

IMR-HZB workshop on material and quantum-beam sciences

IMR and HZB have agreed on a formal Memorandum of Understanding in May 2018 with the aim of promoting material science through advanced high magnetic field and quantum-beams such techniques. In the first workshop, which was held in Berlin, we exchanged information on the current status of each institute and discussed future prospects of collaboration.

The Institute for Materials Research (IMR) and the Helmholtz-Zentrum Berlin (HZB) have their long history of material science and condensed matter physics. Bearing in mind the outstanding and unique activities, especially those related to neutron scattering, high magnetic fields, and x-ray scatterings. IMR and HZB have considered the advantages that can be obtained from close cooperation in these fields of research and development and have agreed on a formal Memorandum of Understanding (MOU) in May 2018. Following subjects are listed for collaboration,

A. Materials' research using neutron scattering capabilities of IMR and HZB, including the high-field HFM-EXED facility, as well as common experiments at other neutron sources,

B. Materials research related to high magnetic field science at the high magnetic field laboratory for superconducting material at IMR,

C. High-field experiments at BESSY II synchrotron source at HZB,

D. Development of experimental capabilities for pulsed magnet experiments at the HZB synchrotron source BESSY II,

E. Sample preparation and characterization at the laboratories and facilities at IMR and at the Core-labs at HZB, and Development of sample environment for neutron and X-ray scattering experiments.

Along with this MOU, several pieces of collaborative research have been operated. For example, in September 2018, Dr. Prokhnenko visited IMR by single visit program and studies some of the magnetic oxide compounds at IMR high field laboratory. At the same time, the team has designed a compact pressure device which can be installed into 26 T high field magnet for neutron scattering at HZB. The device is under processing and will be used in experiments planned in the summer of 2019. Dr. Weschke Eugen and Prof. Nojiri, Prof. Nakamura (SPring-8 JASRI, IMR Guest Professor in FY2018-2019) are working together to set up a compact high field



Fig. 1 The first IMR-HZB collaborative workshop was held on 25th-26th May, 2019 in Berlin. Profs. Nojiri, Fujita and Dr. Ikeda joined to the workshop from IMR.

XMCD spectrometer at BESSY II by introducing the experienced technique of high field generation of IMR group. The members of neutron group, Prof. Fujita, Dr. Nambu, and Dr. Ikeda are also collaborating with neutron scattering team of HZB for various material and are going to perform neutron spin echo measurements at HZB in 2019.

To extend existing collaborations and to launch new projects among researchers in IMR and HZB, especially relating to the science and technology at neutron instruments in the research reactor JRR-3 and at POLANO in J-PARC, Tokai, we hold the first collaborative workshop. The workshop was organized by Dr. Prokhnenko and co-workers in HZB and held on 25th and 26th March 2019 at Berlin. In the workshop, we discussed the following subjects by introducing the current status of researches at each institute.

- 1) Exchange of sciences in the field of superconductivity, magnetism, and others,
- 2) Collaboration of developing high field setup in BESSY II,
- 3) Collaboration of neutron science at JRR3, transfer of techniques and



Fig. 2 View of experimental hall of BESSY II. After the workshop, we visited BESSY II. BESSY II. Is located in the Wilhelm-Conrad-Röntgen Campus of HZB, Berlin.

- 4) Collaboration of development of polarized neutron devices and focusing devices and those applications to POLANO,
- 5) Collaboration of developing multiple extreme conditions for neutron scattering,
- 6) Science and technical cases for Soft x-ray science at synchrotron rings.

Prof. Noriji, Fujita, and Dr. Ikeda attended the workshop from IMR, and there were more than 20 participants from HZB. We confirmed the importance of collaboration between HZB and IMR. Firstly, as was announced by the Japan Atomic Energy Agency (JAEA), JRR-3 reactor will be re-operated in FY 2020 after the unexpected shut down in FY 2011 due to the Great East Japan Earthquake. IMR manages three neutron instruments (2 spectrometers and 1 diffractometer) in JRR-3. However, there is not enough resource to run all these instruments with full activity. In particular, the lack of human resources such as experienced neutron scientists is very crucial. On the other hand, Berlin reactor research reactor will be decided to close at the end of FY 2019. Therefore, if HZB members, who have excellent experiences on neutron scattering experiment, could work together with IMR members by using JRR-3 spectrometers after the shut-down of Berlin reactor, we could expect to conduct high-

level scientific researches. Such a collaborative work will be extended to future researches at POLANO in J-PARC, which is now under the commissioning phase for installing polarization devices. The second benefit of IMR-HZB collaboration is to develop x-ray scattering techniques under pulse high magnetic field at BESSY II, which is a third-generation synchrotron radiation source, and to introduce experiences of BESSY II in the planning of commitment of IMR to Tohoku synchrotron x-ray storage ring, which will be built from 2019. In IMR, there are many x-ray users who have produced various interesting results at SPring-8 and at PF of KEK. However, for the contribution of IMR to Tohoku storage ring, we need to have clear visions for constructing beam lines and spectrometers dedicated to materials sciences. In the workshop, we discuss the strategic use of synchrotron x-ray on material science. New trends of research at BESSY II were presented and several unique instruments at BESSY II were introduced in the lab. tour after the workshop. Furthermore, we met the HZB scientific director, Prof. J. Lüning to introduce IMR and discussed future prospective of IMR-HZB collaboration.

The workshop was successful as the start-up meeting of collaboration. Holding a series of meetings will contribute to extending the collaborations based on the MOU between HZB and IMR. We are going to organize the 2nd workshop in Sendai in 2020 after the shutdown of the HZB reactor.

Keywords: high magnetic field, neutron scattering, x-ray diffraction
 Quantum Beam Metal Laboratory
 E-mail: fujita@imr.tohoku.ac.jp
<http://qblab.imr.tohoku.ac.jp>



Workshop on

Scientific Opportunities for Materials Research using Scattering Techniques

Helmholtz-Zentrum Berlin, March 25-26, 2019

Monday, March 25, 2019 / Wannsee

Lise-Meitner-Campus (LMC), Colloquium's room, H132

Program

Time	Speaker	Title / Activity
------	---------	------------------

10:00	B. Lake	Welcome
-------	---------	---------

10:05	B. Lake	Experimental Investigations of Quantum Magnets at HZB
-------	---------	---

10:35	M. Fujita	Recent Activities of Neutron Research Center in IMR
-------	-----------	---

11:05	K. Kiefer	Sample Environment at HZB
-------	-----------	---------------------------

11:35	Y. Ikeda	Current Status of Polarized Neutron Spectrometer POLANO
-------	----------	---

12:05		<i>Lunch</i>
-------	--	--------------

13:30		<i>HFM and Labs' Tour.</i>
-------	--	----------------------------

Participants: H. Nojiri, M. Fujita, Y. Ikeda

15:00	O. Prokhnenko	HFM/EXED Facility: Overview and Selected Scientific Examples
-------	---------------	--

15:30	K. Prokes	Neutron Studies in High Magnetic Fields: Application to Uranium Systems
-------	-----------	--

16:00	S. Chillal	Coupling of Charge Density Waves and Magnetism in TbTe ₃
-------	------------	---

16:30		<i>End of the first day</i>
-------	--	-----------------------------



Workshop on

Scientific Opportunities for Materials Research using Scattering Techniques

Helmholtz-Zentrum Berlin, March 25-26, 2019

Tuesday, March 26, 2019 / Adlershof

Wilhelm-Conrad-Röntgen Campus (WCRC), bldg. 13.10, room 0006 (“Kino”)

Program

Time	Speaker	Title / Activity
10:00	F. Kronast	Spatially Resolved Investigation of All-optical Magnetization Switching by XPEEM
10:30	H. Nojiri	Applications of High Magnetic Fields for X-ray scattering and Spectroscopy.
11:00	E. Schierle	Resonant Soft X-Ray Scattering at UE46-PGM1: Experimental Capabilities & Selected Applications
11:30	Ch. Schüßler-Langeheine	Charge-, spin- and energy transfer on fundamental time scales: The femtoslicing laboratory at BESSY II
12:00		<i>Lunch</i>
13:30		<i>Meeting with HZB Scientific Director J. Lüning</i> <i>Participants: H. Nojiri, M. Fujita, Y. Ikeda</i>
14:00		<i>BESSY tour</i> <i>Participants: H. Nojiri, M. Fujita, Y. Ikeda</i>
15:30		<i>End of the tour; Departure to LMC</i>