AIR²
Access to INFRASTRUCTURES for Radiation protection Research

Issue 33
December 2018

Editorial

After more than 30 issues of AIR², it appears that the research infrastructures of some CONCERT partners have still not been featured. Therefore, starting with this 33rd issue, we are inviting a number of partners to give an overview of their infrastructures in *"The Floor to …"*, beginning with CIEMAT. It is crucial for the radiation protection research of each country to be represented, and the infrastructures of all the partners must be given visibility. Thus, in addition to *"The Floor to…"*, the first CIEMAT analytical platform is also presented in this issue and other platforms will follow, in particular exposure and analytical platforms. Another tool we have implemented in CONCERT is the AIR²D² infrastructure database. If you wish to have your infrastructure listed without featuring it in the AIR² bulletin, you can do so directly from the CONCERT website.

Dr Laure Sabatier, CEA

The floor to...

CIEMAT (Research Centre for Energy, Environment and Technology) is a Public Research Institution of the Spanish Ministry of Science, Innovation and Universities. CIEMAT is a reference centre for R&D activities in radiological protection in Spain, participating and leading national and international research projects in radioecology, dosimetry of ionising radiation, environmental radioactivity monitoring, radiation protection of workers, the public and the environment, radioactive waste management and ionising radiation metrology. CIEMAT also plays an important role in the social sciences and in the education and training of professionals (radiation protection, radioactive waste management, nuclear safety), and has wide experience in organising workshops and other scientific events.

CIEMAT - Spanish national reference centre for R&D activities in radiological protection

To date, CIEMAT has participated in many relevant European and international projects (BIOMOVS-II, BIOMASS, TARRAS, CREAM, FUTURAE, GENRISK, FASSET, ERICA, EMRAS-II, STAR, NERIS-TP, MODARIA-I, PREPARE, COMET, MODARIA-II, OPERRA-CAThyMARA). In addition, CIEMAT is a member of the European radiation protection research platforms ALLIANCE, EURADOS and NERIS, where it actively contributes to the development of the Strategic Research Agendas and Roadmaps of these platforms.

In the EJP-CONCERT, CIEMAT was mandated as Programme Manager by the Spanish Ministry of Economy, Industry and Competitiveness, and actively participates in WP2, WP3, WP6, WP7, as well as in the 1st CONCERT Call funded projects CONFIDENCE (coordinating WP4) and TERRITORIES (coordinating WP1).

CIEMAT's infrastructures for radiation protection research are presented in AIR², starting with the Whole Body Counter laboratory featured in the current issue (category "Analytical platforms, Models & Tools"), and continuing in 2019 with other CIEMAT radiation protection infrastructures such as the Radioanalytical Laboratories (including the *in vitro* bioassay laboratory and the ICP-MS laboratory), the Retrospective Dosimetry Laboratory and the External Dosimetry Service.

CIEMAT has supported the implementation of a Quality Assurance Program in the radiological protection facilities; the Radiation Dosimetry laboratories achieved the accreditation according to ISO/IEC 17025 standard in 2012.

Dr Almudena Real
CIEMAT representative in EJP-CONCERT
CONCERT WP2, WP3, WP6, WP7, CONFIDENCE, TERRITORIES

Photo: CIEMAT

CONCERT CORNER

Future events:

Call for Travel Grants
Next deadline: 31st December 2018
Information

WP 6 News:

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

Follow the TERRITORIES PROJECT BLOG https://territoriesweb.wordpress.com/

Contents:

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February 2018

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

PARISII

Internal contamination facility for rodents

The international scientific community, and particularly scientists in the field of radiation protection in Europe, are confronted with the effects of chronic exposure to low concentrations of radionuclides, a problem highlighted by the consequences of the accident at the Fukushima nuclear power plant. To tackle this problem requires implementation of *in vivo* experimental studies based on the effects of long term exposure of rodents (rats and mice), complemented by *in vitro* studies. This type of research programme requires an authorized animal facility for rodents (rats, mice) contaminated by radionuclides, and radiotoxicology laboratories for the exploitation of biological material. This is the aim of PARISII, an experimental platform unique in Europe and operational since September 2017.

Rodents can be exposed either by ingestion or inhalation in order to study the effects of internal contamination, notably by different radionuclides such as radioactive uranium, cesium and strontium, over the short, medium and long term (up to 24 months). Exposure to some radiopharmaceuticals is also possible. This platform is suitable for conducting research projects on environmental, occupational and accidental situations complementary to epidemiological studies.

PARISII includes a fully-equipped experimental platform with 850 m^2 dedicated to *in vivo* experiments and 600 m^2 to associated laboratories:

- Eight rooms for housing rats (1300) and mice (1500) in racks with ventilated cages, and auxiliary rooms (laundry, storage).
- A behavioural studies laboratory with different tests (open-field test, elevated-plus maze, water-maze, forced swim test, rotarod test…).
- An inhalation platform using nose-only inhalation chambers, including one for polydispersed micronic aerosols and another for nanosized aerosols.
- Several laboratories dedicated to surgery, biochemistry, radiochemistry, molecular biology, microscopy, histology and electrophysiology.
- Two cell culture rooms (L2).
- Beta and gamma counters are available to monitor exposure and incorporation of radionuclides in the animals following euthanasia. A zooradiameter also allows beta and gamma measurements to be performed on live animals. Another group of laboratories is dedicated to the preparation of biological samples (calcination and mineralization) for subsequent analysis by ICP-MS.

Photo: IRSN

Dr Laurence Roy

PARISII is open to national and international scientific collaboration with both academia and the private sector. These collaborations are supported by IRSN's multidisciplinary research teams, which include toxicologists, radiobiologists, chemists, veterinarians, and physiology and animal experiment technicians. Special attention is given to the housing and care of the animals to ensure their well-being, in line with animal ethics guidelines and regulations.

Photo: F. Acerbis/IRSN

Clockwise from top left: (1) Ratroom, (2) Inhalation glove box for micro and nanoparticles exposure, (3) Procedure room (surgery, dosing and sampling, euthanasia…), (4) Behavioural laboratory, with Morris Water Maze apparatus, (5) Mouse room

Assessment of the central effects of natural uranium *via* behavioural performances and the cerebrospinal fluid metabolome, Lestaevel P., Grison S., Favé G., Elie C., Dhieux B., Martin J. C., Tack K., Souidi M. (2016), Neural Plast, 2016, 9740353

DNA damage induced by Strontium-90 exposure at low concentrations in mesenchymal stromal cells: the functional consequences, Musilli S., Nicolas N., El Ali Z., Orellana-Moreno P., Grand C., Tack K., Kerdine-Römer S., Bertho J. M. (2017), Sci Rep, 7, 41580

IRSN
INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

ID Card:

Exposure type:
Internal contamination

Sources:
U, Sr, Cs, Pb, C, Co,
H Radiopharmaceuticals

Dose rate:
According to each radionuclide and within administrative authorization

Irradiation type:
Alpha, beta, gamma

Irradiated organism type:
Cells, animals (rodents)

Address:
IRSN
31 avenue de la Division Leclerc
92262 Fontenay-aux-Roses Cedex, France

Access:
Open to collaboration

Supporting lab:
SPF animal facility, Inhalation chambers, Biomolecular lab, Biochemistry lab, Cell culture lab, Imaging, Behaviour platform

Internet link:
https://www.irsn.fr/EN/Research/Scientific-tools/experimental-facilities-means/

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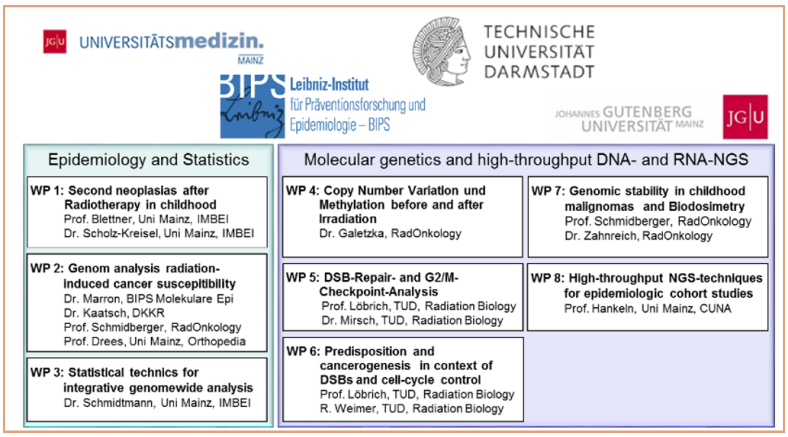
Related to:
EURADOS
MELODI

The ISIBELa cohort

An interdisciplinary study on radiation induced second cancer

Second primary neoplasms (SPN) are one of the most severe late effects of a first primary neoplasm (FPN) in childhood. Nearly one in ten former cancer patients develops an SPN within 35 years of the occurrence of an FPN. Although radiotherapy and chemotherapy are well known risk factors for SPN, there seems to be an intrinsic genetic sensitivity, making some patients more susceptible to radiation-induced cancer than others.



The ISIBELa project partners and working packages

The ISIBELa cohorts are based on the cohort of the German Childhood Cancer Registry (GCCR) which was established in 1980 to collect all cases of childhood cancer in Germany occuring below the age of 15. Since 2009, cases occurring between age 15 and 18 are also included. The GCCR is 96 % complete and patients are actively followed up for survival and SPNs. As GCCR is an epidemiological register, it does not store therapy data. However, 95 % of all cases of childhood cancer are treated in clinical therapy studies.

The ISIBELa Dosimetry cohort SCAR (Second Cancer After Radiotherapy) contains 1,244 SPN cases occurring after childhood cancer and 4,000 age and sex-matched controls of childhood cancer patients without SPN. Individual radiotherapy doses are gathered by reconstruction of the treatment arm of each patient from the particular clinical study involved. This is done in collaboration with the German Society for Pediatric Oncology and Hematology (GPOH), and provides a database containing all pediatric clinical therapy studies. For patients not included in a study or for whom the data could not be retrieved, therapy data have been gathered from hospital medical records.

Individual organ doses are estimated using the University of Florida Hybrid Phantom family developed by Lee et al. (1, 2) and the Eclipse V.15.1 therapy planning system (Varian Medical System, Palo Alto, CA).

Chemotherapy data is provided by the ISIBELa partner study STATT (Second Tumours After Tumour Therapy), conducted by the GCCR.

The molecular epidemiologic ISIBELa study, KIKme, contains 104 cases of patients with SPN and 377 former childhood cancer patients with no SPN, matched by sex, age at first cancer and follow-up duration, and 137 controls with no cancer diseases, matched by sex and age.

Photo: University Mainz

Dr Peter Scholz-Kreisel

All participants are asked to provide a skin tissue sample and a saliva sample, and to fill out a questionnaire on their family history including cancer and other diseases, radiation exposure and lifestyle factors. The skin sample is used to create non-tumour fibroblast cell lines from each patient. Whole RNA-sequencing before and after irradiation and whole genome sequencing is performed for 65 triplets (1 SPN, 1 Non-SPN, 1 Control). Sequencing of a triplet is done on an Illumina Sequencer in a single batch to minimise batch effects.

The study also includes experiments on double-strand breaks, chromosomal aberrations, single nucleotide polymorphisms and methylation, to get close to the full picture of the differences in handling radiation exposure in radiosensitive and non-sensitive persons respectively. The study is sponsored by the German Federal Ministry of Education and Science (BMBF), Study No. 02NUK042A-D.

The ISIBELa research group

Photo: B.Hof-Barocke/University Mainz-Medical Department

ISIBELA Intrinsische Strahlenempfindlichkeit: Identifikation biologischer und epidemiologischer Langzeitfolgen

ID Card:

Cohort type:
Childhood cancer survivors with and without a second primary neoplasm, partly exposed to radiotherapy (6-90Gy). Dosimetry reconstructed for 5,200 patients by analysing treatment protocols and hospital medical records.

Fibroblast samples for 104 second neoplasm patients, 377 first neoplasm patients and 137 age and gender-matched, cancer-free controls.

Age:
- at exposure: 0-15 years (treatment of first neoplasm)
- current age: 18-45 years

Biobank available:
Yes

Sample type:
Non-tumour fibroblasts, saliva

Sample storage conditions:
Fibroblasts: liquid nitrogen

Saliva: room temperature

Access:
Due to data protection issues, no external access is currently possible.

Internet link:
www.unimedizin-mainz.de/isibela
(German language)

Contact:
Dr Peter Scholz-Kreisel
peter.scholz-kreisel@uni-mainz.de
+49 61 31 17 31 21

Related to:
MELODI

Second malignancies following childhood cancer treatment in Germany from 1980 to 2014, Scholz-Kreisel P., Kaatsch P., Spix C., Schmidberger H., Marron M., Grabow D., Becker C., Blettner M. (2018), Dtsch Arztebl Int, 115 (23), 385-392
Searching for gene expression differences in primary fibroblasts between patients with one and two neoplasms in childhood, Victor A., Weis E., Messow C. M., Marron M., Haaf T., Spix C., Galetzka D. (2013), Pediatr Hematol Oncol, 30 (1), 33-45

CIEMAT Whole Body Counter (WBC)

In vivo monitoring of gamma emitters retained in the body

CIEMAT WBC can perform *in vivo* monitoring of radionuclides emitting X-ray and/or gamma radiation, which are incorporated into the human body through inhalation, ingestion, injection or a wound. The activity (Bq) detected in the exposed person is interpreted in terms of committed effective dose E(50) (mSv) in an internal dosimetry frame. The CIEMAT Internal Dosimetry Service is ISO/IEC 17025 accredited (since 2012), validating its technical competence for *in vivo* and *in vitro* monitoring and dose assessment for internal exposures.

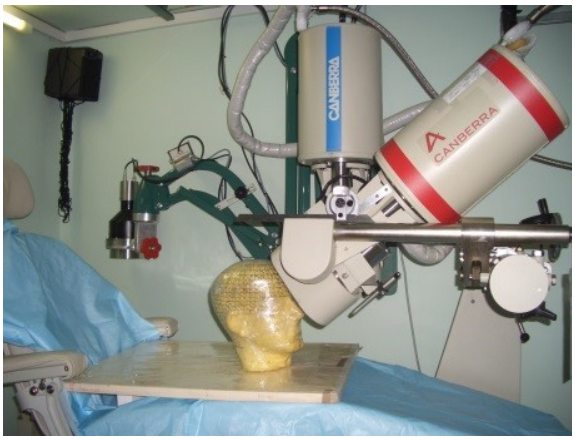


Photo: CIEMAT WBC

Measurement of Am-241 in a USTUR skull phantom with CIEMAT LE Ge detector. EURADOS Intercomparison

Workers at risk of intake of radioactive materials in the workplace, or members of the public affected by a radiological or nuclear accident, can be included in individual monitoring programmes for the identification and quantification of internal contaminants, at the CIEMAT WBC laboratory. Fission and activation products distributed in total body are evaluated using a high efficiency FASTSCAN Counter (2 NaI(Tl) detectors) in routine programmes (count time of 5 minutes).

The CIEMAT WBC facility also includes a shielded room constructed in 1967 with steel walls lined with Pb, Cd, and Cu to perform low-background measurements. One large NaI(Tl) detector and 4 LE Ge detectors of high resolution are used inside the shielded room for different applications.

Photo: CIEMAT

B. Pérez M. A. López J. F. Navarro

The equipment is calibrated by measuring appropriate calibration phantoms simulating the internal contamination of total body or of specific organs (LLNL torso phantom, BOMAB total body phantom, Spitz knee phantom, Cohen skull phantom, ANSI thyroid phantom, IRSN wound phantom) depending on the biokinetics of the radionuclides of interest. Determination of enriched uranium in the lungs is performed with the LE Ge system in the case of incidents where workers have been internally exposed through inhalation during fabrication of nuclear fuel elements for the Spanish Nuclear Power Plants. Thyroid monitoring for radioiodine (I-125, I-131) can be performed with all the detection systems mentioned above.

CIEMAT WBC techniques are validated on a regular basis through participation in intercomparison exercises, mainly organised by IRSN (France) and EURADOS (European Radiation Dosimetry Group). Other methods have been developed as a result of research projects or international actions such as for the determination of contaminants in wounds or of Am-241 in bone (skull and knee), with important feedback from Monte Carlo simulations on the measurement geometries using voxel phantoms, e.g. for improving counting efficiency.

The remaining research activities of CIEMAT WBC are focused on developing capabilities for monitoring populations of different gender and age involved in a radiological or nuclear event (e.g. CAThyMARA Project, EC OPERRA). In these cases, calibration efficiencies are provided in scale for groups of populations according to the ICRP89 publication, to improve the reliability of the results of activity and the dose assessment of the radionuclides detected.

ID Card:

Analytical platform type:
Internal Dosimetry

Main techniques proposed:
In vivo monitoring of exposed persons:
- Radioiodine in thyroid
- Actinides in lungs
- Gamma emitters in total body
- Gamma emitters in a wound by gamma spectrometry

Capacity:
Max. 600 persons per year

Duration of experiment:
Max. 45 min

Intercomparison exercise proposed:
IRSN intercomparisons
EURADOS intercomparisons

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Related to:
EURADOS

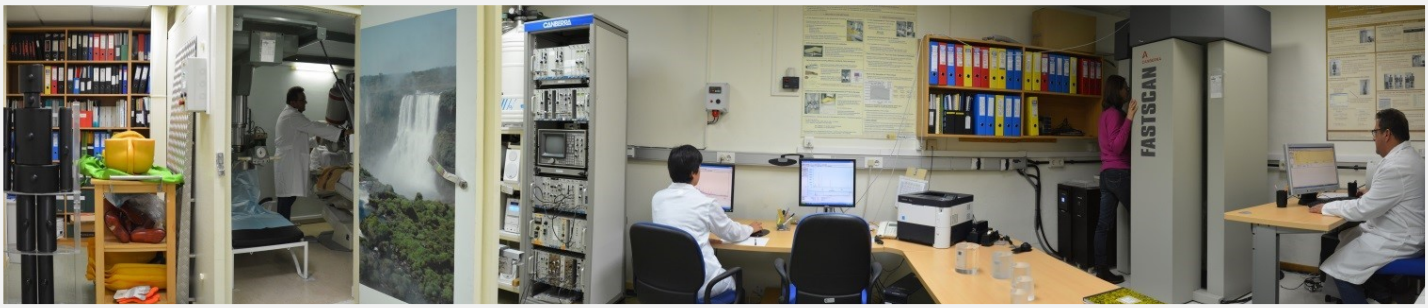

Photo: CIEMAT

CIEMAT Whole Body laboratory. Shielded room and FASTSCAN Counter.

Methodology at CIEMAT Whole Body Counter for *in vivo* monitoring of radioiodine in the thyroid of exposed population in case of nuclear emergency, Pérez B., Navarro J. F., López M. A. (2018), Radiat Prot Dosimetry, doi: 10.1093/rpd/ncy045
Efficiency study of a LEGe detector system for the assessment of ^{241}Am in skull at CIEMAT Whole Body Counter, Pérez B., Navarro J. F., López M. A., Nogueira P. (2016), Radiat Prot Dosimetry, 170 (1-4), 231-236, doi: 10.1093/rpd/ncv404

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	RES^{3}T	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

21 January-1 February 2019

Radiation epidemiology, dosimetry and radiation protection concepts of ICRP, Helmholtz Center, Munich Institute for Radiation Protection, Germany

Contact:
Werner Rühm
werner.ruehm@Helmholtz-muenchen.de

Registration deadline:
10 December 2018

11-22 February 2019

Two-week training course on radiation-induced effects with particular emphasis on genetics, development, teratology, cognition, cancer as well as space-related health issues, SCK•CEN, Belgium

Contact:
Sarah Baatout
sbaatout@sckcen.be

Registration deadline:
18 January 2019

18-22 February 2019

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

Contact:
Nina Chobanova
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Registration deadline:
20 January 2019

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

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

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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 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: L EU-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
Coming soon:			
Feb 2018, #34	To Be Announced	To Be Announced	To Be Announced

Future events:

Other Events

9-25 January 2019
Radioecology Courses 2019 - NMBU, Aas, Norway
Contact:
Ole Christian Lind
olelin@nmbu.no

11-14 February 2019
EURADOS Annual Meeting 2019, Łódź, Poland

21-22 February 2019
Environmental Epigenetics Workshop - From Mechanisms to Regulation, Örebro, Sweden

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:
Bastian Breustedt
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

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

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

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

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

See also on CONCERT website

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

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