AIR²
Access to INFRASTRUCTURES for Radiation protection Research

Issue 18
June 2017

Editorial

In the previous issue of AIR², I invited you to take part in our survey on open access and data sharing. The results were astonishing! More than 60 % of respondents claimed not to be aware of a repository where they could deposit their data.
In AIR², we have repeatedly preached the importance of open access and data sharing. CONCERT highly recommends using the STORE database or a similar open access data archive, in line with the H2020 project guidelines. Beneficiaries of CONCERT-funded projects must agree (per the call text) to provide all resulting data, and clear supporting metadata, to allow potential re-use of the data generated and to harmonize practices.
CONCERT's subtask 6.2.1 aims to develop STORE according to user needs, so please visit it (www.storedb.org), use it and deposit your data there. This database is yours!
Dr Laure Sabatier, CEA

The floor to...

One of the objectives of CONCERT WP6 is to increase the visibility of infrastructures available to perform research in any of the disciplines related to radiation protection, and to facilitate access to these facilities for researchers and students in the field. Knowledge of the available infrastructures is crucial for researchers to allow them to identify the infrastructures best suited to their projects. This information is also needed to avoid unnecessary costs and duplication. Having a list of available infrastructures is important, but it is not enough per se.

Develop and update quality criteria and lists of recommended infrastructures

Researchers need to know the capabilities of these infrastructures (what they offer, their technical characteristics and the access requirements). This need constitutes the rationale behind task 6.1.2 lead by CIEMAT, the aim of which is to define the quality criteria for each type of infrastructure that is considered useful for radiation protection research.
Radiation protection research infrastructures are very diverse since they include radiation exposure facilities, databases, models and tools, epidemiological cohorts, biobanks and analytical platforms. Therefore, in order to adequately define the quality criteria for each type of infrastructure, it has been crucial to have the input of experts from the different disciplines of radiation protection (low dose risks, radioecology, dosimetry, emergency response, medical exposure).
The types of criteria defined in task 6.1.2 include both common criteria (general information about the facility, its owner and the access rules) and a set of technical criteria specific to each type of infrastructure in order to allow researchers to identify suitable infrastructures for their studies.
The quality criteria defined for the infrastructures have been used to create the skeleton of the AIR²D² database which is designed to collect information on radiation protection research infrastructures not only in Europe but all around the world. AIR²D² offers a unique opportunity to achieve national and international visibility for the infrastructures available in your institute, so I would encourage the owners of unique infrastructures to add them to the AIR²D² database.

Dr Almudena Real
CIEMAT
CONCERT WP6.1.2


photo: A. Real /CIEMAT

CONCERT CORNER

Future events:

Second Funding Decision meeting:
July 27th 2017, Munich, Germany

WP 6 News:

Next WP6 meeting:
October, Paris, France
During the ICRP-ERPW

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

MELAF

Facility for high energy photon and electron radiation

The German National Metrology Institute (PTB-Physikalisch-Technische-Bundesanstalt) operates the Metrological Electron Accelerator Facility (MELAF) for service and research in the field of dosimetry for external beam radiotherapy. A custom-designed research electron linear accelerator (LINAC) and two commercially available medical LINACs, together with a Co-60 irradiation facility, offer excellent experimental conditions for investigations requiring high-energy photon and electron radiation. The PTB makes available its metrologically well-characterised radiation fields to external researchers from, for example, the field of radiobiology or medical radiation protection research.

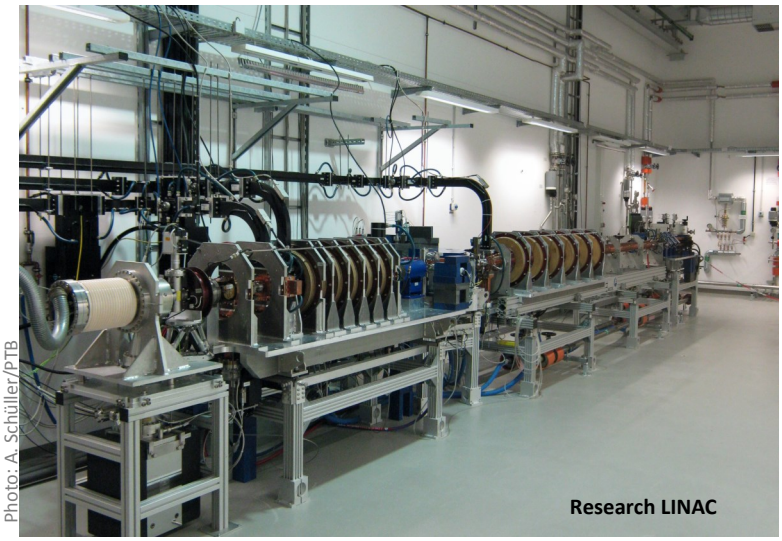


Photo: A. Schüller/PTB

Research LINAC

The MELAF is located in a dedicated building with four irradiation rooms. Two irradiation rooms are equipped with medical LINACs of the type *Elekta Precise Treatment System*. In total, 9 electron beam qualities (nominal energy 4 MeV to 22 MeV) and 6 photon beam qualities (nominal accelerating voltage 4 MV to 25 MV) can be generated. The LINACs provide a pulsed beam (6 Hz to 400 Hz, 3 µs pulse duration) and are equipped with a multileaf collimator which allows irregularly shaped fields of up to 40 cm x 40 cm at 1 m distance. Typical dose rates are 0.1 Gy/min to 5 Gy/min.

The research LINAC consists of a low-energy section (0.5 MeV to 10 MeV) and a high-energy section (6 MeV to 50 MeV). At both sections the electron beam can be deflected into the dedicated beam line in its respective irradiation room. The properties of the beam, e.g. the spectral electron fluence or the beam current, are measured as absolute values with small uncertainties. Thus, radiation effects can be studied as a function of these quantities. The research LINAC provides a pulsed beam (1 Hz to 100 Hz, 2.5 µs duration), and the energy can be varied continuously. At the end of each beam line, the electrons either pass through an exit window for electron irradiations or impinge on a bremsstrahlung target for the generation of high-energy photons. Dose rates are up to several Gy/s.

Photo: A. Schüller/PTB

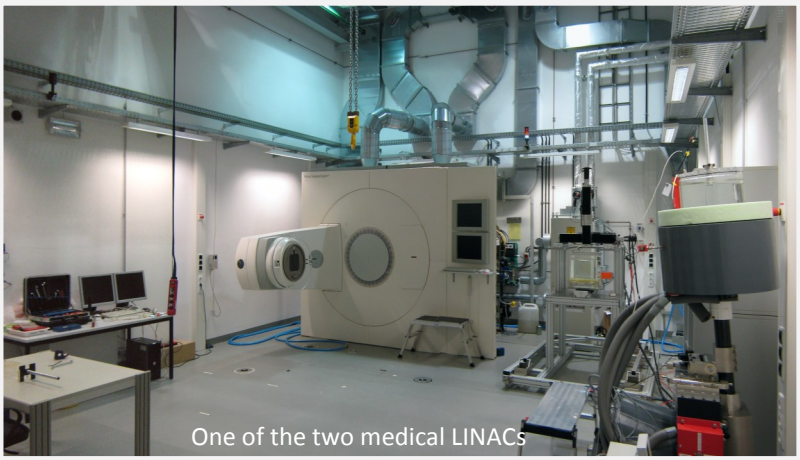
Dr Andreas Schüller

The MELAF is also equipped with an irradiation facility for Co-60 gamma radiation (129 TBq as at May 2017). It generates a radiation field with a field size of 10 cm x 10 cm at a distance of 1 m from the source. Typical dose rates range from 3 Gy/min to 0.03 Gy/min depending on distance from the source (0.5 m to 5 m).

Ionisation chambers with calibrations traceable to the PTB primary standards are available for dose measurements at the highest accuracy level. An alanine/ESR dosimetry system is available for the determination of the total dose in relatively small volumes (alanine probe: ø=4.8 mm, h=3 mm).

Furthermore, the PTB provides an S1 laboratory for cell culture and microbiological preparations with approval to work on genetically modified cells.

Access to the facility is available upon request. The PTB is willing to support external investigators, offering its expertise in the field of dosimetry and on all issues related to the MELAF.



One of the two medical LINACs

Photo: A. Schüller/PTB

Physikalisch-Technische Bundesanstalt Braunschweig und Berlin

ID Card:

Exposure type:
external

Source:
Electron linear accelerator
Co 60

Dose rate:
0.01 Gy/min –100 Gy/min

Irradiation type:
electron and photon beam (vertical and horizontal)
Gamma (horizontal)

Irradiated organism type:
Cell cultures, blood, insects, Plants, measurement devices

Address:
Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany

Access:
free, available upon request

Supporting lab:
for cell culture (S1) and microbiological preparations,
for reference dosimetry

Internet link:
www.ptb.de/MELAF

Contact:
Andreas Schüller
andreas.schueller@ptb.de
Tel.: +49 531 592-6209

Related to: EURADOS

K. Derikum, A Dedicated Irradiation Facility for Radiotherapy Dosimetry, IFMBE Proceedings (2009) p53-55

H. Zutz, **O. Hupe**, Ambient dose and dose rate measurements in the vicinity of Elekta Precise accelerators for radiation therapy, Radiation Protection Dosimetry (2014), 162, 4, p431-437

BELGIAN SOIL COLLECTION

Uncontaminated Belgian soils to use in experiments

A collection of 20 uncontaminated Belgian soils (figure 1) is available at the Biosphere Impact Studies group of the Belgian Nuclear Research Centre (SCK•CEN). These soils can be contaminated with specific radionuclides (e.g. ^{137}Cs, ^{238}U, ^{232}Th, etc.) and used in dedicated lab experiments to study mechanisms and processes to improve the understanding of radionuclide behaviour in the terrestrial environment.

Photo: SCK•CEN

Dr Nathalie Vanhoudt

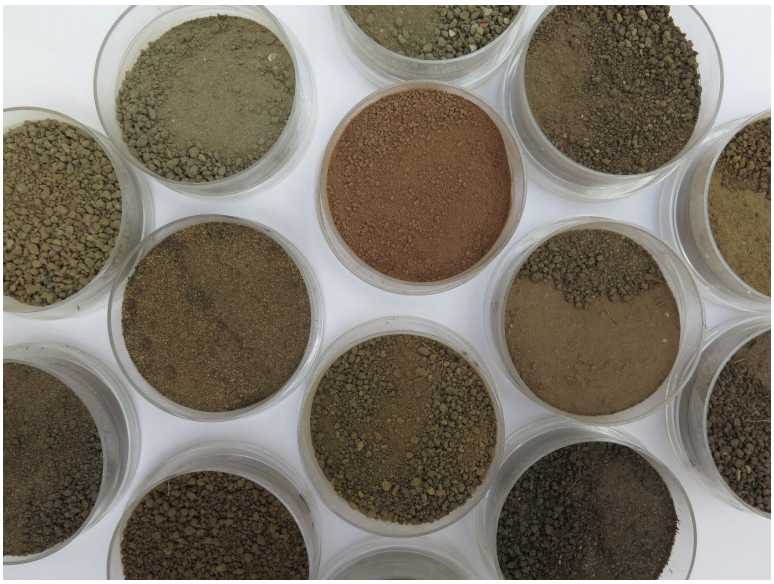


Photo: SCK•CEN

Figure1: Visible differences in colour as present in the Belgian soil collection

The soils were gathered from 20 locations spread over different geological parts of Belgium with the majority coming from Flanders. After removing the vegetation root mat, the soils were collected by sampling the upper 10 cm soil layer. The soils were air-dried, sieved (2 mm) and several soil characteristics were analysed such as texture, total organic matter (OM), cation exchange capacity (CEC), CaCO3, bulk density and field capacity.

In the past, subsamples of these soils were contaminated with ^{238}U, ^{226}Ra, ^{232}Th and ^{99}Tc to evaluate the possibility of linking the mobility and bioavailability of these radionuclides with soil characteristics. Following an incubation period of several weeks, soil characteristics such as pH, exchangeable cations, available P, amorphous Fe, etc., were analysed. Subsequent analysis of the radionuclide concentrations in the extracted soil solutions allowed solid-liquid distribution coefficients to be calculated and relationships with soil characteristics to be evaluated. In addition, in order to evaluate radionuclide uptake by plants and to calculate transfer factors, soil-to-plant transfer studies were performed using several plant species such as ryegrass, clover, maize, etc. (figure 2). Furthermore, some of these soils were used to compare sequential extraction procedures for uranium fractionation in soil.

As highlighted in the September 2016 issue of AIR², SCK•CEN makes available facilities in which these soils can be used for the study of radionuclide availability, transfer and migration.

The facilities are supported by laboratories which are fully-equipped for soil-sampling and characterisation, element analysis and radioactivity measurements.

Photo: SCK•CEN

Figure 2: Plant uptake experiments in the greenhouse using contaminated soil

Vandenhove H., Van Hees M., Wouters K., Wannijn J., (2007), Can we predict uranium bioavailability based on soil parameters? Part 1: Effect of soil parameters on soil solution uranium concentration, Environmental Pollution, 145, p587-595

Vandenhove H., Van Hees M., (2007), Predicting radium availability and uptake from soil properties,. Chemosphere, 69, p664-674

SCK•CEN
STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

ID Card:

Organism type of Sample:
Belgian Soil Collection

Storage Conditions:
Room temperature
Dry conditions

Sample type:
Uncontaminated soil
Upper 10 cm soil layer

Access Conditions:
Joint research collaboration
Subject to internal approval

Internet link:
No

Address:
Belgian Nuclear Research Centre (SCK•CEN)
Boeretang 200
2400 Mol, Belgium

Contact:
Nathalie Vanhoudt
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+32 14 33 21 12

Related to: ALLIANCE

Issue 18
June 2017

INFRAFRONTIER

High quality resources for biomedical research

INFRAFRONTIER is the European Research Infrastructure for the developement, phenotyping, archiving and distribution of model mammalian genomes. It is a pan-European **non-profit** endeavour by more than 25 public research centres and private companies from 14 European countries and Canada, and the European Molecular Biology Laboratory. In INFRAFRONTIER these partners join forces to **advance the understanding of human health and disease.**

The INFRAFRONTIER Research Infrastructure offers **open access to unique scientific platforms, resources and services**, and to the extensive expertise of the INFRAFRONTIER partners:

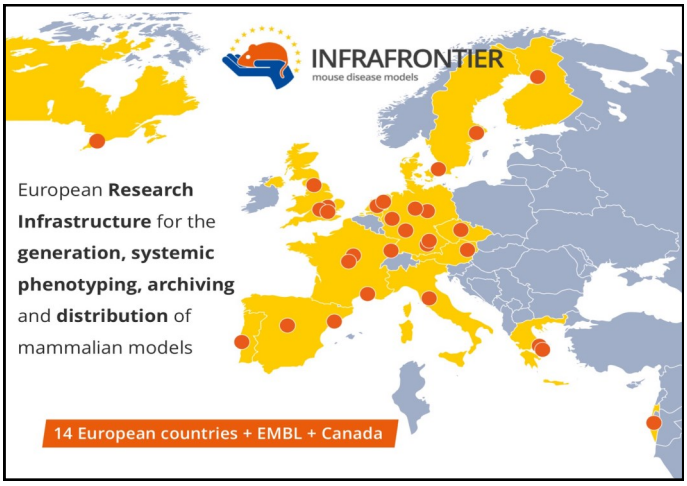

Photo: INFRAFRONTIER/Helmholtz Zentrum München

- Scientifically valuable mutant mouse strains are archived by the **European Mouse Mutant Archive (EMMA)** and distributed to interested researchers around the globe.
- Rodent **model generation** (mouse and rat) is offered using gene targeting in embryonic ES-cells or CRISPR/Cas9 technologies
- **Systemic phenotyping** of mutant mice offers a whole-organism view on gene function and pleiotropic effects. In-depth phenotyping (e.g. immuno-phenotyping, metabolic phenotyping) provides further insights.
- **Germ-free (axenic) mice** reveal the contribution of the gut microflora to phenotype-genotype interactions.
- The GEMM-ESC archive at the Netherlands Cancer Institute offers a rapid target gene validation in **complex cancer mouse models**.
- **Training** courses teach the state-of-the-art in the generation, cryopreservation and phenotyping of mouse models under strict animal welfare standards and promote the 3R -principles.

The INFRAFRONTIER Research Infrastructure has a **global user community**. All resources and services can be accessed at INFRAFRONTIER's central web portal www.infrafrontier.eu.

In 2016, biomedical researchers requested more than 600 mouse strains from the European Mouse Mutant Archive (EMMA).

Dr Martin Hrabě de Angelis

Photo: INFRAFRONTIER/Helmholtz Zentrum München

The INFRAFRONTIER Partners share a **common European spirit and goal**: Advancing the understanding of human health and disease using mammalian models. They actively work together to provide high-quality platforms, resources and services for the biomedical research community, and to disseminate and share knowledge and expertise. This pan-European effort is coordinated by the **INFRAFRONTIER GmbH**, located in Munich, Germany, which guides the development of:

- **common standards and procedures** to ensure highest quality and reliability
- **common technology development** to further improve the INFRAFRONTIER resources and services
- **common outreach activities** to spread the word about INFRAFRONTIER
- **common training activities** to disseminate knowledge to current users and the next generation of biomedical researchers.

INFRAFRONTIER fully embraces the **3R principles: Replacement** - Supporting methods which avoid or replace the use of mice in research; **Reduction** - Using methods which minimise the number of mice used per experiment; **Refinement** - Applying methods which minimise suffering and improve animal welfare. By providing centralised access to high-quality resources, it adds the **INFRAFRONTIER Rs: Reproducibility, Reliability and Responsibility**.

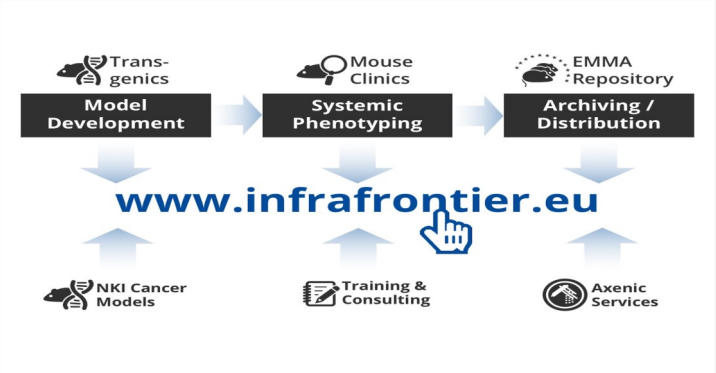

Photo: MRC Harwell/Helmholtz Zentrum München

INFRAFRONTIER mouse disease models

ID Card:

Resources and Services:

- Rodent model development (mouse and rat)
- Systemic phenotypic and specialised phenotyping
- Archiving and distribution of mutant mouse strains
- Axenic (germ-free) mice
- Cancer mouse models
- Training and consulting

Central coordination:
INFRAFRONTIER GmbH,
Ingolstaedter Landstrasse 1,
85764 Neuherberg
Germany

Internet link:
www.infrafrontier.eu

Contact:
info@infrafrontier.eu

Related to:
MELODI, EURAMED

ESFRI European Strategy Forum on Research Infrastructures

INFRAFRONTIER Consortium. 2015. "INFRAFRONTIER–Providing Mutant Mouse Resources as Research Tools for the International Scientific Community." Nucleic Acids Research 43, p1171–D1175. doi:10.1093/nar/gku1193

Raess, Michael, Ana Ambrosio de Castro, Valérie Gailus-Durner, Sabine Fessele, Martin Hrabě de Angelis, and the INFRAFRONTIER Consortium. 2016. "INFRAFRONTIER: A European Resource for Studying the Functional Basis of Human Disease.", Mammalian Genome 27 (7), p445–50, doi:10.1007/s00335-016-9642-y

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 PREPARE 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
Coming soon:			
Jul 2017, #19	To Be Announced	To Be Announced	To Be Announced

Future events:

CONCERT Short Courses

6-16 June 2017
Assessing risk to humans and the environment
NMBU, Oslo, Norway
Contact:
deborah.oughton@nmbu.no

19-23 June 2017
EURADOS-CONCERT School on uncertainty analysis processes for retrospective dosimetry and associated research
IRSN, Paris, France
Contact:
sophie.ancelet@irsn.fr

19-23 June 2017
'Late Phase' Nuclear Accident Preparedness and Management
RIR, Gomel, Belarus
Contact:
crouail@cepn.asso.fr

Other Events

11-17 June 2017
RAD 2017 Fifth International Conference on Radiation and Applications in Various Fields of Research
Budva, Montenegro

18-28 June 2017
NUBIP and NMBU course
Experimental Radioecology and Radiobiology
Kiev, Ukraine
Contact:
Olena.pareniuk@gmail.com
vak@uiar.org.ua

25-29 June 2017
RICOMET 2017 Conference
Social and ethical aspects of decision-making in radiological risk situations
IAIEA, Vienna, Austria

3-8 September 2017
ICRER 2017, 4th International 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, Venice, Italy
See also on CONCERT website

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

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