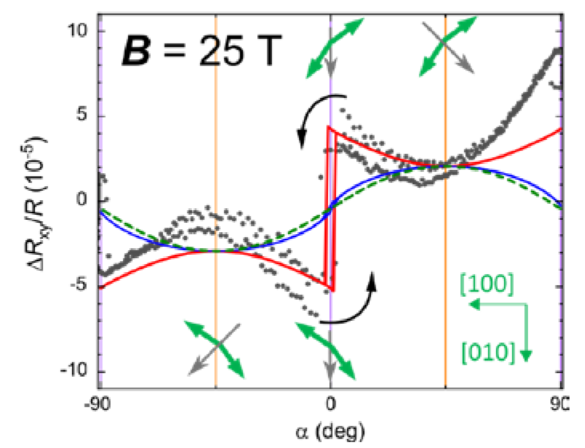
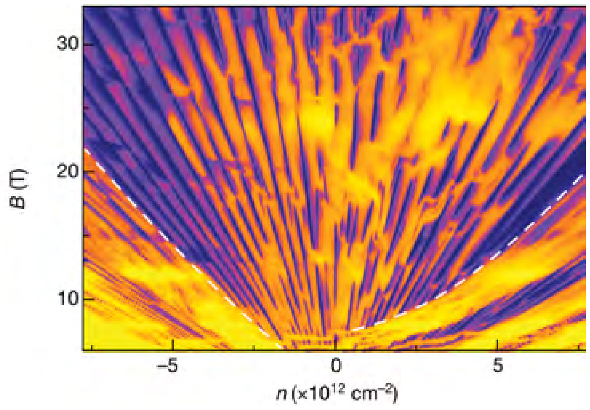
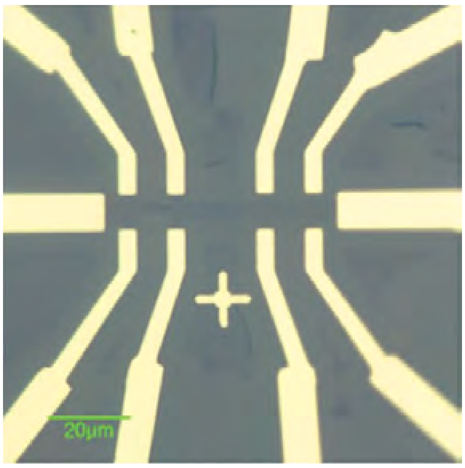
European Magnetic Field Laboratory

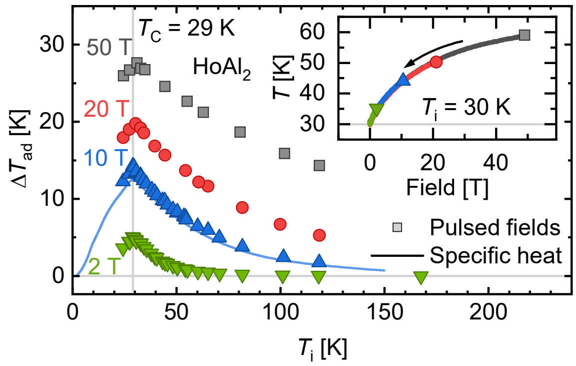
EMFLNEWS

N°3 2023









CONTENTS

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DEAR READER

It is with great pleasure that we present the October edition of EMFLNews, a great opportunity to share with you the latest exciting developments from our laboratory. In this issue, we spotlight recent scientific achievements of our research teams. As usual, we also have the privilege of introducing a distinguished member of our laboratories, and this time, we showcase Jeremy Sourd from Dresden.

This edition, in particular, focuses on two aspects close to our hearts within EMFL. Firstly, we highlight our continued commitment to supporting industrial activities involving intense magnetic fields. Additionally, we invite you to explore remarkable projects and achievements resulting from our collaboration with other European research infrastructures. Last year, we co-organized a seminar in collaboration with neutron sources at ILL in Grenoble and a second seminar on high-power lasers at LULI in Palaiseau. This year, we are delighted to inform you about our joint workshop with THz sources at RU/NWO in Nijmegen (EMFLNews No. 2/23), as well as with synchrotrons and X-FELs at HLD in Dresden. These collaborative meetings greatly contribute to knowledge exchange and the strengthening of our ties with our European counterparts.

Furthermore, we have had the opportunity to co-organize several regional workshops dedicated to intense magnetic fields in various countries, including Poland in Wroclaw (EMFLNews No. 2/23), the Czech Republic in Prague, and Switzerland in Basel. These events further enhanced our international partnerships, and we remain open to organizing similar seminars in other partner countries in the future.

We hope you will enjoy the vibrancy and achievements of EMFL as described in this issue.
On behalf of the entire team, I wish you a most enjoyable autumn.

Charles Simon
Director LNCMI
Chairman EMFL

MEET OUR PEOPLE

Jeremy Sourd, HLD

Since July 2023, I am doing my first postdoctoral stay at HLD. After my undergraduate years in Orsay (France), I did my PhD in Bordeaux (France) on an interdisciplinary topic between solid-state chemistry in the Institut de Chimie de la Matière Condensée de Bordeaux (ICMCB) and condensed-matter theory in the Laboratoire Ondes et Matière d'Aquitaine (LOMA). Our focus was on cerium Kondo lattices and iron-based superconductors. I discovered there a passionating world, and I wish I could learn and work more about f-electron compounds, metallic magnetism, and systems with competing interactions.

I am currently learning at HLD how to perform ultrasound experiments in static and pulsed fields, and I am quite interested in magnetic susceptibility and transport measurements. I also like to develop simple models and calculations, starting from a few assumptions about the excitation spectrum and symmetry considerations on the orbital content and the crystal structure of a given material.

There is a whole aspect of electronics and object-oriented programs that I am very happy to learn here, compared to my PhD where the focus was more on the chemical bonds, the orbitals, and the electrons. Furthermore, belonging to a user facility creates a very stimulating scientific environment that I am glad to have access to.

I am also very excited to integrate into the EMFL community and to meet some of you for a cup of coffee and, eventually, a collaboration.

Jeremy Sourd

THE GRAPHITE PRINCESS AND THE MOIRÉ PEA

Artem Mishchenko, University of Manchester, UK and Benjamin Piot, LNCMI Grenoble

Graphite is made out of a stacking of layers of carbon atoms arranged in a honeycomb lattice. This recurring pattern gets disrupted at the surfaces of the crystal which leads to the occurrence of "surface states" – fading waves as one delves deeper into the bulk, which have been the subject of several investigations.

In this work, "twistronics", where one manipulates the properties of – usually two-dimensional (2D) - crystals through moiré patterns created by specific relative alignments between them, is taken one step further and applied to the surface of three-dimensional graphite. More precisely, electrical transport in bulk Bernal-stacked graphite aligned with hexagonal boron nitride was studied under high magnetic fields, high enough to bring the magnetic length (giving the spatial extent of the electronic wave function) close to the moiré superlattice unit cell, as previously done to evidence the Hofstadter butterfly in graphene. Our findings revealed that the moiré pattern does not just alter the graphite surface states, it also has a significant impact on the electronic spectrum of the entire bulk of the graphite crystal. Drawing a parallel with the well-known fairy-tale of The Princess and The Pea, where the princess felt the pea right through the twenty mattresses and the twenty eiderdown duvets, the moiré influence extends from the surface all the way through graphite of over 40 atomic layers.

As can be seen in the Figure, we observe a unique 2.5-dimensional (2.5D) intertwining of surface and bulk states that we describe as a 2.5D Hofstadter butterfly, a fractal version of the 2.5D quantum Hall effect discovered earlier on thin graphite, originating from the formation of confined vertical standing waves in the quantum limit. In the present case, the standing waves in graphite are orchestrated by twistronics, leading to the spiral dance of electrons trapped between the top and bottom surfaces to be directed both by the strong magnetic field and the moiré pattern. The extension of the surface moiré potential deep into the graphite bulk states opens a route to bring new non-trivial physics (spin-orbit coupling, ferromagnetism, and superconductivity) into graphite via proximity effects, and gives new prospects for controlling electronic properties in graphite or other semimetals.

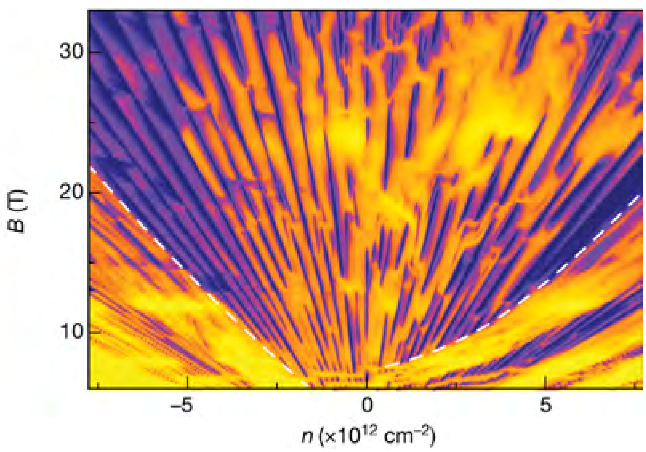

Figure: 2.5-dimensional Hofstadter butterfly. Color map of graphite's conductance (giving an image of the fractal electronic density of states) as a function of the magnetic field and the charge-carrier density. The white dashed curves indicate the transition from surface Landau levels to the bulk quantum regime.

Mixing of moiré-surface and bulk states in graphite, C. Mullan, S. Slizovskiy, J. Yin, Z. Wang, Q. Yang, S. Xu, Y. Yang, B. A. Piot, S. Hu, T. Taniguchi, K. Watanabe, K. S. Novoselov, A. K. Geim, V. I. Fal'ko, and A. Mishchenko, Nature **620**, 756 (2023).

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MAGNETIC-FIELD-DEPENDENT ANISOTROPY IN THE ANTIFERROMAGNETIC STRUCTURE OF CoO | Pt

Michał Grzybowski, Eindhoven University of Technology and University of Warsaw, and Uli Zeitler, HFML Nijmegen

Antiferromagnetic thin-film materials are robust against a magnetic field making them promising to be used in numerous spintronic applications. The magnetic properties of an antiferromagnet are governed by the competition between the magneto-crystalline anisotropy and antiferromagnetic exchange interactions. Conventionally, the anisotropy in antiferromagnetic materials is considered to be independent of the magnetic field.

Researchers from Eindhoven University of Technology, the Universities of Warsaw, Kraków and Mainz, the Polish Academy of Science, and HFML-EMFL have now shown that the magnetic anisotropy in antiferromagnetic films of CoO with an adjacent Pt layer actually does depend on the magnetic field. This observation was realized by the detection of hysteresis loops in the angular dependence of the spin-Hall magnetoresistance persisting up to the highest tested magnetic fields (30 T).

The hysteresis only appears for magnetic fields exceeding the spin-flop transition and for temperatures below the Néel temperature. This surprising behavior can be attributed to an unquenched orbital angular momentum in CoO which promotes a field-dependent magnetic anisotropy. As illustrated in the Figure, such a behavior cannot be explained by a simple macro-spin model nor a domain model. Rather, we have to describe it by a more complex so-called L model, where the field-induced tilting of the orbital momentum from the easy axis is included.

More generally, the findings of this work highlight the importance of magnetic-field-induced anisotropy variations and the role of unquenched orbital moments in the physics of antiferromagnets and their potential applications.

Antiferromagnetic hysteresis above the spin-flop field, M. J. Grzybowski, C. F. Schippers, O. Gomonay, K. Rubi, M. E. Bal, U. Zeitler, A. Kozioł-Rachwał, M. Szpytma, W. Janus, B. Kurowska, S. Kret, M. Gryglas-Borysiewicz, B. Koopmans, and H. J. M. Swagten, Physical Review B **107**, L060403 (2023).

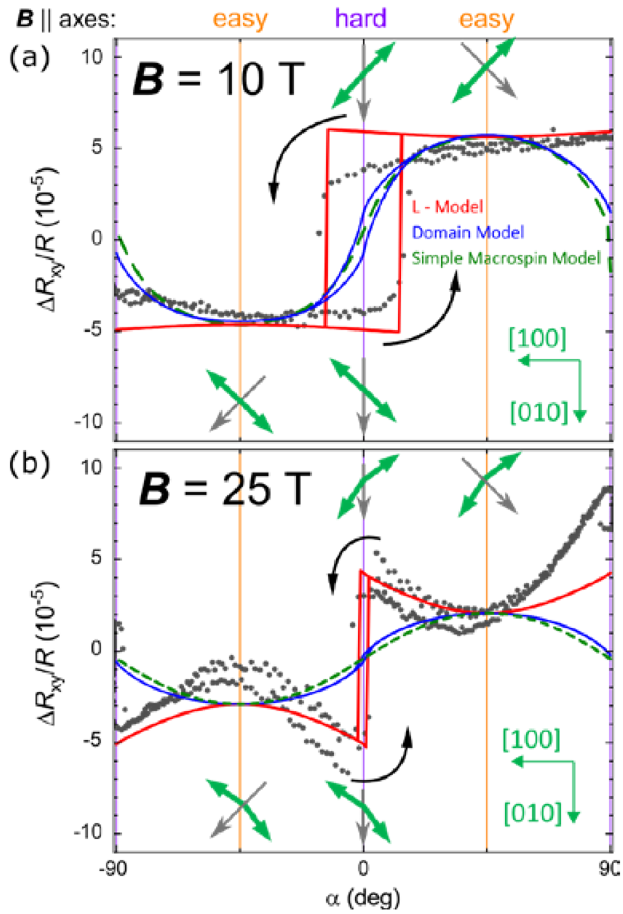

Figure: Angular dependence of the relative spin-Hall magnetoresistance for a CoO / Pt structure measured at (a) B = 10 T and (b) B = 25 T. The experimental data (black dots) is compared to a simple macro-spin model (green dashed line), a domain model (blue line) and L model (red line; see reference for more details).

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MAGNETIC AND ELECTRIC FIELD DEPENDENT CHARGE TRANSFER IN PEROVSKITE/GRAPHENE FIELD EFFECT TRANSISTORS

Walter Escoffier, Michel Goiran, Mathieu Pierre, LNCMI Toulouse, and Oleg Makarovsky, University of Nottingham, UK

Perovskite/graphene field effect transistors (FETs) have garnered substantial attention owing to their unique optical properties and potential for applications in electronics and optoelectronics, including ultra-sensitive photon detectors and FETs for metrology. The charge-transfer processes at the perovskite-graphene interface control the performance of these devices. However, a comprehensive understanding is still lacking especially in the presence of electric and magnetic fields.

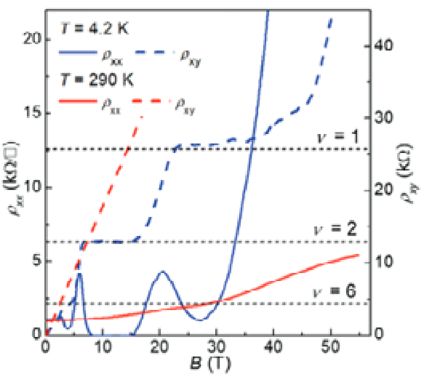
In this study, we explore the charge transfer in heterostructures of stable all-inorganic $CsPbX_3$ perovskite nanocrystals integrated with high-quality chemical vapor deposition (CVD)-grown graphene on SiO_2/Si substrates. Specifically, the performance of these devices is scrutinized under the influence of high electric fields (up to 3000 $kVcm^{-1}$) and magnetic fields (up to 60 T) applied perpendicular to the graphene plane.

We demonstrate the charge transfer to be markedly sensitive to the presence of electric and magnetic fields, and a slow (>100 s) charge dynamics. We also find a significant hysteresis in the charge transfer in magneto-transport experiments in constant (~0.005 Ts^{-1}) and pulsed (~1000 Ts^{-1}) magnetic fields. This aspect has not been widely explored in similar systems, and our work proposes a magnetic time constant (τ_{mag}) as a novel concept to explain and model the influence of magnetic fields on charge transfer in these heterostructures.

We also observe quantum Hall-effect plateaus in the transverse magnetoresistance at low temperatures, a testament to the unique quantum phenomena exhibited by graphene in the presence of high magnetic fields. This, along with other observations, signifies the multifunctional potential of perovskite/graphene devices. Moreover, our study yields a two-capacitor model as a valuable tool for describing and understanding the complex charge distribution between graphene and perovskite nanocrystals, further elucidating the hysteresis effects in device behavior.

By offering a deeper comprehension of the underlying physics, this work contributes to the integration of perovskite materials with graphene for applications in electronics and optoelectronics. High magnetic fields emerge as a crucial tool for probing the fundamental physics underpinning these systems.

a)



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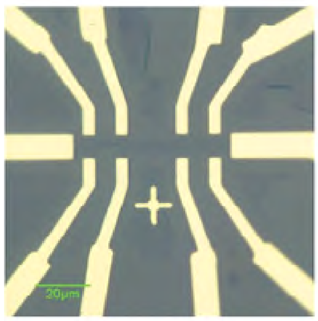

Figure: (a) Longitudinal (solid lines), ρ_{xx}, and transverse (dashed lines), ρ_{xy}, magnetoresistance at zero gate voltage, for T = 4.2 K (blue), and 290 K (red). Dashed black lines show positions of the quantum Hall-effect plateau with Landau index v = 1, 2, and 6. (b) Optical image of the graphene/$CsPb(Br/Cl)_3$ Hall-bar device.

Magnetic and Electric Field Dependent Charge Transfer in Perovskite/Graphene Field Effect Transistors, N. D. Cottam, J. S. Austin, C. Zhang, A. Patanè, W. Escoffier, M. Goiran, M. Pierre, C. Coletti, V. Mišeikis, L. Turyanska, and O. Makarovsky, Adv. Electron. Mater. **9**, 2200995 (2023).

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USING PULSED MAGNETIC FIELDS TO STUDY MAGNETOCALORIC MATERIALS

Catalina Salazar Mejia, HLD

Magnetic-refrigeration and hydrogen-liquefaction technology based on the magnetocaloric effect are emerging as climate-friendly alternatives to conventional methods. To make these applications a reality, the proper characterization of the respective materials is now more crucial than ever. It is necessary to determine the magnetocaloric and other physical properties under various stimuli such as magnetic fields and mechanical loads.

We demonstrated that pulsed magnetic fields are a powerful tool to study and characterize magnetocaloric materials. The high-field regime allows determining, for instance, the saturation value of the magnetocaloric effect and its maximum temperature span and we can induce the transition of the material over a wide temperature range.

We recently summarized an overview of the characterization techniques established at the Dresden High Magnetic Field Laboratory to measure the temperature change of a sample directly under applied fields that reach even beyond 50 T. The short pulse duration of a about 100 ms provides excellent adiabatic conditions during the experiment allowing the direct determination of the adiabatic temperature change of a material, ΔT_{ad}, without any heat loss. ΔT_{ad}, together with the isothermal entropy change, ΔS_T, are the most important parameters to characterize a magnetocaloric material.

In Figure 1, we present ΔT_{ad} measured up to 50 T for $HoAl_2$ as function of the initial temperature T_i. Laves phases are promising materials for gas liquefaction based on the magnetocaloric effect. Therefore, measurements down to low temperatures are necessary to study these materials. The inset shows the temperature change as function of applied field for 2, 10, 20, and 50 T pulses starting at T_i = 30 K. We found no saturation of ΔT_{ad} even up to 50 T. We also show a good agreement between the direct measurements and the values extracted from specific-heat data.

On the high-field characterization of magnetocaloric materials using pulsed magnetic fields, C. Salazar Mejía, T. Niehoff, M. Straßheim, E. Bykov, Y. Skourski, J. Wosnitza, and T. Gottschall, J. Phys. Energy **5**, 034006 (2023).

To understand fully the magnetocaloric behavior of materials in pulsed magnetic fields, we need to measure different physical properties simultaneously. As we show in Figure 2 for a Fe-Rh sample, we can measure simultaneously magnetostriction, magnetization and temperature changes. This gives a comprehensive picture of the material´s behavior.

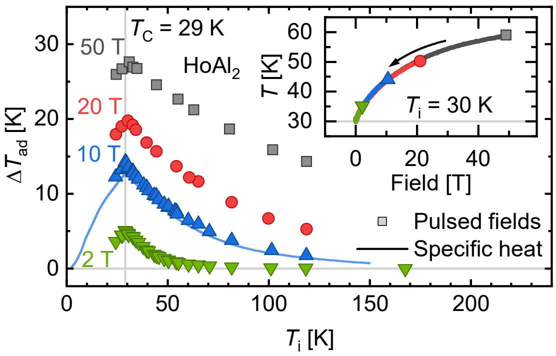

Figure 1: ΔT_{ad} measured up to 50 T for $HoAl_2$ as function of initial temperature T_i. Values calculated from specific-heat data (lines) are shown for 10 T. The inset shows the temperature change as function of applied field for 2, 10, 20, and 50 T pulses starting at T_i = 30 K.

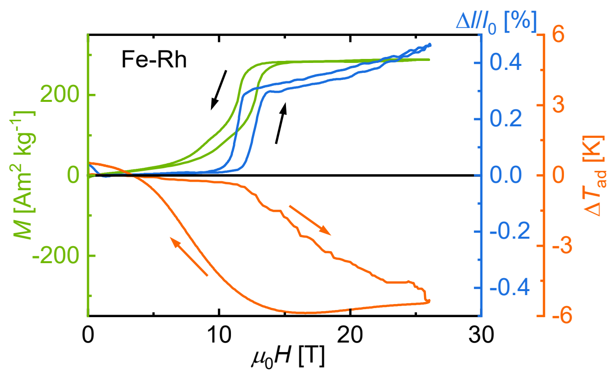

Figure 2: Magnetization M (green), relative length change $\Delta l/l_0$ (blue), and ΔT_{ad} (orange) as a function of field, measured simultaneously for a Fe–Rh sample at T_i = 200 K for a 26 T pulse.

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OPENING OF THE 30TH CALL FOR ACCESS

On October 16, 2023, EMFL launched the 30th call for proposals inviting researchers worldwide to apply for access to one of the large installations for high magnetic fields collaborating within EMFL.

The four facilities

- LNCMI - Grenoble - France: Static magnetic fields up to 36 T
- HFML - Nijmegen - the Netherlands: Static magnetic fields up to 38 T
- HLD - Dresden - Germany: Pulsed magnetic fields to beyond 95 T
- LNCMI - Toulouse - France: Pulsed magnetic fields of long duration to beyond 99 T and on the microsecond scale to beyond 200 T

run a joint proposal program, which allows full access to their installations and all accompanying scientific infrastructure to qualified external users, together with the necessary support from their scientific and technical staff.

Users may submit proposals for access to any of these installations by a unified procedure. You may find the online form for these proposals on the EMFL website.

www.emfl.eu/user

In the frame of the EU-funded ISABEL project, EMFL will continue to trial the novel **dual-access** procedure. Furthermore, EMFL will further proceed with the **first-time access** mode, with the aim of lowering the barrier for researchers to start using the EMFL facilities. Prospective users are encouraged to contact a staff member of EMFL who will be happy to provide support in preparing the proposals. Additionally, EMFL will offer reinforced on-site support and reimbursement of travel and accommodation expenses. This will allow for increasing the size and diversity of the user community.

There are three more recent access modes within ISABEL: The novel **fast-track access** mode is permanently open. A convincingly urgent scientific case may be addressed as request to the EMFL Board of Directors (BoD). The BoD will evaluate the request and decide within typically two weeks, but may optionally consult one or more EMFL Selection Committee members and check the feasibility with the facility manager and the local contact. Further, users may apply for **technical-development access**, dedicated to the interest of scientists wishing to develop and improve technical installations and metrological procedures that could also be of interest to other EMFL users. A tailored **long-term access** mode was set up in order to meet the demand for schemes such as complex high-level science cases, which require a sequel of high-field experiments. If positively evaluated, the user will obtain an extended amount of access over a two- to three-year period. Proposals to the latter two access modes must be submitted during the regular call periods and will be evaluated by the BoD as a special category.

Please note that each experiment carried out must be followed up by a progress report and your publication record filled out online on the EMFL website. Please be aware that this information will also be made available to the Selection Committee.

To improve our user program further, your feedback to the user committee is highly appreciated.
Please find the form on the EMFL website.
https://emfl.eu/SelCom/UserCommittee/feedbackform.php

The deadline for proposals for magnet time is November 15, 2023.

The EMFL Selection Committee will evaluate all proposals. Selection criteria are scientific quality (originality and soundness), justification of the need for high fields (are there good reasons to expect new results), and feasibility of the project (is it technically possible and are the necessary preparations done). We strongly recommended contacting the local staff at the facilities to prepare a sound proposal and ideally indicate a local contact.

Please do acknowledge any support under this scheme in all resulting publications with „We acknowledge the support of the HFML-RU (or HLD-HZDR or LNCMI-CNRS), member of the European Magnetic Field Laboratory (EMFL)." UK users should, in addition, add "A portion of this work was supported by the Engineering and Physical Sciences Research Council (grant no. EP/N01085X/1)."

- You may find more information on the available infrastructures for user experiments on the facility websites.

www.hzdr.de/hld
www.lncmi.cnrs.fr
www.ru.nl/hfml

EMFL
European Magnetic Field Laboratory

The EMFL develops and operates world class high magnetic field facilities, to use them for excellent research by in-house and external users.

EMFL PARTICIPATIONS IN INDUSTRIAL EXHIBITIONS

With the goal of strengthening relations with industries that are in need for research activities pursued in the EMFL facilities, EMFL decided on active measures to advertise the industry-related know-how, initiate promising collaborations, and establish new contacts with companies open for this endeavor. One of the measures is the active participation in important industrial fairs dedicated to the field. The ISABEL Horizon 2020 project made this goal a priority. Since 2021, a project team has attended major events and congresses around Europe.

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> **2021**
- Rendez-Vous Carnot – Lyon (November)

> **2022**
- Wire Düsseldorf – Düsseldorf (June)
- Ind Tech 2022 – Grenoble (June)
- Big Science Business Forum – Granada (October)
- Rendez-Vous Carnot – Paris (October)

> **2023**
- Metrology congress - Lyon (March)
- Hannover Messe – Hannover (April)
- Rendez-Vous Carnot – Lyon (October)

As a result, more than 60 new contacts were initiated and numerous companies contacted EMFL to evaluate possible collaboration. Some of these contacts already led to cooperation contracts and research orders. Researchers and engineers from LNCMI, HZDR, and HFML contributed to these events and allowed for all these fruitful exchanges and new contacts.

This activity is supported by the project ISABEL that received funding from the European Union's Horizon 2020 research and innovation programme under GA n°871106.

REGIONAL MEETING ON RESEARCH IN HIGH MAGNETIC FIELDS IN PRAGUE

A regional meeting, held by our ISABEL project partner, the Materials Growth and Measurement Laboratory (MGML), took place September 6 – 8, 2023, at the Faculty of Mathematics and Physics of the Charles University in Prague.

Besides a number of lectures dealing with science done using high magnetic fields, further presentations during the workshop covered general information on the EMFL facilities and their operation. The latter covered the EMFL operation as a whole as well as information on each EMFL facility individually. This included the EMFL user operation and modes of access.

As excursion highlights, the participants were able to visit all three sites of the MGML research infrastructure in Prague.

The workshop attracted 38 participants from several universities and research institutions in the Czech Republic (Charles University, Masaryk University, University of West Bohemia, Institute of Physics of the Czech Academy of Sciences) and from other countries (Poland, Germany, and France).

EMFL SESSION DURING THE SWISS PHYSICAL SOCIETY ANNUAL MEETING

Swiss researchers benefit from access to EMFL allowing them to perform various experiments every year at the different locations of its large-scale facilities. It enables these Swiss scientists to execute research at the forefront of science. This was the motivation leading to the organization of the special session „Magnetic Fields for materials research" at the annual meeting of the Swiss Physical Society (SPS) and Austrian Physical Society, held in Basel on September 4 – 8, 2023. This annual gathering was selected for its large number of participants with more than 500 registrations – limiting at the same time the traveling efforts for potential future EMFL users – to highlight the remarkable impact of the EMFL on the Swiss and Austrian condensed-matter research.

During this event, Charles Simon, current chair of the Board of Directors of EMFL, presented the capabilities of the laboratories and their development plans. This, on the one hand, included the aim to reach even higher magnetic fields and, on the other hand, to become more sustainable, in particular with respect to its actual use of electric power. Advantages of accessing the high magnetic fields offered by EMFL were illustrated in the scientific talks given by Ana Akrap (University of Fribourg) and Matija Čulo (University of Zagreb). The two speakers discussed magneto-optic and magneto-transport experiments, respectively, performed at different EMFL facilities, in order to unveil the electronic band structure of two-dimensional semimetals and superconductors.

In a further invited talk, Alexander Steppke (PSI and University of Zürich) presented the progress of a collaboration with EMFL to provide pulsed magnetic fields at the Cristallina end-station of the Swiss Free Electron Laser (SwissFEL) for wide-angle x-ray scattering. The aim here is to reach magnetic fields up to 40 T within a repetition rate of minutes.

The well-attended session, chaired by the Swiss representative of the ISABEL project, Stefano Gariglio (University of Geneva), sparked various discussions, both on the science done at highest magnetic fields as well as on future opportunities and developments at EMFL.

FRONTIERS OF SYNCHROTRON AND XFEL RESEARCH AT HIGH MAGNETIC FIELDS

With financial support from the ISABEL EU project, this workshop will provide a forum for scientists to present and discuss the latest research results obtained using x-ray radiation sources and high magnetic fields. The workshop also provides an excellent opportunity for scientists and engineers to discuss the current state of the art of instrumentation and explore possible collaborations between participants and institutions. The workshop will cover topics such as:

- Current trends, challenges, and future perspectives in the field
- X-ray scattering and spectroscopy at high magnetic fields
- New sample materials perspectives
- New high-field x-ray instruments and technologies

This workshop will be held at Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Germany at November 8 – 10, 2023.
More information on the workshop is available at
https://events.hifis.net/event/699/

STRENGTHENING THE LINK BETWEEN RADBOUD UNIVERSITY / NWO AND HZDR

Since many years, strong links exist between HFML-FELIX at Radboud University (RU) and HLD as well as the ELBE facility at HZDR in Dresden. In Nijmegen, continuous high magnetic fields and pulsed infrared and THz light are generated, while Dresden is specialized in pulsed fields and continuous light. Both sites offer a unique combination of high magnetic fields and infrared free electron lasers. Scientists from the labs have been working successfully together for many years. Researchers and technicians exchange the latest knowledge and the labs cooperate within European networks such as FELs of Europe, LEAPS, and EMFL.

On October 5, 2023, representatives of HZDR, RU and NWO-I (Stichting Nederlandse Wetenschappelijk Onderzoek Instituten) signed a Memorandum of Understanding to strengthen the scientific and technological cooperation on high magnetic fields and free electron lasers.

Representatives of HZDR, RU, and NWO present during the signing of the Memorandum of Understanding. From left to right: Sebastian Schmidt (HZDR), Manfred Helm (HZDR), Britta Redlich (RU, HFML-FELIX), Jochen Wosnitza (HZDR), Job de Kleuver (NWO-I), Iwan Hollemann (RU), Diana Stiller (HZDR).

UPCOMING EVENTS

1 68th Annual Conference on Magnetism and Magnetic Materials (MMM 2023), Dallas, USA, October 30 - November 3, 2023.
https://magnetism.org/

2 12th International Conference on Highly Frustrated Magnetism 2024 (HFM24), Madras, India, January 8-13, 2024.
https://ge.iitm.ac.in/HFM-2024/

3 APS March Meeting, Minneapolis, USA, March 4-8, 2024.
https://march.aps.org/

4 DPG Spring Meeting of the Condensed Matter Section, Berlin, Germany, March 17-22, 2024.
https://berlin24.dpg-tagungen.de/

5 EMFL School 2024 - Science in High Magnetic Fields, Dresden, Germany, April 15-19, 2024.

6 International Conference on Science and Technology of Synthetic Electronics Materials 2024, Dresden, Germany, June 23-28, 2024.
https://icsm2024.de/

7 Research in High Magnetic Fields (RHMF 2024), Nijmegen, The Netherlands, June 25-28, 2024.
https://www.hfml.ru.nl/RHMF2024/

8 International Conference on Magnetism (ICM2024), Bologna, Italy, June 30 - July 5, 2024.
https://www.icm2024.org/

9 International Conference on the Physics of Semiconductors (ICPS 2024), Ottawa, Canada, July 28 - August 2, 2024.
https://uottawacpd.eventsair.com/QuickEventWebsitePortal/icps2024/info

10 Applied Superconductivity (ASC 2024), Salt Lake City, USA, September 1-6, 2024.
https://www.appliedsuperconductivity.org/asc2024/

Aerial view of Dresden

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The EMFL develops and operates world class high magnetic field facilities, to use them for excellent research by in-house and external users.

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