Ammel, S. Pommé, J. Paepen, G. Sibbens, Measurement of the ^{109}Cd half-life, Appl. Radiat. Isot. 69 (2011) 785-789
IN PROGRESS	* Half-life determination of ^{230}U, ^{235}U, ^{238}U, ^{22}Na, ^{134}Cs, ^{57}Co, ^{226}Th, ^{222}Ra, ^{218}Rn, ^{214}Po. * Development of software for 4πγ-counting. * Development of the new reference ionisation chamber.
INFORMATION	http://www.irmm.jrc.be/html/activities/radionuclide_metrology/index.htm
IN PREPARATION	* R. Van Ammel, S. Eykens, R. Eykens, S. Pommé, Preparation of drop-deposited quantitative uranium sources with low self-absorption, Nucl. Instr. and Meth. A (2011) * S. Pommé, J. Paepen, T. Altzitzoglou, R. Van Ammel, E. Yeltepe, Measurement of the ^{177}Lu half-life, Appl. Radiat. Isot. (2011) * S. Pommé, STEFFY – Software for calculation of nuclide-specific total counting efficiency in well-type γ-ray detectors, Appl. Radiat. Isot (2012). * S. Pommé, G. Suliman, M. Marouli, R. Van Ammel, V. Jobbagy, J. Paepen, H. Stroh, C. Apostolidis, K. Abbas, A. Morgenstern, Measurement of the ^{226}Th and ^{222}Ra half-lives, Appl. Radiat. Isot (2012) * S. Pommé, T. Altzitzoglou, R. Van Ammel, G. Suliman, M. Marouli, V. Jobbagy, J. Paepen, H. Stroh, C. Apostolidis, K. Abbas, A. Morgenstern, Measurement of the ^{230}U half-life, Appl. Radiat. Isot (2012) * G. Suliman, S. Pommé, M. Marouli, R. Van Ammel, V. Jobbagy, J. Paepen, H. Stroh, C. Apostolidis, K. Abbas, A. Morgenstern, Measurements of the half-life of ^{214}Po and ^{218}Rn using digital electronics, Appl. Radiat. Isot (2012) * M. Marouli, S. Pommé, J. Paepen, R. Van Ammel, V. Jobbagy, G. Suliman, H. Stroh, C. Apostolidis, K. Abbas, A. Morgenstern, Study of alpha-particle emission probabilities in the U-230 decay series, Appl. Radiat. Isot (2012)
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LABORATORY	European Commission - Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Radionuclide Metrology Sector
NAMES	U. Wätjen, J. Merešová, V. Jobbággy, Y. Spasova, M. Vasile, T. Altzitzoglou
ACTIVITY	* development of reference materials * organisation of measurement comparisons for EU member state laboratories monitoring radioactivity in the environment and food (ICS-REM) * facilities for radiochemical separations * large solid angle α-particle spectrometers * primary standardisation equipment when needed * HPGe detector systems and LSC when needed
KEYWORDS	Intercomparisons, proficiency tests, reference materials, traceability, environmental monitoring, life sciences, source preparation, radiochemistry, low-level, liquid scintillation, alpha spectrometry, beta spectrometry, gamma-ray spectrometry
RESULTS	* ICS-REM interlaboratory comparison on anthropogenic ^{137}Cs and ^{90}Sr and natural radionuclides in soil.
PUBLICATIONS	* U. Wätjen, L. Benedik, Y. Spasova, M. Vasile, T. Altzitzoglou and M. Beyermann, EC comparison on the determination of ^{226}Ra, ^{228}Ra, ^{234}U and ^{238}U in water among European monitoring laboratories, Appl. Radiat. Isot. 68 (2010) 1200-1206. * M. Vasile, L. Benedik, T. Altzitzoglou, Y. Spasova, U. Wätjen, R. González de Orduña, M. Hult, M. Beyermann and I. Mihalcea, ^{226}Ra and ^{228}Ra determination in mineral waters – comparison of methods, Appl. Radiat. Isot. 68 (2010) 1236-1239. * V. Jobbágy, U. Wätjen and J. Merešová, Current Status of Gross Alpha/Beta Activity Analysis in Water Samples: A Short Overview of Methods, J. Radioanal. Nucl. Chem. 286 (2010) 393-399. * M. Vasile, Analytical methods for the determination of radionuclides in environmental samples, PhD thesis, Faculty of Chemistry, University of Bucharest, Bucharest, Romania, September 2010. * Y. Spasova and M. Vasile, Homogeneity measurements for the EC comparison radioactivity in soil, Report EUR 24649 EN (2010), ISBN 978-92-79-18866-4.
IN PROGRESS	* CCRI(II) Supplementary Comparison of the activity of ^{40}K, ^{137}Cs and ^{90}Sr in bilberry material. * Development of reference material IRMM-426 "wild berries". * Evaluation of soil comparison for EU member state laboratories.
IN PREPARATION	* ICS-REM interlaboratory comparison on gross-alpha and -beta activity as pre-scanning method for monitoring of drinking water.

	Publications in print: * U. Wätjen, Europäische Ringvergleiche für Messungen der Umweltradioaktivität, In: Umweltpolitik - 14. Fachgespräch Überwachung der Umweltradioaktivität, Editor: Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU), Berlin, Germany (2011) * Y. Spasova, U. Wätjen, L. Benedik, M. Vasile, T. Altzitzoglou and M. Beyermann, Evaluation of EC comparison on the determination of ^{226}Ra, ^{228}Ra, ^{234}U and ^{238}U in mineral waters, Report EUR 24694 EN (2011), ISBN978-92-79-19069-8.
ADDRESS	European Commission Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Retieseweg 111, B-2440 Geel, Belgium Tel. +32 14 571 269 - Fax +32 14 584 273 e-mail: uwe.waetjen@ec.europa.eu
CONTACT	Uwe Wätjen

LABORATORY	**SCK·CEN, Low Level Radioactivity Measurements (SA1/SA2)**
NAMES	C. Hurtgen, F. Verrezen, M. Bruggeman, P. Vermaercke, F. Farina, L. Sneyers, L. Verheyen
ACTIVITY	Gross alpha and beta, ^{3}H, ^{14}C, $^{89-90}$Sr, ^{131}I, ^{210}Po, ^{226}Ra, actinides and gamma activity measurements in environmental samples Assay of actinides (Th, U, Pu, Am...) in biological samples (urine, faeces) and environmental samples (water, sediment, soil ...) by alpha spectrometry and by KPA for U. γ–spectrometry, Preparation of Radioactive Standards, Neutron activation analysis with relative NAA and k_0 – method
KEYWORDS	Alpha spectrometry, measurement, environmental control, gas proportional counter, liquid scintillation, low-level, radiochemistry, coincidence counting, gamma-ray spectrometry, ionisation chamber, low-level, NaI well counter, neutron measurement, simulation code, source preparation, X-ray spectrometry.
RESULTS	Informatisation and integration of our ZnS α counting chain for low-level global α measurements into the QA system of our laboratory. A procedure for coincidence summing corrections applicable in routine gamma-ray spectrometry analysis, and based on CCCC (by T. Vidmar) was developed. Two efficiency transfer codes and coincidence summing correction codes have been compared (EFFTRAN/CCCC, SOLCOI) using experimental data for different measurement geometry. Since CCCC does not require P/T calibrations, the latter was selected for use in the gamma spectrometry lab since results are comparable to those obtained by Solcoi. A method was developed for determining isotopic ratio's using INAA and k0-NAA A method was developed for determining the level of uranium depletion or enrichment in different samples: water, sediments and safeguards swipe samples,
PUBLICATIONS	Bonheure G., Hult M., Gonzales de Orduna R., Arnold D., Dombrowski H., Laubenstein M., Vermaercke P, e.a.- *Charged fusion product loss measurements using nuclear activation*.- Review of Scientific Instruments, 81:10(2010), 10D331 Farina Arbocco F., Strijckmans K., Vermaercke P., Verheyen L., Sneyers L.- *The impact of polyethylene vials on reactor channel characterization in k0-NAA*.- Journal of Radioanalytical and Nuclear Chemistry, 286:2(2010), 569-575. Farina F., Vermaercke P., Sneyers L., Soares Leal A., Goncalves Boucas J.- *The use of k_0-NAA for the determination of the n(235U)/n(238U) isotopic ratio in samples containing uranium: 5th Internation k0 workshop, Belo Horizonte, Brazil, 12-19 September 2009*.- Nuclear Instruments and Methods in Physics Research A, 622:2(2010), 443-448. Gonzales de Orduna R., Hult M., Bonheure G., Arnold D., Dombrowski H., Laubenstein M., Vermaercke P., e.a.- *Angular distribution of proton leakage from a fusion plasma using ultra low-level gamma-ray spectrometry*.- Applied Radiation and Isotopes, 68:7-8(2010), 1226-1230. Ma L., Feng L., Hioki A., Cho K., Vogl J., Berger A., Vermaercke P., e.a.-*International comparison of the determination of the mass fraction of cadmium, chromium, mercury and lead in polypropylene: the Comité Consultatif pour la Quantité de Matière pilot study CCQM-P106*.- Accreditation and Quality Assurance, 15:1(2010), 39-44. Vermaercke P., Farina Arbocco F., Sneyers L., Leal A., Bruggeman M.- *Environmental Monitoring for Safeguards Using k_0-standardized Neutron Activation Analysis*.- In: IEEE Transactions on Nuclear Science, 57:5(2010), 2773-2776. Vermaercke P., Hult M., Verheyen L., Farina Arbocco F.- *Measurement of the isotopic composition of germanium by k_0-INAA and INAA*.- Nuclear Instruments and Methods in Physics Research, 622:2(2010), 433-437.
IN PROGRESS	Revision of our validation report on gross α and β measurements. Validated procedure for routine measurement of Pb-210; Investigate contribution of lump effects of U in environmental samples ;

	Improve quantification of Ra-226 by gamma-ray spectrometry; The effect of thermal and epithermal selfshielding in NAA Validation of robustness for highly absorbing materials in NAA The effect of radiation flux direction in NAA Redetermination of some suspicious k_0-and Q_0 factors
ADDRESS	Low Level Radioactivity Measurements SCK•CEN Boeretang 200 B-2400 Mol Belgium Telephone: (+32-14) 33 28 31 Telecopier: (+32-14) 32 10 56 E-mail:churtgen@sckcen.be Web: http://www.sckcen.be/lrm http://www.gammaspectrometry.be/ http://www.k0naa.be/ http://www.radsources.be/
CONTACT	C. Hurtgen, P. Vermaercke

LABORATORY	**SCK•CEN, Radio-Chemical Analysis laboratories (RCA) (SA1/SA2)**
NAMES	L. Adriaensen, M. Gysemans
ACTIVITY	• Destructive radiochemical analysis of spent fuels for the determination of burn-up and for spent fuel characterization programs • Determination of Pu concentration in MOX fuels (accredited according to ISO17025). • Radiochemical analysis of long-lived and radiotoxic nuclides in various types of radioactive waste such as resins, evaporator concentrates, filters, incinerator ashes... • Study of separation chemistry of actinides and specific radionuclides • Radiochemical analysis of reactor dosimeters and irradiated reactor materials.
KEYWORDS	Alpha spectrometry, beta spectrometry, gamma-ray spectrometry, low-level, NaI well-type counter, radiochemistry, source preparation
RESULTS	• Burn-up determination and spent fuel characterization for the MALIBU program. • Dissolution, separation and analysis of ^{36}Cl, ^{14}C, ^{3}H, ^{63}Ni in radioactive graphite samples in the framework of Carbowaste, a project of the 7th EURATOM programme • Dissolution, separation and analysis of (radio)nuclides in a Pb-Bi matrix in the framework of GETMAT (7th FWP)
PUBLICATIONS	
IN PROGRESS	• Dissolution, separation and analysis of ^{36}Cl in radioactive concrete or metal samples • Dissolution, separation and analysis of Cl-36, I-129 and Tc-99 in resin materials • Microwave and high pressure dissolution of different types of waste materials • Dissolution, separation and analysis of (radio)nuclides in a Pb-Bi matrix in the framework of GETMAT (7th FWP)
ADDRESS	Radio-Chemical Analysis SCK•CEN Boeretang 200, B-2400 Mol, Belgium Telephone: (+32-14) 33 32 26 Fax: (+32-14) 32 07 55 E-mail: ladriaen@sckcen.be
CONTACT	L. Adriaensen

(SA1/SA2)

LABORATORY	Laboratório Nacional de Metrologia das Radiações Ionizantes LNMRI/IRD/CNEN
NAMES	A. Iwahara, C. J. da Silva, A. E. de Oliveira, E. M. de Oliveira, P. A. L. da Cruz, J. dos S. Loureiro, J. U. Delgado, R. Poledna, L. Tauhata, D. S. Moreira, R. dos S. Gomes
ACTIVITY	1- Participation in international comparisons 2- Absolute activity measurements 3- Sources supply to users 4-Quality assurance programa for activity measurements in nuclear medicine
RESULTS	1- Primary standardization of ^{243}Am, ^{166m}Ho, ^{123}I, ^{18}F, ^{111}In solutions; 2-Comparative performance of 4πβ(LSC)-(NaI(Tl) anticoincidence and 4πβ(PC)-(NaI(Tl) coincidence systems
PUBLICATIONS	1- National comparison of ^{131}I measurement among nuclear medicine clinics of eight countries, V. Olsovcova, A. Iwahara, P. Oropesa, L. Joseph, A. Ravindra, M. Ghafoori, Hye-K. Son, M. Sahagia, S. Tastan, B. Zimmerman. Applied Radiation and Isotopes 68 (2010) 1371-1377. 2- The ^{124}Sb activity standardization by gamma spectrometry for medical applications, M. C. M. de Almeida, A. Iwahara, J. U. Delgado, R. Poledna, R. L. da Silva, Nuclear Instruments and Methods in Physics Research A 619 (2010) 365-367 3- International exercise on ^{124}Sb activity measurements, B. Chauvenet, M.-M. Bé, M.-N. Amiot, C. Bobin, M.-C. Lépy, T. Branger, I. Lanièce ; A. Luca, M. Sahagia, A.-M. Wätjen ; K. Kossert, O. Ott, O. Nähle ; P. Dryak, J. Sochorovà, P. Kovar, P. Auerbach ; T. Altzitzoglou, S. Pommé, G. Sibbens, R. Van Ammel, J. Paepen ; A. Iwahara, J.U. Delgado, R.Poledna,Carlos J. da Silva ; L. Johansson, A. Stroak ; C. Bailat, Y. Nedjadi, P. Spring. Applied Radiation and Isotopes 68 (2010) 1207-1210 4- Comparison of activity measurements in nuclear medicine services in Pernambuco, M. da C. Fragoso, A. M. de A. Albuquerque, F. P. Barreto, A. Iwahara, R. de A. Lima, F. F. de Lima, M. Oliveira. Alasbimn Journal Year 13, No 50, October 2010/Año 13, No 50, Article AJ50-4 (2010) 1-7.
IN PROGRESS	1- Primary activity measurements of ^{123}I, ^{111}In and ^{177}Lu, E. A. Rezende, A. R. Correa, A. Iwahara, C. J. da Silva, L. Tauhata, R. Poledna

	2- Standardization of ^{131}I capsules used in nuclear medicine, T. O. Chaves, A. Iwahara, L. Tauhata, E. A. Rezende, A. R. Correia, A. E. Oliveira 3- Calibration of a commercial Capintec CRC-15R radionuclide calibrator for ^{99}Tc^{m} and ^{123}I in syringe geometry, A. R. Correia, E. A. Rezende, T. O. Chaves, A. Iwahara, L. Tauhata, A. E. Oliveira 4- Primary standardization of ^{68}Ge, E. M. de Oliveira, C. J. da Silva, D. S. Moreira, A. Iwahara, R. Poledna 5- Half life determination of ^{57}Co, C. J. da Silva, A. Iwahara, R. Poledna, R. S. Gomes 6- Standardization of ^{166m}Ho and ^{243}Am by live timed anti-coincidence Counting, C. J. da Silva, J. S. Loureiro, J.U. Delgado, A. Iwahara, Ricardo T. Lopes, *et al.*
ADDRESS	Instituto de Radioproteção e Dosimetria, Av. Salvador Allende, s/n, Recreio, CEP 22780-160, Rio de Janeiro, Brasil.Tel: ++55 21 2173 2879 Fax: ++55 21 2442 1605
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(SA1/SA2)

LABORATORY	Laboratório Nacional de Metrologia das Radiações Ionizantes LNMRI/IRD/CNEN
NAMES	E.M. de Oliveira, J.U. Delgado, M. Candida de Almeida, R. Poledna, Ronaldo L. da Silva.
ACTIVITY	1 - Half-life determination. 2 - Impurities study by gamma-ray spectrometry. 3- Determination of photon emission probabilities
RESULTS	Measurements of nuclear data parameters in the standardization of ^{177}Lu. Determination of half-lives of ^{18}F; ^{123}I, ^{111}I and ^{177}Lu
PUBLICATIONS	1- International exercise on ^{124}Sb photon emission intensities determination, Marie-Martine Bé, B. Chauvenet, M.-N. Amiot, C. Bobin, M.-C. Lépy, T. Branger, I. Lanièce ; A. Luca, M. Sahagia, A.-M. Wätjen ; K. Kossert, O. Ott, O. Nähle ; P. Dryak, J. Sochorovà, P. Kovar, P. Auerbach ; T. Altzitzoglou, S. Pommé, G. Sibbens, R. Van Ammel, J. Paepen ; A. Iwahara, J.U. Delgado, R.Poledna, Applied Radiation and Isotopes 68 (2010) 2026-2030
IN PROGRESS	Reference sources for radionuclide metrological calibrations to research in nuclear programmes**,** M. C. M. de Almeida, J. U. Delgado , R. Poledna, R. L. da Silva, E. M. de Oliveira
ADDRESS	Instituto de Radioproteção e Dosimetria, Av. Salvador Allende, s/n, Recreio, CEP 22780-160, Rio de Janeiro, Brazil.Tel: ++55 21 2173 2873 Fax: ++55 21 2442 1605
CONTACT	J. U. Delgado Email:delgado@ird.gov.br

(SA1/SA2)

LABORATORY	Laboratório Nacional de Metrologia das Radiações Ionizantes LNMRI/IRD/CNEN
NAMES	A.C.M. Ferreira, A.E. de Oliveira , A. F. Clain, L. Tauhata, M.E.C. Vianna, M. J. C. S. de Bragança and A.M.G.F.Azeredo.
ACTIVITY	1- Preparation of the spiked sources of beta, alpha and multi-gamma emitters in water matrix; 2- Participation in international comparisons 3-Quality assurance programa for low level activity measurements
RESULTS	1-Participation in interlaboratorial comparison, organized by CNEN / Brazil, to characterize mussel tissue which will be candidate to reference material.
PUBLICATIONS	Preparação de amostras do Programa Nacional de Intercomparação após a implementação da norma ISO 17025 no LNMRI, M. J. C. S. Bragança, E. M.O. Bernardes, A. F. Clain, A. M.G.F. Azeredo, L. Tauhata, 62ª Reunião Anual da SBPC, 2010, July, 25-30
IN PROGRESS	Production soil spike samples and air filter
ADDRESS	Instituto de Radioproteção e Dosimetria, Av. Salvador Allende, s/n, Recreio, CEP 22780-160, Rio de Janeiro, Brazil.Tel: ++55 21 2173 2885 Fax: ++55 21 2442 1605
CONTACT	Almir F. Clain E-mail:almir@ird.gov.br

LABORATORY	**Laboratory for Measurements of Low-level Radioactivity** Ruđer Bošković Institute, Zagreb, Croatia
NAMES	researchers: Bogomil Obelić, Nada Horvatinčić, Ines Krajcar Bronić, Jadranka Barešić assistant: Andreja Sironić technician: Anita Rajtarić
ACTIVITY	• Radiocarbon dating of archaeological, geological and palaeontological samples (benzene synthesis and direct absorption, both measured by LSC technique; preparation of graphite targets for AMS ^{14}C measurement) • Tritium activity measurements of natural waters (electrolytic enrichment and LSC measurement) • Use of stable (^{2}H, ^{13}C, ^{18}O) and natural radioactive isotopes (^{3}H, ^{14}C) in hydrogeological, palaeoclimatological, environmental and ecological studies • Monitoring of ^{14}C in biological samples around nuclear power plant • Physico-chemical and isotopic study of processes in karst environment, particularly in carbonate sediments, and water-sediment interaction • Participation in intercomparison exercises • Participation in IAEA/WMO project: *"Global Network of Isotopes in Precipitation (GNIP) and Isotope Hydrology Information System (ISOHIS)"*. Data for stations Zagreb and Ljubljana since 1976 Participation in ICRU project *"*Key Data for Measurement Standards in the Dosimetry of Ionizing Radiation*" (I. Krajcar Bronić)*
KEYWORDS	(anti) coincidence method, data evaluation, data measurement,, environmental monitoring, liquid scintillation, accelerator mass spectrometry, dating, low-level, AMS, radionuclides C-14, H-3
RESULTS	A system for electrolytic enrichment of water with tritium followed by measurement in LSC has replaced the gas proportional counting technique of tritium measurement. Monitoring of ^{3}H in precipitation and that of ^{14}C in atmospheric CO_2 has been continued, as well as monitoring of ^{14}C in biological samples in a close vicinity of the Nuclear Power Plant Krško in Slovenia. ^{14}C dating of new charcoal samples from the Neolithic settlement Slavonski Brod – Galovo was performed. The study of carbon cycle in karst areas was continued. A system for preparation of graphite for AMS ^{14}C measurement has been validated and the routine sample preparation has started.
PUBLICATIONS	1. Ozkul, Mehmet; Gokgoz, Ali; Horvatinčić, Nada. Depositional Properties and Geochemistry of Holocene Perched Springline Tufa Deposits and Associated Spring Waters: A Case Study from the Denizli Province, Western Turkey Tufa and Speleothems: Unravelling the Microbial and Physical Controls / Pedley, H.M.; Rogerson, M. (eds.). London: The Geological Society Publishing House, 2010. pp. 245-262. 1. Krajcar Bronić, Ines; Horvatinčić, Nada; Sironić, Andreja; Obelić, Bogomil; Barešić, Jadranka; Felja, Igor. A new graphite preparation line for AMS 14C dating in the Zagreb Radiocarbon Laboratory. // *Nuclear Instruments and Methods in Physics Research B - Beam Interactions with Materials and Atoms*. 268 (2010) , 7/8; 943-946

	2. Krajcar Bronić, Ines; Obelić, Bogomil; Horvatinčić, Nada; Barešić, Jadranka; Sironić, Andreja; Minichreiter, Kornelija. Radiocarbon application in environmental science and archaeology in Croatia. *Nuclear Instruments and Methods in Physics Research A*. 619 (2010) 491-496 3. Portner, Antun; Obelić, Bogomil; Krajcar Bronić, Ines. ZAGRADA – the new Zagreb Radiocarbon Database. *Radiocarbon*. 52 (2010) 941-947 4. Surić, Maša; Roller-Lutz, Zvjezdana; Mandić, Magda; Krajcar Bronić, Ines; Juračić, Mladen. Modern C, O, and H isotope composition of speleothem and dripwater from Modrič Cave, eastern Adriatic coast (Croatia). *International Journal of Speleology*. 39 (2010) 91-97 5. Kern, Zoltan; Forizs, Istvan; Horvatinčić, Nada; Széles, É.; Bočić, Neven; Nagy, Balzs. Glaciochemical investigations on the subterranean ice deposit of Vukušić Ice Cave, Velebit Mountain, Croatia. *The Cryosphere Discussions*. 4 (2010) 1561-1591 6. Krajcar Bronić, Ines; Obelić, Bogomil; Horvatinčić, Nada; Barešić, Jadranka; Sironić, Andreja. 14C aktivnost u okolišu: Atmosfera i biosfera. *Arhiv za higijenu rada i toksikologiju*. 61 (2010), Supplement; 81-88 .
IN PROGRESS	Project No. 098-0982709-2741 with the Ministry of Science, Education and Sports (MSES) of the Republic of Croatia: *"Natural radioisotopes in investigation of karst ecosystem and dating"* (**2007-onward**) (*principal investigator:* B.Obelić)); Project No. 197-1970685-0681 with the MSES: *"Prehistorical identity of first agricultural populations in contintental Croatia"* (**2007-onward**) (*principal investigator:* K.Minichreiter, Institute of Archaeology); Project No. 245843 within the 7th Framework Programme *"SOWAEUMED - Network in Solid Wast and Water Treatment between Europe and Mediterranean Countries"* **(2009-2012)**. Universitat Autónoma de Barcelona (Bellaterra, Spain), Kungliga Tekniska Högskolan (Stockholm., Sweden), Ruđer Bošković Institute (Zagreb, Croatia), Université Cadi Ayyad (Marrakech, Morocco), NADREC S.A. (Barcelona, Spain), Sousse University (Sousse, Tunisia) *(responsible person for RBI:* B.Obelić); Bilateral Croatian-Slovene project *"Isotopic composition of precipitation on the region of Croatia and Slovenia"* - co-operation between Ruđer Bošković Institute and Jožef Stefan Institute in Ljubljana (**2009-2010**) (*Principal investigator:* I. Krajcar Bronić); Bilateral Croatian-Slovene project "*Measurement of 3H activity in natural waters with electrolytic enrichmen"* - co-operation between Ruđer Bošković Institute and Jožef Stefan Institute in Ljubljana (**2010-2011**) (*Principal investigator:* J. Barešić); Regional IAEA project **RER 8016** "Using Environmental Isotopes for Evaluation of Streamwater/Groundwater Interactions in Selected Aquifers in the Danube Basin" **(**2010-2012**).** Albania, Bulgaria, Croatia, Georgia, Hungary, Kyrgyzstan, Malta, Montenegro, Moldova, Romania, Serbia, Tajikistan, Macedonia, Turkey; Ukraine, Uzbekistan; (*responsible person for RBI:* N. Horvatinčić). IAEA/WMO project: *"Global Network of Isotopes in Precipitation "(GNIP)* and *"Water Isotope System for Data Analysis, Visualisation and Retrieval" (WISER)*. Included data for stations Zagreb and Ljubljana (**1976-onward**).

INFORMATION SOURCE	http://www.irb.hr/-ONy8-/en/str/zef/z3labs/lna/ http://bib.irb.hr/ for project 098-0982709-2741
IN PREPARATION	1. Barešić, Jadranka; Horvatinčić, Nada; Vreča, Polona; Sironić, Andreja. Distribution of authigenic and allogenic fraction in recent lake sediment: isotopic and chemical composition. Acta carsologica. (2010) submitted 2. Faivre, Sanja; Bakran-Petricioli, Tatjana; Horvatinčić, Nada. Relative Sea-Level Change during the Late Holocene on the Island of Vis (Croatia). Geodinamica acta. (2010) (accepted for publication) 3. Krajcar Bronić, Ines. Određivanje starosti metodom ^{14}C i primjer datiranja dvaju neolitičkih naselja u Hrvatskoj (*^{14}C dating method and an example of dating of two Neolithic settlements in Croatia, in Croatian*). Prilozi Instituta za arheologiju u Zagrebu. (2010) (accepted for publication).
OTHER RELATED PUBLICATIONS	1. Krajcar Bronić, Ines; Minichreiter, Kornelija. Radiocarbon dating and its application to early Neolithic in Croatia. Book of Abstracts, 2nd Balkan Symposium in Archaeometry - Science meets archaeology and art history. S. Akyuz, E. Akalin (Ed.). Istanbul: Istanbul Kultur University, 2010. 25-25. 2. Barešić, Jadranka; Horvatinčić, Nada; Krajcar Bronić, Ines; Obelić, Bogomil. Comparison of two techniques for low-level tritium measurement – gas proportional and liquid scintillation counting. Third European IRPA Congress, Proceedings, Full papers of poster presentations.IRPA, Helsinki, Finland, 2010. P12-21-1 - P12-21-5 3. Krajcar Bronić, Ines; Miljanić, Saveta; Ranogajec-Komor, Mária. 30 years of the Croatian Radiation Protection Association. Third European IRPA Congress, Proceedings, Full papers of poster presentations. IRPA, Helsinki, Finland, 2010. P19-06-1 - P19-06-5 4. Obelić, Bogomil; Krajcar Bronić, Ines; Horvatinčić, Nada; Barešić, Jadranka; Sironić, Andreja; Breznik, Borut. ^{14} in biological samples from the vicinity of NPP Krško. Third European IRPA Congress, Proceedings, Full papers of poster presentations. IRPA, Helsinki, Finland, 2010. P16-06-1 - P16-06-8 5. Barešić, Jadranka; Horvatinčić, Nada; Krajcar Bronić, Ines; Obelić, Bogomil. Comparison of two techniques for low-level tritium measurement – gas proportional and liquid scintillation counting. Abstracts. Third European IRPA Congress: IRPA, Helsinki, Finland, 2010. 212-212. 6. Faivre, Sanja; Bakran Petricioli, Tatjana; Horvatinčić, Nada. Indicators of relative sea-level change on the example of the island of Vis (Croatia) Book of Abstracts, Horvat, Marija Ed.). Zagreb : Hrvatski geološki institut, 2010. 389-389 7. Horvatinčić, Nada; Barešić, Jadranka; Krajcar Bronić, Ines; Obelić, Bogomil. Radiocarbon and tritium activity in the environment of the National Park Plitvice Lakes Abstracts. Third European IRPA Congress: Radiation protection - science, safety and security. IRPA, Helsinki, Finland : IRPA, 2010. 255-255 8. Kern, Zoltan; Forizs, Istvan; Horvatinčić, Nada; Szeles, Eva; Bočić, Neven; Nagy, Balazs; Laslo, Peter. Glaciochemical investigations on the subterranean ice deposit of Vukušić Ice Cave, Velebit Mountain, Croatia. 4th International Workshop on Ice Caves, Abstract volume / Spotl, Luetscher, Ritting (Ed.). 2010. 16-16 9. Krajcar Bronić, Ines. Primjene ^{14}C (Applications of ^{14}C – *in Croatian*) Knjiga sažetaka - II Radionica Sekcije za primijenjenu i industrijsku fiziku Hrvatskog fizikalnog društva / Gracin, D; Juraić, K (Eds.). Zagreb: Hrvatsko fizikalno društvo, 2010. 8-8 10. Krajcar Bronić, Ines. Mean energy required to form an ion pair (W value) for various ionizing particles in air. Abstracts. Third European IRPA Congress: Radiation protection - science, safety and security. IRPA, Helsinki, Finland, 2010. 107-107.

	11. Krajcar Bronić, Ines; Horvatinčić, Nada; Vreča, Polona; Barešić, Jadranka; Obelić, Bogomil; Sironić, Andreja. Izotopni sastav oborina na području Hrvatske i Slovenije (Isotope composition of precipitation in Croatia and Slovenia – *in Croatian*) Meteorološki izazovi današnjice. Zagreb, Hrvatska: Hrvatsko meteorološko društvo, 2010. 12. Krajcar Bronić, Ines; Miljanić, Saveta; Ranogajec-Komor Maria. 30 years of the Croatian Radiation Protection Association. Abstracts. Third European IRPA Congress: Radiation protection - science, safety and security. IRPA, Helsinki, Finland, 2010. 286-286 13. Mandić, Magda; Krajcar Bronić, Ines; Mihevc, Andrej; Leis, Albrecht; Mandić, Luka. Influence of different physical conditions on stable isotopes of water and carbonates in Postojna Cave, Slovenia. 3rd DAPHNE Workshop. Innsbruck, 2010. 70-70 14. Obelić, Bogomil; Krajcar Bronić, Ines; Horvatinčić, Nada; Barešić, Jadranka; Sironić, Andreja; Breznik, Borut. Distribution of ^{14}C in the atmosphere and biological samples around the Nuclear Power Plant Krško in Slovenia. Abstracts. Third European IRPA Congress: Radiation protection - science, safety and security. IRPA, Helsinki, Finland: 2010. 251-251 15. Surić, Maša; Krajcar Bronić, Ines; Obelić, Bogomil. Determination of initial ^{14}C activity of speleothem from Modrič Cave, Croatia. Abstracts, Prvi hrvatski speleološki kongres s međunarodnim sudjelovanjem / Garašić, Mladen ; Kovačević, Meho Saša (ur.). Zagreb : Hrvatski speleoški savez, 2010. 28-30
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LABORATORY	**Laboratory for Radioecology**
NAMES	Delko Barišić, Željko Grahek, Martina Rožmarić Mačefat, Ivanka Lovrenčić Mikelić, Marijana Nodilo, Gorana Cvjetojević, Matea Rogić, Tomislav Kardum, Rajko Kušić
ACTIVITY	• Measurement of 3H, 89,90Sr and gamma emitters in natural samples • Measurement of 3H, 55Fe, 89,90Sr and gamma emitters in low level liquid waste • Participation in intercomparison exercises • Monitoring of NPP • Laboratory is accredited according to ISO 17025 • Participation in CIESM MEDITERRANEAN MUSSEL WATCH (including phase II Po-210 in mussels from the Adriatic sea) • Participation in project of radioactivity monitoring of marine indicator organisms • Monitoring of radioactivity in Danube river
KEYWORDS	environmental monitoring, determination of radionuclides 3H, 55Fe, 89,90Sr and gamma emitters, low level measurement, alpha source preparation, alpha spectrometry, beta spectrometry, gamma-ray spectrometry, gas proportional counter, liquid scintillation, radiochemistry
RESULTS	
PUBLICATIONS	1.Sofilić, Tahir; Barišić, Delko; Rastovčan Mioč, Alenka; Sofilić, Una, **Radionuclides in steel slag intended for road construction**, *Journal of radioanalytical and nuclear chemistr*. **284(1)** (2010) 73-77 2.Sofilić, Tahir; Barišić, Delko; Sofilić, Una, **Monitoring of Cs-137 in Electric Arc Furnace Steel Making Process**, *Journal of radioanalytical and nuclear chemistry* **284(3)** (2010) 615-622 3.Mihelčić, Goran; Barišić, Delko; Vdović, Neda; Legović, Tarzan; Mihelčić, Vladislav, **Impact of Tourism on Trace Metal Concentrations (Pb, Cr, Ni, Cu and Zn) in Sediments of Telašćica Bay (East Adriatic – Croatia)**, *Croatica chemica acta* **83(3)** (2010) 333-339 4.Martina Rožmarić, Astrid Gojmerac Ivšić, Željko Grahek, **Erratum to "Determination of uranium and thorium in complex samples using chromatographic separation, ICP-MS and spectrophotometric detection" [Talanta 80 (2009) 352–362]** *Talanta*, **81(4-5)** (2010) 1884 5.Radić, Sandra; Stipaničev, Draženka; Cvjetko, Petra; Lovrenčić Mikelić, Ivanka; Marijanović Rajčić, Marija; Širac, Siniša; Pevalek-Kozlina, Branka; Pavlica, Mirjana, **Ecotoxicological assessment of industrial effluent using duckweed (Lemna minor L.) as a test organism** *Ecotoxicology*. **19(1)** (2010) 216-222 6. Biljan, Ivana; Cvjetojević, Gorana; Smrečki, Vilko; Novak, Predrag; Mali, Gregor; Plavec, Janez; Babić, Darko; Mihalić, Zlatko; Vančik, Hrvoj. **Nitrosobenzene Cross-dimerization: Structural Selectivity in Solution and in Solid State** *Journal of molecular structure*. **979(1-3)** (2010) 22-26
IN PROGRESS	• Development of methods for uranium and thorium isotopes determination in natural samples by ICP MS • Development of methods for determination of alpha emitters in natural samples by alpha spectrometry (using microprecipitation and electrodeposition)

INFORMATION	www.irb.hr
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	**Laboratory for Radioecology** Rudjer Bošković Institute Bijenička 54 10000 Zagreb, Croatia phone: 00385 1 4560 932 fax: 00385 1 4680 205
CONTACT	Martina Rožmarić Mačefat, rozmar@irb.hr

LABORATORY	Czech Metrology Institute Inspectorate for Ionizing Radiation Prague, Czech Republic
NAMES	J. Sochorová , M.Havelka, P. Auerbach P.Dryák, P.Kovář
ACTIVITY	Modification of TDCR system - defocusing Routine standardization of 25 radionuclides Radionuclide impurities measurement Environmental samples measurement Standards production checking (activity measurement) Verification, type testing and calibration of alpha, beta and gamma spectrometers used in the Czech Republic, Slovakia and Bulgaria. Noble gases standardization
KEYWORDS	Alpha spectrometry, beta spectrometry, coincidence method, data evaluation, data measurement, define solid angle (ASD) measurement, environmental control, Euromet, gamma-ray spectrometry, gas proportional counter, ionisation chamber, life sciences, liquid scintillation, low-level, NaI well-type counter, neutron measurement, radioactive gas, radiochemistry, simulation code, SIR, source preparation, traceability, X-ray spectrometry, ^{3}H, ^{14}C, ^{18}F, ^{22}Na, ^{24}Na, ^{32}P, ^{35}S, ^{45}Ca, ^{51}Cr, ^{54}Mn, ^{56}Mn, ^{55}Fe, ^{59}Fe, ^{56}Co, ^{57}Co, ^{58}Co, ^{60}Co, ^{63}Ni, ^{64}Cu, ^{65}Zn, ^{67}Ga, ^{75}Se, ^{85}Kr, ^{88}Y, ^{85}Sr, ^{89}Sr, ^{90}Sr, ^{95}Zr, ^{95}Nb, ^{99}Mo, ^{99}Tc, ^{103}Ru, ^{106}Ru, ^{109}Cd, ^{111}In, ^{113}Sn, ^{124}Sb, ^{125}I, ^{129}I, ^{131}I, ^{133}Ba, ^{134}Cs, ^{137}Cs, ^{139}Ce, ^{141}Ce, ^{144}Ce, ^{152}Eu, ^{153}Gd, ^{155}Eu, ^{198}Au, ^{192}Ir, ^{203}Hg, ^{201}Tl, ^{204}Tl, ^{210}Pb, ^{241}Am
RESULTS	Standardisation of ^{64}Cu for EURAMET 1085 Monte Carlo calculation of coaxial Ge and BEGe detectors efficiency True summing corrections calculation
PUBLICATIONS	P. Dryák, P. Kovář: MC efficiency and true summing calculation,
IN PROGRESS	New coincidence system with small pressurised proportional counter M. Havelka, J. Sochorová: Standardisation of 64Cu using software coincidence counting system Jana Sochorová, Pavel Auerbach, Zdeněk Dutka: Activity standardization of 45Ca and 204Tl using the new TDCR system at CMI P. Kovář, P. Dryák: Calibration of stack monitors for measurement of noble gases in nuclear facilities. P. Dryák, J. Šolc, P. Kovář: Correction of the actual summations in volume sources
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	ČMI - IIZ Radiová 1 CZ-102 00 Prague 10 Czech Republic
CONTACT	E-mail:pdryak@cmi.cz tel.: +420 266020497 fax: +420 266020466

LABORATORY	Laboratoire National Henri Becquerel (LNHB), France
NAMES	M.M. Bé, V. Chisté, C. Dulieu, X. Mougeot
ACTIVITY	Evaluation of Radionuclide Decay Data
KEYWORDS	data evaluation, ^{182}Ta, ^{41}Ar, ^{64}Cu, ^{99}Tc, ^{125}I, beta spectra
RESULTS	Evaluation of ^{182}Ta, ^{41}Ar, ^{64}Cu, ^{99}Tc, ^{125}I http://www.nucleide.org/DDEP_WG/DDEPdata.htm
PUBLICATIONS	**X. Mougeot, M.-M. Bé, V. Chisté, C. Dulieu, V. Gorozhankin, M. Loidl**. Calculation of beta spectra for allowed and unique forbidden transitions. RadioCarbon M.A. KELLETT*, M-M. BE[1], V. CHECHEV[2], HUANG XIAOLONG[3], F.G. KONDEV[4], A. LUCA[5], G. MUKHERJEE[6], A.L. NICHOLS[7], and A.PEARCE[8] **NEW IAEA ACTINIDE DECAY DATA LIBRARY** International Conference on Nuclear Data for Science and Technology 2010 **Monographie BIPM-5 – Table of Radionuclides, Volume 5 (2010)** Marie-Martine BÉ, Vanessa CHISTÉ, Christophe DULIEU, Xavier MOUGEOT, Edgardo BROWNE, Valery CHECHEV, Nikolay KUZMENKO, Filip G. KONDEV, Aurelian LUCA, Monica GALAN, Arzu ARINC, Xiaolong HUANG, A. NICHOLS. Table of Radionuclides, Monographie BIPM-5, vol.5 Breteuil, 92312 Sèvres, France. Table of Radionuclides, Monographie BIPM-5, Commentaires, vol.5, ISBN 13 978-92-822-2235-5 (CD-Rom), CEA/LNE-LNHB, 91191 Gif-sur-Yvette, France and BIPM, Pavillon de Breteuil, 92312 Sèvres, France. M.M. Bé, E. Browne, V. Chechev, V. Chisté, C. Dulieu, M. Galàn, R.G. Helmer, A. Luca, X. Mougeot, N. Kuzmenco, A.L. Nichols, A. Pearce, E. Schönfeld. NUCLEIDE, Table de Radionucléides sur CD-Rom, Version 3- 2010, CEA/LIST-LNHB, 91191 Gif-sur-Yvette, France , EDP Sciences Editeur, ISBN : 978-2-7598-0077-3
IN PROGRESS	Evaluation of: ^{147}Nd, ^{67}Ga, ^{68}Ge-Ga
INFORMATION	Program to calculate beta spectra with the Gove and Martin formalism done, experimental study started. Monographie: issue 5 published in 2010, vol. 6 in preparation
OTHER RELATED PUBLICATIONS	CD Rom NUCLÉIDE, Editor EDP Sciences, ISBN 978 2 7598 0077 3
ADDRESS	CE Saclay LNHB – PC 111 F- 91191 Gif sur Yvette Cedex Tel : +33 1 69 08 46 41 Fax : +33 1 69 08 26 19 E-mail : mmbe@cea.fr
CONTACT	Marie-Martine Bé

LABORATORY	Laboratoire National Henri Becquerel
NAMES	Lourenço V., Le Garrérès I., Morelli S., Lacour D.
ACTIVITY	Source preparation for all the measurement techniques. Development of certified reference materials representative of environmental radioactivity either by spiking or by characterized sampling.
KEYWORDS	Source, environmental radioactivity, sampling
RESULTS	2 mineralization processes for biological samples were set up
PUBLICATIONS	/
IN PROGRESS	- sampling and sample pretreatment for the determination of radionuclides (selecting an appropriate sampling process ; documenting the sampling design and its rationale ; storage ; drying ; homogenizing, sample conservation) - cleaning processes and contamination testing - mineralization processes and separation of radionuclides for their measurement
SOURCE IN PREPARATION	^{238}U, ^{210}Pb, solid sources of ^{51}Cr, ^{18}F, ^{113}Sn and so on.
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CONTACT	valerie.lourenco@cea.fr / Tel: +33169083951 / Telecopy: +33169082619

LABORATORY	LNE-Laboratoire National Henri Becquerel
NAMES	M.N. Amiot, M. Morin, F. Rigoulay, V. Chisté
APPARATUS	Ionisation chamber dose calibrators.
ACTIVITY	Monte Carlo calculations for the determination of ionisation chambers response to photons, positrons and electrons. Participating in international intercomparison of activity measurements organized by BIPM. Routine metrological assessment and calibration of radionuclide calibrators used in Nuclear Medicine Services. Standardization of radioactive sources and solutions for Secondary Metrology Services. Half life measurements
RESULTS	Standardisation of ^{123}I, ^{125}I, ^{131}I, ^{153}Sm, ^{186}Re, ^{129}Ce, ^{51}Cr, ^{60}Co, ^{18}F and ^{90}Y for Secondary Metrology Services. Measurements of ^{139}Ce, ^{113}Sn, ^{103}Ru, ^{57}Co, ^{88}Y for multi-gamma solutions used for national intercomparisons among Nuclear Power Plants Laboratories. Participation to SIR for ^{177}Lu, ^{123}I, ^{113}Sn, ^{64}Cu, ^{18}F. Assessment and calibration of 30 commercial dose calibrators.
IN PROGRESS	Monte Carlo simulation of a PTW-Vacutec ionisation chamber for electrons and positrons and for a new IC geometry. Standardization of ^{99}Mo, ^{241}Am, ^{131}I, ^{133}Ba Activimeters calibration.
ADDRESS	DRT/LIST/LNHB CEA-Saclay F-91191 Gif sur Yvette Cedex, FRANCE Tel/Fax : 33 1 69 08 36 89 / 26 19 E-mail : marie-noelle.amiot@cea.fr
CONTACT	Marie-Noëlle Amiot

LABORATORY	LNE- Laboratoire National Henri Becquerel
NAMES	Sylvie Pierre
ACTIVITY	Alpha spectrometry and alpha counting
KEYWORDS	^{210}Po, half-life, ^{222}Rn, uranium
RESULTS	Measurements of the polonium half-life with and without cooling.
PUBLICATIONS	On the variation of the ^{210}Po half-life at low temperature, *S. Pierre et al.,* Applied Radiation and Isotopes 68 (2010) 1467-1470
IN PROGRESS	Measurement of ^{222}Rn activity by defined solid angle alpha counting using cryogenic source: requalification of the system in progress.
INFORMATION	Alpha spectrometry chambers for high and low level activities, defined solid angle (ASD) equipment. All equipments with PIPS detectors.
SOURCE IN PREPARATION	^{238}U, ^{235}U : measurements in progress for activity and spectrometry
OTHER RELATED PUBLICATIONS	
ADDRESS	LNE/LNHB CEA-Saclay – PC 111 F-91191 Gif-sur-Yvette cedex, FRANCE Tel +33.0.1 69 08 43 75 Fax : +33.1.69.08.26.19 E-mail : sylvie.pierre@cea.fr
CONTACT	Sylvie Pierre

LABORATORY	LNE- Laboratoire National Henri Becquerel
NAMES	Laurent Ferreux, Yves Ménesguen, Xavier Mougeot, Sylvie Pierre, Marie-Christine Lépy
ACTIVITY	Gamma-ray spectrometry
KEYWORDS	Gamma-ray spectrometry, Monte Carlo simulation, Calibration, decay scheme
RESULTS	Efficiency calibration of HPGe detectors within 0.5 % relative uncertainty for point sources. Efficiency calibration for volume sources (15 and 50 cm^3)
PUBLICATIONS	Measurement of beta plus emitters by gamma-ray spectrometry, *M.-C. Lépy, P. Cassette, L. Ferreux* Applied Radiation and Isotopes 68 (2010) 1423-1427 Decay scheme study of ^{126}Sn and ^{126}Sb, *L. Ferreux, M.-C. Lépy, M.-M. Bé, P. Cassette, P. Bienvenu, G. Andreoletti* Applied Radiation and Isotopes 68 (2010) 1571-1577
IN PROGRESS	Contribution to the measurement of the decay scheme of ^{64}Cu and ^{82}Sr Accurate calibration of HPGe detectors in the 50 to 150 keV energy range Studies on the coincidence summing corrections in gamma spectrometry Studies on the efficiency calibration in the 50-200 keV energy range
INFORMATION	Coaxial and planar HPGe Detectors
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	Intercomparison of methods for coincidence summing corrections in gamma-ray spectrometry *M.-C. Lépy and all the participants of the intercomparison* Applied Radiation and Isotopes 68 (2010) 1407-1412
ADDRESS	LNE/LNHB CEA-Saclay – PC 111 F-91191 Gif-sur-Yvette cedex, FRANCE Tel : +33.1.69.08.24.48 Fax : +33.1.69.08.26.19 E-mail : marie-christine.lepy@cea.fr
CONTACT	Marie-Christine Lépy

LABORATORY	LNE- Laboratoire National Henri Becquerel
NAMES	Laurent Ferreux, Isabelle Tartès
ACTIVITY	Low-level activity measurements
KEYWORDS	Alpha spectrometry, environmental control, gamma-ray spectrometry, gas proportional counter, liquid scintillation, low-level
RESULTS	
PUBLICATIONS	Determination of activity of radionuclides in marine sediment by gamma spectrometer with anti cosmic shielding *T. Tran Thien, L. Ferreux, M.C. Lépy, C.V. Tao* Journal of Environmental Radioactivity 101 (2010) 780-783
IN PROGRESS	Participation in the IAEA-2009-03 world wide open proficiency test on the determination of natural and artificial radionuclides in moss-soil and spiked water Measurement of the photon emission probabilities of ^{235}U
INFORMATION	Main equipment: HPGe detector with active anti-cosmic shielding
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	LNE/LNHB CEA-Saclay – PC 111 F-91191 Gif-sur-Yvette cedex, FRANCE Tel. : +33.1.69.08.56.08 Fax. +33.1.69.08.26.19 E-mail : laurent.ferreux@cea.fr
CONTACT	Laurent Ferreux

LABORATORY	LNE- Laboratoire National Henri Becquerel
NAMES	Laurent Ferreux, Isabelle Tartès, Valérie Lourenço
ACTIVITY	Low-level activity measurement Organisation of national and international inter laboratory comparisons in the field of activity measurements.
KEYWORDS	Alpha spectrometry, environmental control, gamma-ray spectrometry, gas proportional counter, liquid scintillation, low-level, traceability,
RESULTS	
PUBLICATIONS	**EDF-LNHB A105** - LNHB Report 2010/68 **EDF-LNHB FA12** - LNHB Report 2010/67
IN PROGRESS	CCRI(II) Supplementary Comparison on ^{40}K, ^{137}Cs and ^{90}Sr activity content in dried bilberry material. **LNHB R54A** - LNHB 2011/XX **LNHB R54B** - LNHB 2011/XX
INFORMATION	The intercomparison program for 2011 is: – Mass activity measurement of ^{3}H in an effluent matrix (about some kBq/g) – Mass activity measurement of mixtures of gamma emitting radionuclides and ^{3}H with high activity (about 4 kBq/g, and 400 Bq/g respectively) – Mass activity measurement of mixtures of gamma emitting radionuclides and ^{3}H with high activity (about 10 Bq/g, and 1 Bq/g respectively) – Mass activity measurement of mixtures of gamma emitting radionuclides ^{3}H in an “plant” matrix (about some kBq/g) An opened intercomparison program is proposed every year by LNE-LNHB.
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	LNE/LNHB CEA-Saclay – PC 111 F-91191 Gif-sur-Yvette cedex, FRANCE Tel. : +33.1.69.08.56.08 Fax. +33.1.69.08.26.19
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LABORATORY	LNE- Laboratoire National Henri Becquerel
NAMES	Yves Ménesguen, Marie-Christine Lépy
ACTIVITY	X-ray Spectrometry
KEYWORDS	X-ray Spectrometry, fluorescence yield, attenuation coefficient
RESULTS	Measurement of linear attenuation coefficients and fluorescence yields of different materials Characterization of the response of X-ray detectors using a reference proportional counter
PUBLICATIONS	Mass attenuation coefficients in the range $3.8 \leq E \leq 11$ keV, K fluorescence yield and Kβ/Kα relative X-ray emission rate for Ti, V, Fe, Co, Ni, Cu and Zn measured with a tunable monochromatic X-ray source *Y. Ménesguen, M.-C. Lépy,* Nuclear Instruments and Methods in Physics Research B 268 (2010) 2477–2486 Mass attenuation coefficients in the range $3.0 < E < 35$ keV for Ag and Sn measured at the SOLEIL synchrotron metrology beamline, *Y. Ménesguen and M.-C. Lépy,* submitted to X-Ray Spectrometry
IN PROGRESS	Characterization of the metrology beamline at the SOLEIL synchrotron facility
INFORMATION	Si(Li), Si XPIPS, SDD and HPGe Detectors Tunable monochromatic X-ray source (1-28 keV) (SOLEX) Synchrotron beam line (SOLEIL)
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	LNE/LNHB CEA-Saclay – PC 111 F-91191 Gif-sur-Yvette cedex, FRANCE Tel : +33.1.69.08.50.88 Fax : +33.1.69.08.26.19 E-mail : yves.menesguen@cea.fr
CONTACT	Yves Ménesguen

LABORATORY	Physikalisch-Technische Bundesanstalt
NAMES	Dr. Annette Röttger, Anja Honig, Diana Linzmaier, Jörg Leppelt, Thomas Reich, Matthias Fritsche
ACTIVITY	Radon measuring technique: Radon-220 (Thoron) progeny reference chamber and mixed atmosphere reference chamber (Radon-222, Radon-220 and their progenies) of the PTB. Production and measurement of reference atmospheres. Online α-spectrometry and offline simultaneous $\alpha\gamma$-spectrometry.
KEYWORDS	Rn-220, Rn-222, Alpha and Gamma spectrometry, radioactive gas
RESULTS	Reference atmospheres for Rn-220, Rn-222 and their progenies. Calibration service.
PUBLICATIONS	A. Röttger, D. Arnold, A. Honig, R. Dersch, O. Ott: A primary standard for the thoron activity concentration, In: Applied radiation and isotopes 2010, 68, p.12921296.
IN PROGRESS	Reference atmospheres for Rn-220 and Rn-222 (primary standards). Reference atmospheres for Rn-220 and Rn-220/Rn-222 mixtures with reduced uncertainties. Lab movement. Set-up of new reference chambers.
INFORMATION	http://www.ptb.de/de/org/6/61/613/index.htm
SOURCE IN PREPARATION	Low-Level radon reference atmospheres (below 1 kBq/m^3). New thoron progeny chamber. New radon reference chamber.
OTHER RELATED PUBLICATIONS	http://www.ptb.de/de/org/6/61/613/index.htm
ADDRESS	Physikalisch-Technische-Bundesanstalt Department 6.1 Bundesallee 100 D-38116 Braunschweig Germany Tel. ++49-531-592-6130 Fax. ++49-531-592-8525 E-mail: Annette.Roettger@ptb.de
CONTACT	Annette Röttger

LABORATORY	Bhabha Atomic Research Centre, India
NAMES	Leena Joseph, Anuradha Ravindra, D.B. Kulkarni
ACTIVITY	1. Participation in international intercomparisons 2. Absolute activity measurements 3. Audit program of activity measurements in nuclear medicine centres 4. Calibration of radionuclide calibrators
APPARATUS	1. 4π β(PC)- γ(NaI) coincidence system. 2. Calibrated 4π Gamma ion chamber. 3. Dose Calibrator, CRC –15 Beta (Capintec Make) 4. Automatic 4π β(PC)- γ(NaI) coincidence system
KEYWORDS	CIEMAT/NIST, Audit, large area reference sources
RESULTS	1. H-3 solution was standardized under international intercomparison programme of BIPM, by liquid scintillation counting using secondary method 2. An automatic 4πβ-γ coincidence counting system is under development. The system consists of a circular disk which can hold eight sources at a time and can count each of the sources for a preset time. Software was developed for indexing the samples placed on the circular disk and to synchronize between the data acquisition software and the motor control hardware. The data communication was carried out via RS232 serial port. 3. Large area reference sources of Sr-90/Y-90 of various dimensions with different source strengths were prepared for users on request. 4. Calibration of the isotope calibrators of the nuclear medicine centres at the laboratory. 5. National audit of activity measurements of I-131 with isotope calibrators among eighty hospitals and nuclear medicine centres was conducted. 6. Calibrated radioactive sources for users
PUBLICATIONS	1. National comparison of ^{131}I measurement among nuclear medicine clinics of eight countries, Veronika Olˇsovcova´, Akira Iwahara, Pilar Oropesa, Leena Joseph, Anuradha Ravindra, Mostafa Ghafoori, Hye-Kyung Son, Maria Sahagia, Selma Tastan, Brian Zimmerman, Applied Radiation and Isotopes 68 (2010) 1371–1377. 2. A new technique for making large area beta reference sources required for calibration of surface contamination monitors, Anuradha R, D.B. Kulkarni, Leena Joseph and A.K. Mahant presented at the National Symposium on Nuclear Instrumentation (NSNI-2010) at Mumbai.
IN PROGRESS	1. Standardize Co-60 with automatic 4π β(PC)- γ(NaI) coincidence system. 2. Emission rate measurements of large area sources with window less, gas flow multi-wire proportional counter system. 3. Calibration of sources for users 4. Calibration of radionuclide calibrators
SOURCE IN PREPARATION	Standardization of I-131: Implementation of CIEMAT/NIST method at BARC, India. D.B.Kulkarni, R. Anuradha, P.J. Reddy and Leena Joseph, Submitted to Applied Radiation and Isotopes.

OTHER RELATED PUBLICATIONS	
ADDRESS	Mr. A. K. Mahant Head , Radiation Standards Section, Radiation Safety Systems Division, BARC, Mumbai - 400 085, India Telephone: 25595075 Telefax: 0091(22) 5505151,5519613 E-mail: amahant@barc.gov.in
CONTACT	Leena Joseph , E-mail: leena@barc.gov.in

ENEA-INMRI, Radionuclide Metrology
2009-2012 Progress Report and Work Plan
(information for ICRM members)

The programmes at the National Institute for Ionising Radiation Metrology (ENEA-INMRI) in the field of radionuclide metrology in the years 2009-2012 were and will be focused, as in the past, on maintaining and developing the national standards for activity measurements and on the more general activities in the field of standardisation and quality-assurance in radioactivity measurements.

The ENEA-INMRI Radionuclide and Neutron Metrology staff in 2010 is the following:

Scientists	**Function**
P. De Felice	ENEA-INMRI Head
M. Capogni	Primary Radionuclide activity standards
G. Cotellessa	Primary Radionuclide activity standards
P. Carconi	Secondary Radionuclide activity standards
F. Cardellini	Radon standards
S. Loreti	Neutron standards
M.L. Cozzella	Source preparation and radiochemistry
Technicians	
A. Fazio	Secondary Radionuclide activity standards
M. Pagliari	Radon standards

The main specific activities carried out at ENEA-INMRI in this field are summarised below.

Activity line	**ENEA-INMRI Radionuclide Metrology 2009-2010 Progress report**	**ENEA-INMRI Radionuclide Metrology 2011-2012 Work plan**
Development of primary standards, Improvement of measuring methods and instrumentation	• Development of new primary standards: Cu-64 • Developments: Blank atmosphere in radon chamber, characterization of climatic parameters in 1m^3 radon chamber	• Development of new primary standards: Rn-222, Mn-56, F-18, Tc-99m, Rn-220 • European Projects: MetroFission WP6 (TDCR), Metrofission WP7 (DCC) • Developments: Aerosol atmosphere in radon chamber
International comparisons	• BIPM (Lu-177) • Bilateral: surface emission rate with POLATOM	• BIPM (Y-90 microspheres, Large area sources, Rn-222 atmosphere) • BIPM CCRI(II) SIR Extension (Ni-63) • SIR (Co-60, Rn-222, I-124, F-18, Tc-99m, Cs-134) • EURAMET (Cu-64) • Bilateral: radon-in-water
Standardization of measurement methods	• IAEA characterization reference material #448 (soil from oil field) • ICRM GSWG Coincidence summing comparison for volume sources • Uranium groundwater measurements and investigation of anomalies • Application of YAP crystals to radon	• Nuclear track detection methods • Application of digital electronics to YAP crystals detectors • Development of a Metrological Low-Level gamma-spectrometry system in the Gran Sasso laboratory

Activity line	ENEA-INMRI Radionuclide Metrology 2009-2010 Progress report	ENEA-INMRI Radionuclide Metrology 2011-2012 Work plan
	metrology • Accurate self-absorption correction in gamma ray spectrometry (Pb-210, Am-241)	
National QA programmes and services	• Preparation of radioactive standards (liquid solutions, point sources, paper filters and spiked reference materials) for external users. • Collaboration with IAEA (Air Filter proficiency test)	• Calibration service • Organisation of Proficiency Tests for national laboratories: radioactivity surveillance network, radon measurement laboratories, nuclear medicine departments
Membership in international and national organisations	• ICRM Secretary (2002-2009) • ICRM, BIPM/CCRI(II), IEC/TC45, ISO/TC85/WG2, UNI-CEI (National Standardisation Organisation)	• ICRM Presidency (2009-2012) • ICRM, BIPM/CCRI(II), IEC/TC45, ISO/TC85/WG2, UNI-CEI (National Standardisation Organisation)
Management and Organization	• European Projects: Metrofission WP8 (Impact) • European Projects: (Prog. Call 2010 Industry and Environment) • Reactivation of measuring systems after laboratory restructuration	• European Projects: MetroRWM and MetroMetal • Completion of reactivation of measuring systems after laboratory restructuration
Teaching activity	• Invited lectures	• Invited lectures
Quality system	• Management of Quality System	• Improvement of Quality System

LABORATORY	**ENEA - Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti (INMRI) - Italy.**
NAMES	M. Capogni, P. Carconi, M.L. Cozzella, P. De Felice, A. Fazio
APPARATUS ACTIVITY	Liquid Scintillation counting system 4πγ integral counting system Gamma-ray spectrometry system 4πγ well-type ionisation chambers Radiochemistry laboratory Participation of the ENEA in the SIR for ^{64}Cu radionuclide.
RESULTS	Absolute activity measurements by liquid scintillation techniques (CIEMAT/NIST method) and 4πγ integral counting method with a NaI(Tl) 5''x5'' well-type detector. Calibration of a HPGe spectrometer and determination of the calibration factors for two well-type ionisation chambers for relative measurements
IN PROGRESS	Link the ENEA to the SIR for ^{64}Cu
PUBLICATIONS	Capogni M., De Felice P., Fazio A., Latini F., Abbas K., "*Development of a primary standard for calibration of ^{64}Cu activity measurements system*", Applied Radiation and Isotopes 2008 Jun-Jul, 66 (6-7):948-53 M. Capogni, P. De Felice, A. Fazio, "*A travelling standard for radiopharmaceutical production centres in Italy*", Radiation Effects and Defects in Solids 2009 May, 164 (5-6), 297-01
ADDRESS	ENEA Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti Centro Ricerche Casaccia P.O.Box 2400 - Roma (Italy) Phone: +39 06 3048 6628 Fax: +39 06 3048 4650 marco.capogni@enea.it
CONTACT	M. Capogni

LABORATORY	**ENEA - Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti (INMRI) - Italy.**
NAMES	M. Capogni, M.L. Cozzella, P. De Felice
APPARATUS	Liquid Scintillation counting equipment. Radiochemistry laboratory
ACTIVITY	Participation in an inter-laboratory comparison of activity measurements of the ^{63}Ni solution in the frame of a BIPM project for the extension of the SIR (ESIR) to β-emitters.
RESULTS	Study of experimental aspects concerning source preparation, measurement procedures and analysis techniques in the application of the CIEMAT/NIST method for ^{63}Ni absolute measurements
IN PROGRESS	^{63}Ni absolute measurements by using the HIDEX 300SL metrological version TDCR counter. Link the ENEA to the ESIR for ^{63}Ni radionuclide
PUBLICATION	Ceccatelli A., De Felice P., "*Standardisation of ^{90}Sr, ^{63}Ni and ^{55}Fe by the $4\pi\beta$ liquid scintillation spectrometry method with ^{3}H standard efficiency*", Applied Radiation and Isotopes 1999, 51(1):85-92
ADDRESS	ENEA Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti Centro Ricerche Casaccia P.O.Box 2400 - Roma (Italy) Phone: +39 06 3048 6628 Fax: +39 06 3048 4650 marco.capogni@enea.it
CONTACT	M. Capogni

LABORATORY	**ENEA - Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti (INMRI) - Italy.**
NAMES	M. Capogni, P. De Felice, S. Loreti
APPARATUS ACTIVITY	TDCR counting systems and DCC unit Development of a new TDCR portable instrument for *in-situ* measurements of β-emitters; metrological characterisation of some commercial digitizers for digital coincidence counting applications; measurements tests with the Hidex 300SL metrological version counter
RESULTS	Preliminary measurements of a standard ^{3}H solution with the HIDEX 300SL TDCR counter; preliminary test with the module DT5720 CAEN to digitalise signal coming from different photomultiplier tubes.
IN PROGRESS	Participation to the WP6, WP7 and WP8 of the Joint Research Project "Metrofission". Draw up a protocol for the design of a portable liquid scintillation counter based on the TDCR method; measurements test with the DT5720 CAEN digitizer for digital signal processing in single and coincidence mode; ^{241}Am source measurements with the Hidex 300SL system to characterise the linearity of the instrument
ADDRESS	ENEA Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti Centro Ricerche Casaccia P.O.Box 2400 - Roma (Italy) marco.capogni@enea.it Phone: +39 06 3048 6628 Fax: +39 06 3048 4650 stefano.loreti@enea.it Phone :+39 06 3048 4950 Fax: +39 06 3048 4650 pierino.defelice@enea.it Phone: +39 06 3048 3580 Fax: +39 06 3048 3558
CONTACT	M. Capogni, P. De Felice, S. Loreti

LABORATORY	**ENEA - Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti (INMRI) - Italy.**
NAMES	M. Capogni, F. Cardellini, P. De Felice
APPARATUS ACTIVITY	YAP:Ce scintillator detector Metrological characterization of a new ^{222}Rn in fluids active monitor based on a new kind of scintillator detector: YAP:Ce .
RESULTS	Detection properties of a YAP:Ce scintillator ($YAlO_3$:Ce crystal) have been investigated in the radon and radon-daughters γ-ray spectrometry by using the radon Reference Measurement System of the ENEA-INMRI.
IN PROGRESS	Study of experimental aspects concerning detection of α-particle and γ-radiation emitted by ^{222}Rn dissolved in water ad its decay products by using a YAP:Ce scintillator detector. The new device will be calibrated by the ENEA-INMRI radon standard.
PUBLICATION	Wolfango Plastino, Pierino De Felice, Francesco de Notaristefani, "*Radon gamma-ray spectrometry with YAP:Ce scintillator*", Nuclear Instruments and Method in Physics Research A 486 (2002) 146-149
ADDRESS	ENEA Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti Centro Ricerche Casaccia P.O. Box 2400 - Roma (Italy) Phone: +39 06 3048 3084 Fax: +39 06 3048 4650 francesco.cardellini@enea.it
CONTACT	F. Cardellini

LABORATORY	National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology (NMIJ/AIST)
NAMES	Yoshio HINO, Akira YUNOKI, Yasushi SATO and Yasuhiro UNNO
ACTIVITY	Calibrations of activity by using the following apparatus; 4πβ(pc)-γ(NaI) and 4πβ(ppc)-γ(Ge) coincidence systems, Calibrated 4πγ ionisation chamber, HP-Ge and Si(Li) detectors, Liquid scintillation system, NaI(Tl) well-type counter, PIPS for α counting and 2π multi wire chamber, Length-compensated internal gas counting system.
KEYWORDS	remote calibration, coincidence method, defined solid angle measurement, gamma-ray spectrometry, gas-proportional counter, ionisation chamber, liquid scintillation, NaI(Tl) well-type counter, radioactive gas, simulation code, source preparation, ink-jet printer
RESULTS	(1) We have completed a development of a large area surface source made by using an ink-jet printer. (2) APMP.RI(II)-K2.I-131 finished. Draft B report in progress.
PUBLICATIONS	(1) Y. Sato, H. Murayama, T. Yamada, T. Hasegawa, K. Oda, Y. Unno and A. Yunoki, "Monte Carlo simulation of standardization of ^{22}Na using scintillation detector arrays", Applied Radiation and Isotopes 68 (2010) 1354–1357. (2) T. Yamada, K. Ishii, Y. Sato, Y. Unno, A. Yunoki and Y. Hino, "Standardization of ^{99m}Tc and ^{99}Mo by the use of 4πβ-4πγ counter", Applied Radiation and Isotopes 68 (2010) 1324–1329.
IN PROGRESS	(1) Air kerma strength standards for brachytherapy sources. (2) Improvement of a radioactive gas standard.
INFORMATION	ICRM2011 will be held in Japan this September.
SOURCE IN PREPARATION	--
OTHER RELATED PUBLICATIONS	--
ADDRESS	Radioactivity and Neutron Section, Quantum Radiation Division, National Metrology Institute of Japan. Central2,1-1-1 Umezono Tsukuba, Ibaraki 305-8568, JAPAN.
CONTACT	Akira Yunoki (e-mail: a.yunoki@aist.go.jp)

LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara "Horia Hulubei" ("Horia Hulubei" National Institute for R&D in Physics and Nuclear Engineering) IFIN-HH; Radionuclide Metrology Laboratory
NAMES	M. Sahagia, C. Ivan
ACTIVITY	- Standardization of Cu-64, EURAMET project 1085; - Standardization of Ga-68, eluted from a (Ge-Ga)-68 generator; - Annual RENAR Accreditation Survey, Certificate: LE/013/2009; - Notification, CNCAN Designation LE 05/2009
KEYWORDS	Coincidence method, Efficiency extrapolation, Uncertainty budget, Radionuclides by name (Cu-64; Ga-68)
RESULTS	Measurement by using the efficiency extrapolation method in two variants: (i) positron-annihilation coincidence, and (ii) counting of all emitted radiations and applying supplementary corrections; the final result was calculated as the mean of the two variants. The comparison with the results of the gamma-ray spectrometry and with the classical coincidence method was realized; the efficiency extrapolation mean result is situated between the two comparative values.
PUBLICATIONS	1. B.Chauvenet, M-M.Bé, M-N.Amiot, C.Bobin, M-C.Lépy, T.Branger, I.Lanièce, A.Luca, M.Sahagia, A.C.Wätjen, K.Kossert, O.Ott, O.Nahle, P.Dryak, J.Sochorova, P.Kovar, P.Auerbach, T.Altzizoglou, S.Pommé, G.Sibbens, R.Van Ammel, J. Paepen, A. Iwahara, J.V.Delgado, R. Poledna, C.J. da Silva, L. Johansson, A. Stroak, C. Bailat, Y. Nedjadi, P.Spring. "International exercise on Sb-124 activity measurement ". Appl. Rad. Isotopes. 68(2010)1207-1210 2.C.Michotte, S.Courte, G.Ratel, M.Sahagia, A.C.Wätjen, R.Fitzgerald, F-J. Maringer, "Update of the ongoing comparison BIPM.RI(II)-K1.Co-60 including activity measurements of the radionuclide Co-60 for the IFIN-HH (Romania), NIST (USA) and the BEV (Austria)". Metrologia 47(2010) 06010
IN PROGRESS	Preparation of two papers proposed for the ICRM2011 Conference
INFORMATION	
SOURCE IN PREPARATION	1. M. Sahagia, A. Luca, A. Antohe, C. Ivan. Standardization of ^{64}Cu and ^{68}Ga by the 4πPC-γ coincidence method and calibration of the ionization chamber . 2. A. Luca, M. Sahagia, A. Antohe. Measurements of ^{64}Cu and ^{68}Ga half-lives and gamma-ray emission intensities.
OTHER RELATED PUBLICATIONS	
ADDRESS	IFIN-HH, PO Box MG-6, RO-077125, 30 Reactorului Str., Magurele, Jud. Ilfov, Romania; tel: +4021 4046163, fax: +4021 4574440, +4021 4574945; e-mail: msahagia@nipne.ro
CONTACT	Dr. Maria Sahagia

LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara “Horia Hulubei” (“Horia Hulubei” National Institute for R&D in Physics and Nuclear Engineering) IFIN-HH, Radionuclide Metrology Laboratory
NAMES	A. Luca
ACTIVITY	Nuclear decay data evaluation
KEYWORDS	Data evaluation, Sn-113
RESULTS	-Contribution to the Final Report for the IAEA CRP F42006 “Updated Decay Data Library for Actinides” ; -Participation at the Workshop DDEP 2010: Training sessions of the Decay Data Evaluation Project, LMRI-CIEMAT, Madrid, Spain, 9-11 June 2010
PUBLICATIONS	-A. Luca, «Evaluation of ^{234}Th nuclear decay data», Appl. Radiat. Isot. 68 (2010), issues 7-8, pages 1591-1594 ; -M.-M. Bé et al., “Monographie BIPM-5: Table of Radionuclides (Vol. 5 – A=22 to 244)”, Ed. BIPM, Sèvres, France, 2010; -M.-M. Bé et al., “Monographie BIPM-5: Table of Radionuclides (Comments on evaluation)”, Vol. 1-5, Ed. BIPM, Sèvres, France, 2010; - M.A. Kellett, M.-M. Bé, V. Chechev, Huang Xiaolong, F.G. Kondev, A. Luca, G. Mukherjee, A.L. Nichols, A. Pearce. “New IAEA Actinide Decay Data Library”, paper presented at International Conference on Nuclear Data for Science and Technology (ND2010), Jeju Island, Korea, April 26-30, 2010 (proceedings in press).
IN PROGRESS	-Evaluation of Sn-113 nuclear decay data (in co-operation with CEA/LNHB, France)
INFORMATION	
SOURCE IN PREPARATION	-A. Luca, M.-C. Lépy. «Measurements of relative photon emission intensities and nuclear decay data of Sn-113»
OTHER RELATED PUBLICATIONS	
ADDRESS	IFIN-HH, PO Box MG-6, RO-077125, 30 Reactorului Str., Magurele, Jud. Ilfov, Romania; tel: +4021 4046163, fax: +4021 4574440, +4021 4574945; e-mail: aluca@nipne.ro
CONTACT	Dr. Aurelian Luca

LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara “Horia Hulubei” (“Horia Hulubei” National Institute for R&D in Physics and Nuclear Engineering) IFIN-HH, Radionuclide Metrology Laboratory
NAMES	A. Luca, A. Antohe
ACTIVITY	Gamma-ray spectrometry
KEYWORDS	Data measurement, EURAMET, Gamma-ray spectrometry, Radioactive gas, X-ray spectrometry, Rn-222, Cu-64, Ga-68, Sn-113 (at LNHB)
RESULTS	-Determination of photon emission intensities for Cu-64 (EURAMET project 1085), Ga-68 and Sn-113 (in co-operation with CEA/LNHB, France). -New efficiency calibrations for vials with Rn-222 gas and activity measurements for various samples -Participation at a bilateral comparison (with ANSVSA Romania) of activity measurement for a radioactive food sample. -Annual RENAR accreditation Survey, Certificate: LI/804/2009; Notification, CNCAN Designation LE 05/2009.
PUBLICATIONS	-A.Luca, A.C.Wätjen, E.L.Grigorescu, M.Sahagia, C.Ivan, “Conclusions from the Participation at Proficiency Tests for Gamma-Ray Spectrometry Measurements”, Rom. J. Phys. 55, 7-8 (2010) 724. - M.Sahagia, D.Stanga, A.C.Wätjen, A.Luca, P.Cassette, C.Ivan, A.Antohe, “The Rn-222 standard system established at IFIN-HH, Romania”, Appl. Radiat. Isot. 68, 7-8 (2010) 1503. -M-M.Bé et al., “International exercise on Sb-124 photon emission determination”, Appl. Radiat. Isot. 68,10 (2010) 2026.
IN PROGRESS	-Participation at the CCRI(II)-S8 Supplementary comparison on K-40, Cs-137 and Sr-90 activity content in dried bilberry material. -Participation at the IFIN-HH Inter-Laboratory Comparison for activity measurements of volume sources in water-equivalent matrix. -Preparation of two papers proposed for the ICRM-2011 Conference.
INFORMATION	
SOURCE IN PREPARATION	A. Luca, M.-C. Lépy. Measurements of relative photon emission intensities and nuclear decay data of Sn-113.
OTHER RELATED PUBLICATIONS	
ADDRESS	IFIN-HH, PO Box MG-6, RO-077125, 30 Reactorului Str., Magurele, Jud. Ilfov, Romania; tel: +4021 4046163, fax: +4021 4574440, +4021 4574945; e-mail: aluca@nipne.ro
CONTACT	Dr. Aurelian Luca

LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara “Horia Hulubei” (“Horia Hulubei” National Institute of R&D for Physics and Nuclear Engineering), IFIN-HH. Radionuclide Metrology Laboratory
NAMES	M. Sahagia, A. Luca, A. Antohe, C. Ivan
ACTIVITY	- Measurement with the Ionisation camber CENTRONIC IG12/20A of ^{222}Rn and daughters, as gas and dissolved in LS; - Calibration of the chamber for ^{222}Rn, ^{64}Cu, ^{68}Ga; - Calibration of radioiosotope calibrators with ^{131}I and ^{99m}Tc standard solutions - Calibration of various sources and solutions. Radionuclide Metrology Laboratory (RML), Ionisation chamber measurement: -Annual RENAR accreditation survey, Certificate: LE/013/2009 - Notification, CNCAN Designation LE 05/2009
KEYWORDS	Ionisation chamber, Radionuclide by name: ^{222}Rn, ^{64}Cu, ^{68}Ga
RESULTS	A list of 20 radionuclides calibration factors was obtained.
PUBLICATIONS	1. M.Sahagia, A.C.Wätjen, A.Luca, C.Ivan *« IFIN-HH ionization chamber calibration and its validation; electrometric system improvement »* Appl.Radiat.Isotopes 68(2010) 1266 – 1269 2. V.Olsovcova, A.Iwahara, P. Oropesa, L.Joseph, A.Ravindra, M. Ghafoori, Hye-Kyung Son, M. Sahagia, S.Tastan, B. Zimmerman *« National Comparisons of I-131 measurement among nuclear medicine clinics of eight countries »* Appl. Radiat.Isotopes 68(2010)1371 - 1377 3. M. Sahagia, A.C. Wätjen, A.Luca, C.Ivan, A.Antohe *«National and International Comparisons on Radiopharmaceuticals' activity measurement»,* Romanian Journal of Physics 55, 7-8 (2010) 733-740
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	1. M. Sahagia, A. Luca, A. Antohe, C. Ivan. Standardization of ^{64}Cu and ^{68}Ga by the 4πPC-γ coincidence method and calibration of the ionization chamber . 2. A. Luca, M. Sahagia, A. Antohe. Measurements of ^{64}Cu and ^{68}Ga half-lives and gamma-ray emission intensities.
OTHER RELATED PUBLICATIONS	M. Sahagia, A. Luca, A. C. Wätjen, A. Antohe, C. Ivan, C.Varlam, I. Faurescu, P. Cassette « Establishment of the ^{222}Rn traceability chain with the Romanian Standard System ». Nuclear Instruments and Methods A 631 (2011) 73-79
ADDRESS	IFIN-HH, PO Box MG-6, RO-077125, 30 Reactorului Str., Magurele, Jud. Ilfov, Romania; tel: +4021 4046163, fax: +4021 4574440, +4021 4574945; e-mail: msahagia@nipne.ro
CONTACT	Dr. Maria Sahagia

LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara "Horia Hulubei" ("Horia Hulubei" National Institute for R&D in Physics and Nuclear Engineering) IFIN-HH Radionuclide Metrology Laboratory
NAMES	M. Sahagia, C. Ivan, A. Antohe, P. Cassette
ACTIVITY	- Measurements of Rn-222 decay chain and establishment of the radon traceability chain. - Study of the detection efficiency of the Rn-222 daughters - Testing of the system with 6 CPMs and comparison3PMTs and 6CPMs - Measurement of H-3 and Am-241 solutions for applications - Annual RENAR Accreditation Survey, Certificate: LE/013/2009
KEYWORDS	LSC-TDCR, CPM, Traceability, Radionuclides: Rn-222, H-3, Am-241
RESULTS	Several rounds of Rn-222 standardization were performed. The absolutely determined activities of Rn-222 recipients were used for the calibration of the secondary standard systems: gamma-ray spectrometry and ionization chamber. The 6 CPMs and 3 PMTs systems were tested by comparison and conclusions regarding radon chain liquid scintillator efficiency detection were drawn.
PUBLICATIONS	1. M. Sahagia, D. Stanga, A.C. Wätjen, A. Luca, P. Cassette, C. Ivan, A. Antohe «The ^{222}Rn standard system established at IFIN-HH, Romania » Appl.Radiat.Isotopes 68 (2010) 1503 -1506 2. C. Ivan, A.C. Wätjen, P. Cassette, M. Sahagia, A. Antohe, E.L. Grigorescu « Participation in the CCRI(II)-K2.H-3 comparison and study of the new TDCR-LS counter with 6 CPMs » Appl.Radiat.Isotopes. 68(2010)1543-1545 3. M. Sahagia, A. Luca, A. C. Wätjen, A. Antohe, C. Ivan, C.Varlam, I. Faurescu, P. Cassette « Establishment of the ^{222}Rn traceability chain with the Romanian Standard System«. Nucl. Instr. Methods A631(2011)73-79 4. M.Sahagia, A.Luca, A.C.Watjen, A.Antohe, C.Ivan, D.Stanga, C.Varlam, I.Faurescu, L.Toro, M.Noditi, P.Cassette "Results obtained in the measurement of Rn-222 with the Romanian standard system" Third European IRPA Congress, Helsinki, Finland, 14-18 June 2010. 5. A.Antohe, M.Sahagia, A.Luca, Ph. Cassette, C.Ivan "Influence of detection efficiency on the measurement of radon by liquid scintillation counting" Advances in Liquid Scintillation Spectrometry LSC 2010, Conference. September 6-10, 2010, Paris, France
INFORMATION	
SOURCE IN PREPARATION	Doctoral thesis. Constantin Ivan. "Development of a TDCR-LCS using new photodetectors" PhD Supervisor: Dr. E.L.Grigorescu
ADDRESS	IFIN-HH, 30 Reactorului Str., Magurele, Ilfov County, POB. MG 6, Code 077125, Romania Tel.: +40214046163, Fax: +40214574432, +40214574440; E-mail: msahagia@nipne.ro; ivan@nipne.ro
CONTACT	Dr. Maria Sahagia, Constantin Ivan

LABORATORY	Slovak Institute of Metrology
NAMES	Jozef Dobrovodský, Robert Hinca, Andrej Javorník, Matej Krivošík, Anton Švec
APPARATUS	Two calibrated well-type ionization chambers HPGe detector and Canberra DSA2000 MCA ANGLE code for efficiency transfer Large area (20 × 30 cm²) scintillation detectors for alpha and beta measurements HIDEX 300 SL TDCR LSC system
KEYWORDS	environmental control, Euromet, gamma-ray spectrometry, ionisation chamber, life sciences, SIR, large area sources
RESULTS	
PUBLICATIONS	
IN PROGRESS	EMRP projects, TDCR apparatus and method implementation, methods for area source measurements, gamma-ray spectrometry
INFORMATION SOURCE	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	Slovak Institute of Metrology, Center for Ionizing Radiations, Karloveská 63, 842 55 Bratislava Tel.: +421 2 60294 671, Fax.: +421 2 60294 670 e-mail: dobrovodsky@smu.gov.sk, svec@smu.gov.sk
CONTACT	Jozef Dobrovodský, the Director of the Center

LABORATORY	Laboratory for Radiological Measuring Systems and Radioactivity Measurements, Laboratory for Liquid Scintillation Spectrometry
NAMES	D. Glavič-Cindro, B. Vodenik, J. Kožar Logar, B. Zorko, M. Nečemer, B. Črnič, M. Korun
ACTIVITY	Semiconductor gamma-ray spectrometers, liquid scintillation spectrometers
KEYWORDS	Gamma-ray spectrometry, liquid scintillation, low-level, X-ray spectrometry
RESULTS	–
PUBLICATIONS	Vidmar T., Vodenik B., Nečemer M., *Efficiency transfer between extended sources* Appl. Radiat. Isot. **68** 2352 (2010) Vidmar T., Vodenik B., *Extended relative method for efficiency determination* Appl. Radiat. Isot. **68** 2421 (2010) Glavič-Cindro D., Korun M., *Traceability in gamma-ray spectrometry* Appl. Radiat. Isot. **68** 1196 (2010) Korun M., Maver Modec P., *Measurements of ^{106}Ru in thin samples* Appl. Radiat. Isot. **68** 1392 (2010) Črnič B., Korun M., Zorko B., *Interpretation of radionuclide concentrations near the detection limit for dose calculations* Proceedings of the Third European IRPA Congress 2010 June 14 – 16, Helsinki, Finland Korun M., Maver Modec P., *Interpretation of the measurement results near the detection limit in gamma-ray spectrometry using Bayesian statistic* Accred. Qual. Assur. **15** 515(2010) Shakashiro A. et al., *The new IAEA reference material: IAEA 434 technologically enhanced naturally occurring radioactive materials (TENORM) in phosphorgypsum* Appl. Radiat. Isot. **69** 231 (2010) Korun M., Kovačič K., Vodenik B., *Probability for Type I errors in gamma-ray spectrometric measurements of drinking water* J. Radioanal. Nucl. Chem. **286** 553 (2010) Korun M., Kovačič K., *Determination of ^{238}U in ground – water samples using gamma-ray spectrometry* Appl. Radiat. Isot. **69** 636 (2011) Maver Modec P., Korun M., Martelanc M., Vodenik B., *Background of radon daughters in gamma-ray spectrometric measurements* Environmental Radioactivity 2010, October 25 – 27 Rome, Book of abstracts Kožar Logar J., *Distillation as a step in tritium analysis*, LSC 2010, International Conference on Advances in Liquid Scientillation Spectrometry, September 6-10, 2010, Paris, France. Book of abstracts, p. 60
IN PROGRESS	Empirical evaluation of the probability of Type 1 and Type II errors in gamma-ray spectrometry, censoring in gamma-ray spectrometry, estimation of shielding factors for description of the influence of the sample material on the spectrometer background, statistical methods for analysis of measurement results. Evaluation and optimisation of electrolytic enrichment, statistical methods of measurement results, estimation of seasonal variation of radon on spectrometer background, optimisation of measurement conditions in LSC counter, influence of temperature on LSC measurements.

INFORMATION	–
SOURCE IN PREPARATION	Korun M., Maver Modec P., *Coincidence summing between X-rays and conversion electrons in ^{137}Cs* Maver Modec P., Korun M., Martelanc M., Vodenik B., *A comparative study id radon-induced background in low-level gamma-ray spectrometers* Korun M., Kovečič K., Kožar Logar J., *Concentration of tritium and members of the uranium and thorium decay chains in ground waters in Slovenia and their implication for managing ground-water resources* Kovačič K., Kožar Logar J., Korun M., *Tritium and gamma emitters in Slovenian groundwater*, LSC 2010, International Conference on Advances in Liquid Scintillation Spectrometry, September 6-10, 2010, Paris, France. Book of abstracts, p. 61 Krištof R, Kožar Logar J., *Quench in determination of biocomponent in diesel by LSC*, LSC 2010, International Conference on Advances in Liquid Scintillation Spectrometry, September 6-10, 2010, Paris, France. Book of abstracts, p. 107
OTHER RELATED PUBLICATIONS	–
ADDRESS	Jožef Stefan Institute, Jamova cesta 39, 1000 Ljubljana, Slovenia Tel. +386 1 4773900, Fax +386 1 251 93 85 E-mail: denis.cindro@ijs.si
CONTACT	Denis Glavič-Cindro

LABORATORY	IRA
NAMES	Claude Bailat, Frédéric Juget, Youcef Nedjadi
ACTIVITY	Source preparation, coincidence method, gas proportional counter, NaI well counter, liquid scintillation, alpha spectrometry, gamma-ray spectrometry, ionisation chamber, Monte Carlo simulation, Radon measurements
KEYWORDS	Alpha spectrometry, beta spectrometry, (anti) coincidence method, cryogenic detector, data evaluation, data measurement, define solid angle (ASD) measurement, environmental control, Euramet, gamma-ray spectrometry, gas proportional counter, ionisation chamber, life sciences, liquid and plastic scintillation, low-level, NaI well-type counter, neutron measurement, radioactive gas, radiochemistry, simulation code, SIR, source preparation, traceability, X-ray spectrometry
RESULTS	
PUBLICATIONS	Claude Bailat, Yvan Caffari, Philippe Spring, Youcef Nedjadi, François Bochud. Factors influencing 18F activity measurements using commercial radionuclide calibrators, SSRPM proceedings 2010. Youcef Nedjadi, Claude Bailat, Yvan Caffari, François Bochud, Primary standardisation of 18F activity using a 4πβ-4πγ coincidence counting system, SSRPM proceedings 2010. Yvan Caffari, Claude Bailat, Youcef Nedjadi, Philippe Spring, François Bochud, Activity measurements of 18F and 90Y with commercial dose calibrators for nuclear medicine in Switzerland, Applied Radiation and Isotopes 68 (2010), 1388-1391. Youcef Nedjadi, Claude Bailat, Yvan Caffari, François Bochud, Standardisation of 18F by a coincidence method using full solid angle detectors, Applied Radiation and Isotopes 68 (2010), 1309-1313. Claude Bailat, Thierry Buchillier, Yvan Caffari, Youcef Nedjadi, Philippe Spring, Sybille Estier and François Bochud, Seven Years of Gamma-ray Spectrometry Comparison in Switzerland, Applied Radiation and Isotopes 68 (2010) 1256–1260. B. Chauvenet, M.-M. Bé, M.-N. Amiot, C. Bobin, M.-C. Lépy, T. Branger, I. Lanièce, A. Luca, M. Sahagia, A.C. Wätjen, K. Kossert, O. Ott, O. Nähle, P. Dryák, J. Sochorovà, P. Kovar, P. Auerbach, T. Altzitzoglou, S. Pommé, G. Sibbens, R. Van Ammel, J. Paepen, A. Iwahara, J.U. Delgado, R. Poledna, C.J. da Silva, L. Johansson, A. Stroak, C. Bailat, Y. Nedjadi and P. Spring, International exercise on ^{124}Sb activity measurements, Applied Radiation and Isotopes 68 (2010), 1207-1210, doi:10.1016/j.apradiso.2010.01.037.
IN PROGRESS	Validating the TDCR method; Measuring the period of Ho-166m and replacing the reference sources for the Swiss reference ionisation chamber;

INFORMATION	Frédéric Juget is working at IRA since 01.01.2011 following the departure of Yvan Caffari.
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	C.Bailat, T.Buchillier, S. Baechler, F. Bochud, Calibration of surface contamination monitors for the detection of iodine incorporation in the thyroid gland, Radiation Protection Dosimetry (2010), pp. 1–5 J. Damet, F. O. Bochud, C. Bailat, J. P. Laedermann and S. Baechler, VARIABILITY OF RADIOIODINE MEASUREMENTS IN THE THYROID, Radiat Prot Dosimetry (2010)
ADDRESS	Institut de Radiophysique Grand-Pré 1 CH-1007 Lausanne Switzerland Tel : +41 21 6233434 Fax : +41 21 6233435 http://www.chuv.ch/public/instituts/ira
CONTACT	Claude Bailat

LABORATORY	NPL
NAMES	Lena Johansson, John Keightley, John Sephton
ACTIVITY	4πβ–γ coincidence counting
KEYWORDS	Coincidence method, gas proportional counter, liquid scintillation, SIR.
RESULTS	CCRI(II) Key comparison exercise of Pu-241 solution submitted. Submission of Cu-64 to the SIR
PUBLICATIONS	H. C. Phillips, **L. C. Johansson** and J. P. Sephton, Standardisation of ^{85}Kr, *Appl. Radiat. Isotop.* 68 (2010)1335-1339. **L. C. Johansson** and J. P. Sephton, Validation of the new TDCR system at NPL, *Appl. Radiat. Isotop.* 68 (2010)1537-1539. Arzu Arinc, Chris R D Gilligan, Andy K Pearce, **Lena C Johansson**, ^{210}Pb standardisation by Cerenkov counting, accepted for publication in *Appl. Radiat. Isotop.* (2010)
IN PROGRESS	Commissioning of new 4πβ(HPPC)–γ coincidence system, which is being extended to incorporate: 4π–γ counting and 4πβ–γ sum counting systems. EMRP "MetroFission" project.
INFORMATION	http://projects.npl.co.uk/metrofission/
SOURCE IN PREPARATION	Papers on standardisation of Gd-153 and Pu-241 being prepared for submission to ICRM 2011 conference.
OTHER RELATED PUBLICATIONS	Presentation on standardisation of Cu-64 by efficiency tracing technique and 4πβ(LS)–γ coincidence counting at LSC Conference 2010
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CONTACT	Lena Johansson (lena.johansson@npl.co.uk)

LABORATORY	National Physical Laboratory
NAMES	Julian Dean, Arvic Harms, Sean Collins
ACTIVITY	UK Measurement Infrastructure for Nuclear Decommissioning • Development of reference materials (e.g. concrete). • Organisation of Nuclear Industry Proficiency Test Exercises (i.e. 'mock' waste-drum comparisons). • Contributions to guidance documents on radionuclide metrology in site decommissioning. • Research into metrology of contaminated surfaces.
KEYWORDS	Gamma-ray spectrometry, ionisation chamber, low-level, NaI well-type counter, radiochemistry, traceability
RESULTS	2009 PTE complete (see publications). 14 participating laboratories submitted results for 'Exempt' and 'LLW' drum types. Drums contained ^{241}Am, ^{60}Co and ^{137}Cs. Matrix was ion-exchange resin and vermiculite.
PUBLICATIONS	Dean, J. C. J. 'A Second Comparison of Procedures for the Assay of Low Levels of Gamma-emitters in Nuclear Site Waste.' NPL Report IR19 (July 2010).
IN PROGRESS	• Third Nuclear Industry Proficiency Test Exercise. • Good Practice Guide on mathematical modelling for measurements of gamma-emitters in waste. • Measurement of attenuation effects of paint layers in surface monitoring.
INFORMATION	The synthetic reference materials (e.g. SiO_2 based) developed in the NPL environmental radioactivity project are applicable in metrology for nuclear decommissioning.
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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CONTACT	Julian Dean (julian.dean@npl.co.uk)

LABORATORY	NPL
NAMES	Andy Pearce, Joel Gasparro, Sean Collins
ACTIVITY	High Resolution Gamma Spectrometry
KEYWORDS	Gamma-ray Spectrometry
RESULTS	Measurements of actinides in low-volume samples to support nuclear decommissioning and remediation: • Reactor graphite samples • Very small-volume, high specific activity nuclear fuel reprocessing debris
PUBLICATIONS	-
IN PROGRESS	-
INFORMATION	-
SOURCE IN PREPARATION	-
OTHER RELATED PUBLICATIONS	-
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CONTACT	Andy Pearce : andy.pearce@npl.co.uk

LABORATORY	NPL
NAMES	Hilary Phillips, John Sephton, Lena Johansson, Julian Dean
ACTIVITY	Standardisation of radioactive gas by internal proportional counting
KEYWORDS	gas proportional counter, radioactive gas, SIR, traceability, tritium, tritiated water, krypton-85, carbon-11, carbon-14
RESULTS	Standardisation of ^{11}C, HTO, ^{3}H, Participation in BIPM HTO comparison exercise
PUBLICATIONS	
IN PROGRESS	Exposure of tritium in air monitors to HTO, and ^{3}H in humid conditions, calibration of secondary standard instrument for PET discharges
INFORMATION	Development of environmental level standards of ^{3}H and $^{14}CO_2$ Development of radioactive gas monitoring systems for waste repositories planned as Workpackage WP3 under EMRP project 'MetroRWM'. Expected to begin Summer 2011.
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	ICRM 2009 conference proceedings Standardisation of positron-emitters in gas with the NPL primary gas counting system Standardisation of ^{85}Kr
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CONTACT	Hilary Phillips (hilary.phillips@npl.co.uk)

LABORATORY	NPL
NAMES	John Keightley, Andrew Fenwick, Michaela Baker, John Sephton
ACTIVITY	Ionisation Chamber Measurements
KEYWORDS	Ionisation chamber, dose calibrator, radionuclide calibrator, life sciences Gd-153, Lu-177, Cu-64, Ho-166m, Ra-223
RESULTS	New and/or refined calibration factors for NPL Secondary Standard Ionisation Chambers: FIDELIS (ISOCAL - IV): Gd-153, Cu-64, Lu-177, Ho-166m Various: Ir-192 LDR brachytherapy wires I-125 seeds/strands I-131 capsules
PUBLICATIONS	NPL report on Intercomparison exercise for Y-90 measurements in UK Hospitals (in press). Details from contact below.
IN PROGRESS	Ra-223 calibration factors for FIDELIS (ISOCAL-IV) Continued validation of new electrometer system and associated analysis software (operating in parallel with existing system). Commissioning of new robotic sample changer
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Physical Laboratory
NAMES	Chris Gilligan, Simon Jerome, Arzu Arinc, Andy Pearce, Lena Johansson and Arvic Harms
ACTIVITY	*Organisation of laboratory proficiency testing programmes *Provision of low-level standards of radioactivity *Provision of synthetic environmental radioactivity reference material (SiO_2) *Accreditation of the NPL Environmental Radioactivity Proficiency Test Exercise (ISO 17043)
KEYWORDS	Alpha spectrometry, (anti) coincidence method, gamma-ray spectrometry, ionisation chamber, liquid scintillation, low-level, radiochemistry, source preparation, traceability, ^{3}H, ^{7}Be, ^{14}C, ^{36}Cl, ^{55}Fe, ^{60}Co, ^{89}Sr, ^{90}Sr, ^{95}Zr, ^{95}Nb, ^{99}Tc, ^{133}Ba, ^{134}Cs, ^{137}Cs, ^{152}Eu, ^{154}Eu, ^{210}Po, ^{210}Pb, ^{226}Ra, ^{232}Th, ^{238}U, ^{237}Np, ^{238}Pu, ^{239}Pu, ^{241}Pu, ^{241}Am and ^{244}Cm
RESULTS	*Organisation of the NPL Environmental Radioactivity Proficiency Test Exercise 2010 (70 participants; eight sample types (aqueous and solid); nuclides included ^{3}H, ^{7}Be, ^{14}C, ^{36}Cl, ^{55}Fe, ^{60}Co, ^{89}Sr, ^{90}Sr, ^{95}Zr, ^{95}Nb, ^{99}Tc, ^{134}Cs, ^{137}Cs, ^{152}Eu, ^{154}Eu, ^{210}Po, ^{210}Pb, ^{226}Ra, ^{232}Th, ^{238}U, ^{237}Np, ^{238}Pu, ^{239}Pu, ^{241}Pu, ^{241}Am and ^{244}Cm) *Provision of ^{241}Pu standards *Provision of a synthetic environmental radioactivity reference material (SiO_2) containing ^{55}Fe, ^{90}Sr, ^{133}Ba, ^{134}Cs, ^{137}Cs and ^{152}Eu *UKAS accreditation (ISO Guide 17043 Proficiency Test Exercise Providers) for the NPL Environmental Radioactivity Proficiency Test Exercise
PUBLICATIONS	Harms, A.V., Gilligan, C. 2010. Development of Neutron-irradiated Concrete Powder Reference Material. Applied Radiation and Isotopes, 68, 1471-1476 Arinc, A., Johansson, L.C., Gilligan, C.R.D., Pearce, A.K., 2011. Standardisation of ^{210}Pb by Čerenkov counting. Applied Radiation and Isotopes, 69, 768-772
IN PROGRESS	*Organisation of the NPL Environmental Radioactivity Proficiency Test Exercise 2011 *Development of more synthetic reference materials (SiO_2 based)
INFORMATION	–
SOURCE IN PREPARATION	–
OTHER RELATED PUBLICATIONS	–
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CONTACT	Arvic Harms

LABORATORY	National Physical Laboratory
NAMES	Arzu Arinc, Eleanor Bakhshandeiar, Chris Gilligan, Lena Johansson, John Keightley, Andy Pearce
ACTIVITY	Liquid Scintillation Counting
KEYWORDS	Liquid scintillation, CIEMAT/NIST, TDCR, DCC
RESULTS	Standardisation of ^{35}S, ^{64}Cu, ^{89}Sr, ^{99}Tc and ^{90}Sr/^{90}Y, ^{236}Pu, ^{239}Pu, ^{241}Pu and ^{242}Pu by CIEMAT/NIST, 100 % efficiency alpha liquid scintillation counting and TDCR methods. The NPL TDCR system has been upgraded with new photomultiplier tubes. A new miniature TDCR system is being built within the EMRP MetroFission project that started Sept 2010. Organisation of the ninth Liquid Scintillation Users' Forum (LSUF) in Warrington. This forum is an opportunity for the users' of LSC in the UK to discuss issues encountered with routine measurements and transfer knowledge.
PUBLICATIONS	Arinc, A., Johansson, L.C., Gilligan, C.R.D., Pearce, A.K., 2011. Standardisation of ^{210}Pb by Čerenkov counting. Applied Radiation and Isotopes, 69, 768-772
IN PROGRESS	Standardisations of ^{61}Cu and ^{209}Po
INFORMATION	-
SOURCE IN PREPARATION	Paper on standardisation of ^{241}Pu being prepared for submission to ICRM 2011 conference.
OTHER RELATED PUBLICATIONS	Presentation on standardisation of Cu-64 by efficiency tracing technique and $4\pi\beta$(LS)–γ coincidence counting at LSC Conference 2010
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LABORATORY	National Physical Laboratory
NAMES	Andy Pearce, Arzu Arinc
ACTIVITY	Nuclear Decay Data Evaluations
KEYWORDS	Data evaluation, ^{231}Pa
RESULTS	Decay data evaluation of ^{231}Pa provided to *Decay Data Evaluation Project* as part of IAEA coordinated research project. Participation in the DDEP workshop from 9-11 June 2010 at CIEMAT, Madrid.
PUBLICATIONS	Evaluation of ^{231}Pa: http://www.nucleide.org/DDEP_WG/Nuclides/Pa-231_com.pdf
IN PROGRESS	Data evaluation of ^{106}Ru, ^{106}Rh
INFORMATION	-
SOURCE IN PREPARATION	-
OTHER RELATED PUBLICATIONS	-
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LABORATORY	National Institute of Standards and Technology
NAMES	Denis E. Bergeron, Brian E. Zimmerman, Jeffrey T. Cessna
ACTIVITY	Secondary Standards for Ra-223
KEYWORDS	Ionisation chamber, life sciences, Ra-223
RESULTS	Calibration factors for re-entrant ionization chambers (dose calibrators)
PUBLICATIONS	"Development of secondary standards for Ra-223" D.E. Bergeron, B.E. Zimmerman, and J.T. Cessna, 56th Annual Meeting of the Society of Nuclear Medicine, Toronto, Canada, 13-17 June 2009. "Development of secondary standards for Ra-223" D.E. Bergeron, B.E. Zimmerman, and J.T. Cessna, 17th International Conference on Radionuclide Metrology and its Applications (IRCM 2009), Bratislava, Slovak Republic, 7-11 September 2009. "Development of secondary standards for Ra-223" D.E. Bergeron, B.E. Zimmerman, and J.T. Cessna, Appl. Radiat. Isot., 68, 1367 (2010)
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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CONTACT	Dr. Denis E. Bergeron, Dr. Brian E. Zimmerman, Mr. Jeffrey T. Cessna

LABORATORY	National Institute of Standards and Technology
NAMES	Denis E. Bergeron, Brian E. Zimmerman
ACTIVITY	Triple-to-Double Coincidence Ratio Liquid Scintillation Spectrometry
KEYWORDS	Coincidence method, liquid scintillation, Pu-241
RESULTS	Standardization of Pu-241 as part of CCRI(II) comparison
PUBLICATIONS	"TDCR Measurements on Pu-241 at NIST," D.E. Bergeron and B.E. Zimmerman, Advances in Liquid Scintillation Spectrometry (LSC2010), Paris, France, 6-10 September, 2010.
IN PROGRESS	Development of Field Programmable Gate Array-based data acquisition system
INFORMATION	
SOURCE IN PREPARATION	
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CONTACT	Dr. Denis E. Bergeron, Dr. Brian E. Zimmerman

LABORATORY	National Institute of Standards and Technology
NAMES	Denis E. Bergeron
INSTRUMENT	Windowless Si(Li) detector
KEYWORDS	Cryogenic detector, gamma-ray spectrometry, X-ray spectrometry
RESULTS	Supporting data provided for the Pb-210 blind comparison
PUBLICATIONS	
IN PROGRESS	Activity calibration curves are being established for point sources and ampoules
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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CONTACT	Dr. Denis E. Bergeron

LABORATORY	NIST
NAMES	Jerome LaRosa, Svetlana Nour, Jackie Mann, and Kenneth G.W. Inn
ACTIVITY	NIST Radiochemistry Intercomparison Program (NRIP) – Emergency Preparedness Testing
KEYWORDS	Alpha spectrometry, beta spectrometry, gamma-ray spectrometry, gas proportional counter, low-level, NaI well-type counter, radiochemistry, source preparation, traceability,
RESULTS	The NRIP radiological emergency exercises have shown, although on a small scale, that the radioassay community can fairly quickly provide gamma-ray and gross alpha/beta screening measurement results for consequence management decision making. It was also demonstrated that radiochemical measurements of relatively high accuracy are possible with an eight hour turnaround. The studies, however, have also shown that there is large variability in the accuracy of the radioassay measurements. This exercise, and others to follow, will provide the laboratories with the opportunity to optimize their emergency response procedures, validate them and establish control systems to assure "fit for use" measurement results. With radiochemical method streamlining, training and exercising, other laboratories would be able to also do rapid measurements of radiochemically separated radionuclides. With experience, it is anticipated that measurement capabilities and the ability to estimate measurement uncertainties can improve measurably. All of these lessons indicate the preparedness exercises 1) need to be expanded to a larger cohort of laboratories to better assess the capabilities and capacity of the national radioanalytical community, and 2) strengthen the laboratory's capabilities to be prepared for an emergency incident. Additionally, a quality system needs to be built to improve statistical control over the laboratory's response capability. As these improvements are put in place, it can be expected that emergency radioanalytical response capabilities will be able to provide measurement results with predictable and known accuracy and acceptable uncertainty.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
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LABORATORY	NIST
NAMES	Svetlana Nour, James Filliben and Kenneth G.W. Inn
ACTIVITY	NIST Environmental Matrix Radionuclide Standard Reference Material – Shellfish, SRM 4358
KEYWORDS	Alpha spectrometry, beta spectrometry, gamma-ray spectrometry, gas proportional counter, low-level, NaI well-type counter, radiochemistry, source preparation, traceability,
RESULTS	This Standard Reference Material (SRM) has been developed in cooperation with member laboratories of the International Committee for Radionuclide Metrology and other experienced metrology laboratories. The SRM consists of approximately 150 grams shellfish powder that was freeze-dried, pulverized, bottled, and sterilized. The SRM is intended for use in tests of measurements of radioactivity contained in matrices similar to the sample, for evaluating analytical methods, and as a generally available calibrated "real" sample matrix for laboratory intercomparison. The certified massic activity or activity ratio value for ^{40}K, ^{90}Sr, ^{137}Cs, ^{210}Pb, ^{228}Ra, ^{228}Th, ^{230}Th, ^{232}Th, ^{234}U, ^{235}U, ^{238}U, ^{238}Pu, ^{239}Pu + ^{240}Pu, ^{241}Am, ^{228}Th/^{232}Th, ^{230}Th/^{232}Th, ^{234}U/^{238}U, ^{235}U/^{238}U, ^{238}Pu/(^{239}Pu + ^{240}Pu) was determined from the evaluated average of the individual laboratory means. This approach was selected because of the well-behaved normal distribution of the laboratories' data. The combined standard uncertainties (u_c) for each of the certified values were expanded with the Students' t-statistics. The expanded uncertainty (U) is taken to be the 95 percent confidence interval. The 95/95 tolerance limits means that NIST is 95 % confident that 95 % of the population of SRM measurements fall within the specified limits. The tolerance limits are used when the number of replicates is small (n<5), e.g. when the material is used as a periodic QC sample. The values for radionuclides activities and isotopic ratios (^{208}Tl, ^{212}Pb, ^{214}Pb, ^{214}Bi, ^{226}Ra, ^{241}Pu, ^{242}Cm, ^{244}Cm) for which insufficient numbers of data sets or for which unresolved discrepant data sets were obtained are reported as a mean value of all reported data and the range of reported results. No uncertainties for those values are provided because no meaningful estimates could be made. The massic activities and mass ratios are not certified at this time, but may be certified at some future time if additional data become available. Users are invited to submit measurement data to contribute to the certification process.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
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LABORATORY	NIST
NAMES	Svetlana Nour, Jerome. La Rosa, Balazs Bene, and Kenneth G.W. Inn
ACTIVITY	Radionuclide in soil reference materials for the evaluation and validation of the proto-type semi-automatic field radiochemical separations instrument – ARS-IIe
KEYWORDS	Radiochemistry
RESULTS	Consequence management of a radiological incident requires rapid information about the nuclides, amount, dispersion, and speciation for the determination of sheltering-in-place, evacuation, food safety, population safety/monitoring, access to commerce/critical infrastructure. Consequence management measurements of nuclides dispersed by radiological incidences need to be of the highest certainty because life saving, commerce restoration, and access to critical infrastructure decisions are based on them. The sheer volume of radionuclide measurements that will need to be done in a very short period of time (hundreds of thousands over a few months) require rapid analytical methods that do not require much human intervention (fatigue factor). Additionally, field measurements have the advantage of being conducted at high need sites. Evaluation and validation of semi-automatic field instrumentation by NIST reference materials will provide the confidence to depend on its capability when needed. The U.S. Air Force evaluated the efficacy of using a semi-automatic radiochemical separation instrument (ARS-IIe) in the field for rapid intelligence gathering from radiological incidents. The capabilities of the ARS-IIe needed to be evaluated and validated prior to field use, and NIST collaborated in the effort by developing the radionuclide in soil reference materials for instrument testing. The soils were spiked with NIST SRMs (e.g., 90Sr, 239Pu, natU, 241Am, 230Th), and the spiking process was verified by gamma-ray tracing. These soil reference materials were spiked with yield tracers and carriers, fused with lithium metaborate, dissolved, the radionuclides separated by the ARS-IIe, and the purified nuclide fractions were counted and compared with the NIST certified values. The operational protocol for the ARS-IIe was optimized for accuracy, speed, and operational efficiency and readied for field use for the U.S. Air Force.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
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LABORATORY	NIST
NAMES	Kenneth G.W. Inn
ACTIVITY	Reference Soil for National Technical Nuclear Forensics
KEYWORDS	Low-level, radiochemistry
RESULTS	The U.S. Department of Homeland Security (DHS) is committed to using cutting-edge technologies and scientific talent in its quest to make America safer. The National Technical Nuclear Forensics Center (NTNFC), housed in the Domestic Nuclear Detection Office (DNDO), is tasked with researching and organizing the scientific, engineering, and technological resources within the Departments of Defense (DoD), Energy (DOE) and Justice (DOJ) and leveraging these existing resources into technological tools to help protect the homeland. Additionally, the NTNFC is mandated to enhance the U.S. Government's knowledge and capabilities regarding the forensic examination of pre-detonation radiological and nuclear materials. This materials forensics program supports Homeland Security through the development and maintenance of an enduring national capability to conduct comprehensive, accurate, and timely forensic analysis of those materials. The NTNFC has established one of its mission areas as Pre-detonation Materials Capability Development with a subunit for Reference Standards. A major achievement was the certification of the Peruvian Soil-II overspiked with ^{60}Co, ^{90}Sr, ^{133}Ba, ^{137}Cs, ^{152}Eu, ^{154}Eu, ^{155}Eu, ^{210}Pb, ^{226}Ra, ^{230}Th, ^{237}Np, ^{234}U, ^{235}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Am, ^{243}Cm for nuclear forensics methods development, validation and performance evaluation.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
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LABORATORY	NIST
NAMES	Kenneth G.W. Inn
ACTIVITY	The Urgent Requirement for New Radioanalytical Certified Reference Materials for Nuclear Safeguards, Forensics, and Consequence Management
KEYWORDS	Radiochemistry
RESULTS	A multi-agency workshop was held from 25–27 August 2009, at the National Institute of Standards and Technology (NIST), to identify and prioritize the development of radioanalytical Certified Reference Materials for field and laboratory nuclear measurement methods to be used to assess the consequences of a domestic or international nuclear event. Without these CRMs, policy makers concerned with detecting proliferation and trafficking of nuclear materials, attribution and retribution following a nuclear event, and public health consequences of a nuclear event would have difficulty making decisions based on analytical data that would stand up to scientific, public, and judicial scrutiny. The workshop concentrated on three areas: post-incident Improvised Nuclear Device (IND) nuclear forensics, safeguard materials characterization, and consequence management for an IND or a Radiological Dispersion Device detonation scenario. The workshop identified specific CRM requirements to fulfill the needs for these three measurement communities. Of highest priority are: 1) isotope dilution mass spectrometry standards, specifically ^{233}U, ^{236}Np, ^{244}Pu, and ^{243}Am, used for quantitative analysis of the respective elements that are in critically short supply and in urgent need of replenishment and certification, 2) CRMs that are urgently needed for post-detonation debris analysis of actinides and fission fragments, and 3) CRMs used for destructive and nondestructive analyses for safeguards measurements, and radioisotopes of interest in environmental matrices. A follow-up workshop was held 9-11 February 2010 at NIST to develop solution options and cost estimates for the gaps defined at the August 2009 workshop. A total of thirty-four gap analyses and proposals were generated: 7 hex-chart proposals for consequence management issues; 4 hex-chart proposals for detecting nuclear technology; 10 for safeguard material characterization; and 13 for post-nuclear detonation material characterization. The proposal package was submitted to DoD for the 2012-2016 submission.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	NIST
NAMES	Iisa Outola
ACTIVITY	Optimization of the sequential radionuclide extraction protocol
KEYWORDS	Low-level, radiochemistry
RESULTS	Experiments have been carried out on the NIST lake sediment SRM4354 to develop a NIST method for simple but robust radionuclide sequential extraction. The goal of this work is to establish the NIST method for characterization of a new line of environmental radionuclide SRMs which will serve as benchmark reference materials. The new SRMs will be used by environmental assessment and risk management investigators working on environmental cleanup and accident/incident remediation efforts. Optimum extraction conditions are chosen based on radiochemical analysis for Pu and U performed by NIST, and on stable elemental analysis performed by Environmental Protection Agency (EPA). Work has been carried out for the five fractions: I (exchangeable), II (bound to carbonates), III (metal oxides), IV (organics), and V (resistates) that shows some substantial differences from the sequential extraction parameters determined on previous trials using the Ocean Sediment (SRM 4357), i.e., optimized extraction time, reagent concentration, and extraction times. The results on the NIST lake sediment provided an important test of the robustness of the optimized extraction conditions. The optimized sequential extraction protocol, which accommodates the extraction differences between the Lake and Ocean Sediment SRMs, has been proposed and is now ready to be used for future radionuclide SRM characterizations.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	NIST
NAMES	Payam Motabar
ACTIVITY	Characterizing Natural Hot Particles
KEYWORDS	Low-level, radiochemistry
RESULTS	NIST Columbia River Sediment (SRM 4350B), Rocky Flats Soil (SRM 4353), and Ocean Sediment (SRM 4357) were developed for analytical methods evaluation. These materials were analyzed using a KF fusion procedure and an acid dissolution procedure. The latter method resulted in uranium and thorium isotopic massic activities that were 15 to 20 % lower than the certified values. This was due to a fraction of the sample, zircon-like "resistates," that did not dissolve during acid treatment. An HF acid dissolution was performed on the NIST natural matrix SRMs to isolate the "resistate" fractions. The uranium and thorium radionuclides were extracted from the "resistate" fractions using a $LiBO_2$ fusion procedure. These resistates accounted for the "missed" uranium and thorium radionuclide content from the HF acid dissolution process. Research related to resistate minerals in NIST SRM soil samples has been ongoing for over 30 years. The analysis of the NIST environmental radionuclide SRMs has shown the ubiquitous nature of these resistate minerals, as well as their potential to harbor uranium and thorium radionuclides that can contain significant amounts of radioactivity. This study provides evidence that radioactive accessory minerals contained in igneous rock can be found in many siliceous samples, not only ones extracted near mountainous regions.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	NIST
NAMES	Evan Crawford and Jerome LaRosa
ACTIVITY	Rapid screening of ^{90}Sr and ^{63}Ni in urine
KEYWORDS	Low-level, radiochemistry
RESULTS	Treatment of ^{90}Sr and ^{63}Ni-spiked, acidified urine samples with activated carbon has been shown to remove the quenching problem without adsorption loss of the radionuclide. The results to date offer a promising method for the development of a truly rapid urine screening procedure for ^{90}Sr and ^{63}Ni that, despite its non-selectivity, has excellent sensitivity with high throughput and minimal operator handling.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R. Collé, L. Laureano-Pérez
ACTIVITY	Blind Measurement Comparisons of the USA and UK ^{210}Pb National Standards
KEYWORDS	Alpha spectrometry, beta spectrometry, (anti) coincidence counting, gamma-ray spectrometry, HPGe, liquid scintillation, low-level, NaI sandwich detector, Pb-210, Po-210 ingrowth, Si surface barrier, Si(Li) detector
RESULTS	The NIST Radioactivity Group and the National Physical Laboratory (NPL) of the UK, exchanged ^{210}Pb solution sources for a blind measurement comparison. The solutions from each laboratory were linked to their primary standardizations and national standards. Measurements by NIST on both solutions were performed by three methods: *viz*., liquid scintillation (LS) standardizations (with ^{3}H-standard efficiency tracing); with relative photonic emission rates with a 4$\pi\gamma$(NaI) sandwich detector; and by high-resolution Si(Li) spectrometry. All three methods were linked to extant NIST standards, which are disseminated as Standard Reference Material SRM 4337. The NPL measurements were based on four methods: high resolution HPGe gamma-ray spectrometry; Čerenkov counting of the ^{210}Bi progeny; LS counting with efficiency tracing with a ^{3}H standard; and measuring the ^{210}Po daughter, in equilibrium, by alpha spectrometry, where the efficiency was traced with ^{208}Po. For both solutions, the massic activity measurements from the two laboratories agreed to about 0.5 %, which was well within the 1.1 % propagated standard uncertainty assigned to the two sets of measurements. These findings add support to an earlier suspicion that the measurement uncertainty previously assigned to the certified massic activity values for both the NIST ^{210}Pb SRM and that for the NPL disseminated standards may be overestimated.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4337 available
OTHER RELATED PUBLICATIONS	**A liquid-scintillation-based primary standardization of ^{210}Pb**, Laureano-Pérez, Lizbeth, Collé R., Fitzgerald, R., Outola, I., and Pibida L., *Appl Radiat Isot*. , Dec 2007 Volume 65, Issue 12, Pages 1368-80 ; **On the Standardization of ^{209}Po and ^{210}Pb,** R. Collé and L. Laureano-Perez, *Radiocarbon*, 2009, LSC 2008 Proceedings, Pages 77-85.
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	L. Laureano-Pérez, R. Collé
ACTIVITY	Standardization of ^{243}Am
KEYWORDS	beta spectrometry, liquid scintillation, CNET, Am-243
RESULTS	A new standard solution of ^{243}Am was developed and disseminated at NIST as SRM 4332E. The certified massic activity for ^{243}Am in radioactive equilibrium with ^{239}Np was obtained by 4παβ liquid scintillation (LS) spectrometry with three commercial LS counters. The LS detection efficiency was calculated using the CN2003 code for the CIEMAT/NIST method with composition matched LS cocktails of a ^{3}H standard as the efficiency detection monitor. The combined standard uncertainty (k = 2) on the standardization is 0.9 %. Based on comparative LS measurements, the certified value of the massic activity for SRM 4332E was in agreement with that for the previously issued SRM 4332D to within 1.0 %, with a k = 2 combined uncertainty on the two massic activities of 1.2 % .
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4332E available
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R.Collé, L. Laureano-Pérez
ACTIVITY	Primary Radioactivity Standardization of ^{63}Ni
KEYWORDS	beta spectrometry, liquid scintillation, CNET, TDCR, Ni-63
RESULTS	A new primary radioactivity standardization of ^{63}Ni was performed. This standardization was used to support SRM 4226d which is presently out of stock. The standardization links all previous ^{63}Ni standardizations that have been performed over the past 42 years (1968; 1984; 1995; 2006) adding another point for the determination of the half life by radioactive decay. The primary standardization of ^{63}Ni was performed by CIEMAT/NIST ^{3}H-standard efficiency tracing (CNET) and the value confirmed by the triple-to-double-coincidence ratio (TDCR) method. The certified massic activity of the new issue of ^{63}Ni is wholly consistent with the decay corrected certified activity in SRM 4226c (issued in 1995), SRM 4226b (issued in 1984) and SRM 4226 (issued in 1969) using the previously derived half-life value of (101.1 ± 1.4) a and hence confirming the extant value. The present agreement with the previous issues are +0.6 %, +0.9 % and +0.5 %, respectively.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4226E available
OTHER RELATED PUBLICATIONS	**^{63}Ni, its half-life and standardization: revisited**, Collé, R., Zimmerman, B.E. Cassette, P. and Laureano-Pérez, L. *Appl Radiat Isot*. Jan 2008 Volume 66, Issue 1, Pages 60-8
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	L. Laureano-Pérez, R. Fitzgerald, R.Collé, D. Bergeron, B.E. Zimmerman, S. Nour, L.Pibida
ACTIVITY	International Comparison of ^{241}Pu
KEYWORDS	Beta spectrometry, (anti) coincidence counting, gamma-ray spectrometry, HPGe, liquid scintillation, liquid scintillation, CNET, TDCR, Pu-241
RESULTS	A new solution standard of ^{241}Pu was developed and disseminated as SRM 4340B in 2007, during this standardization an unexpected and inexplicable discrepancy between CIEMAT/NIST ^{3}H-standard efficiency tracing method (CNET) and triple-to-double-coincidence ratio (TDCR) counting method was uncovered. In an effort to further study and resolve this measurement discrepancy, an international measurement comparison amongst a few select national metrology laboratories was planned and conducted. The ^{241}Pu international comparison was hosted by NPL. This discrepancy between CNET and TDCR was found in the preliminary determinations of the NPL solution but further investigation during this calibration showed some of the reasons for the discrepancy. Certain modifications to the TDCR hardware, a use of a different model, a change in vial type and a more accurate accounting for impurities corrections and ^{241}Am ingrowth caused the difference between CNET and TDCR to change from -7.7 % to -2.6 %. The primary standardization was based on relative LS rate measurements with a 30+ years aged solution, whose activity in turn had been determined by 4πα(LS)-γ(NaI) live-timed anticoincidence (LTAC) measurements of ^{241}Am to follow the in-growth from ^{241}Pu (LTAC/LS). The result was confirmed by measurements on the NPL solution by three other methods: (i) CNET; (ii) TDCR method; (iii) LTAC (LTAC/^{241}Am) measurements of ^{241}Am to follow the in-growth from ^{241}Pu directly on the NPL solution. The expanded (k = 2) uncertainties for the three confirmatory methods were: (i) 3.8 %; (ii) 2.6 %; and (iii) 3.1 %, respectively. All of the confirmatory measurements agreed with the NPL reported value within their respective measurement uncertainties. The ^{241}Pu content of the 30+ aged solution, by ^{241}Am ingrowth, has been followed by various determinations. Every determination was within 1 % of the previous result irrespective of measurement method, i.e., 4πα(LS) - γ(NaI) coincidence and anti-coincidence counting of ^{241}Am daughter ingrowth, LS following the ingrowth of ^{241}Am, LTAC, and CNET.
PUBLICATIONS	In preparation
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4340B available
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	L. Laureano-Pérez, J. LaRosa, L. Pibida, R.Collé
ACTIVITY	New Standardization of ^{228}Ra
KEYWORDS	Alpha spectrometry, gamma-ray spectrometry, radiochemistry, HPGe, liquid scintillation, low-level, Si surface barrier detector, Ra-228
RESULTS	During the last year a $Th(NO_3)_2$ solution which was last milked (^{228}Ra separated) in 1982 was used as the mother solution for the current milking of the ingrowth of ^{228}Ra from the ^{232}Th parent. This intricate separation involved several steps roughly summarized here: co-precipitation of ^{228}Ra with $Pb(NO_3)_2$; precipitation of PbS with H_2S; filtration; and N_2 bubbling to expel excess H_2S. Filtrate was evaporated and residue dissolved with HNO_3. The resulting solution was then eluted through an anion exchange column with HNO_3 to remove any Th leftover. The standardization of a new ^{228}Ra Standard Reference Material (SRM 4339B), after its separation, is currently underway at NIST. The certification of this standard will be based on HPGe γ-ray spectrometry (γ-SPECT) already completed. Confirmatory measurements are underway by 2πα spectrometry using Si surface barrier detector (α-SPECT). Liquid scintillation measurements (4παβ LS spectrometry) will be performed in order to confirm the dilution factor. .
PUBLICATIONS	
IN PROGRESS	Confirmatory measurements
INFORMATION	
SOURCE IN PREPARATION	SRM 4339B
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R.Collé, L. Laureano-Pérez, R. Fitzgerald, (U Penn collaborators: D. Jacobson, N. Khan, I. Dmochowski)
ACTIVITY	Radon Binding to a Water-Soluble Cryptophane: A Novel Use of ^{222}Rn Emanation Standards
KEYWORDS	Alpha spectrometry, beta spectrometry, liquid scintillation, low-level, radioactive gas, Rn-222
RESULTS	Investigations into the thermodynamics of radon (^{222}Rn) binding with a new and novel class of cryptophane molecules was conducted in collaboration with researchers from the University of Pennsylvania. The ^{222}Rn emanation standard, consisting of polyethylene-encapsulated ^{226}Ra solutions in an air-free, water-filled accumulation chamber, that was developed and disseminated by NIST over a decade ago was used for this work, which was a unique application involving the determination of the binding affinity of radon to a cryptophane molecular host, viz., a new cryptophane-A derivative, tris(triazole ethylamine) cryptophane (TTEC). The novel experimental design used for this work involved performing the reactions at femtomole levels, developing exacting gravimetric sampling methods and making precise ^{222}Rn assays by liquid scintillation counting. A cryptophane-radon association constant for TTEC was determined to be K_A = 49,000 ± 12,000 L mol^{-1} at 293 K, which was the first measurement of radon binding to a molecular host. This work may have one important metrological application. Ion chamber and gamma spectrometry measurements of radium solutions in ampoules are compromised by radon partitioning between the solution and airspace. The use of cryptophane as a binding agent may keep radon in solution making measurements more reliable. However, further investigation is required to assess the effect that this would have on the solution density.
PUBLICATIONS	In preparation
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R. Fitzgerald, A. M. Forney, L. L. Lucas
ACTIVITY	Anticoincidence measurements (LS-NaI) for primary standards
KEYWORDS	anti-coincidence, ^{229}Th, ^{241}Pu, ^{241}Am, ^{67}Ga, ^{18}F, ^{99}Mo, ^{177}Lu , ^{99m}Tc, ^{99}Tc
RESULTS	primary standards for ^{229}Th, ^{241}Pu, ^{241}Am, ^{67}Ga, ^{177}Lu, ^{99m}Tc, ^{99}Tc; absolute γ-ray emissions for ^{229}Th.
PUBLICATIONS	Fitzgerald, R., Collé R., Laureano-Pérez L., Pibida L., Hammond M.M., Nour S., and Zimmerman B.E., 2010. A new Primary Standardization of ^{229}Th. Applied Radiation and Isotopes, 68, 1303-1308 Laureano-Pérez, L., Collé R., Fitzgerald R., Zimmerman B.E., and Cumberland L., 2010. Investigation into the Standardization of ^{99}Tc, Applied Radiation and Isotopes, 68, 1489-1494 C. Michotte, R. Fitzgerald, K4 Final Report for Tc-99m 2010/11/18/11/2010, BIPM, Sèvres, http://www.bipm.org/en/scientific/ionizing/radionuclides/sir/
IN PROGRESS	^{99}Mo, ^{18}F, digital coincidence counting, LS system improvements.
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	Fitzgerald, R. and Schultz M.K., 2008. Liquid-scintillation-based anticoincidence counting of Co-60 and Pb-210. Applied Radiation and Isotopes 66, 937-940.
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R. Fitzgerald, L. L. Lucas, R. Young, D. Golas, J. Cessna, M. Unterweger
ACTIVITY	Ionization chambers for maintaining standards
KEYWORDS	Ionisation chamber
RESULTS	Validation of new automated ionization chamber system. Correction factors for height effect in existing system.
PUBLICATIONS	Fitzgerald, R., 2010. An Automated Ionization Chamber for Secondary Radioactivity Standards. Applied Radiation and Isotopes, 68, 1507-1509.
IN PROGRESS	Paper submitted to ICRM 2011 meeting (Unterweger et al.).
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R. Fitzgerald, R. Collé, A. M. Forney
ACTIVITY	Liquid scintillation counting inefficiency (wall effect) for alpha emitters
KEYWORDS	liquid scintillation, ^{241}Am, anti-coincidence counting
RESULTS	LS counting inefficiency measured to be $(6 \pm 5)\cdot 10^{-5}$.
PUBLICATIONS	Determination of the Liquid Scintillation Counting Inefficiency (wall effect) for alpha emitters, using the alpha-gamma anticoincidence method, R. Fitzgerald and A.M. Forney, LSC 2010 conference proceedings (submitted)
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute for Standards and Technology (NIST)
NAMES	B. E. Zimmerman, J. T. Cessna, D. E. Bergeron, M. Mille, and H. H. Chen-Mayer
ACTIVITY	Installation and calibration of a clinical PET-CT scanner for metrology applications in medical imaging
KEYWORDS	Life sciences, calibration, phantoms, medical imaging, Ge-68, F-18
RESULTS	A new Philips Gemini TF 16 PET-CT scanner has been installed at NIST as part of a program to develop calibration phantoms and calibration methods to allow image-based measurements to be made in a way so as to be traceable to the SI. Efforts to date are focused on becoming familiar with the operational details of the scanner and on calibrating the system against the NIST F-18 and Ge-68 standards.
PUBLICATIONS	
IN PROGRESS	Development of traceable phantoms to investigate partial volume correction, development of measurement/uncertainty models for image-based measurements, testing of system to assess uncertainties in PET-CT imaging process
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute for Standards and Technology (NIST)
NAMES	B. E. Zimmerman, D. E. Bergeron, J. T. Cessna and M. Mille
ACTIVITY	Construction and calibration of traceable radioactive phantom sources for PET and SPECT imaging
KEYWORDS	Life sciences, calibration, phantoms, medical imaging, Ge-68, Ba-133
RESULTS	Prototype cylindrical phantom sources containing calibrated Ge-68 activity in an epoxy resin have been constructed for use in the standard Jaszczak phantom for calibration and testing of PET scanners. The calibration methodology developed permits the Ge-68 activity in each source to be individually calibrated to about 0.7 %.
PUBLICATIONS	
IN PROGRESS	Construction, calibration, and distribution of Ba-133 phantom sources to be used in IAEA interlaboratory comparison study for SPECT image-based radioactivity quantification. Calibration methodology will be similar to that used for the Ge-68 sources cited above.
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	Zimmerman BE, Cessna JT (2010) "Development of a traceable calibration methodology for solid ^{68}Ge/^{68}Ga sources used as a calibration surrogate for ^{18}F in radionuclide activity calibrators", J. Nucl. Med., 51(3):448-53.
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