AIR²
Access to Infrastructures for Radiation protection Research

Issue 21
October 2017

Editorial

The European Radiological Protection Research (ERPR) week is being held next week (10-12 Oct) near Paris. For the first time ever, there will be no session dedicated to infrastructures. From the very first MELODI workshop in Stuttgart (2009) to the Radiation Protection Week in Oxford (2016), there has always been an infrastructure session. Will every speaker remember to mention the infrastructures they used to perform their work? Let's hope so. Access to high quality infrastructures is a prerequisite for excellent research, and the European Commission has been supporting access to effective research infrastructures for researchers all over Europe for more than a decade. The best solution is not always at the end of your bench! Increasing the visibility of infrastructures will always be our credo, so don't hesitate to download (and read) the AIR² bulletins to compensate for the absence of a session devoted to infrastructures in this ERPW.

Dr Laure Sabatier, CEA

The floor to...

In 2010, the European Commission (EC) published a definition of biobanks in a scientific and technical report by the Joint Research Centre, entitled "Biobanks in Europe: prospects for Harmonization and Networking" (Biobanks in Europe: Prospects for Harmonisation and Networking). This report describes biobanks as organised collections consisting of biological samples and associated data of great significance for research and personalised medicine. Two years later, the EC published a report by an Expert Group on Dealing with Ethical and Regulatory Challenges of International Biobank Research, entitled "Biobanks for Europe, A challenge for governance", which provides a more detailed definition along the following lines (Biobanks for Europe: A Challenge for Governance. Report of the Expert Group on Dealing with Ethical and Regulatory Challenges of International Biobank Research):

- Biobanks typically collect and store biological materials that are annotated with both medical and epidemiological data.
- The collection of biological materials and data is a dynamic process, usually undertaken on a continuous or long-term basis, and associated with current and/or future research projects at the time of sample collection.
- Biobanks require established governance structures and procedures for collecting biological materials including donor consent and provisions to apply anonymisation and data coding under specific conditions which will ensure donor privacy and protect donors' rights and stakeholder interests while allowing clinically relevant information to be fed back to the donor.

The word "retrospective" can be used to imply a look back at work carried out in the past. In this context, subtask 6.2.3 "Retrospective studies" focuses on suitable biological, physical and chemical approaches to study the biobanked materials (blood, saliva, hair, urine etc) and encourages scientists to explore these materials where applicable in combination with current research in the CONCERT calls.

Retrospective studies:

Encourage biological, physical and chemical approaches and study that could be performed on biobanked and archived materials.

Archived material presents several advantages such as the large number of lesser known and underexploited samples and the time-place independence between sampling and analysis. However, there are several challenges to overcome, such as the adverse effects of storage conditions or transportation, the degradation over time of biological samples and the high cost of maintenance that comes with large-scale sampling and storage. Thus, our aim is to organise and structure this already archived material in order to successfully guide researchers and to promote reusability of the material.

Dr Rafi Benotmane

SCK•CEN

CONCERT WP 6.2.3

Photo: Rafi Benotmane

CONCERT CORNER

Future events:

10-12 October 2017

Joint ICRP-ERPW 2017

Paris, France

and at the same place

October 9th 2017:

ExB/ESAB: 13h00 - 14h30

MB: 15h00 - 17h00

WP 6 News:

Next WP6 meeting:

October 10th, Paris, France

During the ICRP-ERPW

Deadline Call for Travel Grants:

December 31st 2017

AIR²D²:

- Please complete the online form(s) to register your infrastructure(s) in the database.
- A new option to feature your infrastructure is now available: add document.

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November 2017

EUROPEAN JOINT PROGRAMME FOR THE INTEGRATION OF RADIATION PROTECTION RESEARCH CONCERT

HORIZON 2020

This project has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 662287

CALibration LABoratory(CALLAB)

CERN Radiation Protection Calibration Facility

The CERN radiation protection CALibration LABoratory (CALLAB), in service since 2015, is a new state-of-the-art calibration facility designed according to the requirements of the ISO 17025 standard. Its design, safety and shielding calculations have been the subject of the Ph.D thesis of Dr F. Pozzi. CALLAB consists of two irradiation rooms (named CC60 and main calibration hall), office space, storage and control rooms.

The CC60 room houses a Co-60 source (nominal activity of 11.8 TBq in August 2014). For large systems of around 1 m^3, the Total Ionizing Dose (TID) delivered ranges from 1 to 10 kGy whereas for smaller samples it can reach up to 100 kGy within days or weeks depending on the position.

Simulated geometry of the main calibration hall showing the neutron irradiator

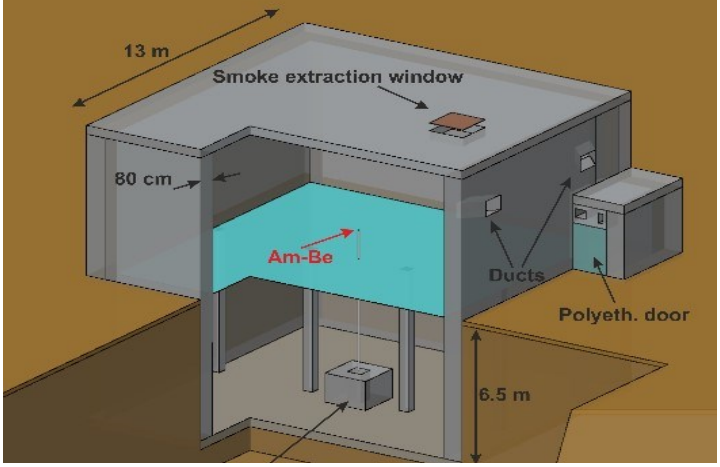

Photo: F. Pozzi/CERN

The CC60 room is expected to be upgraded with a 100 TBq Co-60 source for higher air kerma rate testing. Typical uncertainties on the air kerma values are around 5%.

The CC60 room is used for the qualification of the electronic components against TID effects. The irradiation room size permits coverage of the two windows of low air kerma rate (0.36 to 3.60 Gy/hr) and standard air kerma rate (36 to 360 Gy/hr) as defined by the European Space Agency (ESA) standard .

The main calibration hall is a 13x13x13 m^3 concrete vault, half of which is underground to take advantage from the natural shielding provided by the earth. It houses:

- four Am-Be sources, providing H*(10) rate between tens of nSv/h and 700 µSv/h;
- five Cs-137 sources and one Co-60 source providing H*(10) rate between tens of nSv/h and 200 mSv/h;
- two beta sources : 1.85 GBq of Sr-90 and 4 GBq of Kr-85;
- one X-ray generator with a peak voltage of 320 kV.

Photo: Pierre Carbonez/CERN

Pierre Carbonez

Typical uncertainties on the reference values are below 5%. All the irradiators and their calibration benches are remotely operated from the control room. Simultaneous neutron/photon irradiations are possible in a shared bench to investigate the response of detectors in mixed radiation fields. The layout of the calibration hall is specifically designed to minimise neutron scattering. CALLAB is currently undergoing the ISO 17025 accreditation process.

Every year, about 9000 semi-passive photon dosimeters (DIS-1), 1500 operational photon dosimeters (DMC 2000/3000), 800 portable radiation monitoring devices and ionisation chambers are calibrated at CALLAB. The laboratory is also used to test and evaluate prototype detectors and new commercial products. The investigation of Single Event Effects (SEEs) induced by neutrons is also possible by attaching the instrumentation to the holder of the Am-Be source.

Dr Pozzi installing a REM counter on the Neutron Calibration bench

Photo: Pierre Carbonez/CERN

ID Card:

Exposure type:
External

Source:
Am-Be (x 4) : 100 MBq – 888 GBq
Cs-137(x 5) : 300 MBq – 3 TBq
Co-60 (x 2) : 5 GBq and 10 TBq
Sr-90 : 1.85 GBq
Kr-85 : 4 GBq
X-ray generator 320 kV

Dose rate:
tens of nSv/h to Sv/h

Irradiation type:
gamma, neutron, beta, X-rays, mixed gamma + neutron

Irradiated organism type:
None

Address:
CERN
route de Meyrin
1211 Geneva 23
Switzerland

Access:
Subject to acceptance by the facility manager

Supporting lab:
CERN Dosimetry Service

Internet link:
https://hse.cern/content/rp/calibration-services

Contact:
Pierre Carbonez
Pierre.Carbonez@cern.ch

Related to:
EURADOS

CERN irradiation facilities, Pozzi F., Alia R.G., Brugger M., Carbonez P., Danzeca S., Gkotse B., Jaekel M. R., Ravotti F., Silari M., Tali M. (2017), Radiat. Prot. Dosimetry, doi: 10.1093/rpd/ncx187

New radiation protection calibration facility at CERN, Brugger M., Carbonez P., Pozzi F., Silari M., Tali M. (2014), Radiat. Prot. Dosimetry 161, 181-184

Radon Calibration Laboratory of BfS

Controlled Rn-222, Rn-220, climate and aerosol parameters

Radon measurements in the area of radiation protection and research should be reliable. In order to meet this objective, the Federal Office for Radiation Protection (BfS) operates a laboratory for exposure to Rn-222 (radon) and Rn-220 (thoron) and their progenies, under defined climate conditions. Its infrastructure is dedicated to calibration exposures of measurement instruments, testing of metrological properties (type test), development of measurement methods and further research in the field of radon metrology.

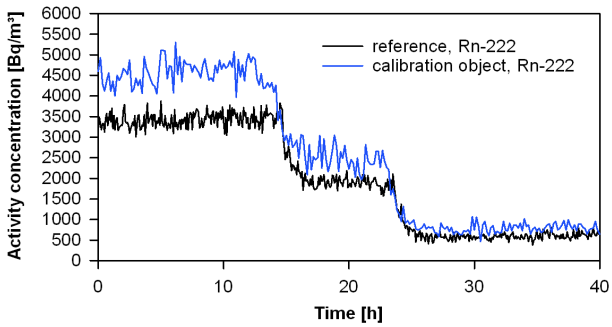

Photo: BfS

Rn-222 activity concentration within the chamber during exposure at different constant Rn-222 levels, measured by a calibration object and the laboratory's reference standards.

The measurands (Rn-222 and Rn-220) of activity concentration in air (CRn, CTn) and the potential alpha energy concentration of the short-lived Rn -222 progenies (PAEC), as well as the environmental parameters, are all traced back to national standards. The laboratory has been accredited since 1999 as a calibration laboratory for the measurands CRn and PAEC according to the norm EN ISO/IEC 17025. International comparisons of passive radon measuring instruments have been carried out since 2003. In addition to offering exposure and calibration services, the laboratory welcomes research collaborations with metrological or scientific institutions.

The radon atmospheres are generated either in several stainless steel containers with volumes of 0.4 m³, or in walk-in chambers with an inner volume of 11m³ and 30m³ (PAEC chamber). Rn-222 activity concentrations of between 50 Bq/m³ and 100 kBq/m³ are adjusted by injections of Rn-222 gas obtained from an Ra-226 source. To compensate for Rn-222 losses due to radioactive decay, the containers are permanently connected to Ra-226 flow-through sources via flow dividers or computer-controlled piston pumps. Atmospheres containing Rn-220 are created by a Th-228 source. The air inside the containers is continuously mixed by fans installed internally, which allow the activity concentrations to be kept sufficiently homogenous and constant in time during the exposures.

Photo: F. Schneider / BfS

Calibration laboratory group

The activity concentrations are continuously measured by scintillation cells and/or with a commercially available instrument. Temperature and humidity are monitored within all calibration containers; in the case of the walk-in chambers, temperature can be adjusted from -2°C to 40°C, and relative humidity from 10% to 90%. Ambient air pressure is also monitored.

The aerosol concentration, aerosol size distribution and air velocity all have a significant influence on the radon decay product atmosphere. Therefore, the PAEC chamber is equipped with:

- an aerosol generator to create aerosols with desired particle concentration (range 200-50,000 per cm³) and desired size distribution,
- a scanning mobility particle sizer spectrometer to measure the aerosol particle concentration and size distribution, and
- fans with adjustable tilt and power.

Thus, the equilibrium factor in the PAEC chamber can be adjusted between 0.1 and 0.9, and the unattached fraction of the radon progenies between 1% and 60%. The PAEC itself reaches values of between 0.3 and 640 µJ/m³. In addition, an air filter system and different alpha and gamma spectrometers are also available.

Laboratory with stainless-steel containers, measurement and dosing system

Photo: MD/ BfS

Bundesamt für Strahlenschutz

ID Card:

Exposure type:
External

Source:
^{222}Rn, ^{220}Rn and their short-living progenies

Dose rate:
^{222}Rn activity concentration 0.5 – 100 kBq/m³

PAEC 0.3 – 640 µJ/m³

Irradiation type:
Alpha radiation (5.3 MeV, 6.0 MeV, 6.8 MeV, 7.7 MeV, 8.8 MeV)

Irradiated organism type:
non-biological materials

Address:
Federal Office for Radiation Protection (BfS)
Koepenicker Allee 120-130,
10318 Berlin, Germany

Access:
Site access by prior appointment only

Internet link:
http://www.bfs.de/EN/topics/ion/service/radon-measurement/calibration-laboratory/calibration-laboratory_node.html

Contacts:
E. Foerster
Dr M. Dubslaff
cal-radon@bfs.de

Related to: MELODI, EURADOS

Performance tests for instruments measuring radon activity concentration, Beck T.R., Buchroeder H., Schmidt V. (2009), Applied Radiation and Isotopes 67 (5), 876-880

The measurement accuracy of passive radon instruments, Beck T.R., Foerster E., Buchroeder H., Schmidt V., Doering J. (2013), Radiation Protection Dosimetry, 158 (1), 59-6

Consolidated Radioisotope Facility (CORiF)

Environmental radioactivity and X-ray fluorescence analysis

Environmental radiation, often termed "background radiation", has been present everywhere in our surroundings since the formation of the earth and originates from naturally occurring or man-made radiation sources. High concentrations of both natural and synthetic radioisotopes have been detected in soils, in the sea and in river slit, especially in close proximity to contaminated sites. Thus, environmental monitoring of radioactivity levels is essential for radiation protection.

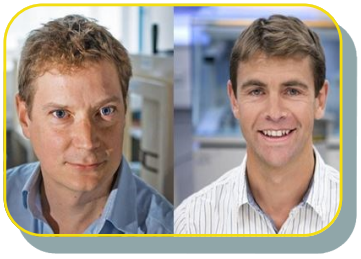

Photo: Plymouth University

Pr William Blake Dr Alex Taylor

Photo: Plymouth University

EG&G Ortec Well (GWL-170-15-S) HPGe Gamma spectrometry system and PANalytical Axios Max WD XRF system

The ISO 9001-2008-certified Plymouth University Consolidated Radio-isotope Facility (CoRiF) is a dedicated laboratory for the manipulation and analysis of natural and enhanced radioactive materials. CoRiF has a licence to hold and dispose of alpha, beta and gamma radionuclides, which are used to support a wide range of research or consultancy services to external academic, public and private sector clients. Data quality is assured through regular participation in external proficiency tests.

Measurement of gamma-emitting radioisotopes is undertaken using three EG&G Ortec gamma spectrometry systems, all of which are suitable for low-level ^{210}Pb determination. The detector geometries allow a wide range of sample types to be analysed: 1 x planar (GEM), 1 x coaxial (GMX) and 1 x well detector (GWL), with typical in-house applications including contaminated land assessment, sediment-contaminant source fingerprinting and sediment and peat geochronology.

X-ray fluorescence spectrometry provides complementary major and minor element geochemical analyses using a wavelength dispersive X-ray fluorescence (WD XRF) spectrometer (PANalytical Axios Max) with facility to prepare and run soil and sediment samples as fused beads (using PANalytical Eagon 2 fusion system), pressed pellets and loose powders.

Alpha and beta emitting radioisotopes are analysed using two Beckman Coulter automated Liquid Scintillation 6500 Counters with facility to prepare and analyse environmental samples and solids and liquids relating to high activity radio-tracer studies (which can be undertaken in-house as required).

Services offered by CoRiF include investigations of contaminated land and aquatic ecosystems, geochemical tracer studies using radiochemicals, investigation of eco- and geno-toxic effects of radionuclides, sediment and peat geochronology, sediment and contaminant source apportionment (fingerprinting), soil erosion and sediment budget evaluation, and complementary research involving non-radiometric analyses.

In relation to environmental forensics, CoRiF is currently involved in the EU Horizon 2020 funded project IMIXSED, in which researchers are applying fallout radionuclide and wavelength dispersive X-ray fluorescence tools to track eroded sediment through a degraded river basin in East Africa.

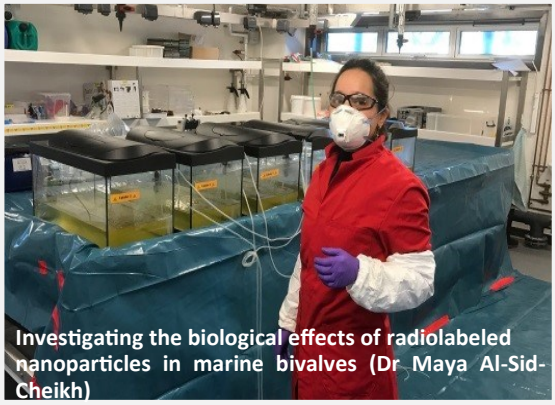

Photo: Plymouth University

Investigating the biological effects of radiolabeled nanoparticles in marine bivalves (Dr Maya Al-Sid-Cheikh)

SUCCEED WITH PLYMOUTH UNIVERSITY

ID Card:

Analytical platform type:
Dedicated laboratory for the manipulation and analysis of natural and enhanced radioactive materials and applications of radioactivity in material analysis

Main techniques proposed:
Gamma spectrometry, Wavelength dispersive X-ray fluorescence (WD XRF), Liquid scintillation counting, Laser particle sizing, Inductively coupled plasma mass spectrometry & optical emission spectrometry (ICP MS & ICP OES)

Capacity:
Hundreds samples per month

Delay to start:
Depends on technique-please enquire

Duration of experiment:
Dependent on the techniques applied

Address:
Consolidated Radio-isotope Facility, Plymouth University, Plymouth University, Plymouth PL4 8AA, United Kingdom

Access:
The analytical facility is accessible to joint research collaborators and scientists of the public or private sector after selection.

Internet link:
https://www.plymouth.ac.uk/schools/school-of-geography-earth-and-environmental-sciences/consolidated-radio-isotope-facility

Contact:
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+44 1752 585969

Related to:
ALLIANCE

Bioaccessibility of U, Th and Pb in solid wastes and soils from an abandoned uranium mine, Foulkes M., Millward G., Henderson S., Blake W. (2017), J Environ Radioact, 173:85–96

Mobilization of Technetium from Reduced Sediments under Seawater Inundation and Intrusion Scenarios, Eagling J., Worsfold P.J., Blake W., Keith-Roach M.J. (2012), Environ Sci Technol 46:11798–11803

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AIR²

Access to INFRASTRUCTURES for Radiation protection Research

Issue	Exposure platforms	Databases, Sample banks, Cohorts	Analytical platforms, Models & Tools
Published to date:			
Oct 2015, #1	FIGARO	FREDERICA	RENEB
Nov 2015, #2	B3, Animal Contamination Facility	The Wismut Cohort and Biobank	The Hungarian Genomics Research Network
Dec 2015, #3	Pulex Cosmic Silence	STORE	METABOHUB
Feb 2016, #4	SNAKE	French Haemangioma Cohort and Biobank	Dose Estimate, CABAS, NETA
Mar 2016, #5	Radon exposure chamber	3-Generations exposure study	PROFI
Apr 2016, #6	Biological Irradiation Facility	Wildlife TransferDatabase	Radiobiology and immunology platform (CTU-FBME)
May2016, #7	CIRIL	Portuguese Tinea Capitis Cohort	LDRadStatsNet
Jun 2016, #8	Mixed alpha and X-ray exposure facility	Elfe Cohort	ERICA Tool
Jul 2016, #9	SCRS-GIG	RES³T	CROM-8
Sep 2016, #10	Facility radionuclides availability, transfer and migration	INWORKS cohort	France Génomique
Oct 2016 #11	LIBIS gamma low dose rate facility ISS	JANUS	Transcriptomics platform SCKCEN
Nov 2016, #12	Microtron laboratory	EPI-CT Scan cohort	CATI
Dec 2016, #13	Nanoparticle Inhalation Facility	UEF Biobanking	The Analytical Platform of the PRE-PARE project
Feb 2017, #14	Infrastructure for retrospective radon & thoron dosimetry	Chernobyl Tissue Bank	HZDR Radioanalytical Laboratories
Mar 2017, #15	Alpha Particles Irradiator Calibration Laboratory at KIT		SYMBIOSE
Apr 2017, #16	Changing Dose rate (SU) Low dose rate (SU)		Advanced Technologies Network Center
May 2017, #17	Chernobyl Exclusion Zone	Chernobyl clean-up workers from Latvia	BfS whole and partial body Counting
Jun 2017, #18	MELAF	Belgian Soil Collection	INFRAFONTIER
Jul 2017, #19	MICADO'LAB	Estchern Cohort	ECORITME
Sep 2017, #20	DOS NDS		CERES
Oct 2017, #21	CALLAB Radon Calibration Laboratory		CORIF
Coming soon:			
Nov 2017, #22	To Be Announced	To Be Announced	To Be Announced

Future events:

CONCERT Short Courses

30 October-10 November 2017

Molecular Mechanisms of Radiation Carcinogenis
Helmholtz Center - Munich Institute for Radiation Biology, Germany

Contact:
Michael Rosemann
Rosemann@Helmholtz-muenchen.de

5-9 February 2018

Emergency and recovery preparedness and response
National Center of Radiobiology and Radiation Protection, Bulgaria

Contact:
Nina Chobanova
n.chobanova@ncrrp.org

19-23 February 2018

Radiation Protection:
Basics and Applications
Forschungszentrum Jülich, Germany

Contact:
Ralf Kriehuber
r.kriehuber@fz-juelich.de

Other Events

24-25 October 2017

International Workshop on the INEX 5 exercises

OECD Nuclear Energy Agency Boulogne-Billancourt, France

5-11 November 2017

MICROS 2017, 17th International Symposium on Microdosimetry, Venice, Italy

See also on CONCERT website

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