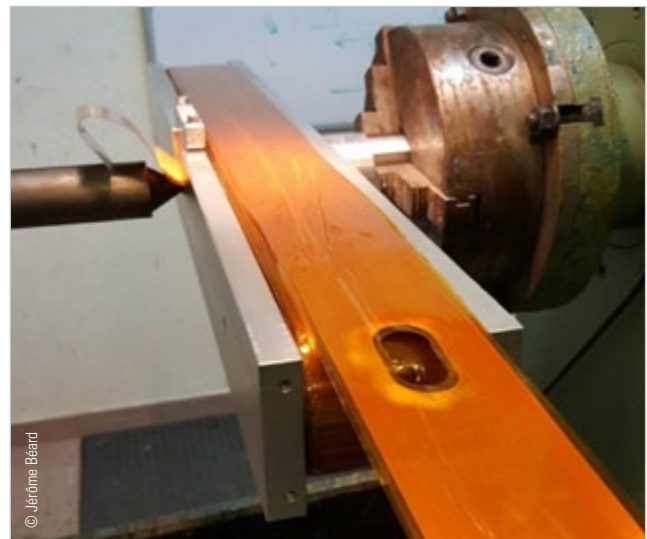
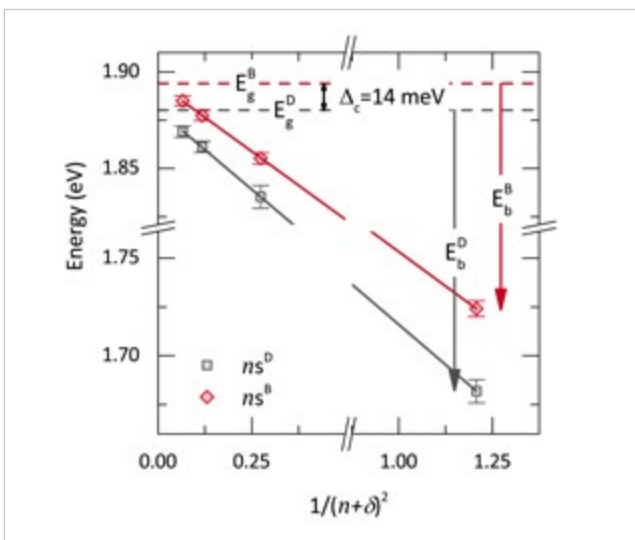
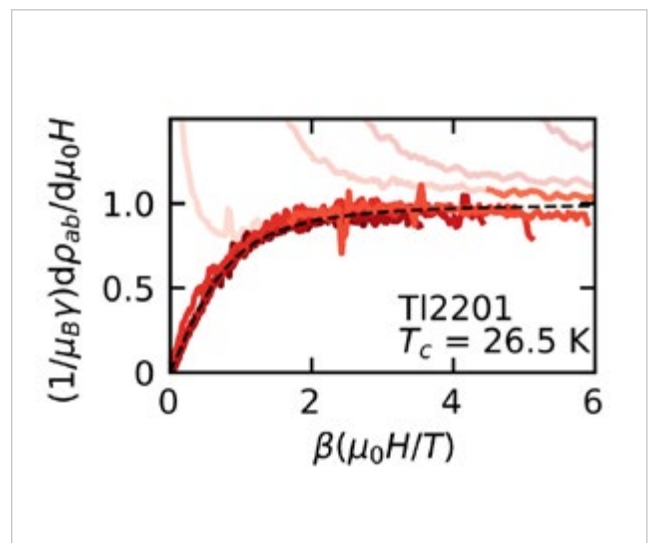
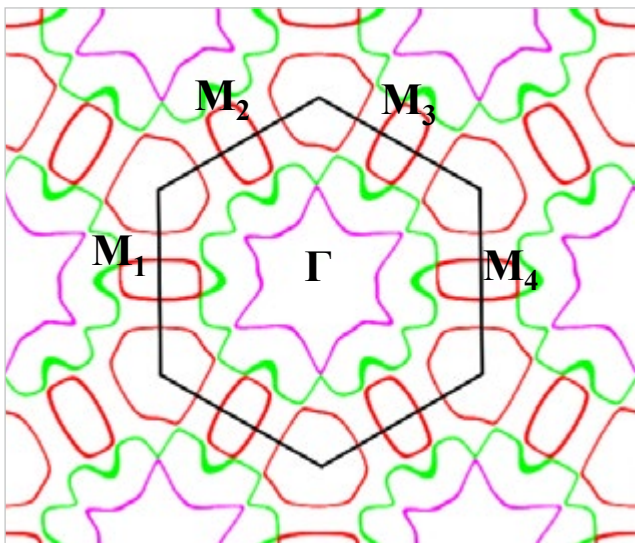


# EMFLNEWS

N°3 2021



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## DEAR READER

This EMFL Newsletter is again filled with many research and technical highlights, illustrating the excellent work performed within the European high magnetic field community. Also included is a report of a successful EMFL-industry collaboration, demonstrating how high-field installations can be used for product testing.

We also present the report of the EMFL user committee meeting, written by the committee chair Raivo Stern, after the very fruitful on-line EMFL user meeting of last June. We want to thank all of you for the valuable feedback, which we will use to make EMFL even more successful.

Please note that the new call for proposals has been opened (deadline November 15th), so do not forget to submit your application for magnet time. We hope to see many of you soon at one of the EMFL facilities,

Peter Christianen  
Director HFML  
Chairman EMFL

## MEET OUR PEOPLE

*Martine Heiligers, HFML-FELIX Nijmegen*

After a master's degree in medical biology with a minor in business management, I started working as an application specialist at Artinis, a company, which develops and sells equipment that uses near-infrared spectroscopy. One of the main components of my job was to keep track of developments in the field and find applications for our products. I travelled the world to visit conferences, letting everyone know what we do and how one can use it for research. Having worked there for five years, I was looking forward to exploring something new!

On July 1st, 2021, I started as business liaison officer at the HFML-FELIX laboratory in Nijmegen. In this role, I am actively involved in strengthening the bonds and cooperation between HFML-FELIX and external parties, such as industrial partners, the government, research facilities, and other relevant parties in the innovation eco-system.

The best part about this job is that I can combine my love for science with a networking role. I am the representative for HFML-FELIX within networks and European consortia. I am looking forward to visiting conferences and events in order to make HFML-FELIX even more well known. Especially after all this time working from home!

I enjoy helping to bridge the gap between academic researchers and organisations and I am looking forward applying my knowledge

and experience to take the collaboration between HFML-FELIX and the industry to a higher level.

I am excited to bring the same energy to EMFL and the ISABEL project.

Thanks for your time! I look forward to getting to know you better and working with you in the future.



 *Martine Heiligers, HFML-FELIX Nijmegen*

# RYDBERG SERIES OF DARK EXCITONS AND THE CONDUCTION BAND SPIN-ORBIT SPLITTING IN MONOLAYER WSe<sub>2</sub>

Piotr Kapuściński and Marek Potemski, LNCMI Grenoble

Strong Coulomb correlations together with multi-valley electronic bands in the presence of spin-orbit interaction are at the heart of studies of the rich physics of excitons in semiconductor structures made of monolayers of transition-metal dichalcogenides (TMD). These archetypes of two-dimensional systems promise the design of new optoelectronic devices. In intrinsic TMD monolayers (ML) the basic, intravalley, excitons are formed by a hole from the top of the valence band and an electron either from the lower or upper spin-orbit-split conduction subbands: one of these excitons is optically active, the second one is “dark”. Dark excitons become, however, optically active when a high in-plane magnetic field is applied to a TMD ML. This magnetic brightening allowed us to unveil the s-series of Rydberg dark exciton states in a WSe<sub>2</sub> ML, which appears in addition to a conventional bright exciton series. The comparison of energy ladders of bright and dark Rydberg excitons (see figure) is shown to be a method to experimentally evaluate one of the missing band parameters in TMD MLs: The amplitude, of the spin-orbit splitting of the conduction band. Its derived value in WSe<sub>2</sub> ML,  $\Delta_c = 14$  meV, is significantly lower than that commonly assumed, what calls for revision of theoretical calculations of electronic bands in TMD MLs. Moreover, our results suggest that the difference between the binding energies of bright and dark excitons can be fully explained by the difference in the masses of electrons in the two spin-orbit-split conduction bands, without referring to exchange interactions.

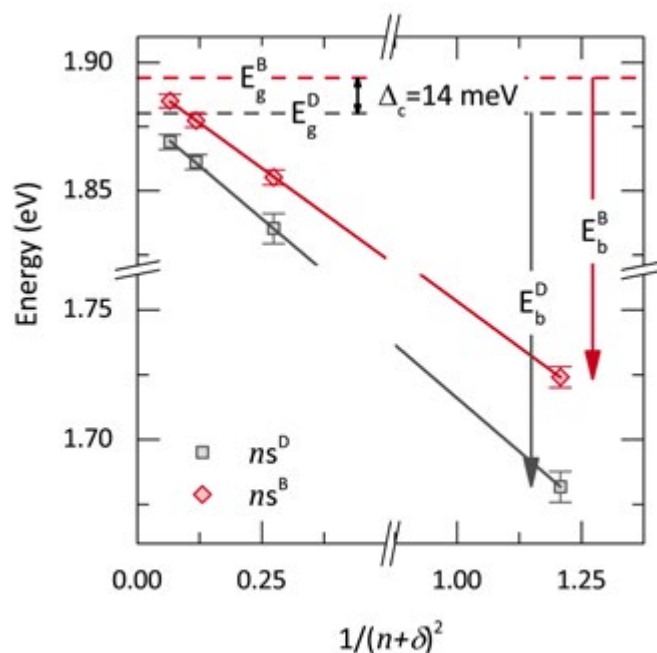


Figure: Energy positions of resonances in a WSe<sub>2</sub> monolayer, associated with bright (red diamonds,  $ns^B$ ) and dark (grey squares,  $ns^D$ ) exciton s-series as a function of  $1/(n + \delta)^2$ , where  $\delta = -0.09$ . Red and grey solid lines follow the model of Coulomb bound states in inhomogeneous medium (monolayer encapsulated in hBN). The dashed red and grey lines denote the band gaps for dark ( $E_g^D = 1.880$  eV) and bright ( $E_g^B = 1.894$  eV) excitons, while the red and grey arrows show the binding energies of bright ( $E_b^B = 171$  meV) and dark ( $E_b^D = 198$  meV) excitons, respectively. The conduction band spin-orbit splitting ( $\Delta_c = 14$  meV) is also indicated.

**Rydberg series of dark excitons and the conduction band spin-orbit splitting in monolayer WSe<sub>2</sub>,** P. Kapuściński, A. Delhomme, D. Vaclavkova, A. O. Slobodeniuk, M. Grzeszczyk, M. Bartos, K. Watanabe, T. Taniguchi, C. Faugeras, and M. Potemski, Commun. Phys. **4**, 186 (2021).

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# SIGNATURES OF INCOHERENT TRANSPORT IN THE STRANGE-METAL REGIME OF HIGH- $T_c$ CUPRATES

Jake Ayres, University of Bristol, Maarten Berben and Nigel Hussey, HFML Nijmegen

Researchers from HFML-EMFL, UK, Netherlands, and Japan studied the high-field magnetotransport properties of overdoped high- $T_c$  cuprates and found behavior that is strikingly different from that of ordinary metals. For the latter, the resistivity increases quadratically with temperature and magnetic field. In cuprates, however, a novel 'strange-metal' phase exists in which the resistivity depends linearly on both temperature and field. Curiously, this behavior is found to persist over a large range of parameters.

Combined linear-in-temperature and linear-in-field resistivity had only been observed previously at a singular quantum critical point where a second-order phase transition is suppressed to absolute zero. In the two cuprate families studied, however, this behavior was observed over an extended range of doping. Moreover, the strength of the magnetoresistance was found to be two orders of magnitude larger than expected from conventional orbital motion and insensitive to the level of disorder in the material as well as to the direction of the magnetic field relative to the electrical current. These features in the data, coupled with the temperature-field scaling properties, imply that the origin of this unusual magnetoresistance may not be the coherent orbital motion of conventional metallic charge carriers, but rather a non-orbital, incoherent motion from a different type of charge carrier whose energy is being dissipated at the maximal rate allowed by quantum mechanics.

Taking into account earlier Hall-effect measurements, the team believes they have uncovered compelling evidence for two distinct charge-carrier types in cuprates - one coherent, the other incoherent.

**Incoherent transport across the strange-metal regime of overdoped cuprates.** J. Ayres, M. Berben, M. Čulo, Y.-T. Hsu, E. van Heumen, Y. Huang, J. Zaanen, T. Kondo, T. Takeuchi, J. R. Cooper, C. Putzke, S. Friedemann, A. Carrington, and N. E. Hussey, *Nature* **595**, 661 (2021).

The key question to address now is which type is responsible for high-temperature superconductivity? Were it to be the latter, then this would signal an entirely new paradigm for superconductivity, one in which the strange metal takes center stage.

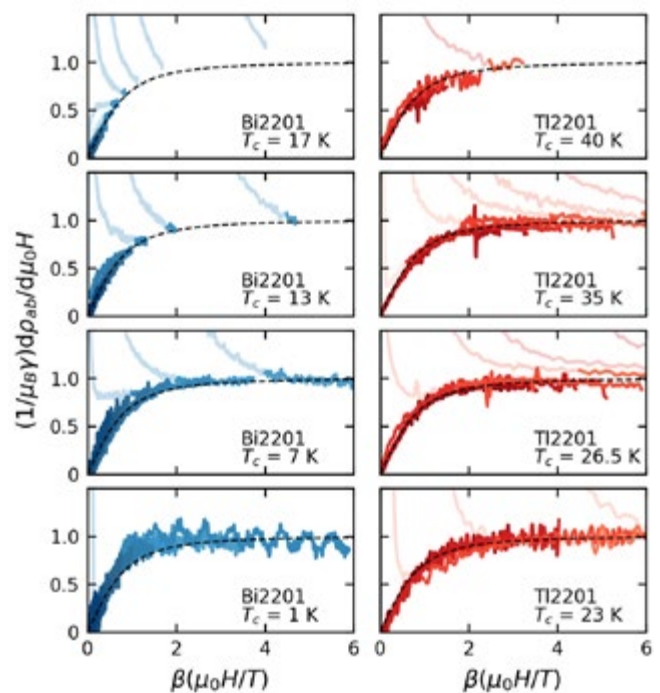


Figure: Scaled derivatives of the in-plane MR at different fixed temperatures between 4.2 and 60 K for various  $\text{Ti}_2\text{Ba}_2\text{CuO}_{6+\delta}$  (Tl2201) and La/Pb-doped  $\text{Bi}_2\text{Sr}_2\text{CuO}_{6+\delta}$  (Bi2201) single crystals with  $T_c$  values as indicated. To emphasize the similarity of the MR response of all the measured samples, both axes have been normalized. In this way, all the data collapse onto the same form given by the derivative of the function  $y = \sqrt{1+x^2}$  as indicated by dashed lines. Note that the sections of individual curves that reside within the vortex state are here plotted faintly, since only in the normal state can the quadrature MR be probed.

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# DESIGN OF A PULSED MAGNETIC DIPOLE FOR MAGNETIC LINEAR BIREFRINGENCE MEASUREMENTS

Jérôme Béard, LNCMI Toulouse

We have designed a novel pulsed magnetic dipole, called foil coil, which can deliver a transverse magnetic field of more than 10 T along a 0.85 m optical access operating without cryogenic equipment. This magnet is dedicated to linear magnetic birefringence measurements in the framework of the Biréfringence Magnétique du Vide (BMV) apparatus installed at LNCMI-Toulouse.

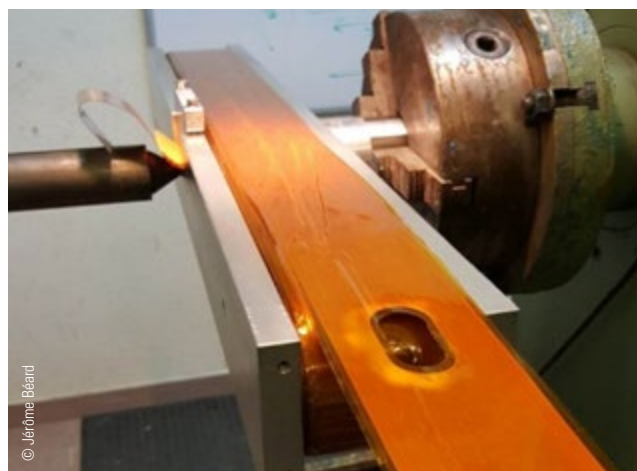
The magnet is based on the winding of a 500  $\mu\text{m}$  thick and 72 mm wide copper foil insulated with two layers of Kapton tape as shown in the figure. We wound about 100 meters of copper foil over a glass fiber/epoxy body with a racetrack shape, representing 50 layers of conductor. The 17 mm diameter optical access is provided by two holes in each turn in the insulated copper. Generating 10 T in about 6 ms allows us to operate the magnet at room temperature. This is the major difference to other pulsed magnets usually cooled in liquid nitrogen. Avoiding the need for a nitrogen cryostat, thus, the thermal insulation between the coil and the vacuum tube of the experiment permits to use the full access diameter of the magnet. This design offers a very good symmetry of the generated magnetic field thanks to the homogeneous current distribution and the very small effect of the layer transition compared to a wire wound coil.

Once connected to one of the 3 MJ mobile banks of LNCMI, tests have been made up to 12.5 T. During scientific measurements, the maximum field is fixed to 11 T, providing a reasonable safety margin. The maximum field achievable by this magnet is limited by the buckling of the foil, mainly influenced by small faults in the winding, and is, therefore, hard to predict by a simulation.

We have proceeded to commission the magnet in the BMV apparatus. Some potential improvement in the design can be made to increase the efficiency or the ergonomics. First, an extra cooling to remove the heat from the magnet box can be installed. The repetition rate will be important to perform an experiment where hundreds of

pulses will be necessary. Our first prototype does not have an optimized cooling because the main objective was to generate at least 10 T over about 0.8 m at room temperature and in air. Actual cooling is due to natural convection and can be increased with a forced flow of air inside the box containing the magnet. A second modification is to optimize the pulse duration, probably by shortening it, either by adapting the actual capacitor bank or using another one available at LNCMI, without lowering the maximum field. A next step could be a modification in the design itself. For example, it is possible to cut the copper foil to concentrate the current density closer to the laser beam path, increasing the efficiency of the coil.

We have taken preliminary scientific data in vacuum during commissioning and first results look encouraging. We installed the new magnet successfully and the absence of a cryostat simplifies the whole apparatus. The BMV team is currently working to optimize optics and to diminish the overall noise by acoustically insulating the apparatus from the coil before pushing the magnetic field to its maximum.



› Figure: Photo of the foil coil during the winding showing one hole in the copper foil and in the Kapton tape. The holes have a racetrack shape to keep a circular access when the foil is wound over the cylindrical end of the magnet.

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**A novel pulsed magnet for magnetic linear birefringence measurements**, J. Béard, J. Agil, R. Battesti, and C. Rizzo, *Rev. Sci. Instrum.* **92**, 104710 (2021).

# LARGE LINEAR NON-SATURATING MAGNETORESISTANCE AND HIGH MOBILITY IN FERROMAGNETIC MnBi

Toni Helm, HLD Dresden

Currently, a group of semimetals excites the physics community due to its intriguing properties derived from massless chiral particles—so-called Weyl fermions. As a consequence of linear band crossings at the Fermi energy and a high Fermi velocity, massless Weyl states can be the origin of a giant, non-saturating transverse magnetoresistance (MR) when exposed to an external magnetic field. In recent years, several groups reported nonmagnetic examples of topological Weyl semimetals, such as TaAs, NbP, and WTe<sub>2</sub>, which show an enormous positive MR of more than 100,000 percent at low temperatures with a high charge-carrier mobility. However, ferromagnetic compounds rarely display a large MR because of localized electrons with a low Fermi velocity.

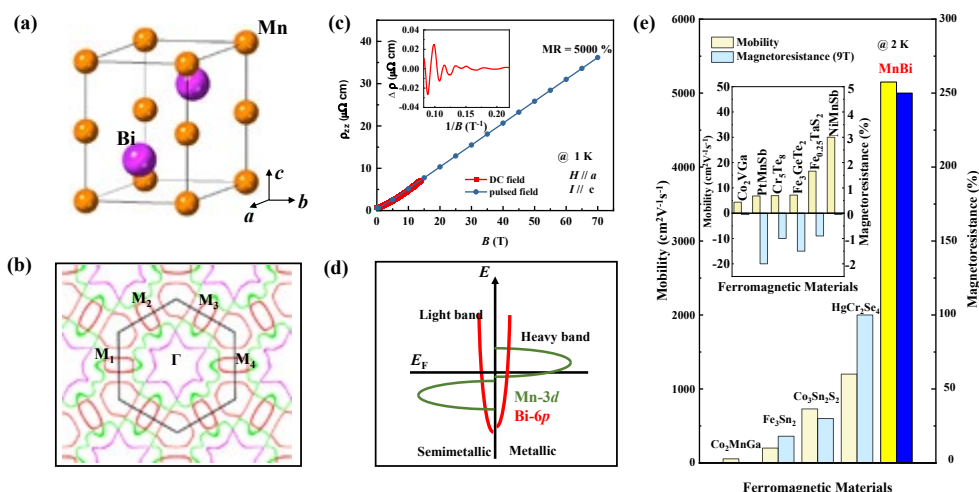
Nevertheless, scientists from the Max Planck Institute CPFS in Dresden, from USA, from Switzerland, and the HLD found a large, linear positive MR and high charge-

carrier mobility in high-quality single crystals of the ferromagnet MnBi (crystal structure and calculated Fermi surfaces are shown in figures 1a and 1b). Our study shows that the MR of MnBi strongly depends on the field orientation and reaches a maximum of 5000 % at 70 T for field aligned along the *a* axis and perpendicular to the current (figure 1c). Shubnikov-de Haas oscillations with a frequency of only 23 T (inset in figure 1c) indicate a tiny Fermi

surface with a light effective mass of the order of 0.4 times the free electron mass. We applied a two-band model to determine the charge-carrier mobilities. The large value of 5000 cm<sup>2</sup>V<sup>-1</sup>s<sup>-1</sup> at 2 K is almost the same for both, electron- and hole-like charge carriers, and is, thus, the highest mobility reported for ferromagnetic materials to date.

The behavior originates from a highly dispersive spin-polarized Bi band with a small effective mass. Figure 1d shows a schematic view of the density of states. Figure 1e provides a comparison of the highest reported mobilities and MR values for ferromagnets. Only a few examples with positive MR exist. The inset showcases selected FMs with the more usual negative MR and low mobilities.

This study demonstrates that also ferromagnets with a high Curie temperature can have high mobilities, which potentially is advantageous for the development of future spintronics applications.



## Large linear non-saturating magnetoresistance and high mobility in ferromagnetic MnBi

Y. He, J. Gayles, M. Yao, T. Helm, T. Reimann, V. N. Strocov, W. Schnelle, M. Nicklas, Y. Sun, G. H. Fecher, and C. Felser, Nat. Commun. **12**, 4576 (2021).

Figure: a) Crystal structure of MnBi (NiAs-type). (b) Calculated Fermi surface at  $k_z = 0$ . (c) Magnetoresistivity. (d) Schematic view of the density of states, showing light semimetallic bands in the spin-up channel and heavy metal bands in the spin-down channel. (e) Highest MR and charge-carrier mobility values for ferromagnetic materials. The inset exemplifies the low mobilities and negative MR for selected ordinary ferromagnetic materials.

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# OPENING OF THE 26th CALL FOR ACCESS

**Although all EMFL sites have resumed user operation, the COVID-19 crisis is still causing restrictions. Quite a number of accepted and scheduled proposals could not be performed, mainly due to travel restrictions. Nevertheless, the Board of Directors decided to stick to the regular policy that proposals will remain valid for one year. Users with older proposals, that could not be performed, are asked to resubmit them. This concerns proposals granted in the call 120 and older. This facilitates the handling of all proposals and provides maximum clarity to all users and funding agencies.**

The 26th call for proposals has been launched on October 15, 2021, 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](http://www.emfl.eu/user)

In the frame of the EU-funded ISABEL project, EMFL will continue to trial the novel **Dual Access** procedure.

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, 2021.

Proposals received after the deadline, which are considered of sufficient urgency, may be handled as they arrive and fit into any available time.

A 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 recommend to contact 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](http://www.hzdr.de/hld)  
[www.lncmi.cnrs.fr](http://www.lncmi.cnrs.fr)  
[www.ru.nl/hfml](http://www.ru.nl/hfml)



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.**

# REPORT FROM THE ANNUAL EMFL USER COMMITTEE MEETING 2021

*Raivo Stern, NICPB Tallinn*

After the cancellation of the user meeting in 2020 due to the worldwide pandemic shutdown, the EMFL and its user community adopted to the “new reality” and gathered online for its annual user meeting for 2021. The high participation of up to 140 people showed the desire for a meeting to exchange on current developments and scientific progress. The user community recognizes this large attendance as a positive adjustment and encourages the EMFL Board of Directors (BoD) to consider hybrid meetings in the future, as well.

Currently, the EMFL User Committee (UC) consists of 9 members. With the user community of EMFL steadily growing, the new UC repeats their request for a renewed, much stronger mandate to better represent the interests of the high-field users. The UC wants to stress that the first priority should be the satisfaction of the users’ needs and the aim to carry out world-class research.

A key part of the UC’s work is to review prior feedbacks and how the EMFL BoD has incorporated it. A point of review this year was the availability of information for users on accessible magnets, cryogenic infrastructure, and experimental techniques. While the UC together with the attendees can see progress in this area, particularly on the new EMFL website, a number of users requested a more detailed description with available resolution and documentation.

Another example of continuous and steady progress is aimed at the users themselves. Without their feedback and clear communication of needs for their experiments, the UC cannot help. With the support of the EMFL BoD, a new feedback form was developed. It

has not led to the expected outcome and the EMFL BoD decided to change to an immediate questionnaire as part of the user meetings. Many of the participants partook in this experiment. However, we still emphasize our call here to all users to give feedback via the EMFL website.

Further issues, which were discussed, include general data protection rules (GDPR), open data strategy, online safety trainings, and how to improve activities of dissemination.

To get a better understanding of the most widely used magnets, the user community is encouraged to get in contact and name the magnet they would like to experiment with the most. The user committee will then combine this input and discuss strategies with the BoD on how to meet the needs of the community best.

The UC welcomed two new initiatives at the EMFL. First, the new secondment activity allowing scientists and technicians to visit other laboratories and teams. Second, travel support for early-stage scientists from Europe and developing countries for attending the EMFL User Meeting and learning about the EMFL and experimental possibilities there.

Last but not least, the UC would like to thank the EMFL laboratories and their staff for the help during the past years in carrying out experiments on a remote basis. This new operational scheme has challenged both the users as well as their local contacts on finding new ways to communicate, long extra hours in the laboratory, as local contacts had to carry out experiments themselves, and logistics to get samples to the laboratories safely.



© HZDR/André Wirsig



# THE 43+T GRENOBLE HYBRID MAGNET: MAJOR ACHIEVEMENTS FOR FINAL ASSEMBLY

Rolf Pfister, Michael Kamke, Eric Verney, Mickaël Pelloux, Eyub Yildiz, Luc Ronayette, and Pierre Pignat, LNCMI Grenoble

The hybrid magnet, combining resistive and superconducting technologies and that is under construction at LNCMI-Grenoble, has reached important milestones in 2021 despite the Covid-19 sanitary crisis. After a thorough preparation phase, we successfully inserted the outsert superconducting coil of 1100 mm aperture into its He vessel (Figure 1). Supported by the company SDMS, we then realized the closure welds of the He vessel (Figure 2) following a strict procedure to not damage the coil, the instrumentation wires, and the ground electrical insulation. After a successful dye penetrant test of the welds, we will further perform pressure and leak tests. On June 30, Cryo Diffusion delivered the cryogenic line to LNCMI-Grenoble. We achieved an overall dummy assembly with the cryogenic line connecting the magnet cryostat to the cryogenic satellite that shall produce pressurized superfluid He (Figure 3). This step allowed us to ensure final mechanical adjustments prior to the final closure welds. We expect the superconducting magnet cooldown to start in the second quarter of 2022.



Figure 1: Successful insertion of the superconducting coil in the He vessel. In the most constraint part, the radial clearance is 0.4 mm.

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Figure 2: Closure welding of the He vessel with the superconducting coil inside requiring a strict control of the temperature to not damage the electrical insulation (contractor SDMS).



Figure 3: Trial assembly of the cryogenic line (contractor Cryo Diffusion) connecting the cryogenic satellite in the back to the superconducting magnet cryostat in the front.

This project is realized in collaboration with CEA-Saclay. It is supported by CNRS, Université Grenoble-Alpes, the French Ministry of Higher Education and Research in the framework of the "Investissements pour l'avenir & Equipements d'excellence" Equipex LaSUP (Large Superconducting User Platform), and the European Funds for Regional Development (FEDER) and Rhône-Alpes region.

# PARAGRAF GRAPHENE HALL SENSORS DELIVER HIGH-ACCURACY OPERATION IN FIELDS EXCEEDING 30 TESLA AND AT CRYOGENIC TEMPERATURES

Paragraf™ has leveraged its expertise in the manufacturing & implementation of graphene technology to make another major advance in Hall-sensor performance. The company has announced the availability of a new sensor range capable of unmatched sensitivity and linearity when placed in low-temperature environments and in strong magnetic fields.

Tested at the High Field Magnetic Laboratory (HFML) at Radboud University Nijmegen, the GHS-C sensors support operation in magnetic fields up to 30 T and at cryogenic temperatures (down to 1.5 K). The sensors deliver a degree of accuracy that has not previously been achievable under these conditions, sustaining non-linearity errors of significantly less than 1 % across the full measurement range.

The transformative magnetic-field measurement capabilities of the GHS-C devices are due to the graphene sensor elements. Graphene's inherent high electron mobility directly translates into high sensitivity capability, which is maintained across the entire magnetic-field range – making these devices far simpler to calibrate.

The two-dimensional nature of graphene also means high quality, repeatable, and accurate data is provided by the GHS-C sensor, with no hysteresis and immunity to in-plane stray fields. This is a step beyond conventional Hall sensors which have demonstrated asymmetry, producing different measurements depending on field direction.

A further advantage of the GHS-C range is their very low power operation resulting in power dissipation in the below nW range, compared to  $\mu$ W or mW associated with non-graphene Hall sensors.

Examples of suitable applications include low-temperature quantum computing, high-field magnet monitoring in next-generation



MRI systems, fusion-energy field control, particle accelerators, and other scientific and medical instrumentation. The sensors can also be directly used in fundamental physics experiments, e.g., quantum physics research, superconductivity, and spintronics.



To learn more, register for Paragraf's and HFML's joint webinar on 1 December 2021, @ 16.00 CET. For more info, visit [www.paragraf.com](http://www.paragraf.com)

## UPCOMING EVENTS

1. International Conference on Magnet Technology (MT27), Fukuoka, Japan, November 15-19, 2021.  
<http://csj.or.jp/conference/MT27/>
2. Joint Conference on Magnetism and Magnetic Materials (MMM) and the IEEE International Magnetics Conference (INTERMAG). New Orleans, USA, January 10-14, 2022.  
<https://magnetism.org/>
3. DPG Spring Meeting of the Condensed Matter Section, Regensburg, Germany, March 6-11, 2022.  
<https://www.dpg-physik.de/aktivitaeten-und-programme/tagungen/fruehjahrstagungen/2022>
4. APS March Meeting, Chicago, USA, March 14-18, 2022.  
<https://march.aps.org/>
5. International Conference on the Physics of Semiconductors (ICPS), Sydney, Australia, June 26- July 1, 2022.  
<https://www.icps2022.org/>
6. International Conference on Magnetism (ICM), Shanghai, China, July 3-8, 2022.  
<http://www.icm2021.com/>
7. 13th International Conference on Materials and Mechanisms of Superconductivity & High Temperature Superconductors (M2S-2022), Vancouver, Canada, July 17-22, 2022.  
<https://www.m2s-2022.com/>
8. 29th International Conference on Low Temperature Physics (LT29), Sapporo, Japan, August 18-24, 2022.  
<http://www.lt29.jp>
9. Spectroscopies of Novel Superconductors (SNS) 2022, Bangalore, India, December 12-16, 2022.  
<https://snsbangalore.iisc.ac.in/>



## VIRTUAL TOUR HFML-FELIX

HFML-FELIX now offers a 360 degree virtual tour to explore the facility. This offers the possibility to better prepare your visit and to have a closer look at all the unique equipment and set-ups available.

We always advise you to contact us if you are interested in using the facility to perform experiments. Explore our facility online via the link on [www.ru.nl/HFML-FELIX](http://www.ru.nl/HFML-FELIX).



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