



**Euro-BiImaging**  
European Research Infrastructure for Imaging Technologies in Biological  
and Biomedical Sciences

**WP9**

Access to Innovative Technologies--Medical Imaging

**Task 9.1**

Organisation of meetings

**Deliverable 9.2**

Summary report on meetings on current and future developments in UHF-MR, PC-CT and new emerging technologies

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## 1 Executive Summary

Work package 9 “Access to Innovative Technologies--Medical Imaging” is aiming to advance novel medical imaging methods in Europe and to provide access to such usually rare modalities. WP9 is thus an important aspect of Euro-Bioimaging to guarantee sustained development of medical imaging to support or even expand the leading position of Europe in this field. As a consequence, WP9 has been designed to be able to quickly adapt and evolve in the reflection of technology development. Important and quickly developing modalities, such as ultra-high field MRI or MR-PET, had already been identified at the onset of Euro-Bioimaging. While especially UHF-MRI is advancing to a more mature research modality, many challenges still need to be addressed to fully exploit the advantages of higher magnetic field strength for clinical applications. Within Europe, the number of UHF systems is increasing with now over 20 UHF MRI in operation proofing the high demand for this modality. MR-PET is an emerging modality that is still facing a number of technical challenges. Nevertheless, and contrary to UHF-MR, the first commercial systems with clinical approval are available. A small number of such systems has been installed in Europe and a small but active and growing community is established. The third modality at the edge of becoming a clinical research tool is X-Ray Phase-Contrast Imaging. Very first systems are becoming available for small animal research and the value of this extremely promising modality is currently evaluated in a number of studies with very first human studies. Future demand will critically depend on these results and the technology development to allow more compact and clinically available technology. Image contrast for soft tissues of PCI is extremely promising. For human applications issues regarding dose handling need to be solved. These three technologies have also been included in the 1<sup>st</sup> Open Call for Expressions of Interest and the respective scientific communities are informed about the progress of Euro-Biolmaging.

During the process of WP9, two additional modalities, MEG-MRI or very low field SQUID-detected MRI and MEG and Electron Paramagnetic Resonance Imaging (EPRI) have been added to the emerging medical imaging technologies. Both modalities are still considered in an early state of development and are currently not applied in humans. They promise advantages for certain application and could provide otherwise not accessible in vivo detection of physiologic information.

WP9 continues to coordinate the communication within and between these communities. In this report on D9.2 the additional meeting and communication activities in WP9 that took place after the report on D9.1 are presented.

## 2 Ultra-high field MRI

The UHF-MR community has held two meetings with all relevant European UHF stakeholders during the first reporting period (Deliverable 9.1). During these meetings the community was informed about the Euro-Biolmaging project and consensus was reached on all relevant aspects of the inclusion of UHF-MR into the first open call. A number of UHF-centres participated in the Proof of Concept Study and successfully demonstrated the feasibility of open access to this medical imaging technology.

An update about the progress of Euro-Biolmaging has been given to the community on the occasion of the Ultra-high field MR Workshop from March 2<sup>nd</sup> to 5<sup>th</sup> 2013 in the Netherlands. A number of UHF centres have expressed their plan to submit an expression of interest in the first Open Call. These initiatives are largely coordinated on a national level and we expect submissions from a number of UHF-centres.

The next meeting representatives of the European UHF-centres will take place during the next annual scientific meeting of the ISMRM in April 20 to 26 2013.

## 3 X-Ray Phase-Contrast Imaging (PCI)

### 3.1 PCI – an Emerging Technology

Access to technologies is the central topic of *Euro-Biolmaging*. To the emerging technology of biomedical X-ray Phase-Contrast Imaging (PCI) this is of special significance. The technology is now established in biological and medical research practice and several groups are developing applications towards clinical routine (e.g. mammography, pulmonary imaging and others). Yet the installation of a PCI facility is accompanied by significant monetary and intellectual efforts. And present capacity is not readily accessible to most life-scientists.

In order to develop a European network of PCI sites that satisfy user needs, WP9 (*Access to Innovative Technologies--Medical Imaging*) task 9.1 proposes the organization of meetings that bring together leaders in innovative medical imaging technology development. The aim of these meetings is to explore the latest and future developments in X-ray PCI and to discuss demand and prerequisites for access, services, and training in Europe.

The Institute for Clinical Radiology at the Clinic of the Ludwig-Maximilians University in Munich, Germany, organizes an international symposium for the interdisciplinary European PCI community, bringing together groups of scientists from medicine, biology and physics to discuss the European PCI infrastructure and potential *Euro-Biolmaging* PCI nodes.

### 3.2 IMXP - European Biomedical PCI Network

The Institute for Clinical Radiology at the Clinic of the Ludwig-Maximilians University closely collaborates with the Department for Medical Physics of the Technical University Munich to establish a variety of biomedical applications of PCI. The department head of the Institute for Clinical Radiology, Prof Maximilian Reiser, and the head of the Department for Medical Physics, Prof Franz Pfeiffer, are highly esteemed scientists in their respective fields, both within Europe and the world. Both are well connected with all renowned scientists engaged in PCI. Both groups are involved in a *DFG Research Cluster of Excellence* entitled *Munich Advanced Photonics*. Within the cluster, both groups are committed to advance PCI towards clinical applications. Manifold interactions with other European PCI research groups are well established. With Profs Reiser and Pfeiffer as part of the organizing committee, we are able to bring together all relevant European PCI scientists from medicine and physics, to ensure optimal outreach within the scientific communities.

### 3.3 PCI & Euro-Biolmaging

The symposium is entitled IMXP (*International Symposium on BioMedical X-ray Phase-Contrast Imaging*). It has been held on 13 Jan 2012 and on 24-25 Jan 2013 in Garmisch-Patenkirchen, Germany.

During the IMXP in 2012 (94 Participants from 12 countries), a plenary discussion on Euro-Biolmaging and the proof-of-concept studies has been moderated by WP9 Chair Oliver Speck. The leading opinion was that a European web of PCI nodes would serve the community well. Working groups that operate experimental PCI set-ups are generally open for collaborative external access upon case-by-case negotiations. However, available instrument capacity appeared to be a highly limiting factor. The general opinion was that newly established PCI capacity would be highly requested if established in Euro-Biolmaging and that this was expected to be proven in the proof-of-concept studies.

During the 2<sup>nd</sup> IMXP in Jan 2013 106 participants were registered and 13 countries (10 European and 3 non-European) were represented. During the meeting the *Euro-Biolmaging* call for nodes was announced and discussed within the international community. The European PCI community appeared highly delighted that PCI was deemed eligible for the 1<sup>st</sup> call for nodes. The preliminary access policies were largely endorsed. Non-European external perspectives (from Japan, USA, South Korea) strongly endorsed the *Euro-Biolmaging* concept with respect to PCI as an emerging technology. The proof-of-concept studies provided strong evidence of high demand for access PCI instrument capacities. The present working groups discussed different strategic scenarios with respect to the geographical distribution of European PCI nodes, yet no final consensus was achieved, as to which centres would best serve as nodes for the European PCI Community. The decision to apply as a *Euro-Biolmaging* node was left with each group.

## 4 MR-PET

In December 2012, the first MR-PET summit has been organized by Siemens in Tübingen, which reviewed the worldwide MR-PET activities and addressed methodological issues associated with integrated MR-PET units. Attenuation correction based on tissue segmentation was identified as the most important challenge for the accurate quantification of PET data. Especially the truncation of the PET data by the smaller MR field of view was felt as an important limitation not only for attenuation but also scatter correction. The data on diagnostic performance confirmed first observations in Germany that whole body MR-PET compares favourably with PET-CT in most tumour entities. In Germany, a consortium of the DFG funded MR-PET sites collected more than 1000 patients with PET-CT and MR-PET studies in close temporal proximity. A taskforce was initiated, which will analyse the diagnostic performance of both hybrid methods in a number of tumour entities. The comparison will be restricted to FDG as tracer for the PET applications.

There will be first training courses for the reading of MR-PET studies organized, which will be held in Germany, Switzerland and Spain. In April 2013, the second international workshop for MR-PET will be organized by the University of Tübingen.

Preclinical and clinical data will be presented by MR-PET groups from Europe and overseas.

A first MR-PET imaging atlas (Springer) will be published by a consortium of European MR-PET users (Geneva, Copenhagen and Munich) highlighting the clinical potential of the new technique.

## 5 MEG-MRI

The MEGMRI consortium had its final meeting in Parma, Italy, on March 28-30, 2012, discussing the future of the technology and also its possible role within the Euro-Biolmaging initiative.

In addition, several members of the MEG-MRI consortium met at the Paris Biomag Conference on 26-30 August, 2012, and agreed about a project that has the aim of building a full-scale MEG-MRI system suitable for clinical and scientific use by the year 2017. We subsequently applied for EU funding (FP7-HEALTH-2013-INNOVATION-2) to realize the plan, but the application was not successful.

## 6 EPRI

There was no official meeting or teleconference between the groups working on Electron Paramagnetic Resonance Imaging since the last report (except several bilateral contacts).