



CEITEC

Central European Institute of Technology
BRNO | CZECH REPUBLIC



BULLETIN VOL. 2

MAFIL Core Facility



Introductory Word

Dear researchers, colleagues, partners interested in the services of our laboratory,

We have prepared the second issue of our bulletin informing about news and interesting facts related to the Core Facility of Multimodal and Functional Imaging Laboratory - CF MAFIL. At the end of 2015, a project of the national research infrastructure CzechBioImaging was approved, that is significant for our laboratory and users in terms of the budget support and access to the services. The project CzechBioImaging is addressed in a separate paragraph - see below. As a part of the national infrastructure CzechBioImaging, we will also attempt to obtain investments for supplementing the laboratory equipment, which is planned to take



MAFIL

place in 2017-2018. This issue of our information bulletin also offers an overview of our completed or planned events, as well as detailed information on the possibilities of access to the CF's services in 2016 and a list of contact persons whom you can contact if you need to resolve any specific issue. Several selected projects will be newly presented in this bulletin that have either been completed or for which measurements are currently being taken.

Thank you for your hitherto support and looking forward to our future co-operation,

On behalf of CF MAFIL, Michal Mikl, Head of the Core Facility

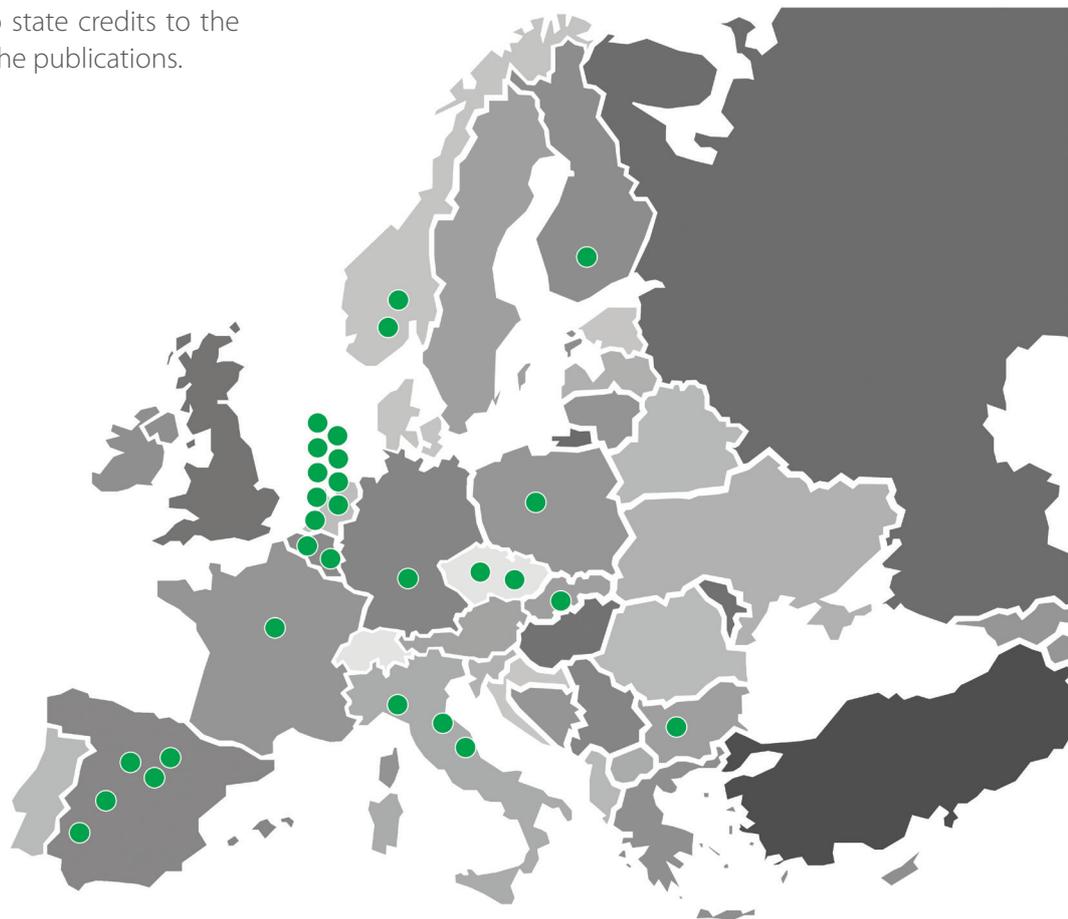




CF MAFIL as a Part of CzechBioImaging and EuroBioImaging

Since 1 January 2016, the core facility MAFIL has been a part of the national research infrastructure CzechBioImaging (www.czech-bioimaging.cz). This national research infrastructure consists of leading imaging sites in the Czech Republic. The infrastructure is equipped with biological (in particular optical microscopes) as well as medical imaging (in particular tomography methods for both human and animal studies). The research infrastructure CzechBioImaging has been approved for the period of 2016 - 2019 and the follow-up financial support will depend on the results of the research infrastructure evaluation that will take place in 2017. The laboratories participating in the infrastructure CzechBioImaging offer open access both for all academic users from the Czech Republic and abroad. Thanks to the obtained financial support, the users will only pay a fraction of the full price for the measurements performed in the participating laboratories - the user only pays a part of the costs demonstrably incurred during the measurement. The infrastructure CzechBioImaging also offers a grant scheme that is completely free of charge for selected projects of external users. In the case of access to the services of CF MAFIL through the CzechBioImaging infrastructure, the user is obliged to state credits to the infrastructure and the laboratory in the publications.

At the end of 2015, the EuroBioImaging Node in Brno was approved as the candidate node for the preparatory stage of the European infrastructure project EuroBioImaging (www.eurobioimaging.eu). During the preparatory stage, all nodes are referred to as candidate nodes, having had to pass a full approval procedure. EuroBioImaging is a European project which associates a biological and medical imaging sites for the purpose of establishing a unified network of leading sites offering open access.





News and Events 2016

- On 19 April 2016, a meeting with users was organised at CF MAFIL
- On 7 April 2016, an educational workshop „Innovations in mapping of brain function and structure: benefits and pitfalls“ took place
- At the beginning of June, the contents of CF MAFIL’s website were updated and an alternative quick access link was launched for the CF MAFIL website <http://www.ceitec.eu/mafil>

Visits and Excursions

Similarly as in 2015, various excursions, visits and tours took place at CF MAFIL this year - see the following table presenting an overview for the period from January to May 2016.

01/2016	Excursion for the participants of EPODES course
02/2016	Excursion for elementary school students
	Excursion for the participants of CEITEC-IKEM course
04/2016	Excursion for the Academic Senate of MU
	Excursion at CF MAFIL for foreign visitors of the Faculty of Sports Studies of MU
	FMRI demonstration for the visitors of BUT
	Excursion for visitors of the Chancellor’s Office of MU
05/2016	CEITEC MU open day

Planned events

- **15 September 2016** - A festival at MU (an event organised by the university with the aim to hold an open day for the employees of MU and their families - planned excursion at CF MAFIL)
- **30 September 2016** - Scientists’ night focused on the topic of SAFETY - planned excursion at CF MAFIL
- **20 October 2016** - A foreign visitor within the framework of the Life Science Seminar Series Rainer Goebel (Maastricht University)
- **14 - 16 November 2016** - educational course “Neuroimaging: mapping the function and structure of brain” designed in particular for PhD students and starting researchers

Prepared changes

- In August, a software update to the most recent version is planned on both MR scanners. This version will in the future enable the installation of certain new sequence types. In the second half of August, we expect possible partial restrictions due to testing, thank you for your patience.



Access to the Services of CF MAFIL in 2016

All measurement in CF MAFIL are based on entities called research projects (or studies). A research project is defined as a set of measurements with identical measurement protocol relating to the hypothesis of the given research project. Each project is associated with a responsible person (project owner/applicant) and its measurements are usually taken within a predefined time period.

Apart from the structure described above, several testing measurements can be taken prior to the commencement of the actual project, in order to verify the technical feasibility of the tested hypothesis and settings of the parameters. These measurements are taken in a specific regime of cooperation between the lab employees and the researcher.

Formal requirements prior to the commencement of measurements in a research project:

- Discussion of technical possibilities and time-schedule options of the project with CF staff.
- Filling in the "CF MAFIL Access Form" (available at www.ceitec.eu/mafil/doc).
- Provide final electronic version of the informed consent and approval by the ethics committee of the investigator's institution. In the case of MU applicants, this is typically the Research Ethics Committee (EKV) (<http://vyzkum.rect.muni.cz/cs/zazemi/etika-vyzkumu>).
- Final specification of the measurement protocol in the form of so-called "cookbook" containing detailed description of the measurement protocol, sequence settings, list of used devices and their parameters, etc. This part is particularly important for assuring high data quality and reproducibility.
- Selection of the access mode and the associated type of financing.

Prior to the commencement of each measurement, an informed consent signed by the measured subject is required (a copy is sufficient). The signed informed consent have to be subsequently archived together with the filled safety form of CF MAFIL.

Users book their measurement time-slots using the CEITEC planning board (<http://booking.ceitec.cz>). Each reservation on the planning board must be assigned to a specific project and confirmed by an employee of CF MAFIL prior to the measurement commencement.

The measured data will be delivered only to the researchers listed in the "CF MAFIL Access Form". All data is anonymised. Personal data of the participants may be only provided to the project owner or his designee.

Access modes

There are several access modes to services of CF MAFIL available in 2016. The differences are based on user classification (i.e. internal/external) and source of funding.

- Direct access
- CEITEC open access (www.ceitec.eu/projekt-ceitec-open-access/t1368), deadline for submission of requests: 31 July 2016
- CzBI open access (www.czech-bioimaging.cz)
- CzBI grant scheme (www.czech-bioimaging.cz/index.php?page=user_support)
- Collaboration with CF MAFIL

Details relating to each of the alternatives are described in the document entitled "Access to services of CF MAFIL in 2016" available at www.ceitec.eu/mafil/doc.

If you need any explanations or if you wish to co-operate with us, please do not hesitate to contact us.



User Support – Who to Contact

The following table provides an overview of important contact details of the lab employees:

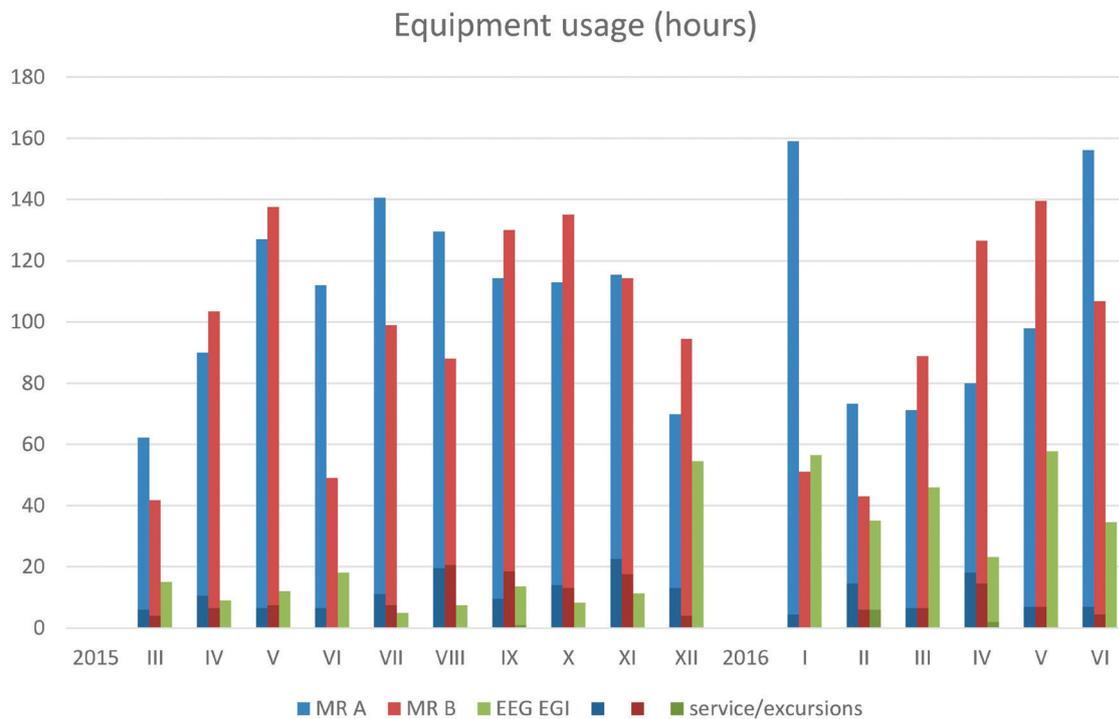
MRI Sequences, protocols, pilot measurements, etc.	Lubomír Vojtíšek Petr Kudlička	lubomir.vojtisek@ceitec.muni.cz petr.kudlicka@ceitec.muni.cz
EEG + electrophysiology Electrodes, data acquisition parameters, etc.	Martin Kojan Pavel Daniel Martin Lamoš	martin.kojan@ceitec.muni.cz pavel.daniel@ceitec.muni.cz martin.lamos@ceitec.muni.cz
General (electro)technical solutions Tools for MR and EEG measurements, connection setup, etc.	Martin Kojan Pavel Daniel	martin.kojan@ceitec.muni.cz pavel.daniel@ceitec.muni.cz
Simultaneous MR + EEG measurement Data processing, etc.	Martin Lamoš Radek Mareček	martin.lamos@ceitec.muni.cz radek.marecek@ceitec.muni.cz
Functional MRI studies Design optimisation, stimulation programming, etc.	Radek Mareček Michal Mikl Martin Gajdoš Martin Lamoš	radek.marecek@ceitec.muni.cz michal.mikl@ceitec.muni.cz martin.gajdos@ceitec.muni.cz martin.lamos@ceitec.muni.cz
MR data processing Pre-processing, group analysis, SPM toolbox, etc.	Marek Bartoň Martin Gajdoš Tomáš Slavíček	marek.barton@ceitec.muni.cz martin.gajdos@ceitec.muni.cz tomas.slavicek@ceitec.muni.cz
EEG/ExG data processing Pre-processing, signal filtering, etc.	Radek Mareček Martin Lamoš	radek.marecek@ceitec.muni.cz martin.lamos@ceitec.muni.cz
MR data transfer and preparation Data uploading, conversion, transfer, etc.	Tomáš Slavíček Marek Bartoň	tomas.slavicek@ceitec.muni.cz marek.barton@ceitec.muni.cz
Administrative support Project registration, informed consents, etc.	Michaela Vaňharová Michal Mikl	michaela.vanharova@ceitec.muni.cz michal.mikl@ceitec.muni.cz





Measurement reports of 2015/2016

In 2016, MR measurements have been so far taken for 13 research projects and EEG measurements for 7 projects. The numbers of measurement hours divided according to the devices in the past period are illustrated in the graph below. The data for calculation were taken from the CEITEC booking system (so-called planning board).



Overview of measurements in the period of 03/2015 - 05/2016



Presentation of Selected Projects

Sleep Deprivation and Structural Fluctuations in White Matter

This is an external project of prof. Paus (Rotman Research Institute, Baycrest, University of Toronto) as the principal investigator. The project was measured in January and February 2016 within the framework of a CEITEC Open Access project, with the financial support of Child Mind Institute, New York. Its objective was to monitor the impacts of sleep deprivation (4 vs. 8 hours of sleep for a period of 8 nights) on immunity and changes in the white matter in 24 healthy young men. In the course of the 10-day study, repeated MR (5 times) and EEG (4 times) measurements of all participants were taken. 48 hours of measurement time at the High-density EEG were used for the project in total and more than 120 measurement hours at MR, including simultaneous physiology recording with the use of MR compatible ExG device.

Pre-clinical genotype-phenotype predictors of Alzheimer’s disease and other dementias (APGeM)

In this project, CEITEC MU acts as a subcontractor of the project consortium. The project investigator on behalf of CEITEC MU is prof. Rektorová. In this project, patients suffering from Alzheimer’s disease and Parkinson’s disease have been monitored on a long-term basis, in comparison with age-linked healthy subjects. The goal of the project is finding early biomarkers of the analysed diseases. CF MAFIL performs measurements for the project, but there are also other examinations and neurochemical analyses being performed within the framework of the project. The project was commenced in 2014, but the first series of MR measurements was taken after the installation of MR scanners in spring 2015 (more than 220 hours of MR measurement time) and the second series, focused on the patient monitoring in one year interval, took place in spring 2016.

Innovated physical therapy programs for drivers: Neurobehavioral evaluation of empathy training (miniDRIVEN)

This is a joint research project of CEITEC MU and the Transport Research Centre (CDV). The principal investigator is Daniel J. Shaw, Ph.D. The goal of the project is finding better understanding of the empathy capability of different groups of drivers and to identify the possibilities of modifying social behaviour in the drivers' population with a complicated record of their driving practice. The project utilises the so-called "hyperscanning" - the brain activity is scanned simultaneously in two interacting individuals (the measurements are taken simultaneously at two MR devices). Thus, neurophysiology of socio-emotional behaviour is analysed in real time interactions. The project is financed by the Grant Agency of the Czech Republic and will be implemented in the period of 2016 - 2018.

STN DBS dependent modulation of functional connectivity of cortical networks

Deep brain stimulation (DBS) is a long-term efficient method of treatment of late motion symptoms of the Parkinson's disease (PD). The most frequent target of stimulation is the sub-thalamic nucleus (STN). In certain patients, we can sometimes encounter, despite the positive effect on motion symptoms, certain defects of cognitive functions and other neuropsychiatric symptoms. PD is associated with a distorted function of basal ganglia, their distorted links to the cortical structures and the resulting changes of functional connectivity of the cortex. STN plays an integrative role in the motor skill and cognition control and its stimulation probably partially renews the physiological functional connection between cortical areas, although the effects on somato-motoric and cognitive networks probably differ.

The 256-lead scalp EEG is recorded in the course of the switched on and switched off stimulation. Furthermore, in the case of intracranial subgroup, a simultaneous direct intracerebral recording is taken in combination with the scalp EEG. Advanced computation and analytic methods are used to explain the effects of STN-DBS on the motor skills and cognitive cortical networks and they correlate with the longitudinal clinical testing.

The goal of the project is the detection of changes in the functional cortical connectivity as a result of STN-DBS in order to optimise the treatment and to find a possible prediction indicator of cognitive defects associated with DBS.

Volunteers for Research Projects

One of the most important parts of the research projects implemented in the CF MAFIL are the volunteers who participate in various measurements. In order to optimize the measuring protocols, CF MAFIL performs numerous testing measurements and implements various research studies focused on technical and methodological aspects. If you are interested in taking part in these measurements, you can make a registration at the e-mail address volunteers.mafil@ceitec.muni.cz



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