

Editorial

Funding opportunities for exposure platforms are infrequent, so this month we're highlighting the [CORA](#) call: **ESA's new Continuously Open Research Announcement for Investigations into the Biological Effects of Space Radiation**. This open call allows scientists to make use of beamtimes available at 5 European state-of-the-art radiation facilities in Europe ([GANIL](#)—France, [AGOR KVI-CART](#)—The Netherlands, [HIT](#)—Germany, [UPTD](#)—Germany and [TIFPA](#)—Italy). Scientific priorities are focused on radiation protection topics:

- To provide quantitative estimates of the dose and dose-rate dependence of the risk for radiation-induced acute and late morbidity, including cancer and noncancerous effects
- To identify, develop and validate early biomarkers of risk for ensuing radiation-induced health detriment
- To identify, develop and validate biomedical and physical countermeasures, including the potential impact of individual susceptibility.

ESA will support selected proposals with a maximum of €50K to cover the access costs to the facility as well as consumables and costs for travel/subsistence for the investigators.

So, don't hesitate to apply - the winners are those who try!

Dr Laure Sabatier, CEA

The floor to...

The Portuguese Foundation for Science and Technology (FCT), a publicly-funded government agency under the responsibility of the Ministry for Science, Technology and Higher Education, supports science, technology and innovation across all areas of research. As part of its mission, FCT also supports research in infrastructures in all fields, thus sustaining scientific and technological advances and strengthening the scientific R&D&I community at national and international level.

Within the CONCERT EJP consortium, FCT is involved in WP4, together with the Swedish Radiation Safety Authority (SSM), the State Research Agency of the Ministry of Economy, Industry and Competitiveness of Spain (MINECO-AEI), and the French National Research Funding Agency (ANR), who leads the workpackage.

The main objective of WP4 is to organise and manage the two CONCERT open calls to support multidisciplinary and transnational innovative research projects in radioprotection. As a funding agency, FCT has extensive experience in managing calls for SR&TD project grants in all domains of science, at both national and international level.

FCT has contributed to WP4 by actively participating in the defining of adequate call procedures and in the preparation of call documents;

FCT has also acted as an observer in the Peer Review Panel meetings and has been involved in the elaboration of deliverables. Now that the evaluation process for the two CONCERT calls is finished, the next WP4 task of monitoring the nine funded projects is starting. FCT has also collaborated in creating the templates for the progress reports and final reports.

The two open CONCERT calls

have added value to this programme by creating the opportunity to implement transnational and multidisciplinary project consortia of very high quality in radiation protection research; these consortia are composed of teams from different research fields and included members not only from among the CONCERT partners but also the Third Parties.

The outcome of these projects remains to be assessed, but hopefully they will contribute towards a better knowledge of how to minimise the side-effects of radiation and a better level of preparedness for radiation disasters.

Aiming towards sustainable scientific and technological advances by reinforcing research at national and international level

Dr Rita Cavaleiro
Science Officer - FCT
CONCERT WP4



Photo: FCT



Future events:

E&T Call 2018

Opening date: 1st April 2018

Deadline: 30th April 2018

[Information and template](#)

Call for Travel Grants

Next deadline: 30th June 2018

[Information](#)

WP 6 News:

Next WP6 meeting:

19th April, CIEMAT

Madrid, Spain

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:

Contents:

Exposure platforms	Forest observatory site in Yamakiya
Databases, Sample banks, Cohorts	BBM
Analytical platforms, Models, Tools	OEDIPE

Next issue

May 2018



Observatory sites

Forest observatory site in Yamakiya

Fukushima observatory sites contaminated by radiocaesium

Fukushima University has established forest observatory sites in Yamakiya, Tsushima and Okuma (Fukushima). The Yamakiya forest observatory site (37°35'20.5"N, 140°42'37.1"E) is located 35 km north-west of the TEPCO* Fukushima Daiichi Nuclear Power Station and has been operational since it was established in 2014.

two orders of magnitude, even in the limited area. The external radiation dose in the frog from radiocaesium ($^{134+137}\text{Cs}$) calculated using the ERI-CA tool was $4.2 \mu\text{Gy}\cdot\text{h}^{-1}$. The internal radiation dose in the frog was $0.2 \mu\text{Gy}\cdot\text{h}^{-1}$, which was 5% of the external dose.



Photo: H. Tsukada/IER

Dr Hirofumi Tsukada



Photo: H. Tsukada/IER

Forest observatory site in Yamakiya, Fukushima

The site is a cedar-dominant community of approximately 7 ha, with an elevation difference of approximately 100 m. Average temperature is 12.7°C (-9.3 - 37.1°C) and annual precipitation is $1220 \text{ mm}\cdot\text{y}^{-1}$.

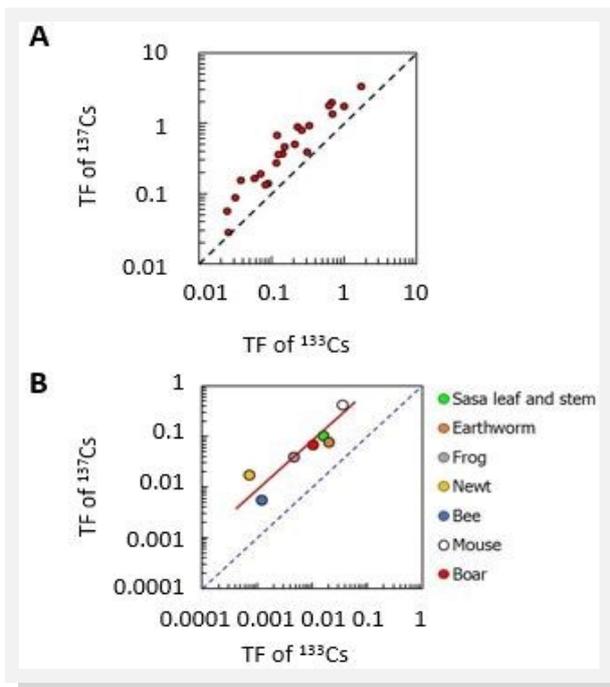
The major soil type is Andosols and it supports a planted Japanese Sugi cedar stand. The ^{137}Cs inventory is $670 \pm 400 \text{ kBq}\cdot\text{m}^{-2}$ ($n=6$) and ^{137}Cs activity concentration in surface soil (humus + depth of 0-10 cm) is $19 \pm 8.3 \text{ Bq}\cdot\text{g}^{-1}$. The distributions of ^{137}Cs in exchangeable, bound-to-organic matter and residual fractions in the 0-5 cm soil layer collected in 2015 were 5%, 4% and 91% respectively, with most of the ^{137}Cs in the strongly bound fraction.

No other contamination by heavy metals was observed in the area. Aggregated Transfer Factor (TF) for ^{137}Cs , defined as the concentration of ^{137}Cs in animals ($\text{Bq}\cdot\text{kg}^{-1}\text{FW}$) divided by soil ^{137}Cs levels ($\text{Bq}\cdot\text{m}^{-2}$), has been determined. Tags in earthworm, frog, newt, bee, mouse and boar were 0.0022, 0.0014, 0.00049, 0.00016, 0.012 and 0.0019 respectively.

The mean ^{137}Cs radioactivity concentration in the Montane brown frog collected at the Yamakiya observatory site in 2016 was 1.12 ± 0.81 ($n=20$) $\text{Bq}\cdot\text{g}^{-1}\text{FW}$. The range of radioactivity concentration (0.08 - $3.2 \text{ Bq}\cdot\text{g}^{-1}\text{FW}$) was

Previously reported TF from substrate to mushroom of ^{137}Cs is well correlated with that of stable ^{133}Cs . This suggests that the transfer of ^{133}Cs from substrate to mushroom is utilised as a natural analogue of radiocaesium. The transfer factors, defined as the concentration of ^{137}Cs in plant and animals divided by that in surface soil, were well correlated with the transfer factor of ^{133}Cs . This indicates that the behaviour of ^{133}Cs can be regarded as a useful analogue for predicting long-term changes of radiocaesium in the forest environment.

*Tokyo Electric Power Company



A) Comparison of transfer factor of stable ^{133}Cs and ^{137}Cs in mushroom in 1992.

B) Comparison of transfer factor of stable ^{133}Cs and ^{137}Cs in plants and animals collected in Yamakiya, Fukushima.



ID Card:

Type of ecosystem contaminated:

Semi-natural forest environment

Compartment of environment contaminated:

Soil, water, sediments, plants, animals

Contamination source:

Radiocaesium, radioiodine and other radionuclides from TEPCO's FDNPS accident

Radioactivity or dosimetric characteristics:

Radiocaesium is the major source of contamination, and Pu, ^{90}Sr et al. are also deposited in the surrounding areas of the FDNPS

Total contaminated area:

953 km^2 ($>20 \text{ mSv}\cdot\text{y}^{-1}$, 7% of Fukushima Prefecture)

Species exposed/present in the site:

Japanese cedar, pine and broad-leaf trees, bamboo, fern, sasa plant, earthworm, frog, newt, mouse, wild boar, etc.

Authorized related data/samples:

COMET report, publications

Supporting lab:

Institute of Environmental Radioactivity (IER) at Fukushima University supports sampling, pretreatment and analyses

Access:

Permission from IER is required

Address:

Yamakiya, Kawamata, Fukushima Prefecture

Contact:

Pr. Dr Hirofumi Tsukada
hirot@ipc.fukushima-u.ac.jp
+81 24 503 3013

Related to:

ALLIANCE

The Bank of Biological Materials of SBRC

A 20,000 sample collection of individuals exposed to long term ionising radiation at various doses

The Bank of Biological Materials (BBM) was created in Seversk (Russia) in 2002 by the Seversk Biophysical Research Center of the Russian Federal Medical and Biological Agency (SBRC). The aim of the BBM is to collect samples from employees of the Siberian Group of Chemical Enterprises (SGCE), the world's largest nuclear industrial complex, and from the residents of Seversk, an industrial town located in immediate proximity to the SGCE.



Low-temperature refrigerators "Sanyo MDF-U32V" for deep freezing and storage of biological samples

The BBM collection is subdivided into four categories: 1) Healthy employees of SGCE, 2) Healthy Seversk residents, 3) Patients with malignant tumours (MT) (SGCE employees and Seversk residents), and 4) Patients with acute myocardial infarctions (AMI) (SGCE employees and Seversk residents).

The collection currently comprises 20,000 samples from more than 10,000 donors. Sample types include whole blood, blood DNA, tissue samples (normal and tumour tissue) and cytogenetic suspensions. These four categories contain the following bioresources:

- 1) "Healthy employees of SGCE" category includes biological materials from 1,678 donors (1,139 men and 539 women) with no previous diagnosis of MT or AMI (Table 1). 197 employees of the SGCE have had no previous exposure to ionising radiation, 742 employees have been exposed only to external γ -radiation and 739 employees have been exposed to combined (external and internal) irradiation.
- 2) "Healthy Seversk residents" category contains biological materials from

individuals with no previous diagnosis of MT or AMI, and no previous exposure to ionising radiation. As of 2018, this category contains biomaterial from 1,734 donors (258 men and 1,476 women).



Photo: SBRC

Dr Ravil Takhauov

3) "MT patients" category contains whole blood samples from 982 MT patients (473 men and 509 women) of which 501 patients (319 men and 182 women) were employees of the SGCE and 481 (154 men and 327 women) were residents of Seversk who had never worked at the SGCE (Table 2). The "MT patients" category also includes tumour and normal tissue samples in FFPE blocks collected from 2,331 patients.

4) "AMI patients" category contains biological samples from 573 patients with AMI (394 men and 179 women). Out of a total of 573 patients, 386 (307 men and 79 women) were employees of the SGCE and 187 (87 men and 100 women) were residents of Seversk (Table 2).

A database (Unified Electronic Database or UED) was set up at SGCE in 2014 to provide information on donors and their biological material. This database contains information such as sex, age, donor's life status, presence/absence of radiation exposure, irradiation dose and diagnosis.

Together the BBM and UED constitute a unique resource of human biological materials and data for conducting studies on the molecular basis of individual radiosensitivity, and on the genetic mechanisms involved in the pathogenesis of common diseases following long-term exposure to low-dose ionising radiation, as well as other research studies involving radiation and medical genetics.

Table 1. Structure of the BBM category "Healthy employees of SGCE"

Healthy employees of SGCE	Unexposed to irradiation	External irradiation	Combined irradiation
Number	197	742	739
Average age (M \pm SE), years	59.73 \pm 1.07	56.20 \pm 0.40	55.36 \pm 0.41
Average duration of work (M \pm SE), years	29.93 \pm 1.58	28.75 \pm 0.66	27.09 \pm 0.76
External dose (M \pm SE), mSv	–	117.49 \pm 7.23	69.29 \pm 4.26

Table 2. Structure of the BBM categories "MT patients" and "AMI patients"

Parameter	Seversk residents	Employees of SGCE		
		Unexposed to irradiation	External irradiation	Combined irradiation
"MT patients"				
Number	481	254	147	100
Average age (M \pm SE), years	61.43 \pm 0.60	64.48 \pm 0.66	64.41 \pm 0.67	64.91 \pm 0.85
Average duration of work (M \pm SE), years	–	29.00 \pm 2.33	34.70 \pm 2.32	35.31 \pm 2.28
External dose (M \pm SE), mSv	–	–	169.67 \pm 18.63	113.46 \pm 14.04
"AMI patients"				
Number	187	147	125	114
Average age (M \pm SE), years	69.30 \pm 1.61	61.61 \pm 0.89	64.74 \pm 0.89	65.16 \pm 1.05
Average duration of work (M \pm SE), years	–	35.07 \pm 1.28	38.05 \pm 1.08	38.70 \pm 1.01
External dose (M \pm SE), mSv	–	–	135.02 \pm 19.73	120.22 \pm 14.86



ID Card:

Sample bank:

Collection of 20,000 biological samples (blood, tissue, blood DNA, cytogenetic suspensions) from more than 10,000 donors. Donors comprise: 1,734 Seversk residents, 1,678 healthy SGCE employees, 982 patients with cancer at different sites (Seversk residents and SGCE employees) and 573 patients with acute myocardial infarction (Seversk residents and SGCE employees).

Organism type of sample:

Human blood, total DNA, tissue samples

Storage condition:

–20°C, –80°C

Address:

Seversk Biophysical Research Center (SBRC)
87, Kommunistichesky avenue,
Seversk, Tomsk Region, 636070,
Russia

Access:

The database is owned by SBRC. Access to coded (anonymised) data is subject to permission from SBRC's Commission of Experts.

Internet link:

www.sbrc.ru

Contact:

Andrey B. Karpov
mail@sbrc.ru
sbnc@fmbamail.ru
+7 3823 99 40 01

Related to:

EURADOS, MELODI, EURAMED



OEDIPE

A software tool for personalised dosimetry in nuclear medicine

Nuclear medicine is currently a rapidly evolving sector, particularly due to the discovery of new tumour-specific biomarkers and the availability of previously unconsidered radionuclides. Therapeutic procedures are of particular interest in this context, and one of the challenges is how to determine the individual activity to be administered to each patient. Currently, the administered activity is still largely standard, and sometimes tailored to patient weight or body surface area, although the European Directive 2013/59/Euratom emphasises that individual dose planning should be performed.

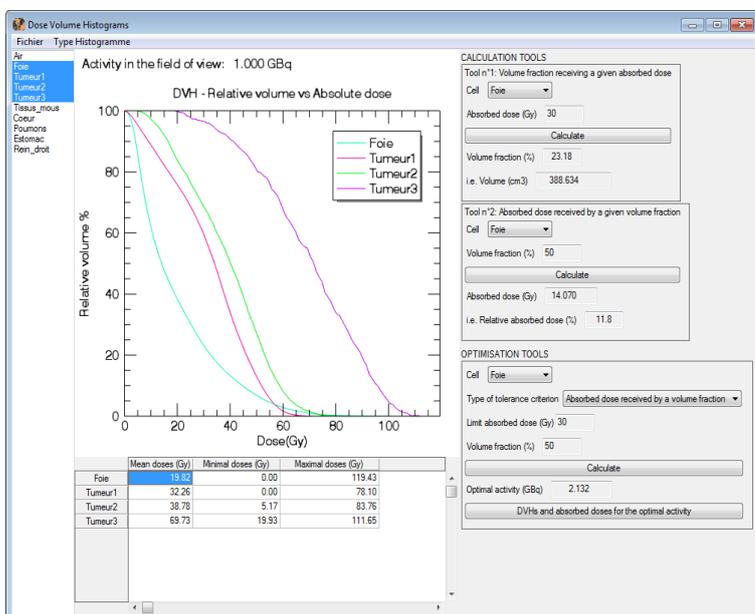
simetry. OEDIPE creates an input file that must be run with the MCNPX Monte Carlo code, and it provides tools to process the results.

Mean absorbed doses to the regions of interest, isodose curves and dose-volume histograms can be obtained from data describing the patient's anatomy, based on



Photo: Céline Lelache/IRSN

Dr Aurélie Desbrée



Dose-volume histograms for regions of interest and treatment planning optimisation tools

Since biological effects, both in terms of response and toxicity, are primarily dependent on dose rather than administered activity, it is crucial to determine the personalised absorbed doses delivered to healthy tissues.

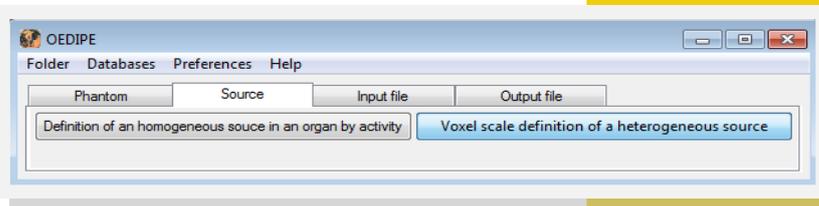
Only these estimations can ensure that healthy tissue irradiation will not lead to unacceptable toxicity, and can optimise treatment planning by calculating the maximal activity that can be safely administered to each patient. This activity is determined according to tolerance criteria for organs at risk, either for mean absorbed doses, dose-volume fractions or maximal absorbed doses.

The OEDIPE software offers a user-friendly graphical interface to carry out dosimetry, and a treatment planning tool for clinical applications of nuclear medicine. This tool has been developed to drive nuclear medicine treatment planning towards the refinements proposed in external do-

simetry. The distribution of Biological Effective Dose (BED) at the organ or voxel level can also be derived from the heterogeneous absorbed dose distribution. For treatment planning optimisation, tools have been implemented to provide the maximal injectable activity that can be administered to the patient according to tolerance criteria for organs at risk, expressed in terms of mean absorbed doses or dose-volume fractions.

Moreover, it is possible to calculate the maximal injectable activity for fractionated protocols, based on a BED tolerance criterion and depending on the number of fractions, the activity administered at each fraction, and the time delays between fractions.

In particular, this tool has been applied to selective internal radiation therapy (SIRT) in collaboration with the George Pompidou European Hospital in Paris. Therapy consists of injecting microspheres labelled with ^{90}Y into the lesions *via* the hepatic artery to treat unresectable hepatic cancers. This has allowed a 3D personalised dosimetry evaluation to be performed, based on patient-specific data and Monte Carlo calculations, and evaluated retrospectively on clinical data.



Main interface of the OEDIPE software



ID Card:

Purpose:

Dose assessment in nuclear medicine

Use:

Need some skills in the field

Housed at:

Administered by IRSN, France

Training proposed on the software:

N/A

Address:

IRSN
31 avenue de la Division Leclerc
92260 Fontenay-aux-Roses
France

Access:

On demand/through collaboration

Internet link:

<http://www.irsn.fr/EN/Research/Scientific-tools/Computer-codes/Pages/OEDIPE-Personalised-dosimetric-evaluation-tool-3443.aspx>

Contacts:

Dr Aurélie Desbrée
aurelie.desbree@irsn.fr
+33 1 58 35 80 36

Related to:

MELODI
EURADOS

Future events:

CONCERT Short Courses

16-20 April 2018

Preparedness and response for nuclear and radiological emergencies, SCK•CEN, Belgium

Contact:

Catrinel Turcanu

cturcanu@sckcen.be

16-27 April 2018

InterRad - Interdisciplinary Radiation Research, BfS, Germany

Contact:

Maria Gomolka

mgomolka@bfs.de

23 April-4 May 2018

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

Contact:

Andrzej Wojcik

andrzej.wojcik@su.se

28 May-8 June 2018

Modelling radiation effects from initial physical events, University of Pavia, Italy

Contact:

Andrea Ottolenghi

andrea.ottolenghi@unipv.it

11-29 June 2018

NORM (Naturally Occurring Radioactive Material) in work and natural environment: identification, exposure assessment and decision making process, Central Mining Institute, Katowice, Poland

Contact:

Boguslav Michalik

b.michalik@gig.eu

Other Events

11-15 June 2018

EPRBioDose 2018, Munich, Germany

13-15 June 2018

RICOMET 2018, Antwerp, Belgium

15 June 2018

MELODI Award Call 2018 deadline

20-24 August 2018

NEA International Radiological Protection School (IRPS), Stockholm, Sweden

22-25 August 2018

ERR 2018, Pecz, Hungary

1-5 October 2018

3rd ERPW, Rovinj Rovigno, Croatia

8-11 October 2018

HEIR 2018, Fontenay-aux-roses, France

[See also on CONCERT website](#)

Issue

Exposure platforms

Databases, Sample banks, Cohorts

Analytical platforms, Models & Tools

Published to date:

Oct 2015, #1	FIGARO
Nov 2015, #2	B3, Animal Contamination Facility
Dec 2015, #3	Pulex Cosmic Silence
Feb 2016, #4	SNAKE
Mar 2016, #5	Radon exposure chamber
Apr 2016, #6	Biological Irradiation Facility
May 2016, #7	CIRIL
Jun 2016, #8	Mixed alpha and X-ray exposure facility
Jul 2016, #9	SCRS-GIG
Sep 2016, #10	Facility radionuclides availability, transfer and migration
Oct 2016 #11	LIBIS gamma low dose rate facility ISS
Nov 2016, #12	Microtron laboratory
Dec 2016, #13	Nanoparticle Inhalation Facility
Feb 2017, #14	Infrastructure for retrospective radon & thoron dosimetry
Special Issue 1	1st CONCERT Call: CONFIDENCE, LDensRad, TERRITORIES
Mar 2017, #15	Alpha Particles Irradiator Calibration Laboratory at KIT
Apr 2017, #16	Changing Dose rate (SU) Low dose rate (SU)
May 2017, #17	Chernobyl Exclusion Zone
Jun 2017, #18	MELAE
Jul 2017, #19	MICADO'LAB
Sep 2017, #20	DOS NDS
Oct 2017, #21	CALLAB Radon Calibration Laboratory
Nov 2017, #22	Calibration and Dosimetry Laboratory (INTE-UPC)
Dec 2017, #23	NMG
Special Issue 2	MEDIRAD
Feb 2018, #24	UNIPi-AmBe
Special Issue 3	2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS
Mar 2018, #25	IRRAD
Apr 2018, #26	Forest observatory site in Yamakiva

FREDERICA
The Wismut Cohort and Biobank
STORE
French Haemangioma Cohort and Biobank
3-Generations exposure study
Wildlife TransferDatabase
Portuguese Tinea Capitis Cohort
Elfe Cohort
RES²T
INWORKS cohort
JANUS
EPI-CT Scan cohort
UEF Biobanking
Chernobyl Tissue Bank
1st CONCERT Call: CONFIDENCE, LDensRad, TERRITORIES
Chernobyl clean-up workers from Latvia
Belgian Soil Collection
Estchern Cohort
German airline crew cohort
Techa River Cohort (TRC)
MEDIRAD
Greek interventional cardiologists cohort
2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS
MARIS
BBM

RENEB
The Hungarian Genomics Research Network
METABOHUB
Dose Estimate, CABAS, NETA
PROFI
Radiobiology and immunology platform (CTU-FBME)
LDRadStatsNet
ERICA Tool
CROM-8
France Génomique
Transcriptomics platform SCKCEN
CATI
The Analytical Platform of the PRE-PARE project
HZDR Radioanalytical Laboratories
1st CONCERT Call: CONFIDENCE, LDensRad, TERRITORIES
SYMBIOSE
Advanced Technologies Network Center
BfS whole and partial body Counting
INFRAFONTIER
ECORITME
CERES
CORIF
Centre for Omic Sciences (COS)
iGE3
MEDIRAD
SNAP
2nd CONCERT Call: LEU-TRACK, PODIUM, SEPARATE, VERIDIC, ENGAGE, SHAMISEN-SINGS
BIANCA
OEDIPE

Coming soon:

May 2018, #27	To Be Announced	To Be Announced	To Be Announced
---------------	-----------------	-----------------	-----------------