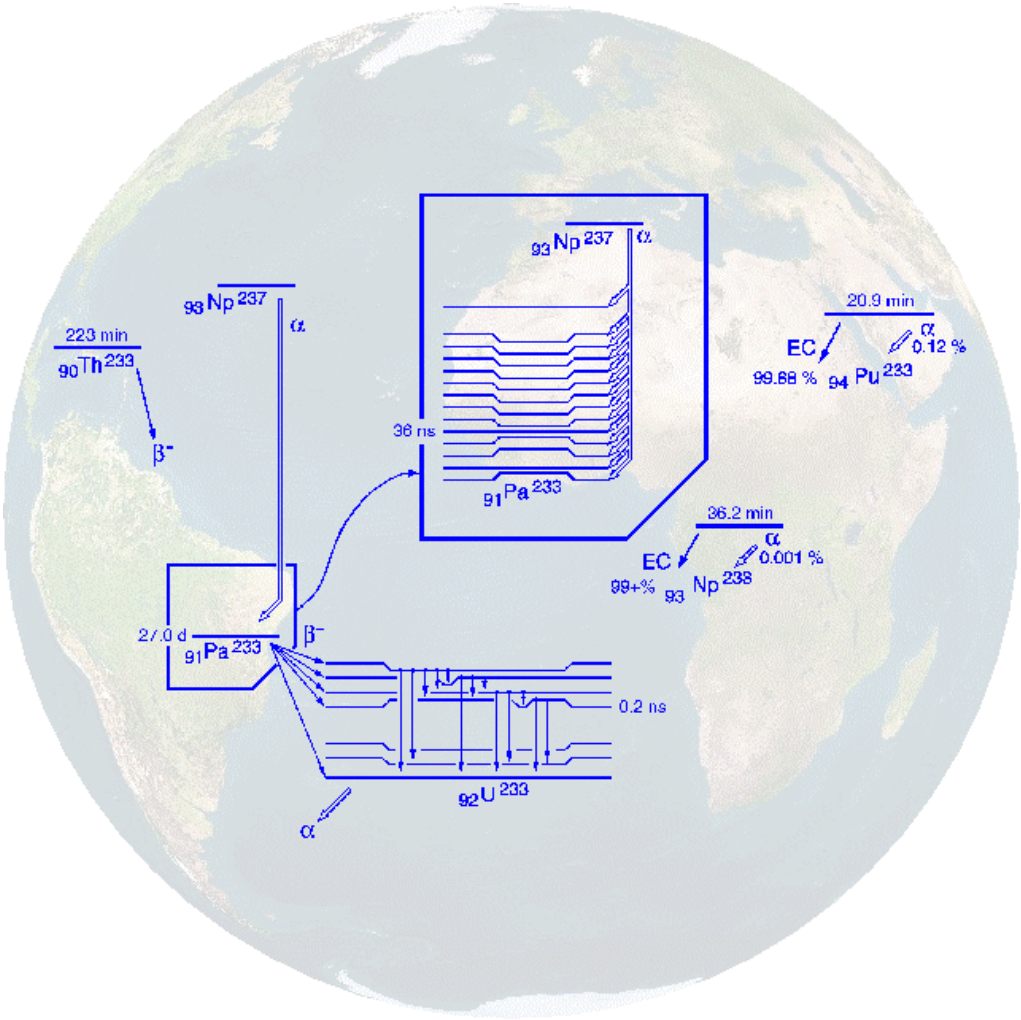
ICRM NEWSLETTER

Issue 20 - March 2006



International Committee for Radionuclide Metrology

Editor : Marie-Martine Bé

LABORATOIRE NATIONAL
HENRI BECQUEREL

International Committee for Radionuclide Metrology ICRM

ICRM NEWSLETTER
Issue 20

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March 2006

CONTENTS

CONTRIBUTIONS

- ***Japan***
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  - Nagoya University, Nagoya
- ***Poland***
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- ***Romania***
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- ***Switzerland***
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- ***The Netherlands***
  - NMi Van Swinden Laboratorium Delf
- ***United Kingdom***
  - National Physical Laboratory, NPL, (SA1/SA2), 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) **format** inside a box of **15,5 cm x 20 cm** which should be situated **4,5 cm** from the upper and **3 cm** from the left margin. Please use font **Times New Roman** size **12**. The format indicated below should be followed.
- 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 use the **"contribution.dot**" file included on the pdf version of this issue.

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.
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 published materials.
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

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 37 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:

Past-President	Mike Woods [1]
President	Yoshio Hino [2]
Vice-President	Matjaz Korun[3]
	Guy Ratel[4] (elected on 2005)
	Carlos José da Silva[5] (elected on 2005)
Secretary	Pierino De Felice[6]

We all thank B.R.S. Simpson for serving the ICRM and wish G. Ratel and C.J. da Silva a fruitful and productive period of office.

The Executive Board 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	Bruce Simpson[7]
Members	Maria Sahagia[8]
	Herbert Janβen[9]

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@irmm.jrc.be>,
Mike Unterweger[11]	<michael.unterweger@nist.gov>
(2) Life Sciences	
Brian Zimmerman[11]	<B.Zimmerman@iaea.org>

(3) Alpha-Particle Spectrometry http://www.ciemat.es/sweb/metrologia/Alpha.html
Eduardo Garcia-Torano[12] <E.garciatorano@ciemat.es>

(4) Gamma-Ray and Beta-Particle Spectrometry
Marie-Christine Lépy [13] <marie-christine.lepy@cea.fr>

(5) Liquid Scintillation Techniques http://www.nucleide.org/icrm.htm
Philippe Cassette[13] <cassette@ortolan.cea.fr>

(6) Low-Level Measurement Techniques
Dirk Arnold[9] <dirk.arnold@ptb.de>

(7) Non-Neutron Nuclear Data
Alan Nichols[14] <A.L.Nichols@iaea.org>

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 last biennial conference was held in September 2005 at Oxford University, Oxford, England.

The next 16th international conference of ICRM 2007 will be held in September or October 2007 in Cape Town, South Africa. This conference will include oral and poster presentations and business meetings of the ICRM Working Groups, in plenary format. More detailed information will be announced soon.

Conference Topics

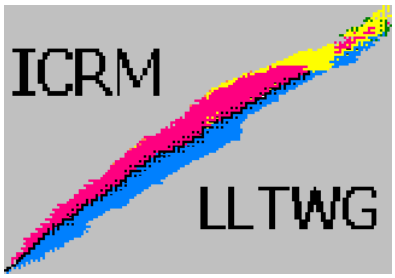
- Aspects of international metrology
- Intercomparisons
- Measurement standards and reference materials
- Radionuclide metrology techniques
- Alpha-particle and beta-particle spectrometry
- Gamma-ray spectrometry
- Liquid scintillation counting techniques
- Nuclear decay data
- Low level measurements
- Life sciences
- Source preparation

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 National Physical Laboratory and social events.

Anyone wishing to participate in ICRM's activities or to receive further information is encouraged to contact one of the officers or Working Group chairs.

References

1. Ionizing Radiation Metrology Consultants Ltd, 152 Broom Road, Teddington, Middlesex TWll 9PQ, U.K.
2. National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, Tsukuba Central 2, 1-1-1, Umezono, Tsukuba, Ibaragi 305-8568, Japan.
3. Jožef Stefan Institute, Jamova 39, Ljubljana, Slovenia.
4. Bureau International des Poids et Mesures, Pavillon de Breteuil, F-92312 Sèvres CEDEX, France.
5. Instituto de Radioproteção e Dosimetria**,** Laboratório Nacional de Metrologia das Radiações Ionizantes, Av. Salvador Allende, 22780-160 Rio de Janeiro, Brazil.
6. Ente per le Nuove tecnologie, l'Energia e l'Ambiente, C.R. Casaccia, P.O. Box 2400, I-00100 Rome, Italy.
7. CSIR National Metrology Laboratory, Radioactivity Standards Laboratory, 15 Lower Hope Road, Rosebank 7700, Cape Town, South Africa.
8. National Institute of C&D for Physics and Nuclear Engineering (IFIN), P.O. Box MG-6, RO-76900 Bucharest, Romania.
9. Physikalisch-Technische Bundesanstalt (PTB), Bundesalle 100, D-38116 Braunschweig, Germany.
10. Radionuclide Metrology Unit, Institute for Reference Materials and Measurements (IRMM), Retieseweg 111, B-2440 Geel, Belgium.
11. Ionizing Radiation Division, Physics Laboratory, National Institute of Standards and Technology (NIST), Gaithersburg, Maryland, 20899-8462, U.S.A.
12. Metrología de Radiaciones Ionizantes, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), Avenida Complutense 22, E-28040 Madrid, Spain.
13. Laboratoire National Henri Becquerel, LNE-LNHB, CEA-Saclay, F-91191 Gif sur Yvette cedex, France.
14. Nuclear Data Section, Division of Physical and Chemical Sciences, Department of Nuclear Sciences and Applications, International Atomic Energy Agency (IAEA), Wagramerstrasse 5, A-1400 Vienna, Austria.



Report on the Activities of the Low-Level Techniques Working Group

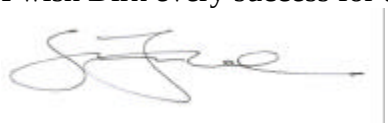
In the period since the last report (i.e. from 1st January 2005-31st December 2005) the main activities of the LLTWG have been to facilitate the Low-Level Measurements session of the ICRM 2005 conference in Oxford. There were five papers presented at the conference; these covered:

- Liquid scintillation counting uncertainties
- Low-level activation measurements
- Underground γ-ray spectrometry
- Plutonium isotope ratio measurements
- Low-level measurements review

The papers were reviewed by IRMM, NPL and PTB staff. A review of current activities was presented at the ICRM General meeting after the conference, at which Dr Dirk Arnold (PTB) was elected as the new coordinator for this working group.

I have enjoyed the eight years I have spent coordinating this working group, which would not have been possible without the support of many colleagues in the radionuclide and low-level measurement communities.

I wish Dirk every success for the future.



Simon Jerome
National Physical Laboratory, UK

I would like to thank Simon Jerome for his great work as the coordinator of the working group. He initiated two big conferences in Mol 1999 and Vienna 2003. Both conferences brought together a large number of participants and were the opportunity for the exchange of ideas and fruitful discussions. In the tradition of these conferences and the earlier two in Monaco 1991 and Seville 1995 I would like to continue and to organize the next conference on Low-Level Radioactivity Measurement Techniques in 2008.

Dirk Arnold
Physikalisch-Technische Bundesanstalt, Germany

2005 Annual Report: Non-Neutron Nuclear Data Working Group (3NDWG)

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: E. Browne, ebrowne@lbl.gov). On-going work was reviewed at a DDEP meeting at ICRM 2005, Oxford, UK, with future contributions committed from LNHB, KRI, KRISS, LBNL and IAEA. Volunteers were also solicited to review DDEP evaluations, with little evidence of success.

3. The 3NDWG meeting of 7 September 2005 urged the ICRM to recognise the soundness and consistency of the DDEP atomic and nuclear decay data contained within Monographie BIPM-5, and to recommend the adoption of these DDEP data to ICRM members and co-workers for their future decay data studies. This proposal was forwarded and adopted at the ICRM General Meeting, 9 September 2005.

4. Other noteworthy events and activities into 2006 include the following:
   (a) IAEA NSDD workshop, 20 February – 3 March 2006, Trieste, Italy (contact: A L Nichols);
   (b) DDEP training workshop, 6 – 10 March 2006, CEA Saclay, France (contact: M-M Bé (E-mail: mmbe@cea.fr));
   (c) IAEA Coordinated Research Project "Update decay data library of actinides" from October 2005 for a programme of work over approximately 4 years (contact: M A Kellett (E-mail: m.kellett@iaea.org)).

5. Further points of note:
   (a) request to re-measure the half-lives of U-235 and U-238 to high accuracy;
   (b) request to evaluate Np-237 decay data;
   (c) requests for better definition of ß-decay shape factors;
   (d) need to resolve anomalies between recent and on-going half-life measurements (particularly all relevant work of national standards laboratories (NMIs): NIST, NPL, PTB, LNHB).

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10 January 2006

Life Sciences Working Group
Coordinator's Report

The purpose of the Life Sciences Working Group (LSWG) is to identify and coordinate activities to solve issues related to the measurement of radionuclides in all aspects of the biological sciences, particularly, but not limited to, the field of nuclear medicine. Most of the Working Group's activities have, in fact, dealt with the metrology of radionuclides of interest in nuclear medicine, as well as the transfer of standards from the NMIs to the clinics and radiopharmacies.

Prior to the WG meeting held in 2005 in Oxford, the most recent meeting of the LSWG was held in 2003 in Dublin as part of the ICRM2003 Conference. At that meeting, the status of the BIPM Key Comparison of ^{18}F (which originated as an ICRM LSWG action item in 2001) using the NPL Vinten 671 chamber was presented. Since that time, the comparison has been completed and the results have been entered into the Key Comparison Database (KCDB).

Another issue that figured prominently in the 2005 LSWG meeting was the results of the ICRM LSWG Pilot Comparison of ^{90}Y, which provided data to suggest that a re-evaluation of the ^{90}Y half-life was needed. As part of the WG meeting, K. Kossert (PTB) presented preliminary results of a recent measurement of the ^{90}Y half-life performed at PTB that was consistent with the discrepancy observed in the Pilot Comparison. Action Items arising from the discussion were: 1) a re-evaluation of the ^{90}Y half-life that includes the new PTB value, and 2) organize a new BIPM Key Comparison of ^{90}Y. Both of these actions have been completed, with the comparison results published in the KCDB in 2005.

During the WG meeting in Oxford, held as part of the ICRM2005 conference, presentations were given that described results of national and radioactivity measurement programmes in the United States and Cuba. A new IAEA Cooperative Research Project, aimed at the formation of an international secondary standard laboratory for radioactivity measurement in nuclear medicine, was also described. Recent work by NPL that was aimed at the determination of calibration factors for the NPL Secondary Standard Radionuclide Calibrator for several nuclides in the Schott 10R vials was also presented.

For future activities, the following topics were discussed:

- Expansion of the planned ^{99m}Tc BIPM Key Comparison to include other short-lived nuclides, namely ^{18}F. In order to measure positrons in the BIPM "traveling standard" detector system, it will be necessary to ensure that enough space exists in the detector well for the sample ampoule and an annihilator insert. This will be coordinated with the CCRI(II) WG being organized to address the topic of comparison using the "traveling standard" detector.
- The need for collection and cataloguing of calibration and/or correction factors for measuring radionuclides in activity calibrators using different geometries.
- To address both of these issues, a meeting of the LSWG is proposed to be held in October/November 2006 at NIST.

Finally, the Coordinator informed the WG of his intention to vacate his position following the ICRM2007 meeting. Individuals interested in being considered as Coordinator starting from Fall, 2007 should inform the Chair of the Nominating Committee.

B. Zimmerman, Coordinator

ICRM

CONTRIBUTIONS

LABORATORY : METROLOGIA DE RADIOISOTOPOS (SA1/SA2)
CNEA, ARGENTINA

NAMES : P. ARENILLAS, C. BALPARDO, M. E. CAPOULAT, D. RODRIGUES

APPARATUS: 4πβ (PPC)-γ (NaI) coincidence system.
4π proportional counter.
Si-PIP and surface barrier detectors.
LSC TDCR System.

ACTIVITY: 1. Absolute activity measurements.
2. Participation in international comparisons.

RESULTS : 1. Upgrade of a LSC TDCR System.
2. Participation in the SIR for the activity measurements for Cs-134
3. Participation in the ICRM-2005 Meeting with the work "Implementation of the TDCR liquid scintillation method at CNEA-LMR, Argentina"

IN PROGRESS: 1. Improvement of a new definite solid angle alpha system.
2. Improvement of a LSC TDCR system.
3. Improvement of a HPPC-NaI(Tl) coincidence system.
4. Absolute activity measurements.
5. Participation in a comparison organised by BIPM for Fe-55.
6. Participation in the SIR for Eu-152.
7. Implementation of a 4π gamma system.

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LABORATORY: METROLOGIA DE RADIOISOTOPOS (SA1/SA2)
CNEA, ARGENTINA.

NAMES: G.L. CERUTTI, X.L. ARAYA, E.CIRELLO, L. RAMÍREZ

APPARATUS: Liquid scintillation counting system.

ACTIVITY: 1.Measurement of natural and artificial radionuclides in environmental samples.

RESULTS: 1. Activity determinations of ^{90}Sr in 235 samples of milk powder, maize, soyabean meal, wheat and cheese .
2. Activity determinations of gross alpha and gross beta in 69 water samples.
3. Activity determinations of ^{241}Am and ^{239}Pu in 235 milk powder, maize, soyabean meal, wheat and cheese samples.

IN PROGRESS: Implementation of a quality system based on Guide ISO 17025.

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CNEA, ARGENTINA.

NAMES: G.L. CERUTTI, F.A. IGLICKI, G.R. BOCCA, X.L. ARAYA, E.CIRELLO, L. RAMÍREZ

APPARATUS:
High pressure ionisation chambers.
HPGe spectrometer systems.
HPGe planar detector.
NaI(Tl) scintillation detector.
Automatic sample changers.
Multichannel analysers and personal computers.

ACTIVITY:
1. Preparation, quality control, standardisation and issue of :
   - Standard point sources and solutions of several radionuclides for gamma-ray and alpha spectrometry.
   - Large area standard sources of alpha, beta and gamma emitters.
2. Routine measurements and certifications of non radioactive contamination in exported foodstuffs.
3. Development of standard sources.

RESULTS:
1. Certifications of non radioactive contamination, by gamma emitters in about 4600 samples of exported foodstuffs.
2. Preparation and calibration of 204 radioactive sources.
3. Determination of Co-60 activity in 442 samples for surface contamination and sealed control of sources used in cobalt therapy.
4. Participation in the ICRM-2005 Meeting with the work “Accreditation experience of Radioisotope Metrology Laboratory of Argentina”
5. Argentinean Accreditation Body audit for accreditation maintenance of “Preparation and calibration of radioactive standards”

IN PROGRESS:
1. Development of simulated water standards.
2. Characterisation of a metrological ionisation chamber

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CONTACT: F. A. IGLICKI

LABORATORY: METROLOGIA DE RADIOISOTOPOS (SA1/SA2)
CNEA, ARGENTINA.

NAMES: M.I. MILA, M. CAPOULAT.

APPARATUS: Ionisation chamber dose calibrators.
GeHp and NaI(Tl) gamma-ray spectrometer systems.

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 intercomparison for activity measurements among Nuclear Medicine Centres in Argentina.

RESULTS:
1. Assessment of 25 Nuclear Medicine Centre calibrator for ^{99m}Tc, ^{131}I, ^{67}Ga , ^{153}Sm, ^{111}In, ^{32}P and ^{201}Tl.
2. Assessment of 38 commercial calibrators for ^{67}Ga, ^{99m}Tc, ^{111}In, ^{131}I, ^{153}Sm and ^{201}Tl.
3. Participation in the XX Congreso de ALASBIMN with the work "Experiencia de Acreditación del Laboratorio de Metrología de Radioisótopos de la República Argentina "
4. Argentinean Accreditation Body audit for accreditation maintenance of "Activimeters calibration"

IN PROGRESS : Organisation of a comparison for activity measurements of ^{131}I, among Argentinean Nuclear Medicine Centres.

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E-mail : mila@cae.cnea.gov.ar

CONTACT: M. I. MILA

LABORATORY	Radiation Metrology, Australian Nuclear Science & Technology Organisation (ANSTO)
NAMES	D Alexiev, L Mo, M Smith
ACTIVITY	1. Development of methodology and system for "low and full power" neutron flux determination in supporting commissioning process of the OPAL reactor at ANSTO. 2. Establishment of TDCR liquid scintillation counting system. 3. International intercomparison of Ba-133 organised by APMP.
RESULTS	1. A neutron flux measurement laboratory has been set up at the OPAL reactor facility. The laboratory contains two gamma spectrometry and one ionisation chamber system. 2. The gamma spectrometers and ionisation chamber have been calibrated for pure Au wires against the primary standard developed in this laboratory. 3. Uncertainty analysis for thermal neutron flux over the energy range 0 – 0.6 eV has been completed. 4. TDCR optical chamber has been completed. Electronics for pulse process are in place.
PUBLICATIONS	1. The influence of rejection of a fraction of the single photoelectron peak in liquid scintillation counting, L. Mo, P. Cassette, C. Baldock, Nuclear Instruments and Methods in Physics Research A, Volume 558 (March 2006), pages 490-496. 2. Calibration of the Capintec CRC-712M dose calibrator for ^{18}F, L. Mo, M, Reinhard, J.B. Davies, D. Alexiev, C. Baldock, Applied Radiation and Isotopes, Vol 64, Issue 4, April 2006, pp485-489.
IN PROGRESS	1. Development of primary standard for Al-Au alloy wires and calibration of gamma spectrometers and ionisation for Al-Au alloy wires. 2. Manufacture of PMT voltage dividers and preliminary test of TDCR system. 3. Activity measurements of Ba-133 for the APMP international intercomparison.
ADDRESS	New Illawarra Road Lucas Heights NSW 2234, Australia
CONTACT	Li Mo, lmx@ansto.gov.au

LABORATORIES	IAEA Nuclear Data Section, Vienna, Austria; Serco Assurance, Winfrith Science Centre, Dorchester, UK
NAMES	A L Nichols (IAEA) and R J Perry (Serco Assurance)
ACTIVITY	Decay-data evaluations and preparation of databases
RESULTS/ INFORMATION	Decay-data evaluations underway in 2005-07: (a) evaluations for DDEP: ^{97m}Tc, ^{109}Pd, ^{126}Sb, ^{127}Sb, ^{127}Te and ^{127m}Te; (b) ^{192}Au and ^{214}Bi (latter within ^{226}Ra decay chain); (c) evaluations for JEFF-3 fusion.
PUBLICATIONS	O Bersillon et al, "JEFF-3T: Decay Data and Fission Yield Libraries", ND2001 Int. Conf. Nucl. Data for Science and Technology, 7-12 Oct 2001, Tsukuba, Japan; also J. Nucl. Sci. Technol., Supplement 2, Vol 1 (2002) pp 478-480.
IN PROGRESS	Evaluation of decay data for DDEP.
INFORMATION	Decay data evaluations completed in 2005, and databases assembled in early 2006 for the JEFF-3 library: ^{21}F, ^{39}Cl, ^{69}Zn, ^{69m}Zn, ^{96}Nb, ^{158}Tb, ^{158m}Tb, ^{160}Tb, ^{171}Tm, ^{172}Tm, ^{179m}Hf, ^{179n}Hf, ^{188}W, ^{184}Re, ^{184m}Re, ^{191}Os, ^{191m}Os and ^{191m}Ir. Evaluations planned in future years for DDEP: ^{106}Rh, ^{132}Te, ^{132}I, ^{144}Pr and ^{201}Pb, and further evaluations for JEFF-3.
IN PREPARATION	^{234m}Pa decay data evaluation.
OTHER RELATED PUBLICATIONS	A L Nichols, Decay Data: Review of Measurements, Evaluations and Compilations, *Appl. Radiat. Isot*. **55** (2001) 23-70. A L Nichols, Nuclear Decay Data: On-going Studies to Address and Improve Radionuclide Decay Characteristics, pp. 242-251 in Proc. Int. Conf. on Nuclear Data for Science and Technology, Santa Fe, USA, 26 Sept. – 1 Oct. 2004, AIP Conf Proc. **769**, Part 1, Melville, New York, 2005. A L Nichols, Nuclear Decay Data: Observations and Reflections, to be published in *Appl. Radiat. Isot*. (2006).
ADDRESS	IAEA Nuclear Data Section, Department of Nuclear Sciences and Applications, PO Box 100, Wagramerstrasse 5, A-1400 Vienna, Austria.
CONTACT	Dr Alan Nichols

Summary of the research programme related to radionuclide metrology
for the years 2005 and 2006
at the "Institut für Isotopenforschung und Kernphysik" (IIK)
of the University of Vienna, Austria

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[also to be regarded as contribution according to the ICRM standing actions SA1 and SA2]

Presently, the activities at the IIK concentrate on the improvement and development of atomic and nuclear measuring techniques and data handling procedures for interdisciplinary applied physics work with special emphasis on the detection of long-lived radionuclides, particularly in the very-low-level range. Nuclear-decay-counting techniques have been widely replaced by mass-spectrometric techniques with high selectivity and high sensitivity. More detailed information about research at the IIK is also provided via the institute's internet home page given above.

Names: M. Auer, R. Drosg, O. Forstner , H. Friedmann, E. Friedl, R. Golser, J. Gröller, P. Hille, M. Kafesie, P. Kröpfl, J. Kühtreiber, W. Kutschera (director), St. Lehr, J. Lukas, K. Melber. L. Michlmayr, E. Pak, A. Pavlik, A. Priller, P. Steier, B. Strohmaier, S. Tagesen, H. Vonach, A. Wallner, F. Weninger, E. Wild, G. Winkler, B. Wünschek

1. The tandem-accelerator mass-spectrometry facility VERA (Vienna Environmental Research Accelerator) and its use

The VERA facility is based on a 3-MV Pelletron tandem accelerator (from National Electrostatics Corporation in Wisconsin, USA). For details on the experimental equipment see :
http://www.univie.ac.at/Kernphysik/VERA/welcome.htm .
Accelerator mass spectrometry (AMS) is a major field of research at the IIK. With AMS the radionuclides are measured by direct atom counting; selectivity is achieved employing energy-, momentum- and velocity-selecting devices (electrostatic, magnetic and time-of-flight or Wien filters) and using ion detectors for counting and final energy measurement. The interesting nuclides (with extremely small radioisotope-to-stable-isotope ratios in the 10^{-10} to 10^{-15} range) cannot be measured at natural levels through radioactive-decay counting, particularly for small samples in the milligram range, typically containing only 10^5 to 10^8 radionuclide atoms. Predominantly isotope ratios are measured relative to appropriate standards.

Typically, in the light-ion region atoms like ^{14}C (5.7×10^3 a, for radiocarbon dating), ^{10}Be ($T_{1/2}=1.5\times10^6$ a) and ^{26}Al ($T_{1/2}=7.2\times10^5$ a) (both, e.g., for applications in geology) are counted with an excellent suppression of isobaric background. Through the recent upgrades of VERA it has been possible to measure also ions from very heavy long-lived radionuclides such as ^{129}I ($T_{1/2} \approx 1.6\times10^7$ a) [$^{129}I/^{127}I$ ratios], ^{210}Pb ($T_{1/2} \approx 22$ a), ^{236}U ($T_{1/2} \approx 23\times10^6$ a) [marker for contamination by irradiated uranium, also daughter product of the decay of ^{240}Pu], ^{244}Pu ($T_{1/2} \approx 81\times10^6$ a) [for

research on e.g. interstellar medium grains], ^{242}Pu ($T_{1/2} \approx 3.8\times10^5$ a) and ^{182}Hf ($T_{1/2} \approx (9\pm2)\times10^6$ a) in natural samples.

Projects dealt with via radiocarbon measurements are, e.g.,

- "dating" of recent events using the "bomb peak"(^{14}C produced by nuclear weapons tests in the atmosphere prior to the Nuclear Test Ban Treaty in 1963), applied to problems of antiquity and forensic science
- identification of carbonaceous aerosols
- absolute chronology of early civilizations in Central Europe
- synchronization of civilizations in the East Mediterranean

Some recent publications relevant to radionuclide metrology are :

TRACING NOBLE GAS RADIONUCLIDES IN THE ENVIRONMENT,
P. Collon, W. Kutschera, Z.-T. Lu;
Annual Review of Nuclear and Particle Science, Vol. **54** (2004) 39-67

NEW HALF-LIFE MEASUREMENT OF ^{182}Hf: IMPROVED CHRONOMETER FOR THE EARLY SOLAR SYSTEM,
C. Vockenhuber, F. Oberli, M. Bichler, I. Ahmad, G. Quitté, M. Meier, A.N. Halliday, D.-C. Lee, W. Kutschera, P. Steier, R.J. Gehrke, R.G. Helmer;
Phys. Rev. Lett. **93** (2004) 172501-1 - 172501-4

ABSOLUTE INTENSITIES OF ? RAYS IN ^{182}Hf DECAY,
I. Ahmad, J.P. Greene, E.F. Moore, W. Kutschera, C. Vockenhuber;
Phys. Rev. **C 70** (2004) 047301-1 - 047301-4

^{182}Hf – FROM GEOPHYSICS TO ASTROPHYSICS,
C. Vockenhuber, R. Golser, W. Kutschera, A. Priller, P. Steier, A. Wallner, M. Bichler;
Proceedings of Nuclei in the Cosmos VIII Conference, Vancouver, Canada, 19-23 July 2004,
Nuclear Instruments and Methods **A 758** (2005) 340c – 343c

PROGRESS IN ISOTOPE ANALYSIS AT ULTRA-TRACE LEVEL BY AMS,
W. Kutschera;
International Journal of Mass Spectrometry 242 (2005) 145 - 160

OPPORTUNITIES AND LIMITS OF AMS WITH 3-MV TANDEM ACCELERATORS,
P. Steier, R. Golser, V. Liechtenstein, W. Kutschera, A. Priller, C. Vockenhuber, A. Wallner;
Nuclear Instruments and Methods **B 240** (2005) 445 - 451

DETERMINATION OF PLUTONIUM IN ENVIRONMENTAL SAMPLES BY AMS AND ALPHA SPECTROMETRY,
E. Hrnecek, P. Steier, A. Wallner;
Proceedings of the 8th International Conference on Application of Nuclear Techniques, Crete, Greece, 12-18 September, 2004; to be published in Applied Radiation and Isotopes

THE ROLE OF ISOTOPES IN ENVIRONMENTAL AND CLIMATE STUDIES
W. Kutschera
Nuclear Physics A 752 (2005) 645c-648c

2. Conventional radionuclide instrumentation and evaluation

a) *Program to evaluate and check the reliability of the half-life values of some long-lived radionuclides ("How well do we know our clocks"*) relevant to

archaeochronology, geochronology and cosmochronology [compare, e.g., F. Begemann et al., Call for an improved set of decay constants for geochronological use, Geochim. Cosmochim. Acta 65 (2001) 111-121]. In addition, the basic question of the change of half-lives due to stellar environments or other extreme environmental conditions are to be discussed.

b) *An improved value of the half-life of ^{44}Ti* was obtained from a 12-year decay measurement relative to the half-life of ^{60}Co (assumed to be 5.2714 ± 0.0005 a), *that is 59.0 ± 0.3 years*, superseding the value from 1998 (that was 59.0 ± 0.6 years; Phys. Rev. Lett. 80, No. 12 (1998) 2550);I. Ahmad, J.P. Greene, E.F. Moore, W. Kutschera, M. Paul; to be published

c) *Completion of the Austrian National Radon Project (ÖNRAP)* [H. Friedmann]
to determine the radon exposure of the population in Austria as well as to classify areas according to their potential radon risk from the ground ("radon potential") (http://www.univie.ac.at/Kernphysik/oenrap/onrap_e.htm).
A "Radon information CD" (H. Friedmann) is also available.
Correlations between the so-called radon potential and details of the geology are to be investigated.

d) *Monte-Carlo simulation* of the of the *total detection efficieny of NaI(Tl) well-type detectors*, also for nuclides with complex decay schemes, has been studied within a physics-diploma thesis, presently primarily using the PENELOPE code. It gives results that agree in most cases very well with previous results using analytical techniques, but the assignment of uncertainties to these simulations is an open problem.

3. Work and co-operation on special reports and standard concepts, training tasks

Co-operation with the *Austrian Standards Institute* (OENORM) [H. Friedmann, G. Winkler] to achieve a uniform interpretation of low-level measurements and to harmonise measurement-uncertainty statements is continued.
Students' training in the field of general experimental physics, quantum physics, atomic physics, nuclear physics, ion physics and radioactivity measurements is taken care of by the staff of the IIK.

4. Participation in international organisations

- International Committee for Radionuclide Metrology (ICRM) [G. Winkler]
- Consultative Committee for Ionising Radiation (CCRI), Section II (Measurement of Radionuclides) at the BIPM, Sèvres, France [personal member: G. Winkler]

February 2006 Gerhard Winkler

LABORATORY	European Commission - Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Isotope Measurements Unit JRC Reference Laboratory for Radionuclide Metrology
NAMES	S. Pommé, G. Sibbens, T. Altzitzoglou, R. Van Ammel, J. Keightley, A. Švec , J. Paepen, J. Camps
APPARATUS ACTIVITY	∗ radioactive source preparation (quantitative drop deposition, vacuum evaporation and electrodeposition) ∗ 4π pressurised gas proportional counter ∗ windowless 4πCsI(Tl)-sandwich spectrometer ∗ two α-particle counters at defined solid angle ∗ atmospheric $4\pi\beta-\gamma$ coincidence counter ∗ pressurised $4\pi\beta-\gamma$ coincidence counter ∗ $4\pi\gamma$ NaI well counter ∗ two secondary standard ionisation chambers ∗ two 4p liquid scintillation counters
RESULTS	∗ standardisation of ^{32}P and ^{125}I for CCRI key comparisons. ∗ A. Švec, Reference ionisation chamber for radioactivity measurement, int. report GE/IM/RN/2005/12/16.
PUBLICATIONS	∗ S. Pommé, T. Altzitzoglou, R.Van Ammel, G. Sibbens, Standardisation of ^{125}I using seven techniques for radioactivity measurement, Nucl. Instr. and Meth. in Physics Research A 544, (2005) 584-592 and Erratum, Nucl. Instr. and Meth. in Phys. Res. A 555, (2005) 459. ∗ R. Van Ammel, S. Pommé, G. Sibbens, Half-life measurement of ^{55}Fe. Appl. Radiat. Isot., in press. ∗ S. Pommé, An intuitive visualisation of intercomparison results applied to the KCDB, Appl. Radiat. Isot., in press. ∗ S. Pommé, J. Keightley, Count rate estimation of a Poisson process: unbiased fit versus central moment analysis of time interval spectra, Am. Chem. Soc. Press, in press. ∗ S. Pommé, Dead time, pile-up and statistics, Am. Chem. Soc. Press, in press. ∗ S. Pommé, Problems with the uncertainty budget of a half-life measurement, Am. Chem. Soc. Press, in press.
IN PROGRESS	∗ half-life determination of ^{55}Fe, ^{54}Mn, ^{109}Cd, ^{233}U, ^{235}U and ^{238}U.

SOURCE IN PREPARATION

* S. Pommé, R. Van Ammel, J. Paepen, A protocol for uncertainty assessment of half-lives.

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Stefaan Pommé

LABORATORY	European Commission - Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Isotope Measurements Unit JRC Reference Laboratory for Radionuclide Metrology
NAMES	G. Sibbens, S. Pommé
APPARATUS ACTIVITY	* radioactive source preparation by vacuum evaporation * two high resolution semiconductor alpha-particle spectrometers
RESULTS	* a new set of alpha-particle emission probabilities and energies in the decay of ^{235}U (EUROMET 591)
PUBLICATIONS	* S. Oberstedt et al., The ^{233}Pa fission cross-section measurement and evaluation. Proceedings of the Sixth European Commission Conference on the Management and Disposal of Radioactive Waste, Luxembourg 29-31 March 2004, EUR 21027, ISBN 92-894-7951-5. * Eduardo García-Toraño, M.Teresa Crespo, Miguel Roteta, Goedele Sibbens, Stefaan Pommé, Alejandro Martín Sánchez, M. Pilar Rubio Montero, Simon Woods, Andy Pearce, Alpha-Particle Emission Probabilities in the Decay of ^{235}U. Nucl. Instr. and Meth. in Phys. Res. A 550, (2005) 581-592.
IN PROGRESS	* EUROMET project no 749 on alpha-particle emission probabilities and energies in the decay of ^{240}Pu.
SOURCE IN PREPARATION	* S. Pommé, E. García-Toraño, G. Sibbens, ^{234}U/^{235}U activity ratios as a probe for the ^{238}U/^{235}U half-life ratio.
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CONTACT	Goedele Sibbens

LABORATORY	European Commission - Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Isotope Measurements Unit JRC Reference Laboratory for Radionuclide Metrology
NAMES	T. Altzitzoglou
APPARATUS	* HPGe detector systems (incl. low background detectors) * Low and Ultra low level liquid scintillation spectrometers * Facilities for radiochemical separations * Various instruments for thin foil production and radioactive source preparation.
RESULTS	* Spectra calculation for the interaction of the ^{54}Mn 835-keV photons in a liquid scintillator (ICRM LS WG). * Support to the ESIR WG by testing the performance of a candidate reference liquid scintillation cocktail. * Support to the NUSIMEP 5 (Interlaboratory comparisons of uranium, plutonium and caesium isotopic ratios in saline medium)
PUBLICATIONS	* S. Pommé, T. Altzitzoglou, R. Van Ammel, G. Sibbens, Standardisation of ^{125}I using seven techniques for radioactive measurement, Nucl. Meth. In Phys. Res. A544 (2005) 584-592. * U. Wätjen, Zs. Szántó, T. Altzitzoglou, G. Sibbens, J. Keightley, M. Hult, EC intercomparisons for laboratories monitoring environmental radioactivity, to be published in Appl. Radiat. Isot. * P. Cassette, G.H. Ahn, T. Altzitzoglou, I. Aubineau-Lanièce, F. Bochud, E. García-Toraño, A. Grau Carles, A. Grau Malonda, K. Kossert, K.B. Lee, J.P. Laedermann, B.R. Simpson, W.M. van Wyngaardt, B.E. Zimmerman, Comparison of calculated spectra for the interaction of photons in a liquid scintillator: example of ^{54}Mn 835 keV emission, to be published in Appl. Radiat. Isot. * M-M. Bé and all the participants to the Euromet action 721, Activity measurements and gamma emission intensities determination in the decay of ^{65}Zn, to be published in Appl. Radiat. Isot. * Zs. Szántó, M. Hult, U. Wätjen, T. Altzitzoglou, Current radioactivity content of wild edible mushrooms – a

candidate for an environmental reference material, International Asia-Pacific Symposium on Radiochemistry, APSORC 2005, Beijing, China, October 17-21, 2005.

* T. Altzitzoglou, "XAN6040 candidate reference liquid scintillation cocktail for the ESIR: Performance tests", IRMM Int. Rep. GE/R/IM/17/05/Set01.

IN PROGRESS

* Characterisation of the IAEA-152 (Milk powder) and IAEA-375 (Soil) RMs using radiochemical methods.
* Standardisation of ^{55}Fe (BIPM/CCRI(II) international comparisons).

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LABORATORY	European Commission - Joint Research Centre Institute for Reference Materials and Measurements (IRMM) Isotope Measurements Unit JRC Reference Laboratory for Radionuclide Metrology
NAMES	Mikael Hult, Gerd Marissens, Joël Gasparro, Elisabeth Wieslander, Patric Lindahl
APPARATUS ACTIVITY	Seven underground HPGe-detectors for ultra low level gamma-ray spectrometry.
RESULTS	∗ Activation products flux monitors activated by the thermonuclear plasma at JET ∗ Radionuclides as a means of check authenticity of organic farming ∗ Neutron cross section measurements ∗ Radiation protection – dosimetry using neutron activation by fast neutrons ∗ Radiopurity measurements detector development. ∗ Nuclear decay data
PUBLICATIONS	∗ Johnston PN, Hult M, Gasparro J, Vasselli R, Martinez-Canet M-J, Mc Kenzie RJ, Solomon SB and Lambrichts I. “The distribution of ^{210}Pb in Human Bone and its impact on Methods for the Retrospective Estimation of ^{222}Rn Exposure from *in vivo* Measurements” Journal of Environmental Radioactivity. J. Environ. Rad., Vol. 80 (2005) pp. 245-257. ∗ Hult M, Preusse W, Gasparro J and Köhler M “Underground Gamma-ray Spectrometry” Acta Chimica Slovenica (2006). ∗ P.N. Johnston, J. Gasparro, M. Hult and G. Bonheure, “Activation product monitors of a thermonuclear fusion plasma”, Proceedings of the 14th AINSE (Australia Institute of Nuclear Science and Engineering) conference on nuclear and complementary techniques of analysis, Wellington, New Zeeland. (2005), p. 161-164.
IN PROGRESS	∗ Measurements of ^{60}Co in steel from Hiroshima ∗ Neutron dosimetry and plasma characterisation using activation of metal discs ∗ Neutron cross section measurements by activation and deconvolution.

- Intercomparison work
- Isotopic fingerprinting of environmental processes
- Ultra low background detector developments

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CONTACT

Mikael Hult

LABORATORY	**SCK·CEN, Low Level Radioactivity Measurements (SA1/SA2)**
NAMES	C. Hurtgen, F. Verrezen.
APPARATUS	▪ ZnS alpha counters ▪ Proportional counters ▪ Liquid scintillation counters ▪ alpha spectrometers ▪ KPA (Kinetic Phophorescence Analyser)
ACTIVITY	Gross alpha and beta, ^{3}H, ^{14}C, $^{89\text{-}90}$Sr, ^{131}I, ^{210}Po, ^{226}Ra and actinides 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. Assay of ^{14}C, ^{63}Ni, ^{99}Tc, ^{129}I in low level waste
RESULTS	Extension to the QA system following ISO17025 of the method for uranium determination by kinetic phosphorescence analysis.
PRESENTATIONS	Verrezen F., "Uranium in Urine samples by pulsed laser phosphorimetry (KPA-11): Method validation." PROCORAD 2005 Meeting, 14-16 June 2005, Bruges, Belgium
IN PROGRESS	Validation of the method for α spectrometry measurement of bioassay samples
OTHER RELATED PUBLICATIONS	Hurtgen C., et.al. "IDEAS/IAEA Intercomparison exercise on Internal Dose Assessment ", Scientific Report SCK·CEN – BLG-1018. SCK·CEN, Mol, Belgium, October 2005
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
CONTACT	C. Hurtgen

LABORATORY	**SCK•CEN, Radiochemistry & Analysis (SA1/SA2)**
NAMES	M. Gysemans, L. Sannen
ACTIVITY	• Destructive radiochemical and chemical analysis of spent fuels (UO_2, MOX, U_3Si_2, UAlx, UMo,...) for determination of burn up and fuel composition after irradiation • Determination of Pu and ^{241}Am concentrations 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... • Radiochemical analysis of reactor dosimeters and reactor materials. • γ- and α-spectrometry of low to highly radioactive samples
RESULTS	• Projects for burn up determination and spent fuel characterization: TOPGUN, GERONIMO, RJH-UMo, REBUS-PWR • Second Campaign for the validation of the LLWAA Code applied for a categorization of radioactive waste streams of the Belgian nuclear power plants • Comparison of radio-analytical techniques with ICP-MS for the analyses of the long-lived radionuclides such as ^{99}Tc, ^{237}Np and ^{129}I in radioactive waste such as resins, evaporator concentrates and filters
ADDRESS	'Radiochemistry and Analyses' Section 'Nuclear Chemical Research' Department SCK•CEN Boeretang 200, B-2400 Mol, Belgium Telephone : (+32-14) 33 32 07 Telecopier : (+32-14) 32 07 55 E-mail : mgyseman@sckcen.be
CONTACT	M. Gysemans.

LABORATORY **Safeguards and Nuclear Physics Measurements (SA1/SA2)**

NAMES M. Bruggeman, P. Vermaercke, P. Willeborts,

ACTIVITY

- α- and γ–spectrometry
- Preparation of Radioactive Standards
- Whole body and organ counting
- Neutron activation analysis with relative NAA and k_0 – method
- Non-destructive assay of nuclear wastes and special nuclear material (γ–spectrometry and neutron counting)

RESULTS

- We designed a new modular phantom for Whole Body Counting (WBC). The phantom is made of nylon pieces that can be put together as to build a complete phantom comparable to the BOMAB phantom. Radioactivity is put in the phantom by means of small diameter linear sources that fit in small holes which are made in the different elements of the phantom. Moreover, the different elements can be combined to actually build many different phantoms of different size (posture). Calibrations with these phantoms are currently set-up for WBC with large NaI(Tl) detectors.
- We organised the WGA (Working Group A) meeting of ENTRAP (European Network for Testing facilities of Radioactive waste Packages) (Brussels, 27-28/09/2005)
- We implemented algorithms for transmission corrected gamma scanning of nuclear waste packages.
- We developed a new algorithm for the analysis of pulse trains in neutron multiplicity counting.
- For NAA we participated in several CCQM-intercomparisons: CCQM-P66 (Zn, Cd, Cu and Co in fertiliser), CCQM-P63 (Sn in tomatopaste), IMEP-20 and CCQM-P39 (As and Se in Tuna Fish), IMEP-19 and CCQM-P29 (As, Cd, Zn and Mn in Rice), CCQM-K43 (As and Se in Salmon), CCQM-K42/P34.1 (Cr, Cu, Fe, Mn, Zn in Al-alloy) and CCQM-P63 (Pt and Rh in Car Catalyst), always with very good z-scores
- We participated in the stability testing and characterisation of several reference materials for IRMM;
- For k0-NAA a synthetic multi element standard SMELS was characterised and is now free for distribution;
- We participated in several international projects in order to study the impact contaminants in medicines;
- We participated in the recalibration of the BR1 reactor for k0-NAA

PUBLICATIONS

Vermaercke P., "Epithermal neutron activation for elemental characterisation", International Workshop “Applications of the Ionising-Radiations to Industry, Health and Environment” IWIRad 2005, 20-21 June 2005, Bucharest, Romania.

Vermaercke P., Sneyers L., Bruggeman M., "Epithermal instrumental neutron activation for the determination of iodine in food samples." Voedselchemie in Vlaanderen V: Trends in de Levensmiddelenanalyse, 26 May 2005, Gent, Belgium.

Vermaercke P., "Characterisation of Synthetic Multi-Element Standards (SMELS) used for the validation of k0-INAA", 4th International k0-users Workshop, 11-14 september 2005, Madeira Portugal

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SA1/SA2)

LABORATORY	Laboratório Nacional de Metrologia das Radiações Ionizantes LNMRI/IRD/CNEN
NAMES	A. Iwahara, Antônio E. de Oliveira, C.J. da Silva, E.M.O. Bernardes, P.A.L. da Cruz, J. dos S. Loureiro, José U. Delgado, R. Poledna, M.A.R.R. di Prinzio
ACTIVITY	1- Participation in international comparisons ; 2- Absolute activity measurements ; 3- Traceability program with Nuclear Medicine Services
RESULTS	1- Standardization of ^{125}I, ^{203}Hg and ^{201}Tl solutions ; 2- Implantation of 4πβ(PC)-γ(Ge) and/or 4πβ(PC)-γ(NaI(Tl)) anticoincidence system with LNHB MTR2 module 3- Comparison runs of activity measurements of ^{99}Tc^{m}, ^{131}I, ^{67}Ga and ^{201}Tl with Nuclear Medicine Services
PUBLICATIONS	1- A. Iwahara, M.A.L. da Silva. A. E. C. Filho, E. M. de O. Bernardes, J. U. Delgado. Determination of disintegration rate and γ-ray emission probabilities of ^{65}Zn and ^{241}Am, Appl. Radiat. Isot., 107-113, 2005. 2- J. A. dos Santos, A. Iwahara, I. G. Nicoli, F. G. Alabarse, C. E. L. dos Santos, A. M. Xavier, E. J. Garcia, C. M. Dias, L. Tauhata, R. T. Lopes. Implementation of a national metrology network of radionuclides used in nuclear medicine, to be published in Appl. Radiat. Isot. 3- A. L. de O. Damasceno, A. Iwahara, M. A. L. da Silva, J. J. da S. Estrada. Activity characterization of ^{192}Ir brachytherapy wires, to be published in Journal of Radioanalytical and Nuclear Chemistry
IN PROGRESS	1- Standardization of ^{67}Ga and ^{55}Fe with MTR2 module using the anti-coincidence and liquid scintillation counting methods; 2- Implementation of TDCR liquid scintillation counting for absolute standardization; 3- Implementation of a coincidence system with plastic scintillator in the beta channel
SOURCE IN PREPARATION	1- Determination of disintegration rate and photon intensities of ^{201}Tl; 2- Radioactivity Laboratory of LNMRI in the Framework of MRA 3- Absolute standardization of ^{55}Fe and ^{67}Ga
ADDRESS	Instituto de Radioproteção e Dosimetria, Av. Salvador Allende, s/n, Recreio, CEP 22780-160, Rio de Janeiro, Brasil.Tel: ++55 21 3411 8179 Fax: ++55 21 2442 1605 E-maiL: iwahara@ird.gov.br
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SA1/SA2)

LABORATORY	Laboratório Nacional de Metrologia das Radiações Ionizantes LNMRI/IRD/CNEN
NAMES	Antonio E. de Oliveira , C.J. da Silva, E.M.O. Bernardes, J.U. Delgado, M.A.R.R. di Prinzio, Maria C.M. de Almeida, R. Poledna.
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 ^{65}Zn and ^{241}Am.
PUBLICATIONS	1- M. A. L. da Silva, R. Poledna, A. Iwahara, C. J. da Silva, J. U. Delgado, R. T. Lopes. Standardization and decay data determination of ^{125}I, ^{54}Mn and ^{203}Hg, to be published in Appl. Radiat.Isot. 2- Half-life of radionuclides determined by the reference source method**.** da Silva, M. A. L.; de Almeida, M. C. M.; Delgado, J. U Journal of Radioanalytical and Nuclear Chemistry (2005), 264(3), 571-576.
IN PROGRESS	1-The Metrological Activity Determination of the ^{238}U and ^{230}Th by Gamma Spectrometry to Industrial Fuel-Cycle application; 2- Precise Determination of Ge Detector Efficiency Curves for Obtaining Activities in Radioclides Gamma-Emitters
ADDRESS	Instituto de Radioproteção e Dosimetria, Av. Salvador Allende, s/n, Recreio, CEP 22780-160, Rio de Janeiro, Brazil.Tel: ++55 21 3411 8173 Fax: ++55 21 2442 1605 EmaiL :delgado@ird.gov.br
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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, Cirilo Santanna.
ACTIVITY	1- Preparation of the spiked sources of beta, alpha and multi-gamma emitters in water matrix. 2- Preparation of the samples of sediment and soils taken from Poços de Caldas region in Brazil.
RESULTS	1- Quality control program of environmental laboratories 2- Homogeneity tests of soil material from Poços de Caldas and Goiânia Regions in Brazil
PUBLICATIONS	1- Preparation of soil reference material with radionuclides from uranium and thorium natural series.A. F. Clain, M. J. C.Bragança, A M.G.F.Azeredo, L.Tauhata Proc.8th.International Conference on Nuclear Analytical Methods in the Life Sciences 2-The influence of uncertainties of measurements in laboratory performance evaluation using an intercomparison program of radionuclide assays in environmental samples, L.Tauhata, M.E.C.M.Vianna, A E.de Oliveira, A C.M. Ferreira, M.J.C.Bragança, A.F.Clain to be published in Appl. Radiat.Isot.
IN PROGRESS	Characterization of soil samples from Poços de Caldas region.
ADDRESS	Instituto de Radioproteção e Dosimetria, Av. Salvador Allende, s/n, Recreio, CEP 22780-160, Rio de Janeiro, Brazil.Tel: ++55 21 3411 8154 Fax: ++55 21 2442 1605 E-mail : tauhata@ird.gov.br
CONTACT	L. Tauhata

LABORATORY	Czech Metrology Institute Inspectorate for Ionizing Radiation Prague, Czech Republic
NAMES	J. Sochorová , M.Havelka, P. Auerbach
APPARATUS	4π(PC)ß-γ coincidence equipment 4π(PPC)X,e-γ coincidence equipment 4π NaI(Tl) detector 4π LS ß-γ coincidence equipment
RESULTS	Standardization of ^{125}I for CCRI(II) international comparison. Routine standardization of 25 radionuclides.
PUBLICATION	M.Havelka, P.Auerbach, J.Sochorová, Standardisation of ^{54}Mn and ^{65}Zn using software coincidence counting system, in press in Appl. Radiat. Isot.
IN PROGRESS	Standardization of ^{55}Fe for CCRI(II) international comparison. Development of software coincidence counting system. Development of TDCR system.

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CONTACT	P. Dryák	

LABORATORY	Czech Metrology Institute Inspectorate for Ionizing Radiation Prague, Czech Republic
NAMES	P.Dryák, P.Kovár
APPARATUS	HPGe detectors for gamma spectrometry Si and Si(Li) detectors for alpha and beta spectrometry DSPs 9660, AIM 556A, GENIE2000
RESULTS	Radionuclide impurities measurement Environmental samples measurement Standards production checking (activity measurement) Verification, type testing and calibration for alpha, beta and gamma spectrometers used in the Czech Republic Noble gases standardization Monte Carlo calculation of HPGe detector efficiency
PUBLICATION	P.Dryák, P.Kovár, Experimental and MC determination of HPGe detector efficiency in the 40 to 2,754 keV energy range for measuring point source geometry with the source-to-detector distance of 25 cm, in press in Appl. Radiat. Isot.
IN PROGRESS	Standardization of ^{41}Ar, MC efficiency calculation
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CONTACT	P.Dryák

LABORATORY	NIRH – National Institute of Radiation Hygiene
NAMES	K. R. Ennow
ACTIVITY	Comparison of activity concentration of radiopharmaceutical solutions for Danish hospitals and Danish Medicine Agency Routine check of medical activity meters and surface contamination monitors.
RESULTS	Calibration of I-123 solution (2 hospitals and DKMA) and Tc-99m solution (1 hospital) Ratel G., Michotte C.; Woods M.J., Comparisons CCRI(II)-K3.F.18 and APMP.RI(II)-K3.F-18 of activity measurements of the radionuclide ^{18}F and links to the key comparison reference value of the BIPM.RI(II)-K1.F-18 comparison, Metrologia, 2005, 42, Tech. Suppl., 06007
PUBLICATIONS	(The laboratory is also involved in Radiation Dosimetry , see: Radiation Protection Dosimetry (2004) Vol 108, pp 33-45)
IN PROGRESS	National intercomparison for F-18 (Ge/Ga-68). Implementation of the NPL calibration figures for The NPL-CRC instrument for Brachytherapy sources. Monte Carlo calculations of the response of the NPL-CRC ionization chamber to gamma and beta emitters.
INFORMATION	Not yet qualified to be a National Reference Laboratory
SOURCE IN PREPARATION	Distribution of Ge/Ga-68 solutions to users of F-18 (FDG)
OTHER RELATED PUBLICATIONS	
ADDRESS	SIS-National Institute of Radiation Hygiene Knapholm 7 DK-2730 Herlev DENMARK
CONTACT	Klaus R. Ennow Tel.: +45 44 54 34 97 Fax.: +45 44 54 34 50 E-mail: kln@sis.dk

LABORATORY	Laboratoire National Henri Becquerel, France
NAMES	M.M. Bé, V. Chisté, C. Dulieu
ACTIVITY	Evaluation of Radionuclide Decay Data
RESULTS	- Evaluation of Ag-108, Ag-108m, Sr-90, Y-90, U-234, Zn-65, Sm-153
PUBLICATIONS	Activity measurements and gamma emission intensities determination in the decay of ^{65}Zn. Rapport CEA R-6081 Articles to be published : • Detailed calculation of Auger electron emission intensities following the radioactive disintegration • Activity measurements and gamma emission intensities determination in the decay of ^{65}Zn A CD-Rom
IN PROGRESS	Evaluation of U-238, Pb-203 Half-life determination of Se-79, Lu-176 Preparation of a DDEP training session
INFORMATION	New issue of the Monographie in preparation
SOURCE IN PREPARATION	Tc-99
OTHER RELATED PUBLICATIONS	http://www.nucleide.org/Nucdata.htm
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CONTACT	Marie-Martine Bé

LABORATORY	Laboratoire National Henri Becquerel
NAMES	C. Bobin, J. Bouchard
APPARATUS ACTIVITY	$4\pi\beta-\gamma$ counting systems Anticoincidence counting based on the live-time technique
IN PROGRESS	Development of a 4π(LS)$\beta-\gamma$ anticoincidence counting system using a liquid scintillation apparatus in the β-channel; TDCR measurements are combined with the coincidence method. Application to the tracer method (^{14}C)
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CONTACT	Bobin Christophe e-mail: christophe.bobin@cea.fr

LABORATORY	Laboratoire National Henri Becquerel
NAMES	Philippe Cassette, Florent Jaubert, Isabelle Tartes
ACTIVITY	Liquid Scintillation Counting, TDCR and tracer methods
RESULTS	Standardization of ^{79}Se, ^{93}Zr, ^{153}Sm Measurement of absorption coefficient of liquid scintillators
PUBLICATIONS	F. Jaubert, I. Tartès and P. Cassette. Quality control of liquid scintillation counters. ICRM 2005, Oxford, UK, September 2005. To be published by Applied Radiation and Isotopes. P. Cassette, M. Sahagia, L. Grigorescu, M. C. Lépy, J. L. Picolo. Standardization of ^{222}Rn by LSC and comparison with alpha and gamma spectrometry. ICRM 2005, Oxford, UK, September 2005. To be published by Applied Radiation and Isotopes. P. Cassette, G.H. Ahn, T. Alzitzoglou, I. Aubineau-Lanièce, F. Bochud, E. Garcia Torano, A. Grau Carles, A. Grau Malonda, K. Kossert, K. B. Lee, J. P. Laedermann, W.M. van Wyngaardt, B. E. Zimmerman. Comparison of calculated spectra for the interaction of photons in a liquid scintillator. Example of ^{54}Mn 835 keV emission. ICRM 2005, Oxford, UK, September 2005. To be published by Applied Radiation and Isotopes. F. Maguet, I. Tartes, P. Cassette, J. Plagnard, M.C. Lépy, F. Jaubert. Measurement of photon absorption coefficients of liquid scintillators in the 5 to 12 keV energy range using a monochromatic X-ray source. LSC2005 conference, Advances on liquid scintillation spectrometry, Katowice, Poland, October 2005. To be published by Radiocarbon.
IN PROGRESS	Triple coincidence counters using new photodetectors Standardization of ^{93}Nb^{m} Development of a random light pulser for LS counters
INFORMATION	
SOURCE IN PREPARATION	
ADDRESS	Laboratoire National Henri Becquerel, LNE-LNHB F 91191 Gif sur Yvette cedex, France
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LABORATORY	Laboratoire National Henri Becquerel
NAMES	Philippe Cassette, Raphaël Plé
ACTIVITY	Standardization of radioactive gas
RESULTS	Standardization of ^{3}H, ^{85}Kr and ^{133}Xe
PUBLICATIONS	D. Stanga, I. Moreau, P. Cassette. Standardization of Tritiated Water by Two Improved Methods. ICRM 2005 conference, Oxford, UK, September 2005. To be published by Applied Radiation and Isotopes.
IN PROGRESS	Standardization of ^{127}Xe
INFORMATION	
SOURCE IN PREPARATION	
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LABORATORY	Laboratoire National Henri Becquerel
NAMES	Philippe Cassette, Pierre Billaud
ACTIVITY	Activity measurement by calorimetry
RESULTS	
PUBLICATIONS	
IN PROGRESS	Standardization of ^{125}I brachytherapy sources Standardization of ^{241}Am
INFORMATION	
SOURCE IN PREPARATION	
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LABORATORY	Laboratoire National Henri Becquerel
NAMES	Philippe Cassette
ACTIVITY	Neutron emission rate measurement (manganese bath)
RESULTS	Standardization of AmBe and ^{252}Cf sources
PUBLICATIONS	
IN PROGRESS	Comparison of Monte Carlo codes (EURADOS working group) Measurement of ^{56}Mn by Cerenkov counting
INFORMATION	
SOURCE IN PREPARATION	
ADDRESS	Laboratoire National Henri Becquerel, LNE-LNHB F 91191 Gif sur Yvette cedex, France
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LABORATORY	LNE- Laboratoire National Henri Becquerel
NAMES	J. Plagnard, C. Hamon, M.C. Lépy
ACTIVITY	Gamma-ray spectrometry
APPARATUS	Coaxial and planar HPGe Detectors
RESULTS	Efficiency calibration of HPGe detectors within 0.5% for pont sources. Characterization of digital signal processor systems
PUBLICATIONS	M.-C. Lépy, M.-N. Amiot, M.-M. Bé, P. Cassette, *"Determination of the intensity of X- and gamma-ray emissions in the decay of ^{153}Sm"*; to be published in ARI M.-C. Lépy, P. Brun, C. Collin, J. Plagnard, *"Experimental validation of coincidence summing corrections computed by the ETNA software"*, to be published in ARI
IN PROGRESS	Determination of $^{93}Nb^{m}$ emission probabilities Monte Carlo simulation of HPGe detector for different source-detector geometries Study of the total efficiency for HPGE detectors to be applied to coincidence summing corrections
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CONTACT	Marie-Christine Lépy

LABORATORY	LNE- Laboratoire National Henri Becquerel
NAMES	M.C. Lépy, J. Plagnard.
ACTIVITY	X-ray spectrometry
APPARATUS	Si(Li) and HPGe Detectors Tunable monochromatic X-ray source (1-20 keV) (SOLEX)
RESULTS	Characterization of semiconductor detectors in the 1-15 keV energy range Measurement of linear attenuation coefficients of liquid scintillators for low-energy photons
IN PROGRESS	Development of a reference detector for semiconductor detectors efficiency calibration using the SOLEX source Study of the metrology beamline that will be installed at the SOLEIL synchrotron facility Preparation of the European X-Ray Spectrometry Conference (EXRS2006) in Paris
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CONTACT	Marie-Christine Lépy

LABORATORY	LNE – Laboratoire National Henri Becquerel
NAMES	E. Leblanc, M. Loidl, M. Rodrigues
ACTIVITY	Cryogenic detectors
RESULTS	^{36}Cl beta spectrum measurement with a magnetic bolometer developed for shape factor determination of pure beta emitters. ^{210}Po and ^{238}Pu alpha spectra measurement with a resistive bolometer : energy resolution FWHM < 6 keV. Construction of a prototype bolometer for gamma spectrometry in the energy range 40 keV – 200 keV.
PUBLICATIONS	E. Leblanc, N. Coron, J. Leblanc, P. de Marcillac, J. Bouchard, J. Plagnard: *"High energy resolution alpha spectrometry using cryogenic detectors"*, Proc. of the 15th International Conference on Radionuclide Metrology and its Applications, (ICRM 2005), Oxford, accepted for publication in Applied Radiation and Isotopes (2006). M. Loidl, E. Leblanc, M. Rodrigues, B. Leprince, L. Eglin, H. Rotzinger, M. Linck, A. Burck, T. Scarbrough, A. Fleischmann, C. Enss: *"Nuclear and atomic data determination with metallic magnetic calorimeters"*,Proc. of the 11th International Workshop on Low Temperature Detectors (LTD-11), Tokyo, accepted for publication in Nucl. Instr. & Meth. A (2006).
IN PROGRESS	Detection efficiency determination of the beta bolometer by measurement of allowed transition decaying nuclide and comparison with theoretical spectrum. Integration of the prototype photon bolometer (40 keV – 200 keV) in the new dilution refrigerator (10 mK). Characterization of the detector with ^{241}Am. Construction of an X-ray bolometer with detection efficiency close to unity for photons in the energy range 1 keV – 20 keV. Uncertainties study for ^{55}Fe activity determination with a 4 pi bolometer.
SOURCE IN PREPARATION	E. Leblanc, N. Coron, J. Leblanc, P. de Marcillac, J. Bouchard, M. Loidl: *"Actinide measurements with high energy resolution alpha spectrometry using cryogenic detectors"*, Proc. of the 4th International Conference on Plutonium and Actinides, California, to be published in the Journal of Alloys and Compounds (2006).
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LABORATORY	Physikalisch-Technische Bundesanstalt
NAMES	D. Arnold, S. Neumaier
APPARATUS ACTIVITY	Two special selected low background HPGe detectors and one Si(Li), placed in the underground laboratory UDO at a depth of 490 m in the ASSE salt mine. 1.) 88% relative efficiency extended range HPGe-detector 2.) 95% relative efficiency extended range HPGe-detector 3.) Si(Li) detector with a crystal diameter of 20 mm and a thickness of 5 mm.
RESULTS	The whole UDO laboratory has been moved from a depth of 925 m to a new position at a depth of 490 m within the ASSE salt mine and is now in full operation again.
PUBLICATIONS	M. Köhler, M. Hult, D. Arnold, M. Laubenstein, J.-L. Reyss: Reference measurements of ^{60}Co in steel. Appl. Radiat. Isot. Vol. 61 No. 2-3 (2004), S 207-211. M. Hult, J. Gasparro, R. Vasselli, K. Shizuma, M. Hoshi, D. Arnold, S. Neumaier: Deep underground measurements of ^{60}Co in steel exposed to the atomic bomb in Hiroshima. Appl. Radiat. Isot. Vol. 61 No. 2-3 (2004), S 173-177. M. Laubenstein, M. Hult, J. Gasparro, D. Arnold, S. Neumaier, G. Heusser, M. Köhler, P. Povinec, J.-L. Reyss, M. Schwaiger, P. Theodorsson: Underground measurements of radioactivity. Appl. Radiat. Isot. Vol. 61 No. 2-3 (2004), S 167-172.
IN PROGRESS	Measurements of ^{60}Co in steel exposed to the atomic bomb in Hiroshima in the framework of CELLAR.
INFORMATION	A seminar about the “Low-level experiments at UDO – future use of the PTB underground laboratory” (in German) will be held May 8 -10, 2006 at PTB.
SOURCE IN PREPARATION	D. Arnold: Improved determination of plutonium content and isotopic ratios in low activity samples by alpha-particle and underground L X-ray measurement. (to be published in Appl. Radiat. Isot, proceedings of the ICRM 2005 Conference in Oxford, 05. – 09. September 2005).
OTHER RELATED PUBLICATIONS	S. Neumaier, R. Zwiener, J. Böhm (Edit.) Experimente im Untergrundlaboratorium UDO der PTB im Bergwerk ASSE II, PTB-Dos-43 (2003), ISBN 3-89701-959-0.

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CONTACT Dirk Arnold

LABORATORY	Physikalisch-Technische Bundesanstalt
NAMES	Karsten Kossert
APPARATUS	Liquid scintillation counters, ionization chambers
ACTIVITY	Activity measurements (e.g. internat. comparisons of ^{55}Fe)
	Half-life measurements of long-lived and short-lived isotopes
	Determination of nuclear decay data
RESULTS	P_γ of Cd-109, Pγ of K-40
IN PROGRESS	Activity/half-life measurements of Be-10 and K-40 (collaborations with TU Munich and Uni. Bern, respectively)
	Test of new approaches of the CIEMAT/NIST for low-Z electron-capture nuclides (e.g. Cr-51, Co-58)
SOURCE IN PREPARATION	Kossert, K., Janßen, H., Klein, R., Schneider, M.K.H.: Activity Standardization and Nuclear Decay Data of Cd-109
OTHER RELATED PUBLICATIONS	Grau Carles, A.; Kossert, K.: New advances in the determination of Rb-87 shape factor function. NPA, accepted for publication.
	Kossert, K.; Günther, E.: LSC measurements of the half-life of K-40. ARI 60 (2004) 459-464
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CONTACT	Karsten Kossert

LABORATORY	Physikalisch-Technische Bundesanstalt
NAMES	A. Röttger and A.Honig
APPARATUS ACTIVITY	Radon reference chamber of the PTB. Production and measurement of radon reference atmospheres.
RESULTS	Production of radon and radon progeny reference atmospheres according IEC 61577.
PUBLICATIONS	A. Röttger, A. Honig, G. Butterweck, Ch. Schuler, V. Schmidt, H. Buchröder, A. Rox, G. M. Kendall, J. C. H. Miles, I. Burian, N. Michielsen, F. J. Maringer and A. Vargas: Intercomparison exercise of calibration facilities for radon gas activity concentration. In: McLaughlin, Simopoulos, Steinhäusler (Eds). Radioactivity in the environment. The Natural Radiation Environment VII, 7. Ed. Elsevier, March 2005. A. Röttger, A. Honig, V. Schmidt, H. Buchröder, A. Rox, G. Butterweck, Ch. Schuler, F. J. Maringer, P. Jachs, R. Edelmaier, N. Michielsen, C. B. Howarth, J. C. H. Miles, A. Vargas, X. Ortega, I. Burian, T. Turtiainen, N. Hagberg. Comparison of calibration facilities for radon activity concentration: Euromet Project 657. In: Metrologia, 2005, 42, Tech. Suppl. 06003. http://www.bipm.org/metrologia/TechSupp.jsp.
IN PROGRESS	Measurement of aerosol size distributions from 2 nm to 1000 nm.
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CONTACT	Annette Röttger

LABORATORY	National Office of Measures (OMH), Radiation Physics Section
NAMES	K. Rózsa, L. Szucs, A. Zsinka
APPARATUS	4πβ(PC)-γ(NaI) and 4πβ(PPC)-γ(NAI) coincidence and anti-coincidence counting system. 4πβ counting system. Calibrated γ-ray spectrometer with HPGe semiconductor detector. Calibrated 4πγ ionisation chambers. Capintec CRC-15R Radioisotope Calibrator. Multi-wire proportional counter for wide area sources. Certified reference solutions and wide area reference sources.
ACTIVITY	Periodical metrological supervision of radionuclide calibrators used in Hungarian medical practice. Periodical metrological supervision of surface contamination monitors. Preparation of radioactive certified reference materials (RCRM).
RESULTS	1. Calibration factors for radionuclide calibrators and surface contamination monitors. 2. 70 pieces new, different type (point, large surface, large volume) RCRMs.
ADDRESS	National Office of Measures H-1535 BUDAPEST, P.O.Box 919. Hungary Phone: (36-1) 458-5800 Fax: (36-1) 458-5937 E-mail: A.Zsinka@omh.hu
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(SA1/SA2)

LABORATORY	Bhabha Atomic Research Centre
NAMES	U.V. Phadnis, V. Sathian, G. Shobha, Yasoda Bharti
APPARATUS	1. Manganese Sulphate Bath System. 2. Standard Thermal Neutron Assembly in Graphite 3. Precision Long Counter. 4. Multi-spheres for spectroscopy. 5. 4p polythene assembly. 6. Activation foils (Threshold detectors). 7. He-3 & BF_3 based thermal neutron fluence rate measuring systems. 8. Neutron rem counter and flux meter. 9. Standard neutron sources including D_2O moderated ^{252}Cf source. 10. Water moderator based thermal neutron jig. 11. Bonner's spheres neutron spectrometry system
ACTIVITY	1. Standardization of radioactive neutron sources. 2. Standardization of fluence rate and dose rate. 3. Calibration of neutron monitors. 4. R&D work associated with neutron standards.
RESULTS	1. Neutron sources were standardized for various users. 2. Neutron fluence rate and dose rate were standardized for users. 3. More than fifty neutron monitors were calibrated. 4. Shielding properties of different materials for neutrons were studied
IN PROGRESS	• Development of Neutron Spectrometer. • Development of a neutron pulsed neutron detector.
INFORMATION	• Fast neutron source yield and the thermal neutron fluence rate

can be taken up for international intercomparison.

PUBLICATIONS

- 'A transfer standard for neutron fluence rate measurement', V.Sathian, U.V.Phadnis, G. Shobha, V.V.Shaha and D.N.Sharma. IARPNC-2005,23-25 Nov 2005, Mumbai.
- 'Inter comparison of neutron detectors in pulsed photo neutron field', G. Haridas, V. Sathian, D. Ponraju, A.K. Nayak, M.P. Dhairyawan, K.K. Thakkur, P.K. Sarkarand D.N. Sharma. IARPNC-2005, 23-25 Nov 2005, Mumbai.
- 'Neutron measurement at BRIT/BARC medical cyclotron facility at RMC Parel', Deepa Sathian,V. Sathian, P.S Sonin and U.V. Phadnis. IARPNC-2005, 23-25 Nov 2005, Mumbai.
- 'Calibration of the criticalily accident dosimetry system', Deepa Sathian,V. Sathian, P.K. Marathe and M.P. Dhairyawan. IARPNC-2005, 23-25 Nov 2005, Mumbai.
- 'Evaluation of Beta efficincy of the activation foil for neutron fluence rate measurements', Deepa Sathian and V. Sathian, NAARI-NAC-2005, 10-11 Novembre 2005, Mumbai.

SOURCE IN PREPARATION

- 'ISO recommended Neutron source for calibration of neutron monitors', V. Sathian, U.V. Phadnis, G. Shobha, V.V. Shaha and D.N. Sharma, NSRP-16, 18-20 Jan 2006, Chennai.
- 'Simulated design of a neutron Spectrometer for radiation protection', Sharma P.S, Sunil C., Anand Raman, Nandy M., Sathian V., Sarkar P.K and Sharma D.N., NSRP-16, 18-20 Jan 2006, Chennai.
- 'Neutron fluence rate measurement at F-7 Posistion and Thermal column of Apsara reactor', Deepa Sathian, V. Sathian U.V. Phadnis & D.N. Sharma, NSRP-16, 18-20 Jan 2006, Chennai.

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V.V. Shaha

LABORATORY	Bhabha Atomic Research Centre
NAMES	Leena Joseph, Anuradha R., D.B. Kulkarni
APPARATUS ACTIVITY	1. $4\pi\ \beta$(PC) γ(NaI) coincidence system. 2. Calibrated 4π Gamma ion chamber. 3. HPGe detector assembly for gamma ray spectrometer. 4. Dose Calibrator, CRC –15 Beta (Capintec Make)
RESULTS	1. ^{22}Na standardized under SIR programme of BIPM deviated by 0.58% from the KCRV 2. ^{110m}Ag and ^{134}Cs standardized for SIR program. 3. Standardized sources for users. 4. ^{99m} Tc intercomparison of activity measurement, using radioisotope dose calibrator among five NMCs in Mumbai, India was conducted. All the five NMCs were in good agreement of ± 1% with BARC.
PUBLICATIONS	1. '^{22}Na -A Positron Emitter, Standardization By 4*pb(PC)-g* Coincidence Counting', R. Anuradha, Leena Joseph, D.B. Kulkarni, V.V. Shaha & D.N. Sharma, AMPICON-2005, Nov 11-13, 2005, Chennai, India. 2. 'Standardization of ^{125}I solution at BARC', D.B. Kulkarni, R. Anuradha, Leena Joseph, Priyanka reddy, K.K. Narayan, V.V. Shaha and D.N. Sharma, AMPICON-2005, Nov 11-13, 2005, Chennai, India.
IN PROGRESS	1. Standardization of ^{55}Fe under international intercomparison of BIPM. 2. ^{65}Zn to be standardised under SIR programme. 3. ^{133}Ba to be standardized under the APMP programme. 4. ^{131}I to be standardized under IAEA CRP programme.
SOURCE IN PREPARATION	1. 'Standardization of ^{54}Mn, an Electron Capture Radionuclide', Leena Joseph, Anuradha R, D.B. Kulkarni & V.V. Shaha.
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CONTACT	V.V. Shaha

LABORATORY	ENEA - Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti - Italy.
NAMES	M. Capogni.
APPARATUS	Liquid Scintillation counting equipment.
ACTIVITY	Development of a new primary standard of ^{64}Cu for medical isotope applications (PET scanning, SPECT imaging, etc.).
IN PROGRESS	Study of experimental aspects concerning source preparation and measurement procedures. A scientific collaboration with the EC Joint Research Centre of Ispra is in progress.
ADDRESS	ENEA Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti Centro Ricerche Casaccia P.0.Box 2400 - Roma (Italy) Phone: +39 06 3048 6628 Fax: +39 06 3048 4650 marco.capogni@casaccia.enea.it
CONTACT	M. Capogni

LABORATORY	ENEA - Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti - Italy.
NAMES	M. Capogni.
APPARATUS	Monte Carlo simulation on Linux and Windows OS.
ACTIVITY	Efficiency determination of HPGe and NaI(Tl) well-type detectors for different nuclides.
IN PROGRESS	Implementation and comparison of different Monte Carlo Codes (GEANT, EGS, Penelope) to compute the counting efficiency of HPGe and NaI(Tl) well-type detectors for different nuclides, including Rn-222 and its product decay.
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CONTACT	M. Capogni

LABORATORY	National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology (NMIJ/AIST)
NAMES	Yoshio HINO, Akira YUNOKI and Yasushi SATO
APPARATUS	$4\pi\beta$(pc)-γ(NaI) and $4\pi\beta$(ppc)-γ(Ge) coincidence systems, Calibrated $4\pi\gamma$ ionisation chamber, HP-Ge and Si(Li) detectors, Liquid scintillation system, Imaging analyser system, PIPS for α counting and 2π multi wire chamber.
RESULTS	1. Participate the CCRI-II Key-comparisons of Fe-55 2. APMP comparison (APMP.RI(II)-K2.Ba-133) for the activity measurements of Ba-133 has been carried out. In total, 10 laboratories from 2 RMOs have taken part in this comparison. 3. Bilateral comparisons of I-133 measurement between KRISS (Korea), and also OAP (Thailand) and INST (Vietnam).
PUBLICATIONS	Yasushi Sato, Yoshio Hino, Takao Yamada " Response calculation for standard ionization chambers in APMP using EGS4 Monte Carlo Code" ICRM'2005, to be published in the Applied Rad. and Isotopes. T. Yamada, Y. Nakamura, Y. Kawada, Y. Sato and Y. Hino " Standardization of ^{152}Eu, ^{154}Eu by $4\pi\beta$-$4\pi\gamma$ coincidence method and $4\pi(\beta+\gamma)$ integral counting" ICRM'2005, to be published in the Applied Rad. and Isotopes.
IN PROGRESS	1. Trial applications of IC tags for control small radioactive sources and also for dissemination of traceability to practical radiation and radioactivity measuring equipments. 2. Continue the “portability of the calibration factors of ionisation chambers” with several ampoule sources from NMIJ.
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CONTACT	Yoshio HINO

(SA1/SA2)

LABORATORY	Nagoya University
NAMES	H. Miyahara, Y. Ogata, K. Morita
APPARATUS	1. 4πβ(ppc)-γ(HPGe) and 4πβ(pc)-γ(HPGe) coincidence apparatus using a live-timed two-dimensional data-acquisition system 2. Gamma-ray spectrometer system 3. Liquid scintillation counting system
RESULTS	The emission probability for the 1575.6 keV γ-ray of ^{142}Pr was measured to be 0.0378(8).
PUBLICATIONS	1. Emission Probability Measurement of γ-ray of ^{105}Rh, K. Morita, H. Miyahara, Y. Ogata and K. Katoh, Nucl. Instr. and Meth. A540 (2005) 324. 2. Tritium Separation by Electrolysis Using Solid Polymer Electrolyte, Y. Ogata, Y. Sakuma, N. Ohtani and M. Kotaka, Fusion Science and Technology, 48 (2005) 136. 3. Development of a Low-level Tritium Air Monitor, Y. Sakuma, Y. Ogata et al., Fusion Science and Technology, 48 (2005) 397. 4. Tritium Measurement with a Proportional Counter, Y. Ogata, T. Aoyama, H. Miyahara et al., Proceedings of the 19th Workshop on Radiation Detectors and Their Uses, p. 177, Nov. (2005)
IN PROGRESS	Measurement of the Induced Radionuclides in Production of Radiopharmaceuticals for Positron Emission Tomography (PET).
ADDRESS	Department of Radiological Technology, School of Health Sciences, Nagoya University, 1-1-20 Daikominami, Higashi-ku, Nagoya, 461-8673 JAPAN Telephone 81-52-719-1147 Facsimile 81-52-719-1506 E-mail ogata@met.nagoya-u.ac.jp
CONTACT	Yoshimune Ogata

LABORATORY	Laboratory of Radioactive Standards, RC POLATOM
NAMES	Krzysztof MALETKA
ACTIVITY	Participation in the 3rd Young Researchers Workshop on Standardization of Radionuclides, VERMI, Varna, Bulgaria. Measurements of radionuclidic purity in radioactive materials and of dose rate from ophtalmic applicators. Activity determination of ^{125}I seeds.
RESULTS	We elaborated the method of calibration of ionisation chamber for activity determination of ^{125}I medical seeds.
IN PROGRESS	Application for the laboratory accreditation by Polish Center for Accreditation.
PUBLICATIONS	R. Broda, A. Chylinski, T. Radoszewski, K. Maletka, T. Terlikowska-Drozdziel. The national standard of the radionuclides activity unit in Poland. Proc. Internat. Conference "Applications of high precision atomic & nuclear methods", Ed. Acad. Romane, Rumunia, pp. 63-68, 2005. R. Broda, K. Maletka, A. Muklanowicz, A. Listkowska. The metrological laboratory in RC POLATOM. (in Polish; will be published in conference proceedings)
ADDRESS	Radioisotope Centre POLATOM 05-400 Otwock-Swierk, Poland E-mail: k.maletka@polatom.pl Tel.: (+48 22) 718 07 21 Fax: (+48 22) 718 03 50
CONTACT	Krzysztof Maletka

LABORATORY	Laboratory of Radioactive Standards, RC POLATOM
NAMES	Ryszard BRODA
ACTIVITY	18^{th} meeting of CCRI(II) in Sevres, 15^{th} ICRM Conference in Oxford, LSC 2005 Conference in Katowice. Participation in the ^{32}P and ^{55}Fe intercomparisons. Scientific visit in LNHB, Saclay, France.
RESULTS	The systematic uncertainty ± 0,3 % of the TDCR method was obtained as a result of the inter-laboratory comparison (LNHB, RC-POLATOM, IFIN-HH, CSIR-NML) of activity measurements of a ^{63}Ni solution.
PUBLICATIONS	R. Broda, A. Chylinski, T. Radoszewski, K. Maletka, T. Terlikowska-Drozdziel. The national standard of the radionuclides activity unit in Poland. Proc. Internat. Conference "Applications of high precision atomic & nuclear methods", Ed. Acad. Romane, Romania, pp. 63-68, 2005. A.C. Razdolescu, R. Broda, P. Cassette, B.R.S. Simpson, W.M. van Wyngaardt. The IFIN-HH triple coincidence liquid scintillation counter. (accepted for publication in *Appl. Radiat. Isot.*) R. Broda, K. Maletka, A. Muklanowicz, A. Listkowska. The metrological laboratory in RC POLATOM. (in Polish; will be published in conference proceedings)
IN PROGRESS	Application for the laboratory accreditation by Polish Center for Accreditation.
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CONTACT	Ryszard Broda

LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara"Horia Hulubei" IFIN-HH Radionuclide Metrology Laboratory
NAMES	M.Sahagia, E.L.Grigorescu, A.C.Razdolescu, C.Ivan
APPARATUS ACTIVITY	4πPC-γ Coincidence; X_K,gamma – X_K,gamma Coincidence
RESULTS	Measurement of: ^{99m}Tc ; ^{131}I, ^{133}Ba(BIPM,RI(II)- K1 Comparison) ^{125}I (X_K,gamma – X_K,gamma Coincidence method); QS implementation, by issue of: Technical Procedures; Quality Manual of Laboratory
PUBLICATIONS	A.C.Razdolescu, M.Sahagia, E.L.Grigorescu, "Comparative measurements of Ni-63, Cs-137, Am-241", Rom. J. Phys. 50,9-10 (2005)957-962 M.Sahagia, A.C.Razdolescu, E.L.Grigorescu, A.Luca, C.Ivan "Results Obtained by the Radionuclide Metrology Laboratory of IFIN-HH in International Comparisons, during the Period 2002-2004" Rom.J.Phys.51,1-2(2006)19-23
IN PROGRESS	Implementation of the QS, by experiments and audits Standardization of:^{55}Fe (CCRI(II)-K2 comparison); ^{131}I (IAEA-CRP. E 2.10.05, Contract.12921/ROM comparison)
INFORMATION	
SOURCE IN PREPARATION	M. Sahagia*, A. C. Razdolescu, E.L.Grigorescu, A.Luca, C.Ivan, Valeria Lungu, The Standardization of ^{177}Lu and its use in Nuclear Medicine, EC-JRC-IRMM, NEMEA-2 Conf. 20-23 October 2004, Romania, accepted for Proceedings M.Sahagia, "Standardization of ^{99m}Tc", ICRM 2005 Conference, Oxford, UK, 4-9.09.2005
OTHER RELATED PUBLICATIONS	C.Ivan, M.Sahagia, A.Luca, E.L.Grigorescu"The experience of the Radioisotope Department of IFIN-HH in production, testing, delivery, transport and evidence of radioactive sources" IAEA-Conf. Bordeaux< France, 2005, Proc. IAEA-CN-134, 2005,pp.164-168
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CONTACT	Dr. Maria Sahagia

LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara ”Horia Hulubei” IFIN-HH Radionuclide Metrology Laboratory
NAMES	Aurelian Luca
ACTIVITY	Evaluation of nuclear decay data.
RESULTS	-Participation at the IAEA Workshop “Nuclear structure and decay data: theory and evaluation”, ICTP-Trieste, Italy, 4-15 April 2005. -Participation at the new IAEA CRP “Updated decay data library for actinides”.
PUBLICATIONS	-
IN PROGRESS	-Evaluation of nuclear decay data for ^{188}W, in co-operation with Dr. Marie-Martine Be, from Laboratoire National Henri Becquerel (LNHB), CEA-Saclay, France; -Participation at the DDEP-TS, organized at LNHB/CEA, Saclay, 6-10 March, 2006.
INFORMATION	
SOURCE IN PREPARATION	- A paper about the evaluation of ^{188}W nuclear decay data will be proposed for publishing. - The evaluation of ^{236}U nuclear decay data.
OTHER RELATED PUBLICATIONS	-
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CONTACT	Dr. Aurelian Luca

LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara ”Horia Hulubei” IFIN-HH Radionuclide Metrology Laboratory
NAMES	Enric Leon Grigorescu, Aurelian Luca and Constantin Ivan
ACTIVITY	Gamma-ray spectrometry
RESULTS	Activity measurements for various types of samples (environmental, radioactive waste), radionuclidic purity check (radiopharmaceuticals), tightness and contamination control for industrial radioactive sources.
PUBLICATIONS	A. Luca, J. Morel, M. Etcheverry, “Determination of the main X and Gamma-rays emission probabilities of ^{237}Np/^{233}Pa and ^{65}Zn”, Proceedings of the International Conference on Applications of High Precision Atomic & Nuclear Methods, Romanian Academy Ed., 2005, p. 97-100.
IN PROGRESS	Measurements needed for decommissioning the IFIN-HH nuclear reactor; application of the ETNA software (efficiency transfer and coincidence summing corrections) for different types of samples
INFORMATION	
SOURCE IN PREPARATION	E. Neacsu, A. Luca, V. Stefan and A. Zorliu, “Romanian experience on wet storage spent nuclear fuel at VVR-S research reactor of IFIN “Horia Hulubei”, EC-JRC-IRMM, Proceedings of NEMEA-2 Conf., October 2004, Romania.
OTHER RELATED PUBLICATIONS	-
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LABORATORY	Institutul National de C&D pentru Fizica si Inginerie Nucleara"Horia Hulubei" IFIN-HH Radionuclide Metrology Laboratory
NAMES	A.C.Razdolescu, E.L.Grigorescu, Ph.Cassette, C.Ivan, M.Sahagia
APPARATUS ACTIVITY	LSC-TDCR
RESULTS	Measurement of ^{63}Ni Implementation of QS: Issue Technical Procedure, Quality Manual
PUBLICATIONS	E.L.Grigorescu, A.C.Razdolescu, M.Sahagia, P.Cassette, "Calibration of tritium monitors using saturated vapors of tritiated water" , Fusion Science and Technology,48,1(2005)382-385 A.C.Razdolescu, M.Sahagia, E.L.Grigorescu, "Comparative measurements of Ni-63, Cs-137, Am-241", Rom.J.P 50,9-10 (2005)957-962
IN PROGRESS	Measurement of ^{55}Fe (CCRI(II)-K2 Comparison). Implementation of the QS , Experiments, Audits
INFORMATION	
SOURCE IN PREPARATION	A.C.Razdolescu, R.Broda, P.Cassette, B.R.S. Simpson W.M.Wyngaardt, « The IFIN-HH triple coincidence liquid scintillation counter » , ICRM 2005 Conf.Oxford, UK, 4-9.09.2005 . P.Cassette, M.Sahagia, E.L.Grigorescu, M.C.Lepy, J.L.Picolo « Standardization of ^{222}Rn by LSC and comparison with alpha and gamma spectrometry », ICRM 2005 Conf.Oxford, UK, 4-9.09.2005
OTHER RELATED PUBLICATIONS	M.Sahagia, A.C.Razdolescu, E.L.Grigorescu, A.Luca, C.Ivan "Results Obtained by the Radionuclide Metrology Laboratory of IFIN-HH in International Comparisons during the Period 2002-2004', Rom.J.Phys. 51,1-2(2006)19-23
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CONTACT	Anamaria Cristina Razdolescu

LABORATORY	Slovak Institute of Metrology
NAMES	Jozef Dobrovodský, Lucia Pernická, Anton Švec
ACTIVITY	Calibrated 4πγ ionization chambers, HPGe spectrometer, large area plastic scintillator α and β measuring system, 4πγ ionization chamber and gammaspectrometric detector calibrations
RESULTS	Participation in ^{152}Eu, ^{65}Zn, ^{241}Am, ^{192}Ir, ^{54}Mn and ^{125}I BIPM CCRI(II) comparisons, Euromet E634 and Coomet 236/BY/01 intercomparisons
PUBLICATIONS	Švec A., Janßen H., Pernická L., Klein R., A modified method for the characterisation and activity determination of large area sources. ICRM 2005 conference, Oxford, England.
IN PROGRESS	New measuring system for large area sources. Methods for installed radioactivity monitors calibration and testing.
INFORMATION	www.smu.gov.sk
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	Slovak Institute of Metrology, Center for Ionizing Radiation, Karloveská 63, 842 55 Bratislava
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CONTACT	

(SA1/SA2)

LABORATORY CSIR National Metrology Laboratory

NAMES Bruce Simpson, Freda van Wyngaardt

ACTIVITY

Activities undertaken in 2005

- Participated in the international key comparison of activity measurements of ^{32}P organised by the BIPM.
- Participated in an international comparison of calculated spectra of 835 keV photons in a liquid scintillator.
- Participated in a multi-laboratory comparison of ^{63}Ni activity measurements by the TDCR efficiency calculation technique.
- Attended the CCRI Section II meeting as well as the CCRI Executive meeting, held at the BIPM in May.
- Participated in the ICRM 2005 conference held at Oxford, UK. Presented two papers (oral and a poster).
- FvW spent 3 months undertaking a research project (on the preparation/stability of a liquid scintillation cocktail for possible use in the extended SIR) at the LNHB, France, from May to July.
- Attended the Extended SIR Working Group meeting held at the BIPM in November.
- Certified two ^{137}Cs encapsulated solid sources and measured the activity of ^{131}I, ^{90}Y, ^{99}Mo and ^{33}P solutions for a reactor-based isotope production facility. Calibrated two Ionization Chambers used for ^{123}I for an accelerator-based isotope production facility.

Programme for 2006

- Participate in the BIPM international key comparison of activity measurements of ^{55}Fe.
- Participate in the APMP regional key comparison of activity measurements of ^{133}Ba.
- Continue the study on the preparation/stability of a liquid scintillation cocktail for possible use in the extended SIR.
- Complete a paper that has been accepted for oral presentation at the CSIR Innovation and Research conference being held in Pretoria during February.
- Publish research results of activity measurements.
- Organise the arrangements for the ICRM 2007 conference.
- Host the ICRM Executive Board meeting in Cape Town during May.
- Continue work on the design and assembly of a symmetrical three phototube LS detection system for activity measurement of non-γ-emitting radionuclides.
- Continue with the commissioning of a new HPGe detector and Digital Spectrum Analyzer.

- Provide radioactivity measurements, standards, sources and calibration services to the user community.

PUBLICATIONS

L. Mo, B. Avci, D. James, B. Simpson, W.M. van Wyngaardt, J.T. Cessna and C. Baldock, *Development of activity standard for ^{90}Y microspheres*. Appl. Radiat. Isot. 63 (2005) 193.

Winifred M. van Wyngaardt, Bruce R.S. Simpson, *Preparation and use of standards for a comparison exercise among users of ^{131}I capsules in South Africa*. Physica Medica Vol. XXI, N. 3 (2005) 101.

IN PROGRESS

W.M. Van Wyngaardt and B.R.S. Simpson, *Absolute activity measurement of the electron-capture based radionuclides ^{139}Ce, ^{125}I, ^{192}Ir and ^{65}Zn by liquid scintillation coincidence counting*. ICRM 2005 proceedings (to be published).

B.R.S. Simpson and W.M. Van Wyngaardt, *Activity measurements of the high-energy pure beta-emitters ^{89}Sr and ^{90}Y by the TDCR efficiency calculation technique*. ICRM 2005 proceedings (to be published).

B.R.S. Simpson and W.M. Van Wyngaardt, *Activity Measurement of Phosphorus-32 in the Presence of Pure Beta-emitting Impurities*. To be published in the CSIR I&R conference proceedings, a special issue of the South African Journal of Science.

INFORMATION

The ICRM 2007 conference will be hosted by the CSIR NML in 2007. The venue will be Cape Town.

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CONTACT

B.R.S. Simpson

LABORATORY	IRA-METAS
NAMES	François Bochud, Claude Bailat, Youcef Nedjadi, Philippe Spring
ACTIVITY	Metrology of ionizing radiation
RESULTS	- Participation to the international key comparison measuring the activity of a 54Mn solution under the auspices of the “Comité Consultatif des Rayonnements Ionisants” (CCRI(II)), the “Bureau International des Poids et Mesures” (BIPM) in Sèvres. The comparison confirms IRA-METAS' activity measurement capability using the coincidence technique. - Participation to the P32 international activity measurment comparison.
PUBLICATIONS	- Wastiel Claude, Valley Jean-François, Bischof Delaloye Angelika, Leresche Michel, Linder Reto, Sassowski Manfred, Bochud François O., ; 'Intercomparison of activity measurements for beta-emitters in nuclear medicine'; Journal of Nuclear Medicine Technology 33; pp. 238-242 (2005). - Laedermann Jean-Pascal, Valley Jean-François, Bochud François O.; 'Measurement of radioactive samples: application of the Bayesian statistical decision theory'; Metrologia 42; pp. 442-448 (2005).
IN PROGRESS	- Contribution of Ho-166m activity measurement to the SIR - Comparison of commercial activimeters measuring F-18 - Improvement of source preparation procedure - Development of new measurements methods, TDCR and 4 pi beta – 4 pi gamma. - Improvement of Rn-222 primary measurement system.
INFORMATION	
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	Institut universitaire de radiophysique appliquée Grand-Pré 1 1050 Lausanne Switzerland
CONTACT	claude.bailat@chuv.ch

(SA1/SA2)

NMi Van Swinden Laboratorium

LABORATORY

NAMES Wim de Vries

APPARATUS
1. Ionisation chamber, with Keithley 617-based charge measuring system, built into a lead castle
2. HPGe-detector with standard electronics, built into a lead castle
3. Windowless large area flow proportional counter, built into a lead castle
4. LSC measurement system for primary standard
5. NaI(Tl)-detectors for the primary standard

IN PROGRESS
1. Beta-measurement system for a coincidence standard
2. Combine the LSC measurement system with the NaI(Tl)-detectors

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CONTACT Wim de Vries

LABORATORY	National Physical Laboratory
NAMES	Lena Johansson, Andy Stroak
APPARATUS	Primary standardisation
ACTIVITY	$4\pi\beta$(APPC)-γ coincidence counting
RESULTS	Results from Tc-99m SIR submission published (see reference below).
	Standardisation of Mn-54 for the Fe-55 BIPM key-comparison (efficiency tracing). The Mn-54 will also be submitted to the SIR.
	Standardisation of U-232 (after chemically separated from its daughters).
IN PROGRESS	Standardisation of Tl-201 for submission to the SIR.
PUBLICATIONS	G Ratel, C Michotte, L Johansson, Update of the BIPM.RI(II)-K1.Tc-99m comparison of activity measurements for the radionuclide $^{99}Tc^{m}$ to include the NPL, *Metrologia* 42 (2005).
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CONTACT	Lena Johansson

LABORATORY	National Physical Laboratory
NAMES	Lena Johansson, Andy Stroak
APPARATUS	NPL Radionuclide calibrator, γ-ray spectrometry
ACTIVITY	Kr-81m (13 seconds half life).
RESULTS	A calibration factor was produced for Kr-81m gas measured in a NPL produced geometry in the NPL radionuclide calibrator (ionisation chamber).
PUBLICATION	Lena Johansson and Andrew Stroak, Kr-81m calibration factor for the NPL ionisation chamber, *accepted for publication in Appl. Radiat. Instrum. 2006*.
IN PROGRESS	
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CONTACT	Lena Johansson

LABORATORY	NPL
NAMES	John Sephton, Andy Pearce, Nigel Watkins, Stephen Giblin, Keith Lines
ACTIVITY	New electrometer for ion chamber measurements
RESULTS	
PUBLICATIONS	
IN PROGRESS	
INFORMATION	Development of electrometer system based on Keithley electrometer, National Instruments GPIB card and LABVIEW software. System uses capacitive feedback at low currents and resistive feedback at high currents.
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
ADDRESS	NPL, Hampton Rd, Teddington, Middlesex, TW11 0LW, UK TEL: +44 (0)20 8943 6526 FAX: +44 (0)20 8943 6680 john.sephton@npl.co.uk
CONTACT	John Sephton

LABORATORY	NPL
NAMES	John Sephton, Lena Johansson
ACTIVITY	Development of low noise amplifier for beta counting
RESULTS	
PUBLICATIONS	Hope to publish paper describing amplifier and activity measurements.
IN PROGRESS	
INFORMATION	Aim is to replace existing amplifier with modern design using low noise FET input stage and integrated circuits. Amplifier should be particularly suitable for counting low energy beta emissions.
SOURCE IN PREPARATION	
OTHER RELATED PUBLICATIONS	
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CONTACT	John Sephton

LABORATORY	National Physical Laboratory
NAMES	Julian Dean, Hilary Phillips and Maria Marouli
APPARATUS	Two sets of Internal Gas Proportional Counters (IGPCs) – constructed from brass and stainless steel (the latter is used primarily for ^{3}H). Gas monitor calibration manifold. Tritiated water-to-gas conversion rig. NaI(Tl) well crystal. Liquid scintillation counters.
RESULTS	The capability for standardising radioactive gases has been maintained and demonstrated by measurements of ^{85}Kr. A paper was presented at a CTBT Workshop in Stockholm (see below) outlining NPL's radioxenon measurement capabilities. The gas monitor (^{3}H and ^{85}Kr) calibration facilities have been maintained and applied to both flow-through and diffusion-type tritium-in-air monitor calibrations. A review of positron metrology and gas standardisation has been drafted, and Monte Carlo modelling of the brass IGPCs investigated, as a precursor to standardising positron-emitters in gas. Users in the UK have been canvassed for their monitor calibration requirements in this field. An abstract has been submitted and accepted for the MARC conference in 2006.
IN PROGRESS	Upgrade of stainless steel IGPCs and ancillary gas-handling manifold to improve voltage plateaux and facilitate operation. Monte Carlo modelling of brass IGPCs for counting positron-emitters and preparations for counting ^{11}C to validate model.
IN PREPARATION	J C J Dean, A K Pearce and H C Phillips, *Outline proposals for the provision of standards for Xenon radionuclides by the National Physical Laboratory*, Proceedings of the CTBT Workshop on Radioxenon Monitoring and IMS Network Related Topics, Stockholm, 28 November – 2 December 2005 (submitted for publication on CD).
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