AIR²
Access to INFRASTRUCTURES for Radiation protection Research

Issue 35
March 2019

Editorial

The results of the 2018 Euratom Call were released last week giving rise to much disappointment that our TERRA project was not rated high enough (12/15) to be selected under Education and Training. The project objective was to boost the capability of the radiation protection research community by providing and promoting hands-on experience at key European research infrastructures. These infrastructures were chosen from among the AIR² Exposure Platforms to cover the essential radiation source material currently needed for research and extend existing capabilities into new disciplines and technologies. However the project's failure to receive funding this time is only a postponement. It was our first attempt to submit a project on research infrastructures for radiation protection to a Call dedicated to Education and Training, and the very relevant comments of the reviewers will be of value in improving the project for the next Call in September 2019. So, let's give it another go!

Dr Laure Sabatier, CEA

The floor to...

JSI's role and infrastructure in Radiation Protection research

Jožef Stefan Institute, Ljubljana is the leading scientific research institute in Slovenia and is involved in a broad spectrum of basic and applied research. It comprises two departments and two special institutional units related to the field of the Radiation Protection (RP):

- Radiation Protection Unit (SVPIS)
- Department of Low and Medium Energy Physics (F2)
- Department of Environmental Sciences (O2)
- Milan Čopič Nuclear Training Centre (ICJT).

The SVPIS has been involved in ionising radiation (IR) measurements and RP since the TRIGA Reactor came into operation in 1966. SVPIS is responsible for the radiological supervision of all activities at the Jožef Stefan Institute (JSI) which involve ionising radiation.

The F2 conducts basic and applied research in atomic and nuclear physics. The applied research activities are chiefly related to the measurement of radioactivity in the environment (ERM). F2 also operates the Mobile Unit.

In 2008, JSI was appointed by the Metrology Institute of the Republic of Slovenia as a designated institute and holder of the national standards for IR quantities: air kerma, dose equivalents and Becquerel (Bq). The best Calibration and Measurement Capabilities of NDS and LMR were approved and reported by the International Bureau of Weights and Measures (BIPM).

The O2 encompasses a broad range of research activities, which are as diverse and varied as the environment itself. These research activities are multidisciplinary, ranging from the natural sciences to the social sciences, in particular chemical, physical, geological and biological sciences, which define our environment, society and human activities. O2 is also engaged in ERM.

The main activity of the ICJT is the promotion of knowledge on the use of nuclear energy. However its activities also span all aspects of the peaceful use of nuclear energy and IR. Its basic activities are the provision of training for Krško Nuclear Power Plant staff, provision of RP training and information to the public on nuclear technology, etc.

Infrastructure related to RP activities:

- Secondary Standard Dosimetry Laboratory (NDS)
- HR γ-ray Spectrometry Laboratory (LMR)
- Liquid Scintillation Laboratory
- TLD Laboratory
- Hot cells
- 2 MV Tandem accelerator
- TRIGA reactor
- Education and Training Centre facilities
- Specialised laboratories for radiochemical research.

Dr Benjamin Zorko
JSI
CONCERT PoM
Slovenia

Photo: JSI

CONCERT CORNER

Future events:

26-27 March 2019
CONCERT review meeting by the EC, Brussels

Call for Travel Grants
Next deadline: 31st March 2019
Information

14-18 October
ERPW 2019
Stockholm, Sweden
14th October: MB & ExB/ESAB

WP 6 News:

16 & 17 April 2019
WP6 Skype meetings
Info and registration
jean-michel.dolo@cea.fr

The first version of CONCERT's Web-handbook (D6.4) is now online!

AIR²D²:
- Please complete the online form(s) to register your infrastructure(s) in the database.

Follow STORE on Twitter: @STOREDatabase

Contents:

Next issue

April 2019

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

IRSE Experimental Farm

Investigation of radionuclide transfer to plants and animals

Unauthorised agricultural activities on the Semipalatinsk Test Site (STS) have been carried out by the local population following the formal closure of the test site in the 1990s. Today, there are about a hundred pastoral farms at the STS, mainly focused on horse, cattle and sheep-breeding, and on forage production.

Since 2007, the Institute of Radiation Safety and Ecology (NNC RK - IRSE) has been running diverse natural experiments to investigate the parameters of radionuclide transfer from soil into agricultural products, in order to assess the opportunities for future agricultural use of the STS territory (18,500km^2). These investigations are conducted on a purpose-built experimental farm located in one of the highly contaminated areas of the test site ("Experimental Field"). High activities of the radionuclides ^{3}H, ^{137}Cs, ^{90}Sr, $^{239+240}$Pu and ^{241}Am in the soil are found within the limits of the testing sites, such as "Experimental field", "Degelen", "4A" and other areas (see Figure).

The natural experiments are performed during the summer months. These involve farming and investigation of livestock and birds typical to the region (large and small cattle, horses, pigs, wild boars, hens, broilers), as well as agricultural crops and vegetation (gramineae, fruits, coleworts, roots, tuberiforms, berries – 21 species in total). Different groups of animals and birds were fed with contaminated forage, soil and water; in some of the experiments, the animals were given ware containing a solution of known amounts of radionuclides.

The forage and soil were prepared at diverse contaminated testing sites within the STS with different radionuclide contamination characteristics (places used for surface nuclear tests, tests of combatant radioactive substances, areas of radioactive waterways). Investigated crops and vegetation were sown or planted out at the experimental farm where high concentrations of radionuclides in soil are observed.

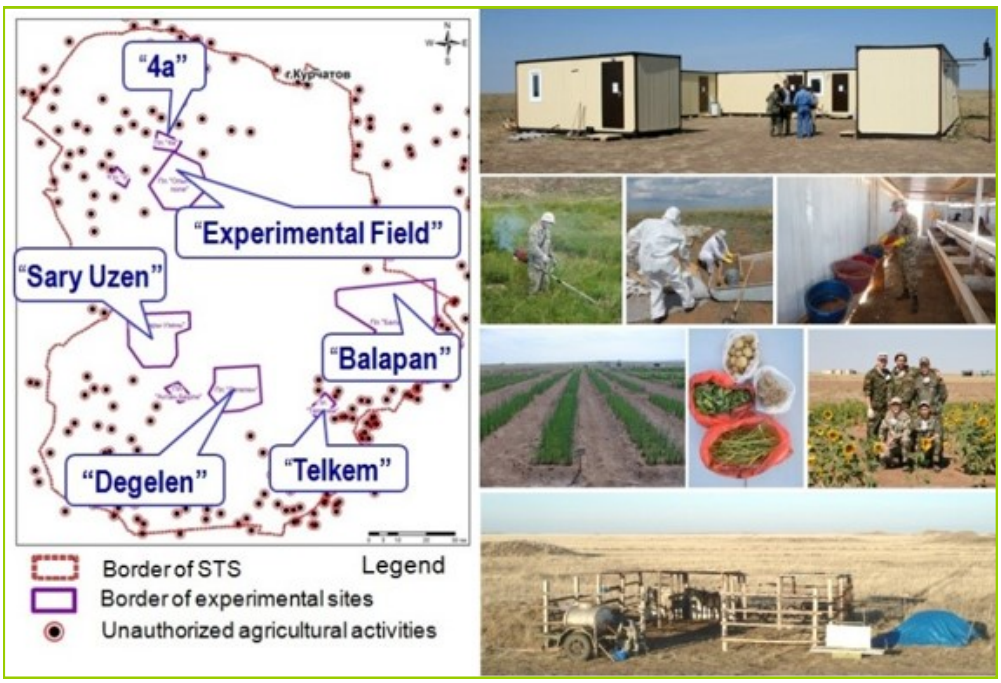
Photo: Z. Baigazinov/IRSE NNC RK

Dr Zhanat Baigazinov

For animals, the dynamics of accumulation and excretion of radionuclides into edible products along with the distribution of radionuclides in organs and animal tissues have been studied and transfer factors to edible products have been calculated (Tf and CR values). For crops, soil to plant transfer coefficients (Af values) have been determined.

Although high activities of the radionuclides ^{3}H, ^{137}Cs, ^{90}Sr, $^{239+240}$Pu and ^{241}Am in the soil are found within the testing sites of the STS, the investigations confirm that agricultural products can be safely produced even within some of these testing grounds (concentration in the products will be well below permissible levels). For animals, this is because of the relatively low migration of radionuclides in the system "soil – vegetation – livestock products". This fact is a peculiar feature of the STS contamination. Exception is the areas around the Shagan River and adjacent to water sources that come from the "Degelen" site, where increased concentrations of ^{3}H are possible in animal and crop products.

Photo: Z. Baigazinov/IRSE NNC RK



Unauthorised agricultural activities on the STS (left). The Experimental Farm (right).

Transfer of tritium into laying hen's meat and eggs at prolonged intake with atmospheric air, water and grass meal, Baigazinov Z. A., Lukashenko S. N., Karatayev S. S., Panitski A. V., Mamyrbayeva A. S., Baigazy S. A., Kozhakhanov T. Y., Subbotina L. F. (2017), J Environ Radioact, 178-179, 110–115
Accumulation of artificial radionuclides in agricultural plants in the area used for surface nuclear tests, Kozhakhanov T. E., Lukashenko S. N., Larionova N. V. (2014), J Environ Radioact, 137, 217-226

ID Card:

Type of ecosystem contaminated:
Steppe, semi-desert environment

Compartment of environment contaminated:
Soil, water, sediment, plants, animals

Contamination source:
Different nuclear experiments, mostly atomic bombs

Radioactivity or dosimetric characteristics:
Radiocesium, radio strontium, transuranium elements, tritium and others can reach MBq

Total contaminated area:
STS territory is 18,500 km^2

Species exposed/present at the site:
Typical for Kazakhstan region: all types of flora and fauna (see text)

Authorised related data/ samples:
Collection of proceedings of IRSE, publications

Presence of an associated contamination:
Radionuclides, heavy metals

Supporting lab:
Institute of Radiation Safety and Ecology (NNC RK)

Address:
Krasnoarmayskaya 2, 071100, Kurchatov, Kazakhstan

Access:
Permission from Energy Control Committee is required

Internet link:
http://irse.nnc.kz/

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Related to:
ALLIANCE

Database of Mayak workers' families

Studying risks of adverse health effects in offspring of exposed parents

The MWF database contains data from a cohort of employees of the first Russian nuclear enterprise, the Mayak Production Association (PA), which comprises 22,377 individuals (including 25% female workers). The advantages of the cohort include its large size, long follow-up period (70 years), individually measured doses from a wide range of external and internal radiation, sex/age/ethnicity heterogeneity as well as varying initial health status of the workers, complete information on health effects and vital status, availability of data on non-radiation risk factors and stored biological specimens collected from cohort members. Studies conducted on this cohort of Russian nuclear workers provide strong evidence for association of incidence and mortality from leukemia, solid cancers, circulatory disease, chronic obstructive pulmonary disease and cataracts with chronic occupational low dose rate radiation exposure.

Annual health examinations of the Mayak PA personnel included routine questioning of workers from the study cohort with regard to their family members and non-radiation factors such as lifestyle, socioeconomic status, etc., using standardised questionnaires. The data from these questionnaires was used to create a database for the Mayak workers' families and offspring. The figure illustrates the roadmap used to build the database.

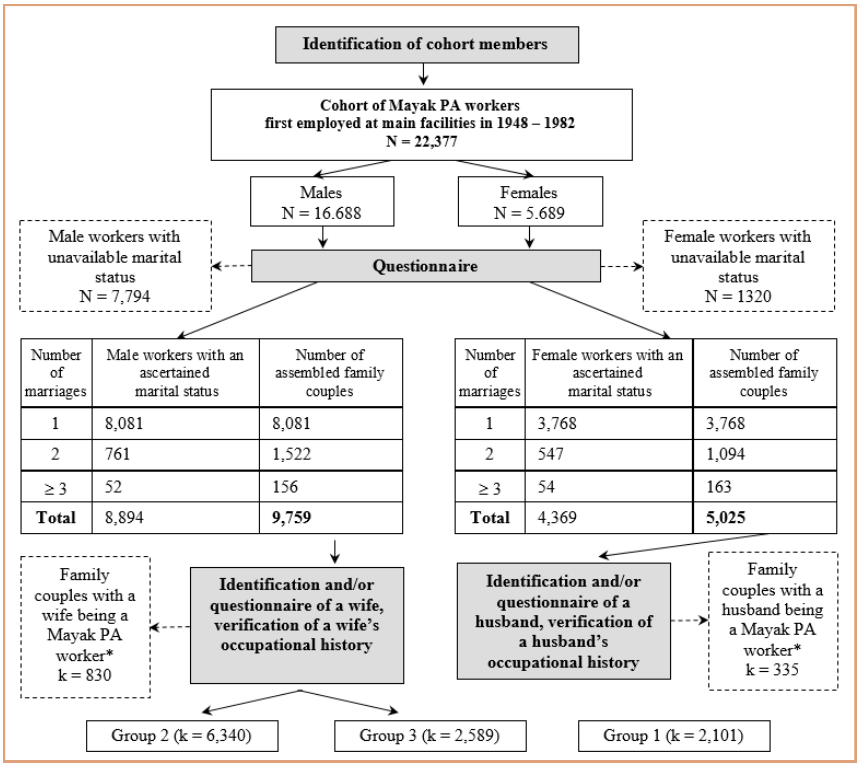
To date, complete information has been collected for 11,030 families from the Mayak PA worker cohort. This includes 6,340 families where only the father was occupationally exposed to radiation, 2,101 families where only the mother was occupationally exposed to radiation and 2,589 families where both spouses were exposed. The range of preconception absorbed gonadal doses is very wide: min 0.01 Gy, max 5.66 Gy, median 0.12 Gy. The mean cumulative preconception gonadal doses from external gamma-rays are 0.37 ± 0.61 Gy for fathers and 0.35 ± 0.50 Gy for mothers.

Photo: SUBI

Dr Tamara V. Azizova

As of 31 December 2018, a total of 16,585 offspring have been identified in these families. The database contains medical data for each family member for the entire follow-up period, data on parental reproductive health and non-radiation factors (smoking, alcohol, body mass index, hypertension, other) as well as individually measured annual (and for 10% of the cohort monthly) doses from preconceptional radiation, stored biological specimens collected from approximately 1,500 family triads, and sufficient statistical power. These resources provide the opportunity to study the risks of adverse health effects in offspring of exposed parents and to investigate the mechanisms of these alterations, including non-targeted and transgenerational effects.

Photo: SUBI



Database roadmap for Mayak workers' families and offspring

Notes: Asterisk (*) denotes that the husband or wife was a worker at the Mayak auxiliary facility or at the main facilities, first employed after 1982 (occupational histories and radiation doses have been clarified and updated), N is the number of workers, k is the number of families: group 1 includes families where only the wife was a Mayak worker, group 2 includes families where only the husband was a Mayak worker, and group 3 includes families where both spouses were employed at the Mayak PA.

Analysis of genome instability in offspring of Mayak workers' families: Minisatellite CEB, Rusinova G. G., Glazkova I. V., Azizova T. V., Osovets S. V., Vyazovskaya N. S. (2014), Russ J Genet, 50 (11), 1200 – 1207

[**DNA bank of exposed Mayak workers and their families**], Rusinova G. G., Glazkova I. V., Azizova T. V. (2010), Medicine of extreme situations, 31 (1), 93–100

ID Card:

Cohort type:
Individual data on families of Mayak PA workers occupationally exposed to external gamma- and internal alpha-radiation at wide dose ranges over prolonged periods.

Age:
- Age at exposure (first employment): 15 – 65 years
- Mean age at end of follow-up: 66 years
- Mean duration of follow-up: 42 years; 939,811 person-years

Biobank available:
Yes

Sample type:
Tumour and non-tumour tissues (formalin-fixed, paraffin-embedded tissues blocks, histology slides), peripheral blood and its components, DNA

Sample storage conditions:
18 - 20°C, -20°C, -80°C, liquid nitrogen

Access:
MWF database is owned by SUBI. Access to anonymous data is limited and is subject to approval by the SUBI Institutional Review Board.

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Related to:
MELODI

DSA Environmental Laboratory

Norwegian Radiation and Nuclear Safety Authority Environmental Lab

The Laboratory for Environmental Radioactivity at the Norwegian Radiation and Nuclear Safety Authority (DSA) is a non-commercial laboratory, with a staff of 7. The laboratory has facilities suitable for radiochemical work with low activity environmental samples, and a low background gamma spectrometry laboratory. DSA also has two laboratories in Northern Norway with gamma spectrometry and emergency preparedness capacity.

In total, approximately 1200 samples are analysed annually by gamma spectrometry while a few hundred are analysed by alpha spectrometry or liquid scintillation counting following radiochemical separation (for example, Pu, Am, U, Po, Sr and Tc). Since the early 2000s, methods for radiochemical separation of NORM radionuclides (uranium, thorium, Ra-226) have also been established. Sample measurements with gamma spectrometry have been accredited according to the standard EN ISO 17025 since 2000, and the laboratory is also active in the IAEA ALMERA and RANET networks. As part of its quality assurance programme, the laboratory participates annually in several intercomparison exercises organised by IAEA, NPL, Nordic Nuclear Safety Research (NKS) and other bodies.

Most of the current samples come from national monitoring programmes and radio ecological research, but the laboratory also acts as a support for the Section for Emergency Preparedness and Response and the Section for Nuclear Safety and Pollution Control. Sample types analysed include sediment, soil, seawater and seaweed as well as various types of biota. Air filters from several air sampling stations in Norway are also prepared and analysed in the laboratory.

In recent years, the laboratory has also employed field measurements, such as *in situ* gamma spectrometry and characterisation of nuclear materials using high-resolution gamma spectrometry.

Photo: T. Kolstad/DSA

T. B. Aleksandersen
B. Lind & T. T. Gäfvert

Moreover, since 2004, the laboratory has operated a mobile laboratory for emergency purposes, with facilities for sample preparation, gamma spectrometry, simple radiochemistry procedures, LSC and whole body counting.

Major detector equipment available at the DSA laboratories includes:

- 11 HPGe-detectors in a low-background counting room
- 4 Portable HPGe-detectors for *in situ* measurements
- 8 NaI-detectors
- 2 Canberra Alpha Analyst spectrometers with a total of 24 PIPS-detectors for alpha spectrometry of U-isotopes, Th-isotopes, Pu-238, Pu-239+240, Am-241 and Po-210
- 2 Risø beta counters for Tc-99
- 1 Quantulus LSC for Ra-226, Sr-90/Y-90 and H-3
- 1 Canberra iSOLO300L for total alpha/beta.

Photo: B. Johnsen/DSA

Collage of our staff and equipment

InSiCal - A tool for calculating calibration factors and activity concentrations in *in situ* gamma spectrometry, Mauring A., Vidmar T., Gäfvert T., Drefvelin J., Fazio A. (2018), J Environ Radioact, 188, 58-66
Radon tightness of different sample sealing methods for gamma spectrometric measurements of ^{226}Ra, Mauring A., Gäfvert T. (2013), Appl Radiat Isot, 81, 92-95

DSA Norwegian Radiation and Nuclear Safety Authority

ID Card:

Analytical platform type:
Radioactivity analysis

Main techniques:
Radiochemistry
Alpha spectrometry
Beta counting
Gamma spectrometry

Capacity:
Ranges from a few hundred to several thousand samples per year, depending on the type of analysis required

Intercomparison exercise:
IAEA ALMERA
NKS
NPL

Address:
Norwegian Radiation and Nuclear Safety Authority
Grini Næringspark 13
1361 Østerås
Norway

Access:
Non-commercial laboratory

Internet link:
www.dsa.no

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Related to:
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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
Special Issue 1	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

Future events:

CONCERT Short Courses

11-15 March 2019

Radiation Protection: Basics and Applications. Forschungszentrum Jülich, Germany

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

Registration deadline:
11 December 2018

15-19 April 2019

EURADOS-CONCERT School on uncertainty in biological, physical, and internal dosimetry following a single exposure. Institut de radioprotection et de sûreté nucléaire (IRSN), France

Contact:
Sophie Ancelet
sophie.ancelet@irsn.fr

Registration deadline:
15 February 2019

23 April-3 May 2019

Assessment of long-term radiological risks from environmental releases. Technical University of Denmark, Risø Campus, Denmark

Contact:
Kasper Andersson
kgan@dtu.dk

Registration deadline:
15 January 2019

29 April-10 May 2019

Cellular effects of ionising radiation – introduction to radiation biology Acronym: CELOD, Stockholm University, Sweden

Contact:
Andrzej Wojcik
andrzej.wojcik@su.se

Registration deadline:
24 February 2019

19 May-2 June 2019

Measurement techniques used in monitoring of naturally occurring radionuclides. Central Mining Institute, Katowice, Poland

Contact:
Boguslav Michalik
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Registration deadline:
4 January 2019

See also on CONCERT website

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

Issue 35
March 2019

AIR2

Access to INFRASTRUCTURES for Radiation protection Research

Issue	Exposure platforms	Databases, Sample banks, Cohorts	Analytical platforms, Models & Tools
Published to date:			
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 2	MEDIRAD	MEDIRAD	MEDIRAD
Feb 2018, #24	UNIPI-AmBe	Greek interventional cardiologists cohort	SNAP
Special Issue 3	2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS	2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS	2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS
Mar 2018, #25	IRRAD	MARiS	BIANCA
Apr 2018, #26	Forest observatory site in Yamakiya	BBM	OEDIPE
May 2018, #27	Belgian NORM Observatory Site	The German Thorotrast Cohort Study	VIB Proteomics Core
Jun 2018, #28	CERF	Mayak PA worker cohort	Geant4-DNA
Jul 2018, #29	TIFPA	RHRTR	D-DAT
Sep 2018, #30	HIT	The TRACY cohort	COOLER
Oct 2018, #31	PTB Microbeam	The BRIDE platform	BRENDA
Nov 2018, #32	AGOR Facility at KVI-CART LNK		MARS beamline at SOLEIL
Dec 2018, #33	PARISII	The ISIBELa cohort	CIEMAT WBC
Feb 2019, #34	The MIRCOM microbeam	The ISE cohort	EFFTRAN
Special Issue 4	NSRL	LSAH & LSDA	GeneLab
Mar 2019, #35	IRSE Experimental Farm	The MWF database	DSA Environmental Laboratory

Future events:

Other Events

5-6 March 2019
NUCL-EU 2020 EURATOM – Horizon 2020 Training on Proposal preparation, Technology Centre CAS, Prague, Czech Republic

25-28 March 2019
TRANSAT:
First Tritium School, Ljubljana, Slovenia

25-29 March 2019
EURADOS Training Course on Technical Recommendations for Monitoring Individuals for Occupational Intakes of Radionuclides, IAEA, Vienna, Austria
Contact:
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Bastian.breustedt@kit.edu

3-5 April 2019
5th NERIS Workshop & 10th General Assembly, Roskilde, Denmark

10-12 April 2019
8th EUTERP Workshop 2019 : Optimizing radiation protection training, Qawra, St. Paul's Bay, Malta

10-12 April 2019
MELODI Workshop on non-cancer effects of ionizing radiation, Sitges, Spain

23-26 April 2019
INSINUME 2019: 8th International Symposium on "IN SItuNUclearMEtrology as a tool for radioecology", Kuşadası, Turkey

13-16 May 2019
ConRad 2019, Munich, Germany

13-16 May 2019
Confidence training course
Use of uncertain information by decision makers at the various levels within the decision making process and its Communication, VUJE, Trnava, Slovak Republic

27-31 May 2019
ICDA-3:
3rd International Conference on Dosimetry, Lisbon, Portugal

10-14 June 2019
Seventh International Conference on Radiation in Various Fields of Research (RAD 2019), Herceg Novi, Montenegro

1-3 July 2019
RICOMET 2019, **Barcelona**, Spain

25-29 August 2019
ICRR 2019: 16th International Congress of Radiation Research, Manchester, UK

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

Issue 35
March 2019