AIR²
Access to Infrastructures for Radiation protection Research

Issue 24
February 2018

Editorial

It's been a busy time for the AIR² team, with the MEDIRAD Special Issue just published plus this February issue and the Special Issue on the results of the 2nd CONCERT Call due out in 2 weeks' time.

We have also been focusing our efforts on the AIR²D² database. In October 2017, it comprised 54 infrastructures, not all of which are intended to be featured in the AIR² bulletin; however some of the 63 infrastructures described in AIR² were not in AIR²D². In fact, only 27 were common to both.

So, we started a reminder campaign asking everyone who had published in AIR² to register their infrastructure in AIR²D² in order to complete/validate the data. To date, our database comprises 74 infrastructures. Our thanks to all of those who responded. For those who haven't yet done so, please enter your data quickly so that all radiation protection researchers can have a better tool!

Dr Laure Sabatier, CEA

The floor to...

A robust scientific ecosystem must be capable of conducting demanding experimental activities to validate new breakthrough ideas and create new technologies for the benefit of society. At the core of these experimental activities are flexible and active research infrastructures, offering scalable solutions to meet needs ranging from basic science to pre-industrial scale.

National support to international activities are critical for the harmonization of the European Research policy

MINECO-AEI, the State Research Agency of the Ministry of Economy, Industry and Competitiveness of Spain, provides support to singular scientific and technological infrastructures in all fields, and is responsible for funding their use by national public research groups and universities.

MINECO-AIE manages the State Plan for Scientific & Technical Research, as well as Spain's participation in co-funded activities within the European Union and non-EU countries. Co-funded activities, including those of the EJP-CONCERT project, are very interesting initiatives for the harmonisation of European research and the achievement of deeper integration of European administration and agencies.

In the case of EJP CONCERT, MINECO-AIE's participation is two-fold:

1) As a Programme Owner Manager (POM) providing financial support to Spanish universities with Third Party (TP) status.

2) As a contributor to WP4.

Under the leadership of the French National Research Funding Agency (ANR), MINECO-AEI has actively participated in managing the evaluation process for CONCERT calls for proposals, providing its experience at national and international level for both EJP and ERA-NET co-funded activities. We consider that a transparent and serious evaluation process for these calls is a key factor for the successful and efficient use of public resources.

Moreover, collaborations with our colleagues from the ANR, FCT (Portugal) and SSM (Sweden) have been very positive.

The implementation of high quality projects in existing research infrastructures is of paramount importance to maintain the functionality and capacities of these installations as well as European competitiveness in science and technology, and to promote a knowledge-based society.

Dr Alberto Abánades Velasco
MINECO-AEI
CONCERT WP4

Photo: MINECO-AEI

CONCERT CORNER

Future events:

16th February 2018
Stakeholder consultation

20th February 2018
Open Information and Networking Day of the European Radiation Protection Research Platforms, Munich, Germany

21st February 2018
- CONCERT MB Meeting
- Extraordinary and ordinary MELODI EOGA and General Assembly, Munich, Germany

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.

Follow STORE on Twitter: @STOREDatabase

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March 2018

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

UNIPI neutron irradiation facility

Neutron irradiation room with AmBe and gamma sources

The University of Pisa's neutron irradiation facility (UNIPI-AmBe) has been in operation since 2010, and consists of an irradiation room for fast neutrons and gamma exposures designed to minimise neutron scattering. The facility, which is part of the Nuclear Measurement Laboratory of the University of Pisa, has been performing nuclear measurements for over 50 years.

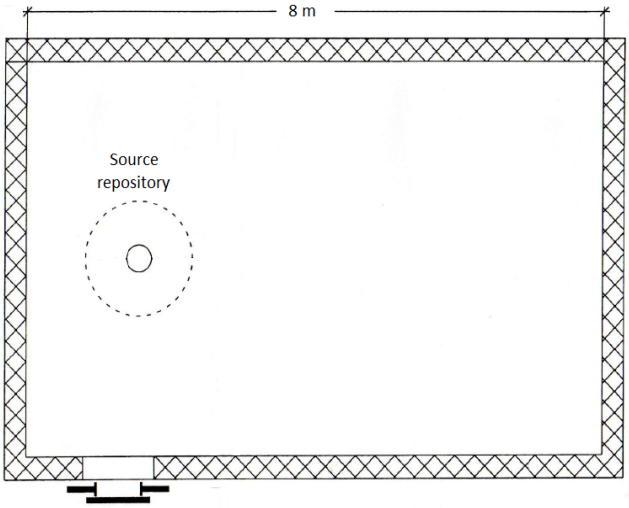

Photo: R. Ciolini/Pisa University

Top view of the neutron/gamma irradiation facility

It consists of an open space (5 m x 8 m x 2.5 m) with concrete walls, no windows and only one access door. Located in a 2 m deep ground repository, it houses two radionuclide AmBe neutron sources with a total nominal activity of 14.2 GBq, and a ^{60}Co source with a nominal activity of 1.1 GBq. The reference neutron dose rate H*(10) is 9.4 µSv/h at 1 m neutron source distance. Moreover, a ^{60}Co calibrated source (dose rate 0.53 mSv/h at 1 m free in air) is available in the source repository, to be used for personal gamma dosimetry calibration or together with neutron sources to investigate the response of the detectors to mixed radiation fields. A broad range of neutron and gamma dose rates can be obtained by varying the distance between the source and the irradiated device.

An air conditioning system maintains the room temperature at a constant value during the exposures. The radioactive sources are extracted from the storage box and positioned inside the room, at a specified distance from the device/detector to be irradiated. At the end of the irradiation, they are stored again in the repository. There are no particular restrictions on the items to be irradiated; only size limitations due to the dimensions of the room and the entrance door. The duration of each exposure is normally within an interval of 0–24 h, but longer time intervals are possible. The facility is protected by a controlled access security system. All irradiation procedures and instrument calibrations are performed according to the facility's ISO 9001 standard certification.

Photo: R. Ciolini/Pisa University

Dr Riccardo Ciolini

The UNIPI-AmBe facility includes ancillary equipment such as a Bonner sphere spectrometer system, 30 cm x 30 cm x 15 cm ISO phantoms, supports for objects to be irradiated, and Rem counters and gamma dose rate meters for environmental gamma/neutron monitoring. The facility is mainly used for nuclear measurement research, instrument calibration (dose/dose rate meters) and radiation protection measurements, but also performs teaching activities (Nuclear and Biomedical Engineering Master's degree courses). In addition to offering exposure and calibration services, the facility welcomes research collaborations with metrological or scientific institutions.

View of the irradiation room

Photo: R. Ciolini/Pisa University

Track size distributions in CR-39 neutron dosimeters treated with carbon dioxide, d'Errico F., de Vasconcelos D. A. A., Ciolini R., Hulber E. (2017), Radiation Measurements, 106, 607-611

Application of a Bonner sphere spectrometer for the determination of the angular neutron energy spectrum of an accelerator-based BNCT facility, Mirzajani N., Ciolini R., Di Fulvio A., Esposito J., d'Errico F. (2014), Applied Radiation & Isotopes, 88, 216-220

UNIVERSITÀ DI PISA

ID Card:

Exposure type:
External

Source:
AmBe and ^{60}Co

Dose rate:
9.4 µSv/h at 1 m (neutron) and 0.53 mSv/h at 1 m (gamma)

Irradiation type:
Neutron, gamma

Irradiated organism type:
None

Address:
Bruno Guerrini Laboratory
Department of Civil and Industrial Engineering (DICI)
University of Pisa
Via di Torretta
I-56122 San Piero a Grado
Pisa, Italy

Access:
Subject to prior agreement with the management staff

Supporting lab:
Nuclear Measurement Laboratory
Department of Civil and Industrial Engineering (DICI)
University of Pisa
Largo Lucio Lazzarino 2
I-56126 Pisa, Italy

Internet link:
www.dici.unipi.it

Contact:
Riccardo Ciolini
+39 050 2218026
r.ciolini@ing.unipi.it

Related to:
EURADOS

Greek interventional cardiologists cohort

Estimation of eye lens doses in Greek cardiologists

The Greek Atomic Energy Commission is the national regulatory authority for radiation safety, and is responsible for maintaining the National Dose Registry (NDR) for workers occupationally exposed to ionising radiation.

Eye lens doses seem to be of great concern, especially for staff working in interventional cardiology, due to a decrease in the eye lens dose limit for occupational exposure, as set out in the latest European Basic Safety Standards Directive 2013/59/EURATOM. For this reason, efforts have been made in the present cohort to retrospectively estimate the eye lens doses in interventional cardiologists, based mainly on the whole body dose data kept in the NDR since 1989.

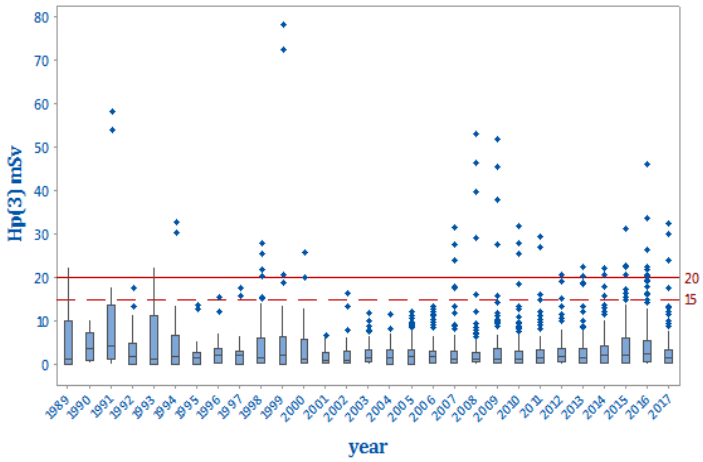

Photo: EEAE

Box plots showing the evolution of the annual Hp(3) in mSv.

A short questionnaire has also been used to collect data on the type and number of procedures, the X-ray system configuration and the use of protective measures during the respective exposure periods. All the relevant data for active interventional cardiologists in the cohort have been extracted from the NDR. Of the 530 cardiologists contacted, 150 completed the questionnaire. The eye lens dose was estimated using the second approach developed in the EURALOC project (OPERRA). For each cardiologist, the distribution of the possible cumulative eye lens doses was estimated individually and separately for each eye. The above graph shows the evolution of the annual Hp(3) dose for the cohort since 1989. From the questionnaires and the estimated eye lens dose values, it can be concluded that:

- The use of personal protective equipment is increasing. More specifically, an increase in the use of protective shields was noted in the 1990s. The use of lead glasses is also increasing; however 30% of the cardiologists are still not using lead glasses.
- Whole body doses seem to have increased over the last 15 years (from 5.3 mSv to 10.6 mSv). The estimated eye lens dose values indicate that the new annual eye lens dose limit has been exceeded in some cases.

Photo: EEAE

Dr Eleftheria Carinou

- The maximum cumulative eye lens dose is estimated at 700 mSv.

The present approach used for estimation of the eye lens doses has the advantage that is based on individual measurements (i.e. whole body doses) for each cardiologist; however, there are also serious disadvantages, mostly related to the constant use of the personal dose meter in the past, and to its position on the worker's body.

Moreover, the findings in the present cohort underline the importance of keeping an NDR, which has proved to be a powerful tool for the retrospective estimation of eye lens doses in interventional cardiologists.

The research leading to these results has received funding from the European Atomic Energy Community's Seventh Framework Programme under grant agreement n° 604984.

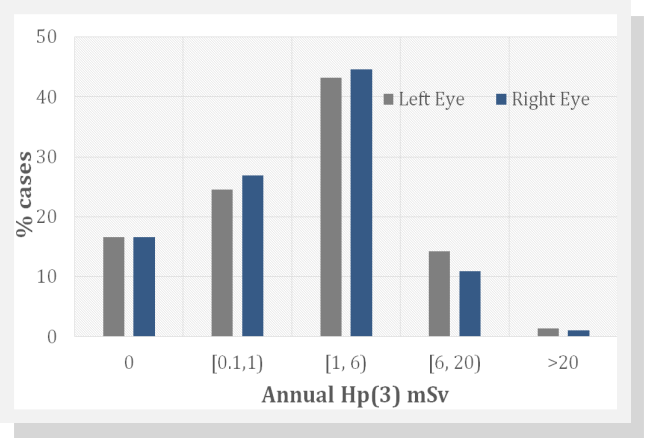

Photo: EEAE

Distribution of the estimated annual Hp(3) for both eyes.

Eye lens radiation exposure in greek interventional cardiology personnel, Thrapsanioti Z., Askounis P., Datseris I., Diamanti R. A., Papathanasiou M., Carinou E. (2017), Radiation Protection Dosimetry, 175 (3), 344–356

The influence of operator position, height and body orientation on eye lens dose in interventional radiology and cardiology: Monte Carlo simulations versus realistic clinical measurements, Principi S., Farah J., Ferrari P., Carinou E., Clairand I., Ginjaume M. (2016), Physica Medica, 32 (9), 1111–1117

EEAE ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΑΤΟΜΙΚΗΣ ΕΝΕΡΓΕΙΑΣ GREEK ATOMIC ENERGY COMMISSION

ID Card:

Cohort type:
Interventional cardiologists
530 contacted; 150 replied

Age/follow-up:
Age at exposure: 30-67 years old
Data extracted from the National Dose Registry database starting from 1989

Biobank available:
N/A

Access:
Contact E. Carinou for possible external use of the cohort data

Internet link:
https://eeae.gr/en/

Contact:
Dr Eleftheria Carinou
Eleftheria.carinou@eeae.gr
+30 2106506718

Related to:
EURADOS, MELODI

The Severe Nuclear Accident Program (SNAP)

A Norwegian model for nuclear emergency

The Norwegian Meteorological Institute (MET) is responsible for modelling atmospheric dispersion of radioactive debris in the event of a nuclear emergency related to a nuclear accident or detonation. An additional task of the MET in a nuclear emergency is to identify unknown sources of radiation indicated by elevated levels of measurement. The basic tool used by the MET for such events is the Severe Nuclear Accident Program (SNAP).

The SNAP model can be run in different domains, ranging from the local domain with a resolution of 2.5 km to the hemispheric domain with spatial resolution of approximately 10 km. Once released into the air, radioactive gases and particles are subject to advection, turbulent diffusion and deposition (dry and wet). In the model calculations, the advection process is immediately followed by the diffusion process. A random walk approach is used to parameterise horizontal and vertical diffusion. When large and dense particles are released, gravitational settling is more effective than vertical diffusion and this process is taken into account. The effectiveness of dry deposition is mainly a function of atmospheric stability which is calculated based on the Local Richardson Number. Wet deposition is a function of precipitation intensity and type, as well as particle size.

Photo: Jan Terje Rausand/MET

Dr Jerzy Bartnicki **Dr Heiko Klein**

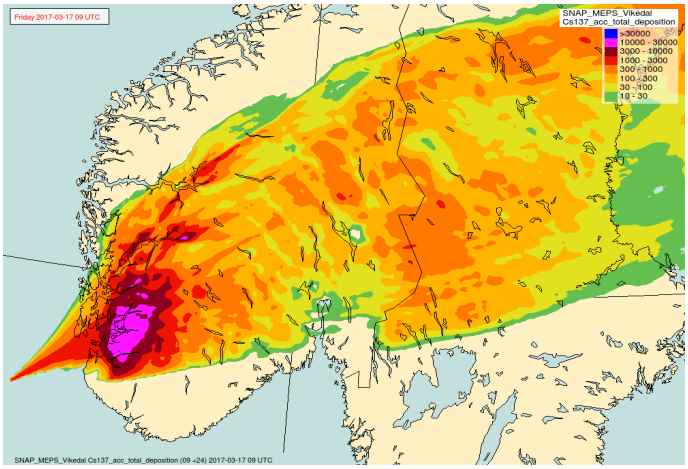

Photo: H. Klein /MET

SNAP dispersion results from a hypothetical accident on a floating nuclear powerplant transported along the Norwegian coast.

The SNAP model was developed at the MET in 1994 as a Lagrangian particle model. The present version is fully operational at the MET and takes into account atmospheric transport and deposition of gases, noble gases and particles of different size and density emitted during nuclear accidents or explosions. SNAP can also be run remotely by experts from the Norwegian Radiation Protection Authority (NRPA) where the Norwegian Crisis Committee is located.

In the event of a nuclear accident, the source term for the model runs is usually provided by NRPA. This source term includes the magnitude of release which is time dependant, the elevation, time profile of release and the nuclides released. In the case of a nuclear explosion, the source term depends on the explosive yield. In this type of event, radioactivity is transported mainly as particles of different sizes. A large variation of the particle size in the initial cloud is represented by 10 discrete classes with a characteristic particle radius ranging from 2 µm to 200 µm. All meteorological input is available on-line at the MET from different operational Numerical Weather Prediction (NWP) models, e.g. from the ECMWF forecast or from the regional Norwegian/ Swedish MetCoOp Ensemble Prediction System (MEPS).

The SNAP model has been used both for simulations of historical events (e.g. nuclear detonations in Novaya Zemlya, Chernobyl Accident) and real time simulations (e.g. Fukushima accident). It was tested in the ETEX experiment and showed good agreement with observations (ETEX 1). It has also been used for tracing unknown sources of radioactivity (e.g. recent ^{106}Ru case). SNAP is the dispersion model currently used by the MET in the CONFIDENCE project and also in CERAD CoE.

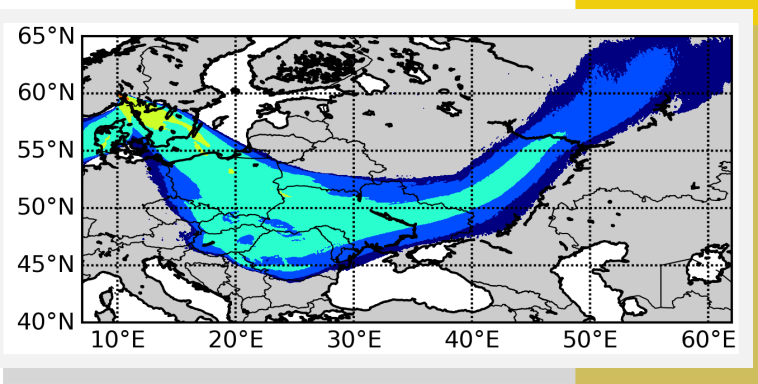

Photo: H. Klein/MET

Inverse SNAP dispersion calculations (-156h) of ^{106}Ru measurements in Oslo on 2/10/2017.

Norwegian Meteorological Institute | CERAD CENTRE FOR ENVIRONMENTAL RADIOACTIVITY

ID Card:

Purpose:
Atmospheric dispersion of radioactivity

Use:
Needs a specialist

Housed at:
Norwegian Meteorological Institute (MET)

Training proposed on the software:
None

Address:
Norwegian Meteorological Institute,
Henrik Mohns Plass 1
0313 Oslo, Norway

Access:
Open source

Internet link:
https://github.com/metno/snap

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Jerzy.bartnicki@met.no

Related to:
NERIS

Atmospheric transport of radioactive debris to Norway in case of a hypothetical accident related to the recovery of the Russian submarine K-27, Bartnicki J., Amundsen I., Brown J., Hosseini A., Hov Ø., Haakenstad H., Klein H., Lind O. C., Salbu B., Szacinski Wendel C. C., Ytre-Eide M. A. (2016), Journal of Environmental Radioactivity, 151, 404-416.
Operational SNAP model for remote applications from NRPA, Bartnicki J., Haakenstad H. and Hov Ø. (2011), Met.no report No. 12/2011. Norwegian Meteorological Institute, Oslo, Norway

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
Special Issue	1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES	1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES	1st CONCERT Call: CONFIDENCE, LDLensRad, TERRITORIES
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
Nov 2017, #22	Calibration and Dosimetry Laboratory (INTE-UPC)	German airline crew cohort	Centre for Omic Sciences (COS)
Dec 2017, #23	NMG	Techa River Cohort (TRC)	iGE3
Special Issue	MEDIRAD	MEDIRAD	MEDIRAD
Feb 2018, #24	UNIPI-AmBe	Greek interventional cardiologists cohort	SNAP
Coming soon:			
Mar 2018, #25	To Be Announced	To Be Announced	To Be Announced

Future events:

CONCERT Short Courses

5-9 February 2018

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

Contact:
Nina Chobanova
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19-23 February 2018

Radiation Protection: Basics and Applications
Forschungszentrum Jülich, Germany

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

5-16 March 2018

Assessment of long-term radiological risks from environmental releases: modelling and measurements, Technical University of Denmark

Contact:
Kasper Andersson
kgan@dtu.dk

12-16 March 2018

EURADOS Training course on Application of Monte Carlo Methods for Dosimetry of Ionizing Radiation, KIT, Germany

Contact:
Bastian Breustedt
Bastian.breustedt@kit.edu

Other Events

5-8 February 2018

EURADOS AM2018, Lisbon, Portugal

27-28 February 2018

ISBER European Biospecimen Research Symposium

International Society for Biological and Environmental Repositories, Luxembourg

11-15 June 2018

EPRBioDose 2018, Munich, Germany

22-25 August 2018

ERR 2018, Pecz, Hungary

1-5 October 2018

3rd ERPW, Rovinj Rovigno, Croatia

See also on CONCERT website

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

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