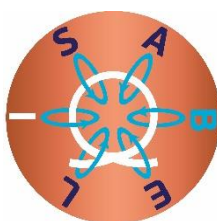


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ISABEL

Improving the sustainability of the European Magnetic Field Laboratory

D2.2 USER COMMUNITY MEETING MINUTES REPORT - 3



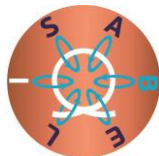
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Project Coordinator: Geert Rikken – CNRS LNCMI (P1 - CNRS)

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Version	Modifications	Date	Authors
1.0	First draft – User Meeting	09/11/23	Uli Zeitler
1.1	First draft – User Committee	14/11/2023	Raivo Stern
1.2	Updates	22/11/2023	Jochen Wosnitza
2.0	Final version	12/12/2023	Eva Bezgousko



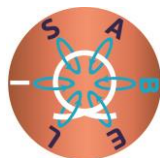
Document abstract

The deliverable is part of Work Package 2 “Community building and membership enlargement” and Task 2.2 “User Community meetings”. This deliverable is a report of the third Annual User meeting, which took place on the 12th and 13th June 2023 in Nijmegen.

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1. Introduction & User-meeting program

The aim of the yearly EMFL User Meeting is to exchange ideas and experiences, to present scientific results obtained in the EMFL facilities, and to discuss possibilities for a further improvement of the facilities' infrastructure and performance. During the meeting, newest developments of the EMFL facilities as well as invited scientific talks from selected users were presented. In addition, the yearly User Committee meeting and a dedicated workshop "*The Combination of High Magnetic Fields and Free Electron Lasers*" took place.

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After the online and hybrid meetings imposed by COVID-19 in 2021 and 2022, the User Meeting 2023 was again organized in its traditional on-site form (with the possibility to also follow it online). It took place at HFML-FELIX in Nijmegen on Tuesday, June 13 (afternoon) and Wednesday, June 14 (morning) and was organized in parallel with an HFML-FELIX user meeting and an ISABEL-supported workshop on the combination of high magnetic fields and THz radiation. In total 93 participants registered for the meeting. On top of the scientific talks of high quality, the in-person discussions during coffee and lunch breaks and a BBQ dinner on Tuesday evening were particularly productive in exchanging ideas and experiences between users and EMFL staff.

EMFL USER MEETING 2023 - PROGRAM

Tuesday, 13 June 2023

12:00 Arrival and lunch – HFML-FELIX, Radboud University, Nijmegen

13:30 Welcome and introduction – EMFL /HFML-FELIX user meeting

Britta Redlich, Director HFML-FELIX, Nijmegen

13:35 **Plenary talk EMFL / HFML-FELIX user meetings**

Gas-phase ion fluorescence spectroscopy – Seeing the light

Steen Brøndsted Nielsen, Aarhus University

14:30 Welcome and Introduction – EMFL user meeting

Charles Simon, Chair EMFL BoD and Director LNCMI-CNRS, Grenoble/Toulouse

14:50 Announcement of the 2022 EMFL prize winner

Jochen Wosnitza, Chair EMFL Selection Committee & Director HLD-HZDR, Dresden

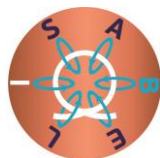
14:55 Presentation by the EMFL prize winner

The Dual Character of Cuprate Superconductors

Jake Ayres, University of Bristol

Invited talks by EMFL users

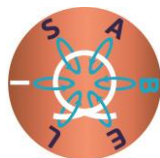
15:20 Research in megagauss fields: the quest for non-perturbative magnetic field effects



- Yasuhiro Matsuda, University of Tokyo
- 15:40 Magneto-optics of Weyl semimetals
Ana Akrap, University of Fribourg
- 16:00 Electrons with Planckian Scattering in Strange Metals
Amirreza Ataei, University of Sherbrooke – online talk
- 16:20 Coffee break
- 16:40 **User Committee Meeting**
Raivo Stern, NICPB Talin, Chair of the EMFL User Committee
- 17:40 Report of the User Committee to the EMFL Board of Directors
- 18:00 Barbeque in the “HFML-FELIX garden”
& Time for informal lab visits and discussions

Wednesday, 13 June 2023

- 09:00 Magnetic quantum oscillations and purity-boosted triplet superconductivity in UTe_2
Alex Eaton, University of Cambridge
- 09:20 Quantum Hall effect in hybrid heterostructures based on graphene
Amalia Patane, University of Nottingham
- 09:40 Superconductors under very high pressure
Sven Friedemann, University of Bristol
- 10:00 Single photon emission from sulphur vacancies in monolayer MoS_2 :
insight from high-field spectroscopy
Andreas Stier, TU Munich
- 10:20 Superconducting 2D materials
Justin Ye, University of Groningen
- 10:40 **Discussion and feedback on future magnet design (ISABEL Work Package 9)**
Oliver Portugall, LNCMI-CNRS, Toulouse
- 11:00 Coffee break
- 11:30 **Plenary talk EMFL / HFML-FELIX user meetings**
Far-infrared, non-linear Ramsey spectroscopy applied to donors in silicon at high
magnetic field
Ben Mordin, University of Surrey
- 12:30 Lunch
- 14:00 HFML-FELIX / ISABEL Workshop**
The Combination of High Magnetic Fields and Free Electron Lasers



2. Welcome presentations

The joint EMFL / HFML-FELIX user meeting started with a warm welcome by Britta Redlich, director of HFML-FELIX and a plenary talk entitled “*Gas-phase ion fluorescence spectroscopy – Seeing the light*” given by Steen Brøndsted Nielsen from Aarhus University.

The EMFL part of the meeting was then opened by Charles Simon, chairperson of the EMFL Board of Directors and director of LNCMI who presented recent technological developments and scientific highlights from EMFL. In addition, he provided an overview of the projects performed at EMFL, some recent development related specifically to ISABEL, and discussed EMFL's global strategic goals and initiatives.

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Below, some details of Charles Simon's presentation:

a) Operation facilities & output

The number of projects requested and executed at the EMFL is increasing again and has started to return to a pre-covid situation. However, since there are often typically 1-2 years between the execution of a project and the publication of the results, the output in 2022 measured as number of publications is still significantly below the pre-pandemic level but we are confident that this will soon increase again.

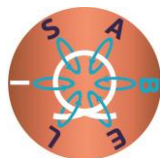
In 2022, 189 proposal were executed, 150 peer-reviewed papers were published and 7 PhD theses were defended.

b) Networking activities

The period since the last user meeting in Grenoble was also the year to resume EMFL network activities. It started in June 2022 with the annual EMFL user meeting held at LNCMI in Grenoble, France, where a part of the EMFL users were again able to meet on-site and the larger rest joined online. In September 2022, the large majority of the staff of all four EMFL facilities came together in Kerkrade, the Netherlands and an EMFL school was held at the same location directly afterwards. In Mai 2023, a Regional Meeting of the community of Polish researchers involved in high-magnetic-field research was held at the University of Science and Technology in Wroclaw, Poland.

c) Technical developments

- HLD developed and commissioned several new user magnets:
 - A 100 T / 10 ms / 12 mm bore triple-coil magnet
The inner and middle coil were already wound in June 2023, the outer coil was in production)
 - New user-demand magnets:
 - 55 T / 150 ms / 20 mm (magnetocaloric effect)
 - 60 T / 25 ms / 16 mm (magnetization)
 - 70 T / 150 ms / 20 mm (with cooling channels)



- The installation and commissioning of the 43 T hybrid magnet at LNCMI Grenoble is progressing further, the commissioning is expected for the end of 2023. Additionally, in 2024, LNCMI Grenoble will upgrade its maximum power from 24 MW to 30 MW, which will enable the lab to reach higher fields and to also further optimize the overall power consumption.
- At HFML in Nijmegen, the 45 Tesla hybrid system project is ongoing with final tests of the cryostat planned towards the end of 2023 and commissioning of the system in the course of 2024.

d) EMFL strategic goals

EMFL strives for scientific excellence for the in-house and user research programs in a maximum number of research areas and aims to improve the high-field infrastructure and instrumentation, including superconducting magnet technology and the combination with other large-scale Research Infrastructures.

In order to reach these objectives, EMFL has developed several measures designed to enhance the scientific and socio-economic impact of EMFL as a whole. For example, supported by their stakeholders, EMFL is working on an expansion of its membership and on an improvement of the communication and outreach activities. With this it aims to enhance the awareness among scientists and the general public on the excellent science, technology, and education done at EMFL. Additionally, at the moment seven regional facilities have joined EMFL to further promote EMFL activities, provide information to (prospective) users and to organize regional workshops and training. The dual-access mode, where users can start high-field project at a regional facility and then move further to one of the large-scale EMFL facilities, is now well developed.

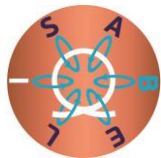
e) ISABEL developments

Within ISABEL, the development of new access modes has started (<https://emfl.eu/apply-for-magnet-time/>). A User Survey in 2021 helped to define the user needs in terms of facility access:

- **Dual access** (since call in April 2021): 5 project proposals submitted in 2022
- **First-time** access (since call in April 2022): 28 project proposals submitted in 2022
- **Long-term** access (since call in April 2023): 2 proposals submitted in 2022
- **Fast-track** access (since call in October 2022): 3 proposals submitted in 2022
- **Technical** access (since call in October 2022): 1 proposal submitted in 2022
- **Industrial** access mode (in preparation).

ISABEL secondments have resumed at full steam in 2022/23 and a new call will be launched in September 2023.

ISABEL is also working on a magnet-technology roadmap. For this purpose, a user survey was conducted and magnet-technology-related issues were discussed with users during the user meeting.



On the international level, strategical external connections are tightening (HiFF, CERN, FuSuMaTech, and the European MRI community).

In order to keep the community informed and to reach out to a wider audience, ISABEL has also developed various communication tools – website updates, social-media developments, flyers, etc.

f) Participation of EMFL in other initiatives

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- EMFL chaired the coordination board of ARIE (Analytical Research Infrastructures in Europe), which represents the main analytical infrastructures of scientific and technological excellence in Europe.

Within ARIE, there exist currently 3 EU proposals with ARIE contribution:

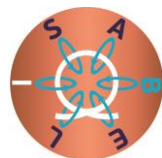
- o ReMade@ARI [HZDR] (Circular Economy), 14 Mio €, 4 years, 46 beneficiaries
- o CANServ [INSPIRE] (Precision Medicine), 15 Mio €; only small part to INSPIRE
- o eRI mote [DESY] (remote/digital access), 1.5 Mio €, 30 months, 8 beneficiaries

In order to enhance visibility, ARIE is also lobbying for Research Infrastructures at the EU level.

- Together with the European Spallation Source (ESS) (coordinator), the Extreme Light Infrastructure (ELI) and two industrial partners (Energy Pool and Alfa Laval) EMFL has successfully submitted a 5-M€ INRFATECH proposal named FlexRICAN (Flexibility in Research Infrastructures: Towards Carbon Neutral). In the next five years this project will help to increase the long-term sustainability of European Research Infrastructures and to meaningfully contribute to the resilience of the European electric-energy distribution system.

g) Announcement of EMFL Prize Winner 2023

Jochen Wosnitza, chair of the EMFL prize committee, announced this year's EMFL prize-winner, Jake Ayres from the University of Bristol, UK. After the prize-awarding ceremony, Jake presented highlights of his high-field research, performed in both continuous as well as pulsed magnetic fields, in a talk entitled "The Dual Character of Cuprate Superconductors".



3. Users' presentations

On Tuesday afternoon, the audience was then able to appreciate the excellent talks of the first group of invited speakers who presented their work done as users at one or more of the four EMFL facilities.

Yasuhiro Matsuda, University of Tokyo started off with presenting experiments performed in megagauss fields (pulsed magnetic fields above 100 T) and the quest for non-perturbative magnetic-field effects. This talk was also intended as a start to a future collaboration between EMFL and the High Magnetic Field Collaboratory in Japan.

In the second talk, Ana Akrap from the University of Fribourg gave an overview on magneto-optics in Weyl semimetals and Amirreza Ataei from the University of Sherbrooke concluded the session with an online talk entitled "Electrons with Planckian Scattering in Strange Metals".

After a coffee break, Raivo Stern chaired the EMFL User Committee Meeting (see section 5 of this report) and the results of the discussions were subsequently reported to the EMFL Board of Directors.

On the following morning, the program continued with five additional invited talks given by Alex Eaton from the University of Cambridge (Magnetic quantum oscillations and purity-boosted triplet superconductivity in UTe_2), Amalia Patane from the University of Nottingham (Quantum Hall effect in hybrid heterostructures based on graphene), Sven Friedemann from the University of Bristol (Superconductors under very high pressure), Andreas Stier from the Technical University of Munich (Single photon emission from sulphur vacancies in monolayer MoS_2), and Justin Ye from the University of Groningen (Superconducting 2D materials).

The final session of the EMFL user meeting chaired by Oliver Portugall (LNCMI) Toulouse was then devoted to a discussion with EMFL users and staff on future magnet designs.

4. Conclusion of the meeting and HFML-FELIX workshop

The joint EMFL / HFML-FELIX user meeting concluded with a plenary talk entitled "*Far-infrared, non-linear Ramsey spectroscopy applied to donors in silicon at high magnetic field*" given by Ben Mordin from the University of Surrey and on Wednesday afternoon and Thursday morning a HFML-FELIX / ISABEL workshop dedicated to the combination of High Magnetic Fields and Free Electron Lasers providing THz radiation was held.

5. User-Community meeting

After the previous successful hybrid user meeting in 2022 in Grenoble, the EMFL and its user community gathered again in hybrid format, but mostly with onsite users for its annual user meeting for 2023 in Nijmegen. The user community reacts very positively to this meeting format and encourages the EMFL Board of Directors (BoD) to consider a hybrid format also for future meetings.



The EMFL User Committee (UC) joins the community in congratulating Dr. Jake Ayres (University of Bristol) for the 2023 EMFL prize. His works demonstrate the high-quality research carried out within the EMFL facilities and their dedication to driving new scientific development.

During the annual meeting of the UC, which is open to all users to attend and provide feedback, recommendations from the user community were discussed and presented to the BoD. With the user community of EMFL steadily growing, the UC again repeats their request for a renewed, stronger mandate to better represent the interests of the high-field users. The UC emphasizes that the first priority is the satisfaction of user needs and the goal of performing world-class research. This priority implies a scientifically active staff with a significant amount of time dedicated to their in-house research and developing cutting-edge methods, driven by staff scientists own interests and collaborations with users. We are happy that this priority is well recognized and adopted by the BoD.

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A key part of the UC's work is to review prior feedbacks and how the EMFL BoD has incorporated them. The UC together with the attendees concluded a very slow if any progress in this area. Those users who requested detailed descriptions of available set-ups with resolution and documentation are asked to specify their needs with local contacts in the labs. Another continuous and steady progress is aimed at the users themselves. Without their clear communication of the needs for their experiments, the UC cannot help. UC stresses once again for all users should give sustentive feedback via the EMFL website.

Other issues discussed include general data protection rules (GDPR), open data strategy, and online safety trainings. Most of these activities are currently being run under the ISABEL project. Proposals were made for standardization of CAD software (which was set aside as all packages can generate STEP files that are seamlessly importable), part-week test experiments and/or for testing new perspective samples in advance of full proposals, and a dramatic increase in staff scientists that have a majority of their time for individual research.

The user community is still concerned about the shortage of "workhorse" equipment. To get a good understanding of the most widely used magnets, we ask the user community to participate actively in the respective survey from ISABEL at <https://emfl.eu/isabel/magnet-survey/>. The UC will then discuss strategies with the BoD on how to meet the needs of the community.

Finally, the UC acknowledged the organizing team from HMFL-FELIX and the BoD for arranging an excellent user workshop (supported by the ISABEL project) on the combination of high fields and THz radiation. In particular, the possibilities of the existing combination HFML-FELIX in Nijmegen and HLD-FELBE in Dresden were introduced. This rich program was well received by the user community.

Last but not least, the UC on behalf of all users would like to thank the EMFL laboratories and their staff for the help during the past years in carrying out our experiments and the return to full on-site mode as fast and as safely as possible, further strengthened by the implementation of the ISABEL project.