AIR² Access to INFRASTRUCTURES for Radiation protection Research

Issue 14
February 2017

Editorial

First, I wish you all a very good year filled with fascinating projects and outstanding results!

This new year coincides with a new cycle in the section "The floor to…". Following invitations to leaders of CONCERT WP 1-7 and Radiation Protection platform leaders of Melodi, Alliance, Eurados, Neris and Euramed, we now invite contributions from all WP6 task leaders and subtask leaders. They will be asked to highlight their contributions and philosophies on infrastructures and suggest improvements to facilitate infrastructure access.

Coming soon: As well as our monthly bulletin, you will shortly receive the first AIR2 special issue dedicated to the 3 projects selected from the 1st CONCERT Call.

Last but not least, 2017 started with a pre-announcement of the 2nd CONCERT Call; let's hope the Call will be launched without delay.

Dr Laure Sabatier, CEA

The floor to...

NMBU has the responsibility for coordinating work within task 6.1, namely, to promote the visibility of selected research infrastructures within the CONCERT EJP. The actions therein consist of three interrelated sub-tasks: 1) Listing the infrastructures (Lead: IRSN); 2) Developing and updating quality criteria and lists of recommended infrastructures (Lead: CIEMAT); 3) Increasing the visibility of recommended infrastructures (Lead: CEA). The leaders of those tasks will describe their work in more detail in future issues of Air².

Promote the visibility of research infrastructures.

An important strategy at the start of the project was to identify three separate categories of infrastructures:

Exposure platforms, which includes both laboratory exposure facilities (external and internal exposure) as well as contaminated field or observatory sites.

Databases, Biobanks, and Epidemiological Cohorts

Analytical platforms, Models and Tools (including e-infrastructures)

This categorization was intended to harmonize the work carried out across the different subtasks, and ensure the inclusion of infrastructures that would be relevant to all four research platforms: ALLIANCE, EURADOS, MELODI and NERIS. It was quickly realized that the infrastructures should go beyond CONCERT partners and possibly include non EURATOM countries. Working groups were set up to draft lists of criteria and quality control for the different types of infrastructure, and the AIR² newsletters and AIR²D² databases have played a central role in promoting the visibility of infrastructures. The breath of infrastructures covered so far in the AIR² newsletter is a strong testament to the outreach carried out between CONCERT and other radiation researchers.

A main objective of the overall work in WP6 is to foster use of the infrastructures and collaboration between researchers, and provide support to students. I feel the task has already made excellent progress in promoting the visibility of infrastructures. But the real success of the work will be if we can demonstrate increase in access and use of these infrastructures within radiation protection, both with CONCERT funded projects as well as other research collaborations.

Dr Deborah Oughton

NMBU

WP6.1 Task Leader

Photo: S. Dahl/NMBU

CONCERT CORNER

Future events:

2nd Call

Jan 2017: Pre announcement

Feb 2017: Launch

April 2017: Deadline

WP 6 News:

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.

Contents:

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March 2017

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

Laboratory for retrospective Radon and Thoron dosimetry

Advancing retrospective radon and thoron dosimetry

The infrastructure for retrospective radon and thoron dosimetry at Sofia University in Bulgaria was completed in 2015 in the framework of the DoReMi project. Its main purpose is to provide low dose retrospective dosimetry for epidemiological studies in which radon/thoron is the primary risk agent or a confounder. However, it can be used for other types of research involving radon/thoron exposure, detector response studies, radon/thoron measurement in buildings and in the environment, etc.

The infrastructure comprises two basic units:
1) Radon (Rn-222) and Thoron (Rn-220) Exposure Facility (RTEF);
2) Laboratory for Electro-Chemical Etching of track-etch detectors (LECE). The emphasised method for retrospective measurements employs CDs/DVDs stored indoors as track-etch detectors.

Photo: D. Dimitrov, Sofia University

Dobromir Pressyanov

Photo,

The RTEF and the research team (from left: S. Georgiev, K. Mitev, I. Dimitrova, D. Pressyanov)

The RTEF is designed for exposures at a wide range of activity concentrations and temperatures. It has the unique capability to support not only static but also dynamic reference exposure conditions in which radon and thoron concentrations and/or the temperature follow pre-programmed time functions. Mixed as well as pure radon and thoron atmospheres can be created with programmable levels/ratios.The RTEF is illustrated in the diagramme and photo, and its capabilities are summarised in the ID card. The activity concentration in the system is controlled by setting the flow regime and the flow rate of air through the sources of radon and thoron. The pump flow rate is controlled by a computer with dedicated hardware and software. The reference activity of radon and thoron in the system is measured by calibrated monitors (AlphaGUARD or RAD7). The temperature inside the exposure vessel is maintained by a specifically designed thermostat that can support programmable static or dynamic temperature regimes.

The RTEF is suitable for:
- Experiments at different (static or dynamic) reference radon and/or thoron concentrations for exposure times ranging from less than an hour to several months (e.g. for calibration of radon and thoron detectors, study of the detector's response and cross-talk between the radon and thoron signals in a mixed atmosphere, exposure of cell cultures, studies of radon sorption and desorption in biological substrates and other materials);
- Exposures under dynamic activity concentration and temperature reproducing the conditions in the real environment.

The LECE is oriented mostly to etching alpha tracks created by radon/thoron and their progeny in CDs/DVDs or other solid state nuclear track detectors. Various etching regimes at HV (effective) within 100 – 4000 V and a frequency of 6 kHz are possible. High precision is achieved by individual *a posteriori* calibration of each disk by additional exposure in the RTEF after the disk is collected. The infrastructure at Sofia University has sufficient capacity to manage the workload of large-scale epidemiological studies or other measurement campaigns

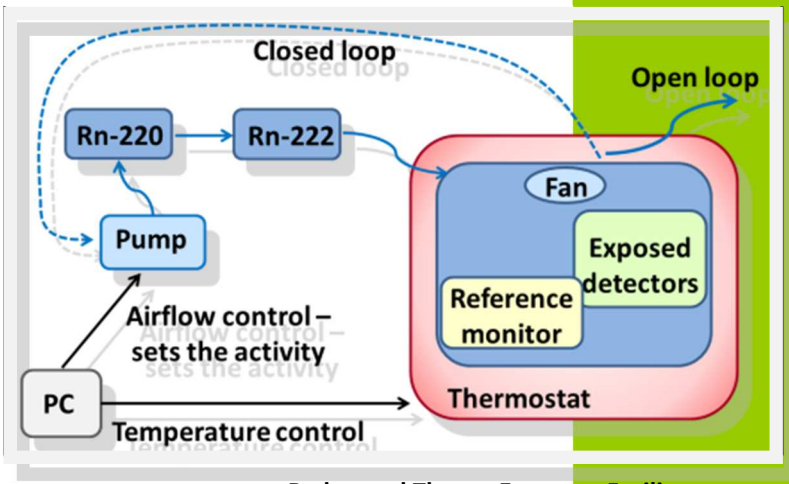

Photo: Faculty of Physics, Sofia University

Radon and Thoron Exposure Facility

ID Card:

Exposure type:
Exposure to staic or dynamic radon/thoron activity concentrations with time-dependent temperature regime

Source:
^{222}Rn and ^{220}Rn

Dose rate:
^{222}Rn: 1-2000 kBq/m^3
^{220}Rn:2-1800kBq/m^3

Temperature range:
-15°C to +60°C

Irradiation type:
alpha particles (5.5, 6.0,6.1,6.3,6.8,7.7,8.8 MeV)

Possible targets:
^{222}Rn and ^{220}Rn detectors cells

Address:
5 James Bourchier Blvd, Sofia 1164, Bulgaria

Access:
Available upon request and task specification

Supporting lab:
Laboratory of Dosimetry and Radiation Protection, Faculty of Physics, Sofia University "St Kliment Ohridski", Sofia, Bulgaria

Internet link:
http://doremi-noe.net/irradiation_facilities

Contact:
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+359 2 8161 268

Related to: DOREMI

LABORATORY FACILITYTO CREATE REFERENCE RADON+THORONATMOSPHERE UNDER DYNAMIC EXPOSURE CONDITIONS D. Pressyanov, K. Mitev, S. Georgiev, I. Dimitrova, J. Kolev., J. Environ. Radioact., 166 (2017), 181-187

OPTIMIZATION OF ETCHING CONDITIONS OF CDs/DVDs USED AS DETECTORS FOR Rn 222 D.Pressyanov, K. Mitev, S. Georgiev, I. Dimitrova,. Radiat. Meas. 83 (2015), 36-40

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CHERNOBYL TISSUE BANK

Providing quality assured and annotated human biosamples

The Chernobyl Tissue Bank (CTB) was established in 1998 to collect, store and distribute biological samples from patients born on or after 26th April 1967, and resident in the regions of Ukraine and Russia contaminated by fallout from the Chernobyl accident and who developed thyroid cancer. The project is supported financially by the National Cancer Institute of the USA and the Sasakawa Memorial Foundation of Japan, and has the political support of the Governments of Ukraine and Russia. Patients attending thyroid clinics in the Institute of Endocrinology in Kiev, Ukraine and the Medical Radiological Research Centre in Obninsk, Russia are asked to consent to the use of samples left over from their operation for suspected thyroid cancer for research. The study cohort includes any patient with a pre-operative diagnosis of suspected thyroid cancer, who was resident in the most heavily contaminated regions of Ukraine and Russia at the time of the accident and aged under 19 at the time of the accident (i.e. born on or after 26th April 1967).

Photo: Imperial College

Pr Gerry Thomas

The current collection comprises 4500 cases of thyroid cancer and adenoma. 3094 of the 4500 cases are from the exposed areas of Ukraine and Russia, whereas 1406 cases come from the unexposed areas of Ukraine and Russia. There are also 758 post Chernobyl cases (born after 1st December 1986) from Ukraine and Russia: 475 cases are from the exposed areas and a further 283 are from unexposed areas. A thyroid dose is estimated for each case once the pathology consensus diagnosis is agreed. The collection includes samples from the Ukraine-American cohort.

Photo, A Galpine, Imperial College, London

CTB laboratory in IEM, Kiev, Ukraine

A sample of blood for extraction of DNA, serum and samples of both frozen (where the tumour is large enough) and formalin fixed paraffin embedded (FFPE) tumour and normal thyroid tissue are provided by each patient. The pathology of every case submitted to the CTB is reviewed by an international panel of pathologists. Molecular biology quality assurance (QA) is carried out on each sample prior to release to researchers. In order to maximise the use of the resource, nucleic acids are extracted from the same frozen tissue block, aliquotted and are distributed to multiple researchers. Individual sections from FFPE blocks from individual cases are also issued to multiple researchers. Researchers apply for material through an online portal (https://cisbic.bioinformatics.ic.ac.uk/ctb/html_ctb_public/). Applications are reviewed by an independent external review panel, thus ensuring that the material is used appropriately in first class scientific research. Researchers agree to provide data from their studies back to the project in order that these can be integrated into future studies. So far, 2828 aliquots of RNA and 2377 aliquots of DNA extracted from tissue, 428 aliquots of DNA from blood, 375 vials of whole blood, 9107 sections from FFPE blocks, and 1137 tissue blocks have been released to researchers in 11 different countries for 39 separate projects.

Thomas GA, Unger K, Krznaric, K, Galpine A, Bethel JA, Tomlinson C, Woodbridge M, Butcher S (2012) **The Chernobyl Tissue Bank — A Repository for Biomaterial and Data Used in Integrative and Systems Biology Modeling the Human Response to Radiation**, Genes 3(2), 278-290

Thomas GA (2012) **The Chernobyl Tissue Bank: integrating research on radiation-induced thyroid Cancer**. J Radiol Prot;32:N77-80

ID Card:

Organism type of sample:
Human

Storage condition:
Depends on type of sample
See website for details

Sample type:
Frozen tissue, DNA and RNA extracted from frozen tissue, blodd samples, DNA extracted from blodd, serum, sections from FFPE tissue

Condition of use:
Available to any bona fide researchers in any country

Address:
Coordinating Centre: CTB secretariat, Department of Surgery and Cancer, Imperial College London, Room 11L04, Charing Cross Hospital, Fulham Palace Road, London W68RF

Internet link:
www.chernobyltissuebank.com

Access:
Application via CTB portal (see website for details), all applications considered by an External Review Panel.
Reviewed via email
No deadlines for application.
full details on website

Contact:
Pr GA Thomas
Gerry.thomas@imperial.ac.uk

HZDR-Radioanalytical Laboratories

Valuable tools for the spectroscopy of radioactive samples

The reliable protection of people and the environment from the hazards caused by radionuclides requires a detailed knowledge of their migration and transfer behaviour in the environment. Hence, a molecular understanding of the chemical reactions of the contaminants in the geosphere and biosphere is indispensable. Comprehensive molecular information can be obtained by a multi-method approach and – in case of radioactive samples – where the spectroscopic techniques are located in an appropriate infrastructure.

Photo, O. Killig/HZDR

Rossendorf Beamline (ROBL) at the ESRF in Grenoble

The Institute of Resource Ecology of the Helmholtz-Zentrum Dresden-Rossendorf (HZDR-IRE) provides experimental and technical equipment for officially licensed work with radionuclides up to a limit of 5×10^9 Bq. The institute uses a broad range of analytical methods, all of which are performed in modern radiochemical laboratories with state-of-the-art equipment. Additionally, some of the laboratories are S1-classified, allowing the handling of genetically modified organisms in a radiation protection area.

The radioanalytical laboratories at HZDR focus mainly on sophisticated spectroscopic techniques in combination with conventional radioanalytical methods. The main research infrastructure comprises:

- Laser spectroscopy: Time-resolved laser fluorescence spectroscopy (TRLFS) with tunable nanosecond and femtosecond laser systems (excitation wavelength: 220 –1,800 nm, detection range: 300–1,500 nm, maximum time resolution in the picosecond range); Cryo-TRLFS (sample cooling: ≥ 4 K), Confocal Laser Scanning Microscopy (excitation wavelength: 350–650 nm); Laser-Induced Photoacoustic Spectroscopy (LPAS)
- NMR spectroscopy – liquid/solid state (400/600 MHz)
- Vibrational spectroscopy – FT-IR (in situ ATR technique, mid/far-IR), FT-Raman
- UV-vis-NIR spectroscopy (conventional and long pass flow cell, maximum path length: 2,500 mm)
- X-ray diffraction for single crystals and powder samples
- Standard and inert gas glove boxes suitable for work with radionuclides, in particular alpha-emitting nuclides, as well as with Schlenk lines for chemical synthesis
- Classical radioanalytical methods (α-, β-, γ-spectroscopy) and elemental analysis (ICP-MS, AAS, IC)
- Methods for characterisation of colloids
- (Micro-)Calorimetry, Isothermal titration calorimetry
- State-of-the-art microbiological and biochemical methods including conventional separation techniques (HPLC, CE)

Photo: private

H. Foerstendorf (left)

A.C. Scheinost (right)

Furthermore, the IRE runs the Rossendorf Beamline (ROBL) at the European Synchrotron Radiation Facility (ESRF) in Grenoble (France). ROBL is the first research facility at a public synchrotron to be dedicated to radionuclide work. The brilliant X-ray flux of the ESRF is used to perform:

- X-ray absorption spectroscopy: EXAFS and (high-resolution) XANES
- X-ray emission spectroscopy (XES) and resonant inelastic X-ray scattering (RIXS)
- Powder and single crystal diffraction
- Surface diffraction (CTR) and resonant anomalous X-ray reflectivity (RAXR)

Photo: O. Killig/HZDR

Radiochemical experiments in glovebox

ID Card:

Purpose:

Spectroscopic and radioanalytical studies of actinides and fission products in biological and geological environmentally relevant systems

Access:

HZDR Radioanalytical Laboratory: Applications are available under surveillance of experienced staff scientists of HZDR. Technical equipment is provided for radionuclide activities up to $5x10^9$ Bq.

ROBL: Beamtime is offered upon scientific merit of the submitted proposal, which is evaluated by review panels of HZDR or ESRF.

Housed on:

Helmholtz-Zentrum Dresden-Rossendorf, Institute of Resource Ecology, Dresden, Germany

Rossendorf Beamline (ROBL) at ESRF, Grenoble, France

Address:

Helmholtz-Zentrum Dresden Rossendorf, Institute of Resource Ecology
Bautzner Landstraße 400
01328 Dresden, Germany

Internet link:

www.hzdr.de/FWO

Contact:

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Related to: ALLIANCE

Günther, A., Raff, J., Merroun, M. L., Roßberg, A., Kothe, E., Bernhard, G., 2014. Interaction of U(VI) with Schizophyllum commune studied by microscopic and spectroscopic methods. Biometals 27, 775-785.

Kvashnina, K. O., Scheinost, A. C., 2016. A Johann-type X-ray emission spectrometer at the Rossendorf beamline. Journal of Synchrotron Radiation 23, 836-841.

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	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 Transfer Database	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
Sept2016,#10	Facility radionuclides availability, transfer and migration	INWORKS cohort	France Génomique
Oct 2016 #11	LIBIS gamma low dose rate facility ISS	JANUS	Transcriptomics platform SCK CEN
Nov 2016, #12	Microtron laboratory	EPI-CT Scan cohort	CATI
Dec 2016, #13	Nanoparticle Inhalation Facility	UEF Biobanking	The Analytical Platform of the PREPARE project
Feb 2017, #14	Infrastructure for retrospective radon & thoron dosimetry	Chernobyl Tissue Bank	HZDR – Radioanalytical Laboratories
Coming soon:			
Special Issue Mar 2017, #15			

Future events:

27 Feb-2 March 2017: Eurados Annual Meeting KIT, Karlsruhe, Germany

March 7-9, 2017: Radiation effects on the immune system: an updated state of the art and future research needs,Budapest, Hungary

25-27 April 2017: COMET final event, Bruges, Belgium

8-11 May 2017: ConRad 2017, Bundeswehr Institute of Radiobiology, München, Germany

14-19 May 2017: Neutron and Ion Dosimetry Symposium, NEUDOS13, Krakow, Poland

23-26 May 2017: Operra final event, Budapest, Hungary

3-8 September 2017: ICRER 2017, 4th Internotional conference on Radioecology and Environmental Radioactivity, Berlin, Germany

10-12 October 2017: Joint ICRP-RPW 2017, Paris, France

5-11 November 2017: MICROS 2017, 17th International Symposium on Microdosimetry, Venezia, Italy

Editorial Committee: Jean-Michel Dolo, Elisabeth May, Laure Sabatier

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